APPENDICES

Appendix I

U.S. Marine Mammal Stranding Network Members

Organization/Individual	Location	Authority	Rehabilitation (NMFS Species)
Greater Atlantic Region			
Allied Whale, College of the Atlantic	Bar Harbor, ME	SA	N/A
Marine Mammals of Maine	Harpswell, ME	SA	Pinnipeds
Seacoast Science Center	Rye, NH	SA	N/A
New England Aquarium (NEAQ)	Boston, MA	SA	N/A
International Fund for Animal Welfare (IFAW)	Buzzards Bay, MA	SA	N/A
National Marine Life Center, Inc.	Buzzards Bay, MA	SA	Pinnipeds
Marine Mammal Alliance Nantucket	Nantucket, MA	SA	N/A
Mystic Aquarium	Mystic, CT	SA	Pinnipeds, cetaceans by consultation
NY Marine Rescue Center	Riverhead, NY	SA	Pinnipeds
Atlantic Marine Conservation Society	Hampton Bays, NY	SA	N/A
Marine Mammal Stranding Center	Brigantine, NJ	SA	Pinnipeds
MERR Institute, Inc.	Nassau, DE	SA	N/A
National Aquarium	Baltimore, MD	SA	Pinnipeds
Maryland Department of Natural Resources	Oxford, MD	109(h)	N/A
Smithsonian Institute	Washington, DC	109(h)	N/A
Virginia Aquarium and Marine Science Center	Virginia Beach, VA	SA	Pinnipeds
Southeast Region			
North Carolina Wildlife Resources Commission Outer Banks Center for Wildlife Education	Corolla, NC	109(h)	N/A
North Carolina State University (NCSU)	Raleigh, NC	Designee of UNCW	N/A
Cape Hatteras National Seashore	Manteo, NC	109(h)	N/A
NMFS SEFSC- Beaufort Lab	Beaufort, NC	109(h)	temporary holding pool
North Carolina Maritime Museum	Beaufort, NC	109(h)	N/A

University of North Carolina at Wilmington (UNCW), Biological Sciences	Wilmington , NC	SA	N/A
North Carolina Aquarium at Fort Fisher	Fort Fisher, NC	109(h)	N/A
Coastal Carolina University	Conway, SC	SA	N/A
Lowcountry Marine Mammal Network	Charleston, SC	Designee of Coastal Carolina	N/A
NOS Charleston Laboratory	Charleston, SC	109(h)	N/A
Georgia Department of Natural Resources, Non-Game Endangered Wildlife Program	Brunswick, GA	SA	N/A
FWC Northeast Field Laboratory, Jacksonville	Jacksonville, FL	109(h)	N/A
Volusia County Environmental Management	DeLand, FL	Designee of HSWRI	N/A
Hubbs-Sea World Research Institute (HSWRI)	Orlando, FL	SA	N/A
SeaWorld Florida	Orlando, FL	SA	Pinnipeds, cetaceans
Florida Atlantic University, Harbor Branch Oceanographic Institute	Fort Pierce, FL	SA	N/A
Marine Animal Rescue Society	Miami, FL	SA	N/A
NMFS SEFSC- Miami Lab	Miami, FL	109(h)	N/A
Dolphins Plus Oceanside Marine Mammal Responders	Key Largo, FL	SA	N/A
FWC Southwest Field Laboratory, Port Charlotte	Port Charlotte, FL	109(h)	N/A
Mote Marine Laboratory	Sarasota, FL	SA	Cetaceans
Chicago Zoological Society-Sarasota Dolphin Research Program	Sarasota, FL	Designee of Mote Marine Lab	N/A
The Florida Aquarium	Tampa, FL	SA	N/A
FWC, Marine Mammal Pathobiology Laboratory	St. Petersburg, FL	109(h)	N/A
Clearwater Marine Aquarium	Clearwater, FL	SA	Cetaceans
University of Florida Marine Animal Rescue	Gainesville, FL	SA	N/A
Gulf World Marine Park	Panama City, FL	SA	Cetaceans
NMFS SEFSC- Panama City Lab	Panama City, FL	109(h)	N/A

Emerald Coast Wildlife Refuge, Inc.	Destin, FL	SA	N/A
Northwest Florida Aquatic Preserves Office, FDEP	Milton, FL	109(h)	N/A
Gulf Islands National Seashore- Florida District	Gulf Breeze, FL	109(h)	N/A
Central Panhandle Aquatic Preserve Office	Tallahassee, Florida	109(h)	N/A
FWC, Imperiled Species Management	Florida	109(h)	N/A
Dauphin Island Sea Lab	Dauphin Island, AL	SA	N/A
Institute for Marine Mammal Studies	Gulfport, MS	SA	Cetaceans
NMFS SEFSC-Pascagoula lab	Pasagoula, MS	109(h)	N/A
Mississippi Department of Marine Resources	Biloxi, MS	109(h)	N/A
Gulf Islands National Seashore- Mississippi District	Ocean Springs, MS	109(h)	N/A
Audubon Institute- Aquarium of the Americas	New Orleans, LA	SA	Cetaceans
Texas Marine Mammal Stranding Network	Galveston, TX	SA	Cetaceans
NMFS SEFSC-Galveston Laboratory	Galveston, TX	109(h)	N/A
Aransas National Wildlife Refuge	Austwell, TX	109(h)	N/A
SeaWorld San Antonio	San Antonio, TX	Designee of TMMSN	N/A
Texas State Aquarium	Corpus Christi, TX	Designee of TMMSN	Cetaceans
Puerto Rico Department of Natural and Environmental Resources	San Juan, PR	109(h)	N/A
Virgin Islands Division of Fish and Wildlife	Frederiksted, VI	109(h)	N/A
West Coast Region			
SeaWorld-San Diego	San Diego, CA	SA	Pinnipeds, cetaceans
NMFS-Southwest Fisheries Science Center	La Jolla, CA	SA	N/A
Pacific Marine Mammal Center	Laguna Beach, CA	SA	Pinnipeds

Marine Mammal Care Center of Los Angeles	Los Angeles, CA	SA	Pinnipeds
Los Angeles County Museum of Natural History	Los Angeles, CA	SA	N/A
Marine Animal Rescue	Topanga, CA	SA	N/A
California Wildlife Center	Malibu, CA	SA	Pinnipeds
Channel Islands Cetacean Research Unit	Santa Barbara, CA	SA	N/A
Channel Islands Marine and Wildlife Institute	Goleta, CA	SA	Pinnipeds
Moss Landing Marine Laboratories	Moss Landing, CA	SA	N/A
Long Marine Laboratory, University of California at Santa Cruz	Santa Cruz, CA	SA	Cetaceans
California Academy of Sciences	San Francisco, CA	SA	N/A
The Marine Mammal Center	Sausalito, CA	SA	Pinnipeds, cetaceans
Noyo Center for Marine Science	Fort Bragg, CA	Designee of CAS	N/A
Humboldt State University	Arcata, CA	SA	N/A
Northcoast Marine Mammal Center	Crescent City, CA	SA	Pinnipeds
Oregon Coast Aquarium	Newport, OR	SA	Pinnipeds
Oregon State University	Newport, OR	SA	N/A
Portland State University	Portland, OR	SA	N/A
Makah Tribe	Neah Bay, WA	109(h)	N/A
Feiro Marine Life Center	Port Angeles, WA	SA	N/A
Olympic National Park	Port Angeles, WA	109(h)	N/A
Dungeness National Wildlife Reserve	Port Angeles, WA	109(h)	N/A
Port Townsend Marine Science Center	Port Townsend, WA	SA	N/A
Cascadia Research Collective	Olympia, WA	SA	N/A
Washington Department of Fish and Wildlife	Olympia, WA	109(h)	N/A
World Vets	Gig Harbor, WA	SA	N/A
MaST Center Stranding Team, Highline Community College	Des Moines, WA	SA	N/A
Seal Sitters Marine Mammal Stranding Network	Seattle, WA	SA	N/A
SR3	Seattle, WA	SA	Pinnipeds

Sno-King Marine Mammal Response	Seattle, WA	SA	N/A
PAWS Wildlife Center	Lynnwood, WA	SA	Pinnipeds
Central Puget Sound Marine Mammal Stranding Network	Whidbey Island, WA	SA	N/A
Wolf Hollow Wildlife	Friday Harbor, WA	SA	Pinnipeds
Whatcom Marine Mammal Stranding Network	Bellingham, WA	SA	N/A
Whatcom Humane Society	Bellingham, WA	Designee of Whatcom MMSN	Pinnipeds
Alaska Region			
Petersburg Marine Mammal Center	Petersburg, AK	SA	N/A
Alaska Whale Foundation	Petersburg, AK	SA	N/A
Sitka Sound Science Center	Sitka, AK	SA	N/A
University of Alaska Southeast	Sitka, AK	SA	N/A
Chichagof Conservation Council	Tenakee Springs, AK	SA	N/A
University of Alaska Southeast	Juneau, AK	SA	N/A
Alaska Department of Fish and Game	Juneau, AK	109(h)	N/A
Dr. Rachel Berngartt	Juneau, AK	SA	N/A
US Forest Service	Juneau, AK	109(h)	N/A
Glacier Bay National Park	Glacier Bay, AK	SA	N/A
Alaska SeaLife Center	Seward, AK	SA	Pinnipeds, Cetaceans
Alaska Consortium of Zooarcheologists	Anchorage, AK	SA	N/A
Alaska Veterinary Pathology Services	Eagle River, AK	SA	N/A
Sun'aq Tribe of Kodiak	Kodiak, AK	SA	N/A
Aleut Community of St. Paul	St. Paul, AK	SA	N/A
Togiak National Wildlife Refuge	Dillingham, AK	109(h)	N/A
University of Alaska Fairbanks Museum	Fairbanks, AK	SA	N/A
Alaska State Parks	Juneau, AK	109(h)	N/A
Alaska State Parks	Kodiak, AK	109(h)	N/A
UAF MAP, SEAK	Ketchikan, AK	SA	N/A
UAF MAP, WA	Nome, AK	SA	N/A
North Slope Borough	Utqiagvik, AK	SA	N/A
Pacific Islands Region			

The Marine Mammal Center- Ke Kai Ola	Kailua-Kona, HI	SA	Pinnipeds
NMFS- PIFSC Ford Island	Honolulu, HI	SA	Pinnipeds
University of Hawaii	Honolulu, HI	SA	N/A
Hawaii Department of Land and Natural Resources	Honolulu, HI	109(h)	N/A

U.S. Large Whale Entanglement Response Network Members

Individual	Organization	Location	Responder Level
Greater Atlantic Region			
Mackie Greene	Campobello Whale Rescue Team	New Brunswick, Canada	5
Scott Landry	Center for Coastal Studies (CCS)	Provincetown, MA	5
David Mattila	CCS	Provincetown, MA	5
David Morin	NMFS, Northeast Regional Office, Protected Resources Division	Gloucester, MA	5
Brian Sharp	International Fund for Animal Welfare (IFAW)	Yarmouth Port, MA	5
Bob Lynch	CCS	Provincetown, MA	4
Everett Sacrey	CCS	Provincetown, MA	4
Lisa Sette	CCS	Provincetown, MA	4
Sue Barco	Virginia Aquarium & Marine Science Center	Virginia Beach, VA	3
Moira Brown	New England Aquarium (NEAQ)	Boston, MA	3
Jay Carroll	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Brent Chasse	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Tim Cole	NMFS, Northeast Fisheries Science Center	Woods Hole, MA	3
Lisa Conger	NMFS, Northeast Fisheries Science Center	Woods Hole, MA	3
Sean Dow	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Laura Ganley	University of Massachusetts	Burlington, MA	3
Phil Hamilton	NEAQ	Boston, MA	3
John Higgins	NMFS, Northeast Regional Office, Protected Resources Division	Gloucester, MA	3
Amy Knowlton	NEAQ	Boston, MA	3
Scott Kraus	NEAQ	Boston, MA	3
Colin MacDonald	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Michael Moore	Woods Hole Oceanographic Institution	Woods Hole, MA	3
Jooke Robbins	CCS	Provincetown, MA	3

Corrie Roberts	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Matthew Sinclair	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Erin Summers	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Jeff Thompson	Virginia Aquarium & Marine Science Center	Virginia Beach, VA	3
Sean Todd	Allied Whale, College of the Atlantic	Bar Harbor, ME	3
Jeff Turcotte	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Matthew Wyman	Maine Department of Marine Resources	Boothbay Harbor, ME	3
Monica Zani	NEAQ	Boston, MA	3
Southeast Region			
Clay George	Georgia Department of Natural Resources (GADNR)	Brunswick, GA	5
Chris Slay	Coastwise Consulting	Athens, GA	5
Mark Dodd	GADNR	Brunswick, GA	4
Tom Pitchford	Florida Fish and Wildlife Conservation Commission (FWC)	St Augustine, FL	4
Jamison Smith	Blue World Research Institute	Cocoa Beach, FL	4
Steve Burton	Florida Atlantic University	Fort Pierce, FL	3
Karen Clark	Outer Banks Center for Wildlife Education NC Wildlife Resources Commission	Corolla, NC	3
Andy Garrett	FWC	St. Petersburg, FL	3
Nadia Gordon	FWC	Jacksonville, FL	3
Katharine Jackson	FWC	St. Augustine, FL	3
Jennifer Jakush	North Atlantic Right Whale Project Florida Fish and Wildlife Conservation Commission Fish and Wildlife Research Institute	St. Augustine, FL	3
William Kolkmeyer	Georgia Department of Natural Resources	Brunswick, GA	3
William McLellan	University of North Carolina Wilmington	Wilmington, NC	3
Keith Rittmaster	North Carolina Maritime Museum	Beaufort, NC	3
Alicia Windham-Reid	Unaffiliated	Gainesville, FL	3

West Coast Region			
John Calambokidis	Cascadia Research Collective	Olympia, WA	4
Pieter Folkens	Alaska Whale Foundation	Bernicia, CA	4
Doug Sandilands	Sealife Response, Rehab, Rescue (SR3)	Seattle, WA	4
Jennifer Tackaberry	Cascadia Research Collective	Olympia, WA	4
Justin Viezbicke	NMFS, West Coast Regional Office, Protected Resources Division	Long Beach, CA	4
Keith Yip	SeaWorld Rescue	Poway, CA	4
David Beezer	Condor Express Whale Watching Tours	Santa Barbara, CA	3
Scott Bensen	NMFS, Southwest Fisheries Science Center	Moss Landing, CA	3
Ryan Berger	The Marine Mammal Center (TMMC)	Petaluma, CA	3
Dana Friedman	Pacific Marine Mammal Center	Mission Viejo, CA	3
Kathi George	The Marine Mammal Center (TMMC)	Benicia, CA	3
Frances Gulland	The Marine Mammal Center (TMMC)	Sausalito, CA	3
Jim Rice	Oregon State University	Newport, OR	3
Peggy Stap	Whale Entanglement Team	Moss Landing, CA	3
Peter Summers	Channel Islands Marine & Wildlife Institute	Santa Barbara, CA	3
Peter Wallerstein	Marine Animal Rescue	El Segundo, CA	3
Dennis Wood	Northcoast Marine Mammal Center	Crescent City, CA	3
Alaska Region			
Don Holmes	Petersburg Marine Mammal Center	Petersburg, AK	4
John Moran	NMFS, Auke Bay Laboratories	Juneau, AK	4
Kate Savage	NMFS, Alaska Regional Office, Protected Resources Division	Juneau, AK	4
Fred Sharpe	Alaska Whale Foundation	Seattle, WA	4
Barry Bracken	Petersburg Marine Mammal Center	Petersburg, AK	3
Gary Freitag	University of Alaska Fairbanks	Ketchikan, AK	3
Chris Gabriele	Glacier Bay National Park	Gustavus, AK	3
Melissa Good	Alaska Sea Grant Marine Advisory Program	Kodiak, AK	3

Steve Lewis	Chichagof Conservation Council	Tenakee Springs, AK	3
Janet Neilson	Glacier Bay National Park	Gustavus, AK	3
Sunny Rice	Petersburg Marine Mammal Center	Petersburg, AK	3
Scott Roberge	Petersburg Marine Mammal Center	Petersburg, AK	3
Suzie Teerlink	NMFS, Alaska Regional Office, Protected Resources Division	Juneau, AK	3
Sadie Wright	NMFS, Alaska Regional Office, Protected Resources Division	Juneau, AK	3
Pacific Islands Region			
Ed Lyman	NOS, Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)	Kihei, HI	5
Lee James	Unaffiliated	Lahaina, HI	4
Grant Thompson	NOS, Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)	Pu'unene, HI	4
Michelle Barbieri	NOAA, Pacific Islands Fisheries Science Center	Honolulu, HI	3
Jessica Lopez Bohlander	NOAA, Pacific Islands Fisheries Science Center	Honolulu, HI	3
Jens Currie	Pacific Whale Foundation	Wailuku. HI	3
Nicole Davis	NMFS, Pacific Islands Regional Office, Protected Resources Division	Kihei, HI	3
Rachel Finn	NOS, Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)	Kihei, HI	3
Bob Gladden	West Hawaii Aquatic Large Entanglement Response Network, Inc.	Kailua-Kona, HI	3
Beth Goodwin	Jupiter Research Foundation	Kamuela, HI	3
Ted Grupenhoff	NOS, Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)	Pukulani, HI	3
Cheryl King	Hawai'i Wildlife Fund	Kihei, HI	3
Gene Lafferty	NOS, Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS) volunteer	Kailua-Kona, HI	3

Jason Moore	NOS, Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)	Lahaina, HI	3
David Schofield	NMFS, Pacific Islands Regional Office, Protected Resources Division	Honolulu, HI	3
Liz Stahl	Unaffiliated	Kihei, HI	3
Jamie Thomton	NMFS, Pacific Islands Regional Office, Protected Resources Division	Kalaheo, HI	3
Paul Wong	NOS, Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)	Kihei, HI	3
Chad Yoshinaga	NOAA, Pacific Islands Fisheries Science Center	Honolulu, HI	3

Appendix II

Stranding Statistics

In this appendix, descriptions of the marine mammals that may occur in each NMFS region are presented, along with an overview of stranding information, including trends in strandings by numbers, species and seasonality, mass strandings, and UMEs. Most marine mammal species are wide ranging, and populations of some species routinely cross regional and national boundaries. Other marine mammals are considered resident, and remain within a relatively localized area.

Animals that strand live may be immediately released, transferred to a rehabilitation facility, humanely euthanized, or die naturally. Animals in rehabilitation may be released, sent to a public display or research facility (if deemed non-releasable), humanely euthanized, or they may die naturally. Significantly more pinnipeds strand each year than cetaceans. Figure 1 shows the total number of strandings (dead and live) nationwide from 2009-2018. The majority of stranded pinnipeds are alive when first reported, and many of the rehabilitated seals and sea lions are released back into the environment. The majority of cetaceans strand dead. Of the live stranded small cetaceans (odontocetes, excluding sperm whales [*Physeter macrocephalus*]), few are taken into a rehabilitation facility and very few are released. Only one baleen whale has ever been rehabilitated in the U.S. – a juvenile gray whale (*Eschrichtius robustus*) in California in 1997. Figures 2 and 3 summarize nationwide pinniped and cetacean stranding responses, respectively, from 2009-2018.

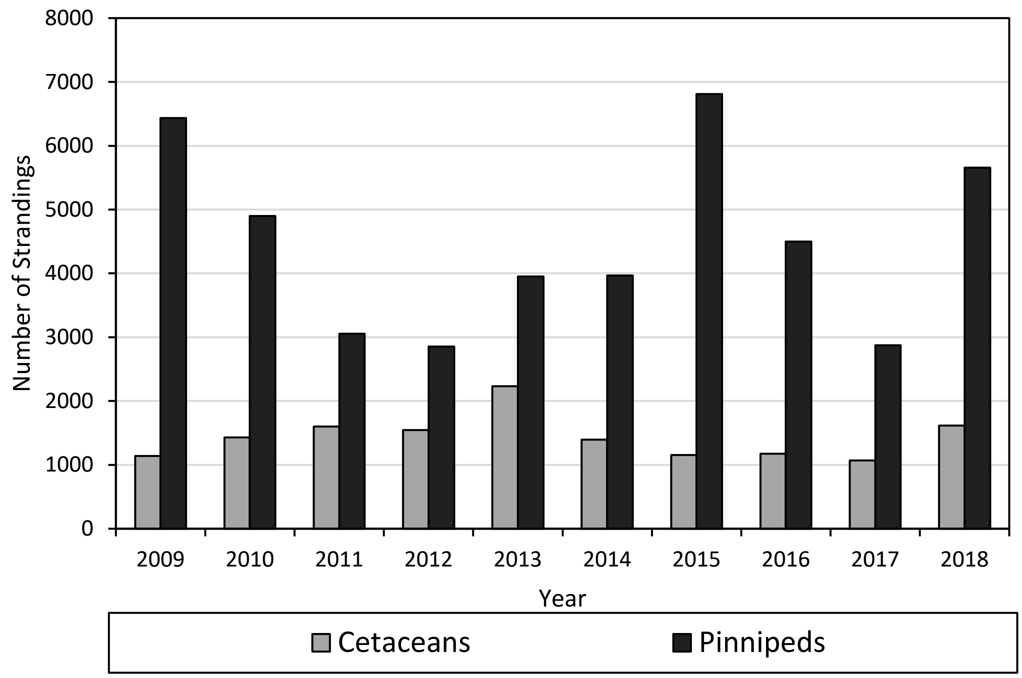

Figure 1. Nationwide Stranding Summary 2009-2018

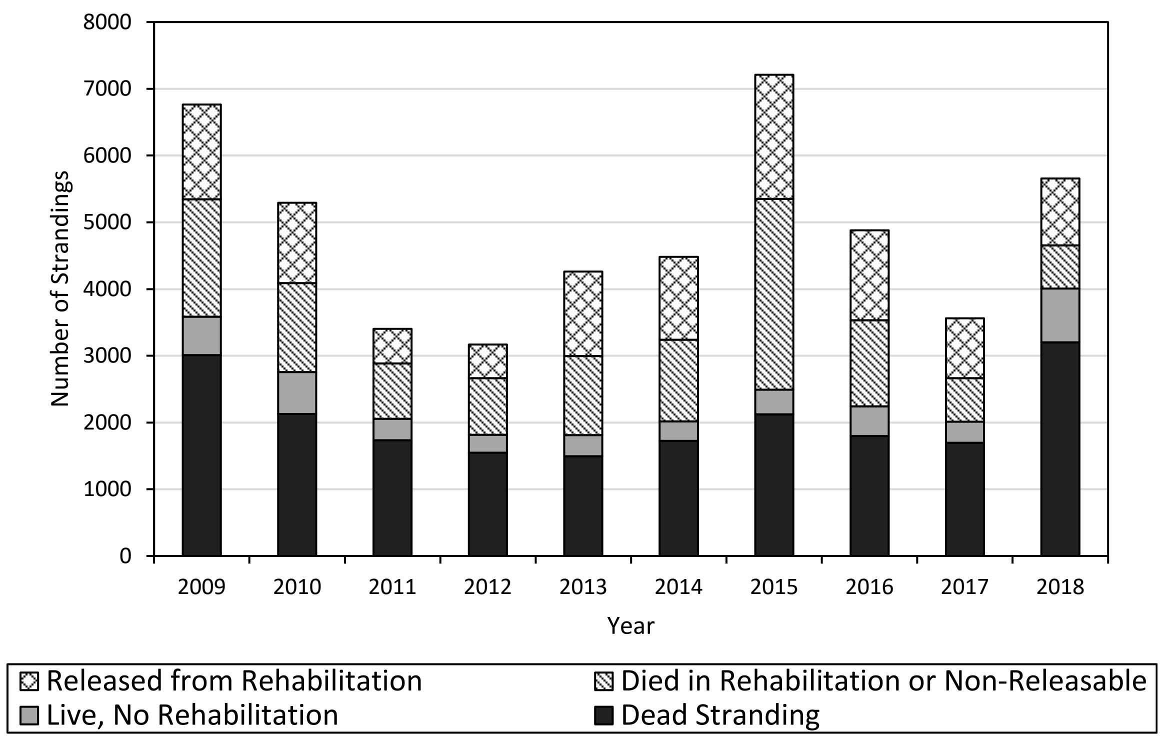

Figure 2. Pinniped Strandings Nationwide 2009-2018

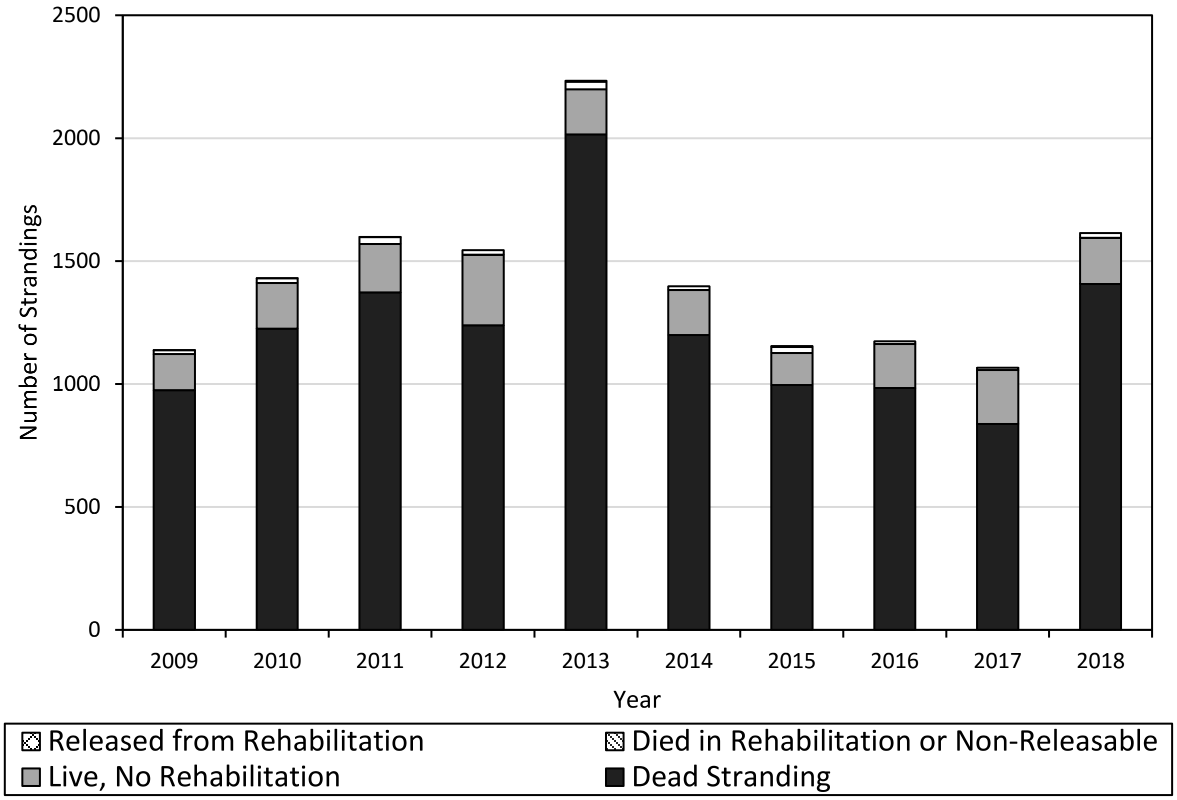

Figure 3. Cetacean Strandings Nationwide 2009-2018

NMFS Greater Atlantic Region

The NOAA Fisheries Greater Atlantic Region includes ten coastal states from Virginia to Maine. This region encompasses approximately 17,433 miles of coastline in the Northwest Atlantic, and includes large bodies of water such as The Gulf of Maine. The region contains several large cities (*e.g.*, New York, Boston), busy, ports and high traffic areas, in addition to a well visited coastline. Thirty-eight species of marine mammals have the potential to occur in the Greater Atlantic Region (see Appendix VI, Table 14) (Geraci and Lounsbury 2005). Five of these species are listed as endangered: the North Atlantic right whale (*Eubalaena glacialis*), fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculus*), sei whale (*Balaenoptera borealis*), and sperm whale. All threatened and endangered marine mammal species are listed as depleted under the MMPA. The Western North Atlantic coastal migratory stocks of bottlenose dolphins, which range from New Jersey to Florida, are also listed as depleted under the MMPA. Critical habitat for the North Atlantic right whale is designated for a large area within the Gulf of Maine and Georges Bank region, including the large embayments of Cape Cod Bay and Massachusetts Bay. (81 FR 4837).

The most commonly stranded pinniped species in the Greater Atlantic Region are harbor seals (*Phoca vitulina*), harp seals (*Phoca groenlandica*), hooded seals (*Cystophora cristata*), and gray seals (*Halichoerys grypus*). The total number of stranded pinnipeds remains relatively consistent year-on-year (excluding 2011 and 2018, years with disease outbreaks), however the frequency of ice seal (harp, hooded, and gray seal) strandings has been increasing in recent years. This is believed to be due to growth in the overall Northeast pinniped populations. Figure 4 depicts the number of reported pinniped strandings in the Greater Atlantic Region from 2009-2018. Eleven pinnipeds that stranded in this region were placed in public display facilities from 2009-2018.

The most commonly stranded cetacean species in the Greater Atlantic Region are bottlenose dolphins, harbor porpoise (*Phocoena phocoena*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*), common dolphins (*Delphinus delphis*), pilot whales (*Globicephala melas* and *G. macrorhynchus*), and minke whales (*Balaenoptera acutorostrata*). Other less common strandings include striped dolphins (*Stenella coeruleoalba*), Risso's dolphins (*Grampus griseus*), pygmy sperm whales (*Kogia breviceps*), dwarf sperm whales (*Kogia sima*), sperm whales, killer whales, humpback whales (*Megaptera novaeangliae*), North Atlantic right whales, and fin whales. Many of the large whale (*i.e.*, baleen whale and sperm whale) carcasses are discovered floating far offshore by aerial survey and fishery spotter planes, and never land on the beach unless towed in by the stranding network for sampling. Figure 5 shows cetacean strandings in the Greater Atlantic Region from 2009-2018. No cetaceans that stranded in this region were placed in public display facilities from 2009-2018.

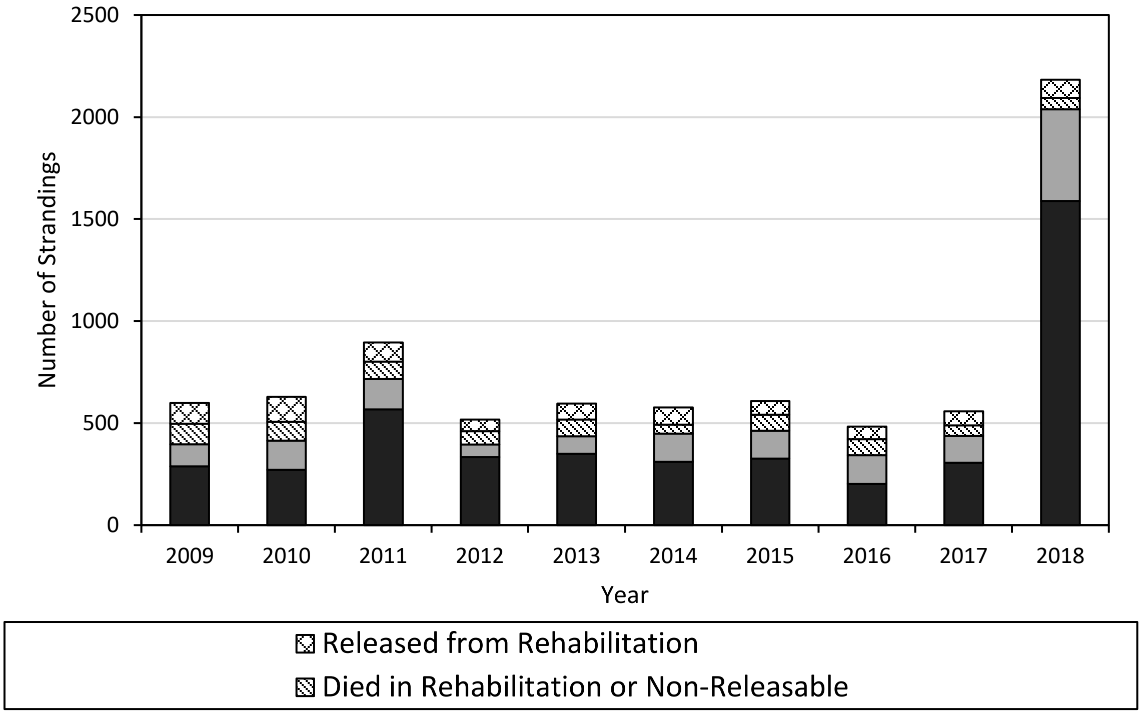

Figure 4. Greater Atlantic Region Pinniped Strandings 2009-2018

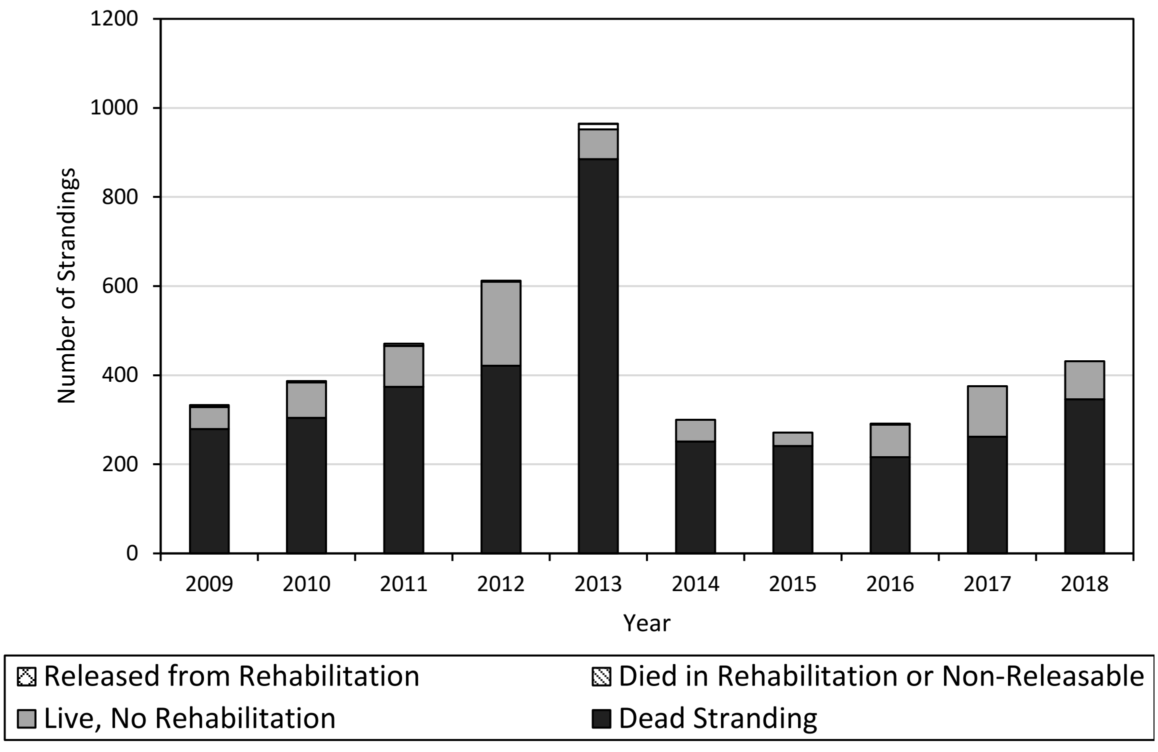

Figure 5. Greater Atlantic Region Cetacean Strandings 2009-2018

<u>Mass Strandings.</u> The Greater Atlantic Region has one of the highest incidences of live single and mass strandings of small cetaceans in the U.S. Mass strandings occur regularly in Massachusetts, particularly

on Cape Cod, resulting in the relatively large proportion of live cetacean strandings in Figure 5. Live cetacean stranding events (single or mass strandings) are more frequent in the Greater Atlantic Region during the winter.

Human Interactions. On average, over 50 fisheries interactions have been documented annually in the Greater Atlantic Region since 2009. Bottlenose dolphins are the small cetaceans most frequently impacted by these fishery interactions. Fishery interactions, as well as other forms of human interaction, have also been documented on stranded large whale and pinniped species. Evidence of entanglements (such as scars) has been documented on approximately 82.9 percent of all known North Atlantic right whales, and between 8.6 to 33.6 percent experience entanglements each year (Knowlton *et al*., 2012). According to the 2018 Stock Assessment, the minimum rate of annual human-caused mortality and serious injury to North Atlantic right whales averaged 5.56 per year between 2012 and 2016 (Hayes *et al*., 2019). Entanglement response activity reports to the MMHSRP have verified entanglements of right, humpback, fin, and minke whales. North Atlantic right whale mortalities from entanglements has increased from 21% between 1970 and 2002, to 51% between 2003 and 2018 (Sharp *et al*., 2019).

Ship strikes are also a threat to large whale species in the region. Eight confirmed ship strikes of Gulf of Maine humpback whales and nine confirmed ship strikes of Western North Atlantic fin whales occurred from 2009 to 2013 in the Greater Atlantic Region. Ship strikes have also been documented for sperm, sei, blue, minke, and North Atlantic right whales. (Henry *et al*., 2015; Jensen and Silber 2003). More than half (56%) of the recorded North Atlantic right whale ship strikes from 1975 to 2002 occurred off the coasts of the Northeast U.S. and Canada, and the mid-Atlantic area accounted for 22 percent (Jensen and Silber 2003). In the U.S. and Canada, vessel speed restrictions have been introduced in certain areas (Seasonal Management Areas), and vessel traffic rerouted, to reduce the likelihood of deaths and serious injuries resulting from collisions with vessels. However, entanglements and vessel strikes continue to impede the recovery of this critically endangered species (Sharp *et al*., 2019; Hayes *et al*., 2019).

Temporal Changes. Stranding patterns vary temporally as marine mammal distribution changes with the seasons. In the spring, strandings of gray seal pups and harbor porpoise (*Phocoena phocoena*) are common, as well as mass strandings of small cetaceans. Harbor seal pups, bottlenose dolphins, and large whale strandings are common in the summer. Ship strikes and entanglements are frequent in the summer. Fall strandings may include marine mammals in out of habitat situations. Common strandings in the winter include ice seals, which are often juvenile animals that fail to forage successfully. Ice seal populations have also increased in Canada, leading to greater numbers in U.S. waters.

Marine Mammal Population Changes. The North Atlantic right whale population continues to be depleted and has not shown signs of recovery. Although other population size estimates are available, the most recent Stock Assessment Report indicates that the best estimate minimum population size for the species is 445 individuals (Hayes *et al*., 2019). Recent models indicate that this population is likely declining, rather than remaining static or increasing (Pace *et al*., 2017). A recent study suggests that despite efforts to reduce human interaction-caused mortalities (*i.e.*, entanglements and vessel strikes) anthropogenic sources of mortality play an outsized role in preventing the recovery of this critically endangered species (Sharp *et al*., 2019).

Conversely, in 2015, following a review of global humpback whale populations, all humpback whales along the U.S. East Coast were determined to be part of the West Indies DPS, and this DPS was removed from the Endangered Species List (Bettridge *et al*., 2015). Recent abundance estimates indicate a continued increase in population growth since that time (NMFS 2019b). Similarly, populations of gray, harp, hooded, and harbor seals are likely increasing in the U.S. EEZ (Waring *et al*., 2007).

UMEs. Table 1 describes the UMEs that have occurred in the Greater Atlantic Region from 2010 to 2019. All infectious disease UMEs have been caused by viruses in the genus *Morbillivirus* (family *Paramyxoviridae*) which includes cetacean *Morbillivirus* and phocine distemper virus (PDV). The 2012015 bottlenose dolphin UME was declared after stranding rates were elevated along the Atlantic coast. Based on necropsy, histopathology, and diagnostic findings, the mortality event was caused by cetacean morbillivirus. Similarly, two UMEs were declared for seals in the Greater Atlantic Region, which were either confirmed or suspected to be the result of a PDV outbreak.

In June 2017, a UME was declared for North Atlantic right whales after elevated mortalities were documented, primarily in Canada. Full necropsies were conducted on a subset of whales, with preliminary findings suggesting that the cause of the UME is likely due to human interactions, specifically vessel strikes and rope entanglements. Similarly, UMEs have been declared for minke and humpback whales in the Greater Atlantic Region, with preliminary findings suggesting human interactions, specifically vessel strikes and rope entanglements.

Table 1. UMEs in the Greater Atlantic Region, 2010-2019

Year	Species	Location	Cause	Number of Animals
2011-2012	Pinnipeds	New England	Infectious disease	784
2012-2015	Bottlenose dolphins, other cetaceans	Atlantic Ocean, New York to Florida	Infectious disease	~1,650
2017	Humpback whales	Atlantic Ocean	Suspect Human Interaction (Vessel Strike)	ongoing
2017	North Atlantic right whale	Atlantic Ocean, Canada, U.S.	Human Interaction (Vessel Strike/Rope Entanglement)	ongoing
2018	Minke whales	Atlantic Ocean	Suspect Human Interaction (Entanglement)/Infectious Disease	ongoing
2018	Pinnipeds	Atlantic Ocean	Infectious disease	ongoing

NMFS Southeast Region

Thirty-two species of marine mammals have been reported in the Southeast Region (Appendix VI, Table 15) (Geraci and Lounsbury 2005). Six of these species are listed as endangered: North Atlantic right whale, humpback whale, blue whale, fin whale, sei whale, and sperm whale. One subspecies, the Gulf of Mexico Bryde's whale (*Balaenoptera edeni*), is also listed as endangered. The West Indian manatee is listed as threatened. All threatened and endangered marine mammal species are also listed as depleted under the MMPA. The Western North Atlantic coastal migratory stock of bottlenose dolphins are also listed as depleted under the MMPA. Critical habitat for the North Atlantic right whale is designated as the nearshore and offshore waters of the southeastern U.S., extending from Cape Fear, North Carolina south to approximately 27 nautical miles below Cape Canaveral, Florida (80 FR 9314–9345). Critical habitat for the West Indian manatee is designated within several watersheds along the east and west coast of Florida (42 FR 47840–47845).

There are few pinnipeds in the Southeast Region, but the most commonly stranded pinniped species are harbor seals, representing over 70 percent of stranded pinnipeds in this region. The majority (80 percent) of these strandings are immediately released. Other pinniped species that strand in small numbers include hooded, harp, and gray seals. Figure 6 depicts the number of reported pinniped strandings in the Southeast Region from 2009-2017. No pinnipeds that stranded in the Southeast Region from 2009-2018 were placed in public display facilities.

The Southeast Region experiences the most cetacean strandings of any region, and a variety of taxa are represented (an average of 17 species of odontocetes strand annually). The most commonly stranded species in the Southeast Region are bottlenose dolphins, pygmy sperm whales and short-finned pilot whales. Other small odontocetes that strand regularly, but in smaller numbers overall include: dwarf sperm whales, harbor porpoise, striped dolphins, spinner dolphins (*Stenella longirostris*), Atlantic spotted dolphins (*Stenella frontalis*), pantropical spotted dolphins (*Stenella attenuata*), Fraser’s dolphin (*Lagenodelphis hosei*), Risso’s dolphin, rough-toothed dolphins (*Steno bredanensis*), and melon-headed whales (*Peponocephala electra*).

Large whale strandings have also been recorded in the region, and the humpback whale is the most common mysticete to strand. On average, approximately five stranded humpback whales are reported each year in the Southeast Region. Other large whales that strand in the Southeast Region include sperm whales, minke whales, and rarely Bryde’s whales, sei whales, and North Atlantic right whales. Figure 7 depicts the number of reported cetacean strandings in the Southeast Region from 2009-2018. Twenty two cetaceans that stranded in this region were deemed non-releasable after rehabilitation and placed in permanent care at public display facilities from 2009-2018.

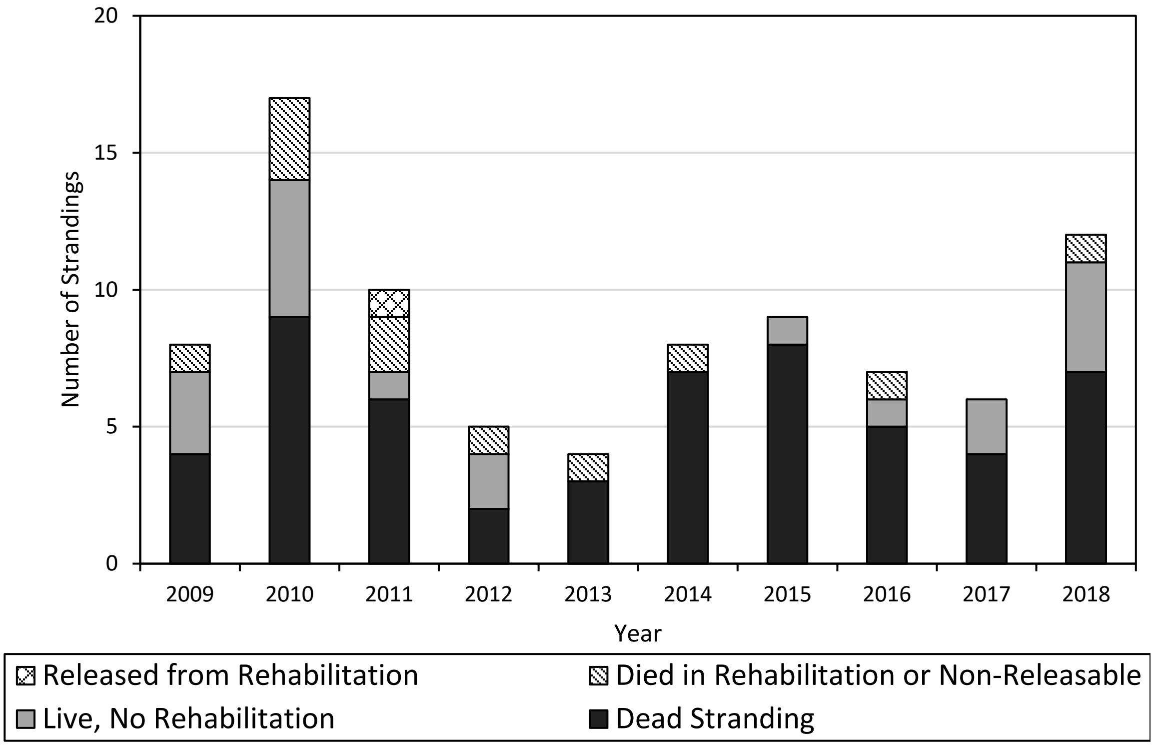

Figure 6. Southeast Region Pinniped Strandings 2009-2018

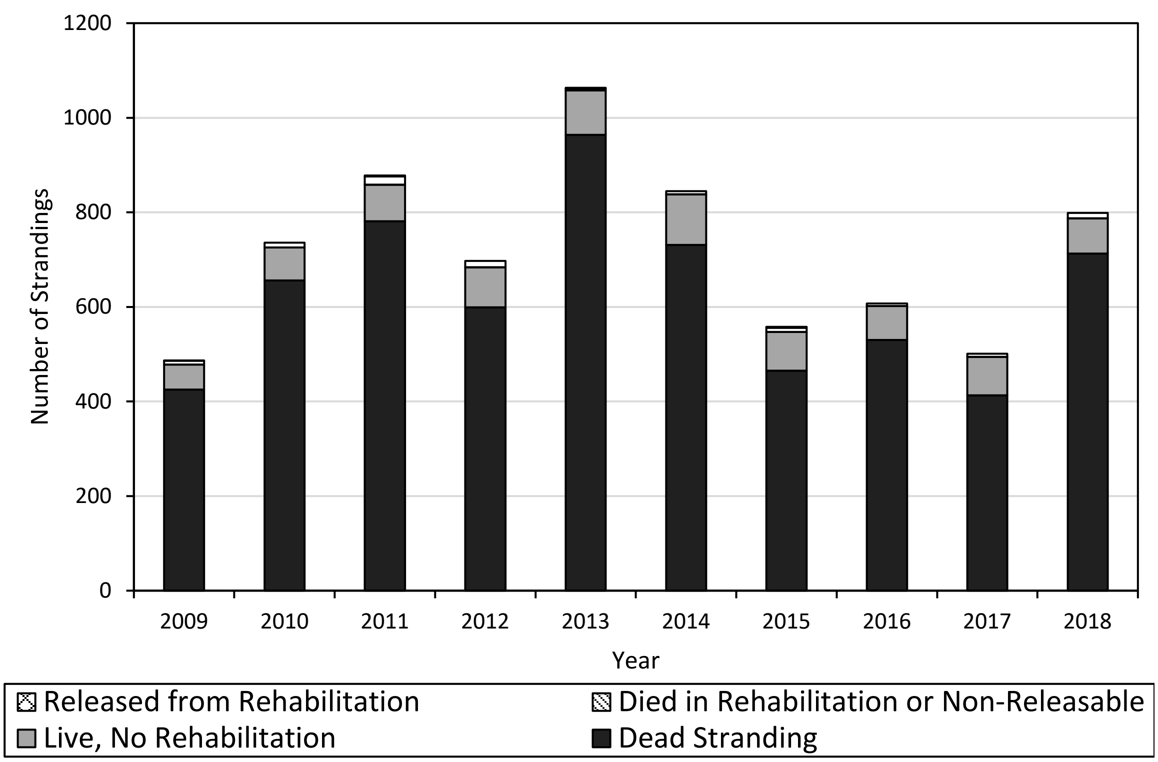

Figure 7. Southeast Region Cetacean Strandings 2009-2018

Mass Strandings. Mass strandings occur frequently in the Southeast Region. Many of the mass strandings involve pilot whales. Other species that have mass stranded include bottlenose dolphins, Fraser's dolphins, striped dolphins, and pantropical spotted dolphins. In 2017, ninety five false killer whales stranded along Hog Key in the Florida Everglades. Of the original 95 whales that stranded, 72 died on their own, 10 were humanely euthanized, and 13 were not seen again.

Human Interactions. Human interactions were seen in approximately 10 percent of the total number of strandings from 2009-2018. Approximately half of these cases involved fishery interactions including crab pot and recreational hook and line, and the remaining cases included, but are not limited to, other human-caused injuries such as vessel strikes, gunshot wounds, and plastic ingestion. Similar to the Great Atlantic Region, North Atlantic right whale strandings have been associated with entanglements and vessel strikes more often than other causes (Sharp *et al*., 2019). Large whale entanglements are rare in the Southeast Region, with two occurring annually since 2007. However, vessel interactions with large whales do occur. Twenty two percent of the recorded ship strikes involving North Atlantic right whales between 1975 and 2002 occurred off the coast of the Southeastern U.S. (Jensen and Silber 2003).

Temporal Changes. Seasonal peaks in strandings are seen in many species in the Southeast Region, and are related to migratory patterns, calving seasons, environmental conditions (including water temperature and harmful algal blooms), and fishery activities. For example, bottlenose dolphin strandings generally occur in the spring and summer in the more southern parts of the region, and in the spring and fall towards the north. North Atlantic right whales and humpback whales annually migrate along the coast, and strandings of these species are most common from November through April.

Marine Mammal Population Changes. Population changes to North Atlantic right whales and West Indies DPS humpbacks are the same as those listed for the Great Atlantic Region. The West Indian manatee was reclassified from endangered to threatened under the ESA in 2017 (82 FR 16668).

UMEs. Table 2 describes the UMEs that have occurred in the Southeast Region from 2010 to 2019. Several UMEs have been confirmed or suspected to be the result of ecological factors during this time. Some of these ecological factor UMEs have been the result of HABs. Marine mammals can be particularly vulnerable to HABs as algal toxins work their way up a foodweb, and could be exposed through the consumption of contaminated prey. Additionally, marine mammals may inhale the toxins since they breathe near the water's surface, where the toxin is often most heavily concentrated. Impacts of HAB toxins to marine mammals can include death or illness. Further, a die off of prey species secondary to a HAB may also impact marine mammal populations.

Table 2. UMEs in the Southeast Region, 2010-2019

Year	Species	Location	Cause	Number of Animals
2010	Manatees	Atlantic Ocean, Gulf of Mexico, Florida	Ecological factors	~529
2010-2014	Cetaceans	Gulf of Mexico, Florida Panhandle, Alabama, Mississippi, Louisiana	Human interaction	1,141
2010	Bottlenose dolphins	St. Johns River, Florida	Undetermined	23
2010-2011	Manatees	Atlantic Ocean, Gulf of Mexico, Florida	Ecological factors	143
2011	Bottlenose dolphins	Atlantic Ocean, South Carolina	Undetermined	37
2012	Bottlenose dolphins	Gulf of Mexico, Texas	Biotoxin	126
2013	Florida Indian River Lagoon Bottlenose Dolphin	Indian River Lagoon, Florida	Ecological factors	79
2013-2015	Bottlenose dolphins, other cetaceans	Atlantic Ocean, New York to Florida	Infectious disease	~1,650
2013	Manatees	Indian River Lagoon, Florida East-coast	Undetermined	ongoing
2018	Bottlenose dolphins	Gulf of Mexico	Biotoxin	ongoing

2019	Bottlenose dolphins	Gulf of Mexico, Florida Panhandle, Alabama, Mississippi, Louisiana	Ecological Factors	337

NMFS West Coast Region

Forty-three species of marine mammals have the potential to occur in the West Coast Region (Appendix VI, Table 17). The Mexico humpback whale DPS, southern sea otter (*Enhydra lutris nereis*), and Guadalupe fur seal (*Arctocephalus townsendi*) are listed as threatened. Blue, sei, sperm, fin, North Pacific right whales, and the Central America humpback whale DPS are listed as endangered. The Southern Resident DPS of killer whales in Washington is also listed as endangered. Approximately 2,560 square miles of inland waters of Washington have been designated as critical habitat for the Southern Resident killer whale DPS (71 FR 69054-69070). Critical habitat has also been proposed for the Central American DPS and Mexican DPS of humpback whales, and would include most offshore waters (84 FR 54354). All threatened and endangered marine mammal species are listed as depleted under the MMPA. The Eastern Pacific stock of the northern fur seal (*Callorhinus ursinus*) is also listed as depleted under the MMPA.

The West Coast Region experiences the most stranded pinnipeds of any region. The most commonly stranded species in the West Coast Region are California sea lions (*Zalophus californianus*) followed by harbor seals and northern elephant seals (*Mirounga angustirostris*). The number of elephant seals reported to the network has been increasing, associated with recently colonized haul-out and breeding sites. The majority of elephant seals that are reported to the network are not stranded, but are hauled out to molt. The network's response includes posting signs to alert the public about the life history of the seals and to help prevent harassment of the resting animals. Other pinnipeds that strand in the region include Steller sea lions (*Eumetopias jubatus*), Guadalupe fur seals (*Arctocephalus townsendi*), and northern fur seals. Over half of all stranded pinnipeds were reported alive when first observed. Figure 8 depicts the number of reported pinniped strandings in the West Coast Region from 2009-2018. One hundred sixty two pinnipeds that stranded in this region between 2009 and 2018 were placed in public display facilities.

The most common stranded cetacean species are the gray whale, harbor porpoise, long- and short-beaked common dolphin (*Delphinus capensis and D. delphis*), bottlenose dolphin, and the humpback whale. Other cetaceans that strand in the region include Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), Risso's dolphins, northern right whale dolphins (*Lissodelphis borealis)*, Dall's porpoises (*Phocenoides dalli*), striped dolphins, killer whales, pygmy sperm whales, sperm whales, blue whales, fin whales, and minke whales (*Balaenoptera acutorostrata*). Most stranded cetaceans are dead when first observed and reported. Figure 9 depicts the number of reported cetacean strandings in the West Coast Region from 2009-2018. One cetacean that stranded in this region in 2010 was placed in a display facility.

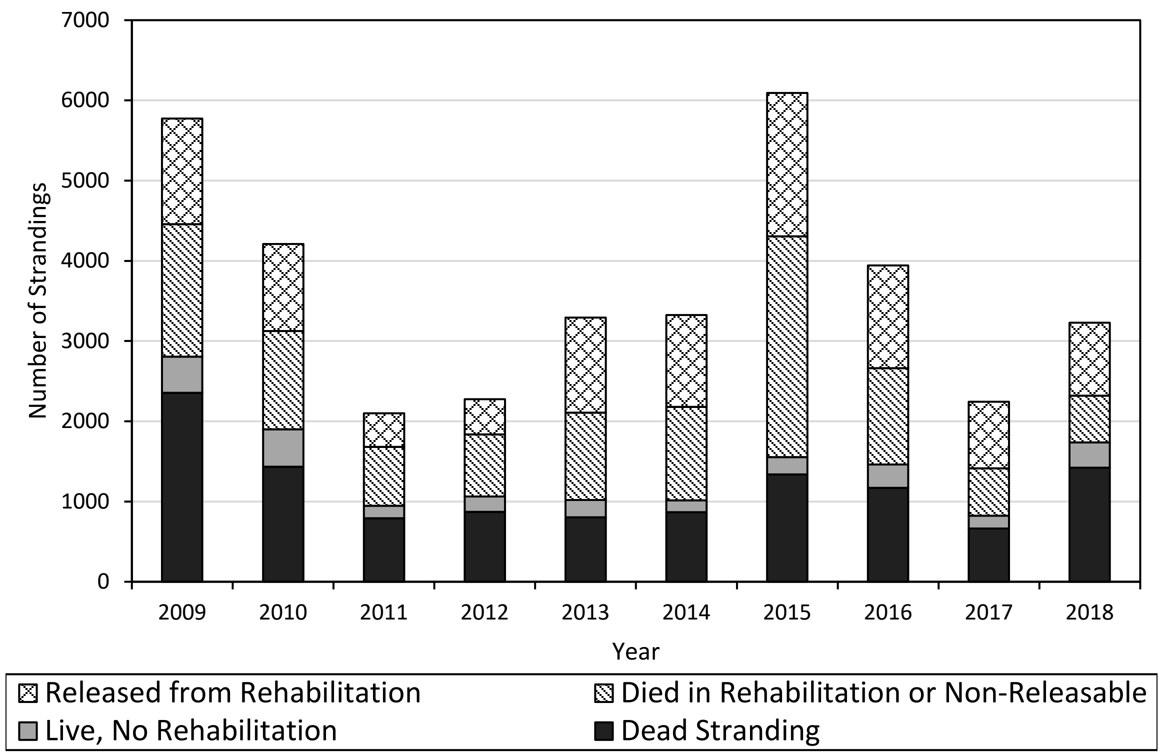

Figure 8. West Coast Region Pinniped Strandings 2009-2018

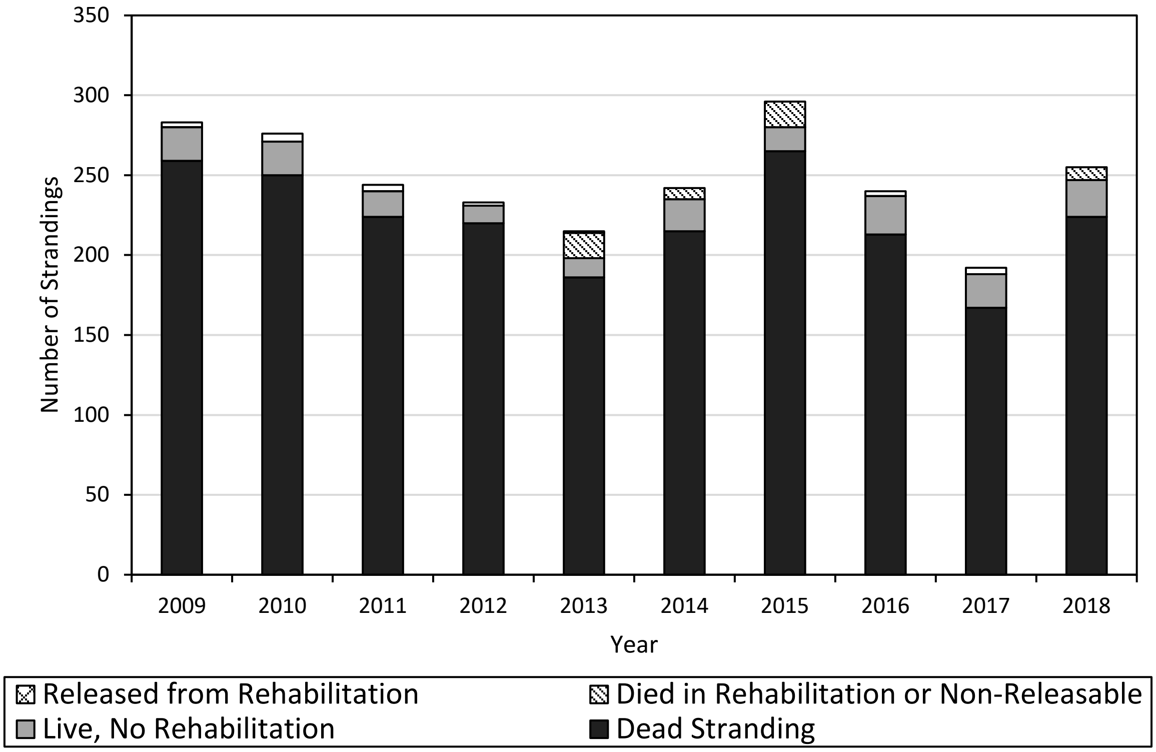

Figure 9. West Coast Region Cetacean Strandings 2009-2018

Mass Strandings. Mass strandings are rarely reported in the West Coast Region. However, a mass stranding of 41 sperm whales occurred in central Oregon in 1979.

Human Interactions. Documented human interaction in the West Coast Region include vessel strikes, fishery interactions, and gunshots. Pinnipeds are most likely to be affected by gunshots, although large whales have been recorded with gunshot wounds as well (typically after they have stranded). Large whales and pinnipeds are also impacted by entanglements and vessel strikes. In recent years, the West Coast Region has documented and confirmed more large whale entanglements than any other region. Additionally, the number of entanglement cases has increased.

Temporal Changes. The majority of gray whale strandings in the West Coast Region occur from March through June during their northward migration. Several large stranding events, affecting both odontocetes and pinnipeds have been recorded in the spring coincident with the occurrence of large HABs. Most harbor porpoise strandings happen in the summer months of July and August and occur during, or right after, calving season. The majority of elephant seals that strand are pups and most strandings occur from March-May, in California, during the fasting period between the end of weaning and when the animals enter the ocean to feed on their own. Most harbor seal strandings in California occur from April-June, coinciding with the peak of pupping season.

Marine Mammal Population Changes. Most marine mammal stocks in the West Coast Region are stable and/or increasing. California sea lions have been increasing at 7 percent per year. The Eastern DPS of Steller sea lions increased at a rate of 4.76 percent per year between 1989 and 2015, and this DPS (which is the only DPS found in the West Coast Region) was delisted in 2013 (78 FR 66139). Following the peak census count of 99 animals in 1995, the Southern resident killer whale DPS experienced an almost 20 percent decline. The population currently stands at 77 animals as of a recent census in 2017 (Carretta *et al*., 2019).

UMEs. Table 3 describes the UMEs that have occurred in the West Coast Region from 2010 to 2019.

Table 3. UMEs in the West Coast Region, 2010-2019

Year	Species	Location	Cause	Number of Animals
2013-2016	California sea lion	Pacific Ocean, California	Ecological factors	8,122
2015	Guadalupe fur seal	Pacific Ocean, California, Oregon, Washington	Ecological factors	ongoing
2019	Gray whale	Pacific Ocean	Ecological factors	ongoing

NMFS Alaska Region

Twenty-nine species of marine mammals have the potential to occur in the Alaska Region (Appendix VI, Table 18) (Geraci and Lounsbury 2005). Threatened marine mammal species include the southwest Alaska DPS of the northern sea otter (*Enhydra lutris kenyoni*), and the polar bear (*Ursus maritimus*). Endangered marine mammal species include the western DPS of Steller sea lions, the western North Pacific DPS of gray whales, the Cook Inlet stock of beluga whales (*Delphinapterus leucas*), bowhead (*Balaena mysticetus)*, blue, Mexican and Western North Pacific humpback DPSs, fin, sei, sperm, and North Pacific right whales. All threatened and endangered species are listed as depleted under the MMPA. The Eastern Pacific Stock of northern fur seals and the AT1 group of transient killer whales are listed as depleted under the MMPA. Critical habitat for the Steller sea lion is designated within Alaska and is defined as major rookeries; haul-outs; and associated terrestrial, air, and aquatic zones. There are also three special aquatic foraging areas that are designated as critical habitat for the Steller sea lion: Shelikof Strait (in the Gulf of Alaska), Bogoslof Island area and Seguam Pass (in the Bering Strait), and the Aleutian Islands area (58 FR 45269–45285). Critical habitat for the North Pacific right whale has been designated in the Gulf of Alaska and the Southeast Bering Sea (71 FR 38277-38297). Critical habitat is also designated for the polar bear (75 FR 76085) and southwest Alaska DPS of the northern sea otter, from western Cook Inlet through the Aleutians and Bristol Bay (74 FR 51987). Lastly, critical habitat has been proposed for the Mexican and Western North Pacific DPSs of humpback whales. Specifically, critical habitat has been proposed for the Mexican DPS in most waters in Southeast Alaska, Prince William Sound, lower Cook Inlet, and Kodiak; critical habitat has been proposed for the Western North Pacific DPS in the Aleutians, from Unalaska through the Kodiak archipelago (84 FR 54354).

The Alaska Regional Stranding Network coordinates with Alaska Native tribal governments and villages, particularly for species that have co-management agreements, as mandated through Section 119 of the MMPA. Dead stranded animals are examined to determine if the death resulted from a struck-but-lost situation. At times, Native villages request animal parts for subsistence use or Native articles of handicrafts and clothing.

Stranding reports in Alaska are limited by the extensive and mostly rural coastline. Commonly reported stranded pinniped species (excluding walrus) include the harbor seal, Steller sea lion, ringed seal (*Phoca hispida*), bearded seal (*Erignathus barbatus*), spotted seal (*Phoca largha*), and elephant seal. On average, from 2009-2018, nine harbor seal pups a year were brought to the rehabilitation facility in Alaska. Figure 10 depicts the number of reported pinniped strandings (excluding walrus) in the Alaska Region from 2009-2018. Eight pinnipeds were placed in a public display facility from 2009-2018.

The most commonly stranded cetacean species in the Alaska Region are gray whales, beluga whales, humpback whales, killer whales, Dall's porpoise, harbor porpoise, and Cuvier's (*Ziphius cavirostris*), Baird's (*Berardius bairdii*), and Stejneger's (*Mesoplodon stejnegeri*) beaked whales. Infrequently reported stranded species include Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), sperm whales, minke whales, and fin whales. Most beluga whale strandings are from the Cook Inlet DPS. On average, from 2009-2018, two beaked whale strandings were reported each year. Figure 11 depicts the number of reported cetacean strandings in the Alaska Region from 2009-2018. Two cetaceans were transferred to rehabilitation facilities during this time period. No cetaceans were placed in public display facilities from 2009-2018.

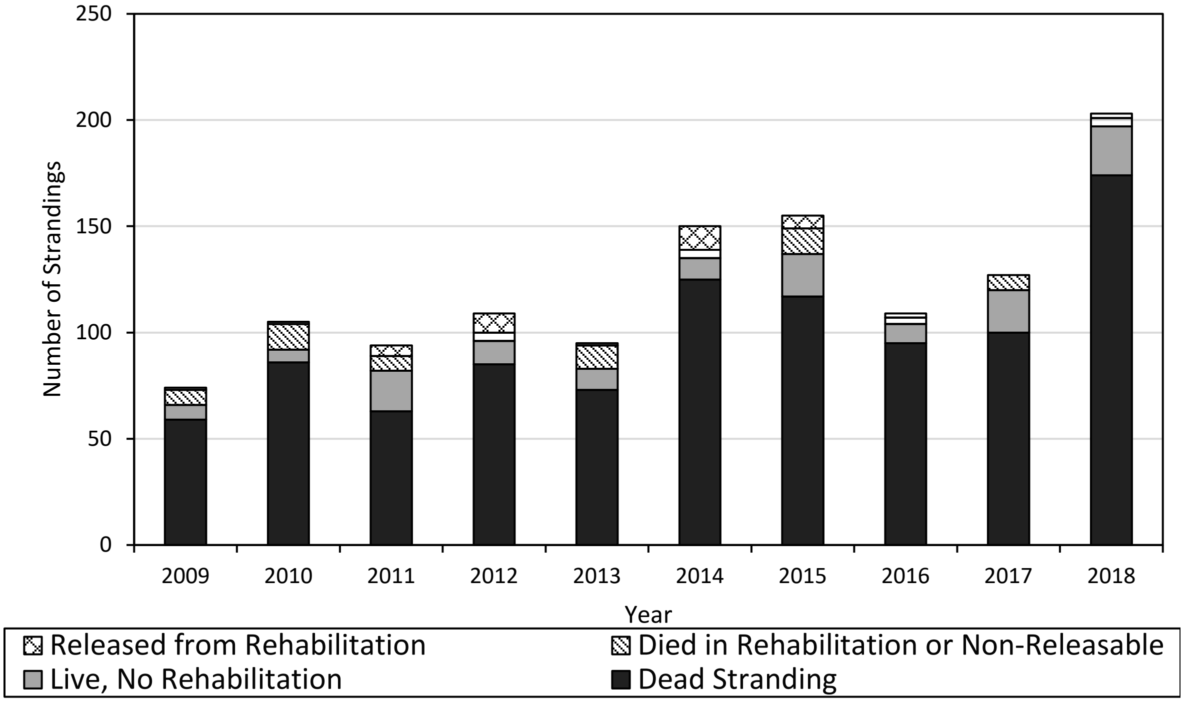

Figure 10. Alaska Region Pinniped Strandings 2009-2018

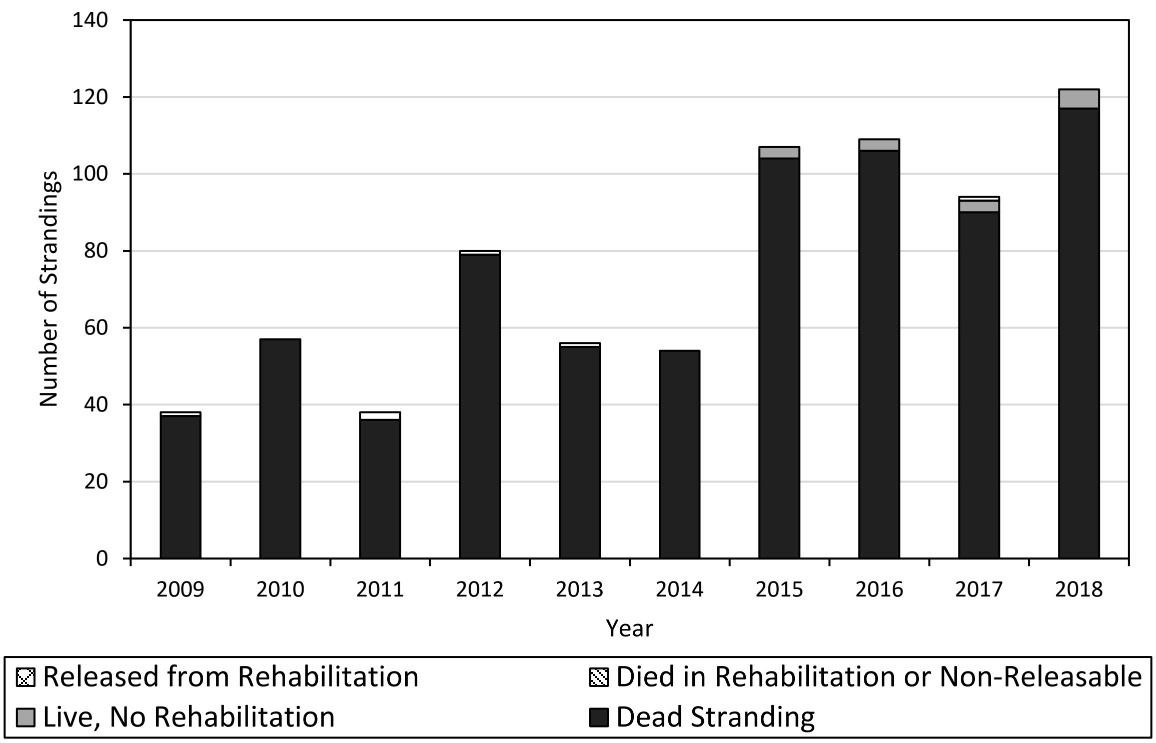

Figure 11. Alaska Region Cetacean Strandings 2009-2018

Mass Strandings. Cook Inlet beluga mass strandings, as related to tides, were reported six times from 2012-2016, with an average estimate of 19 animals per event. Mass walrus mortalities are occasionally reported at haul-outs in Alaska. In one incident, which occurred in 2009, 131 walruses died at Icy Cape on the Northwest coast of Alaska. The most likely causes of death were crushing trauma due to younger animals being trampled by larger animals (Goertz *et. al.*, 2016). Trampling deaths have also been reported in the Punuk Islands near St. Lawrence Island.

Human Interactions. Documented human interactions for stranded animals include vessel strikes and fisheries interactions. From 2009 through 2018, an average of 13 confirmed large whale entanglements were reported annually in the Alaska Region. Some of these entanglement events may be the result of increased reporting awareness. Several reports of vessel strikes involving large whales are documented annually. Numerous cases of Steller sea lion fishery interaction and/or entanglements are reported annually. These cases include animals that have swallowed hooks, flashers, and lures; animals with packing bands around their necks; and animals wrapped in net or other fishery related material. In the most recent Pacific walrus stock assessment report (2014), the estimated mean mortality from fisheries activities was two walrus per year (79 FR 22154).

Temporal Changes. Most stranding reports of NMFS marine mammal species are received during the warmer months (May-October). Some polar bear, ice seal, and Pacific walrus strandings can be most likely attributed to changing sea ice habitat and could occur year round. The most critical times for polar bears would likely be in the spring, soon after cubs are born, through the fall. For Pacific walrus, the critical time for young animals and calves would be during the late spring-early summer when the female and calves follow the ice pack north. In recent years, ice seals have stranded in greater numbers, possibly due to changes in sea ice distribution and timing.

Marine Mammal Population Changes. Some marine mammal populations are increasing, including: bowhead whales, the eastern DPS of Steller sea lions, and Bristol Bay beluga whales. Three humpback whale DPSs occur in Alaska: Mexican, Western North Pacific, and Central North Pacific. The population of the Central North Pacific DPS is increasing (Muto *et al*., 2019). The abundance of the Western North Pacific DPS is slowly increasing (Muto *et al*., 2019). Harbor seal populations have experienced declines in parts of Alaska, notably the Aleutian Islands, Prince William Sound, and Glacier Bay. Cook Inlet belugas were designated as depleted on May 31, 2000 (65 FR 34590) and endangered on October 22, 2008 (73 FR 62919). The Cook Inlet beluga population has declined by nearly 75 percent since 1979, from about 1,300 whales to an estimated 328 whales in 2016 (Muto *et al*., 2019). AT1 killer whales were designated as depleted on June 3, 2004 (69 FR 31321), and are not recovering (Muto *et al*., 2019).

Northern fur seals, which were designated as depleted on May 18, 1988 (53 FR 17888) are not recovering and continue to decline. The size and trend of the Pacific walrus population is currently unknown. Population point estimates from 1975-1990 ranged between 202,039 to 246,360 walruses, but were not precise enough to accurately reflect a trend. The Southern Beaufort Sea population and Chukchi/Bering Seas populations of polar bear are thought to be declining.

UMEs. A pinniped and walrus UME was declared in Alaska on May 1, 2011 following elevated mortalities of primarily ice seals including ringed, bearded, ribbon (*Histriophoca fasciata*), and spotted seals in the Bering and Chukchi seas. The investigation identified that clinical signs were likely due to an abnormality of the molt, but a definitive cause for the abnormal molt and the UME was not determined.

Table 4. UMEs in the Alaska Region, 2010-2019

Year	**Species**	**Location**	**Cause**	**Number of Animals**
2011-2016	Pinnipeds and Walrus	Bering and Chukchi Seas, Alaska	Undetermined	657
2015-2016	Large whales (primarily humpback and fin whales)	Pacific Ocean, Gulf of Alaska	Undetermined, secondary ecological factors	46
2019	Gray whales	Pacific Ocean	Undetermined	ongoing
2019	Alaska Ice seals	Bering and Chukchi Seas, Alaska	Undetermined	ongoing

NMFS Pacific Islands Region

Twenty-three marine mammal species have the potential to occur in the Pacific Islands Region (Appendix VI, Table 19) (Geraci and Lounsbury 2005). Endangered marine mammal species include the Hawaiian monk seal, the Main Hawaiian Islands Insular DPS of false killer whales, blue whales, sei whales, sperm whales, and fin whales. All endangered species are listed as depleted under the MMPA. No threatened species occur in the region. Critical habitat for the Main Hawaiian Islands Insular DPS of false killer whales is designated and defined as waters from the 45-meter depth contour to the 3,200-meter depth contour around the main Hawaiian Islands from Ni'ihau east to Hawaii (83 FR 35062-35095).

The only pinniped species endemic to the Hawaiian Islands is the Hawaiian monk seal. Critical habitat for the Hawaiian monk seal (*Neomonachus schauinslandi*) includes sixteen occupied areas within the range of the species: ten areas in the Northwestern Hawaiian Islands (NWHI) and six in the main Hawaiian Islands (MHI). Hawaiian monk seal critical habitat is defined as all beach areas, sand spits, and islets; lagoon waters; inner reef waters; and marine habitat through the water's edge, including the seafloor and all subsurface waters, and marine habitat within 10 meters (m) of the seafloor, out to 200-m depth in the NWHI. Critical habitat in the MHI include marine habitat from the 200-m depth contour line, including the seafloor and all subsurface waters and marine habitat within 10m of the seafloor, through the water's edge and 5m into the terrestrial environment from the shoreline (80 FR 50925-50988). Rarely, elephant seals and northern fur seals also strand in the main Hawaiian Islands. Hawaiian monk seals that rest and pup on beaches in the MHI may mistakenly be reported as being stranded. However, a total of 220 sick and injured (stranded) monk seals were reported from 2009-2018, and 65 of these animals were found dead. Figure 12 depicts the number of reported pinniped strandings in the Pacific Islands Region from 2009-2018. One pinniped that stranded in 2012 was placed in a public display facility during this period.

The most common cetacean species to be reported stranded are humpback whales, sperm whales, spinner dolphins, spotted dolphins, and striped dolphins. Infrequently reported cetacean species include the bottlenose dolphin, rough-toothed dolphin, pygmy sperm whale, dwarf sperm whales, pilot whales, false killer whales (*Pseudorca crassidens*), melon-headed whales, beaked whales, and killer whales. From 2009-2018, approximately ten large whales were reported stranded each year, with most of the strandings occurring during the humpback whale mating and calving season (November to April). Figure 13 depicts the number of reported cetacean strandings in the Pacific Islands Region from 2009-2018. No cetaceans were sent to public display facilities during this period.

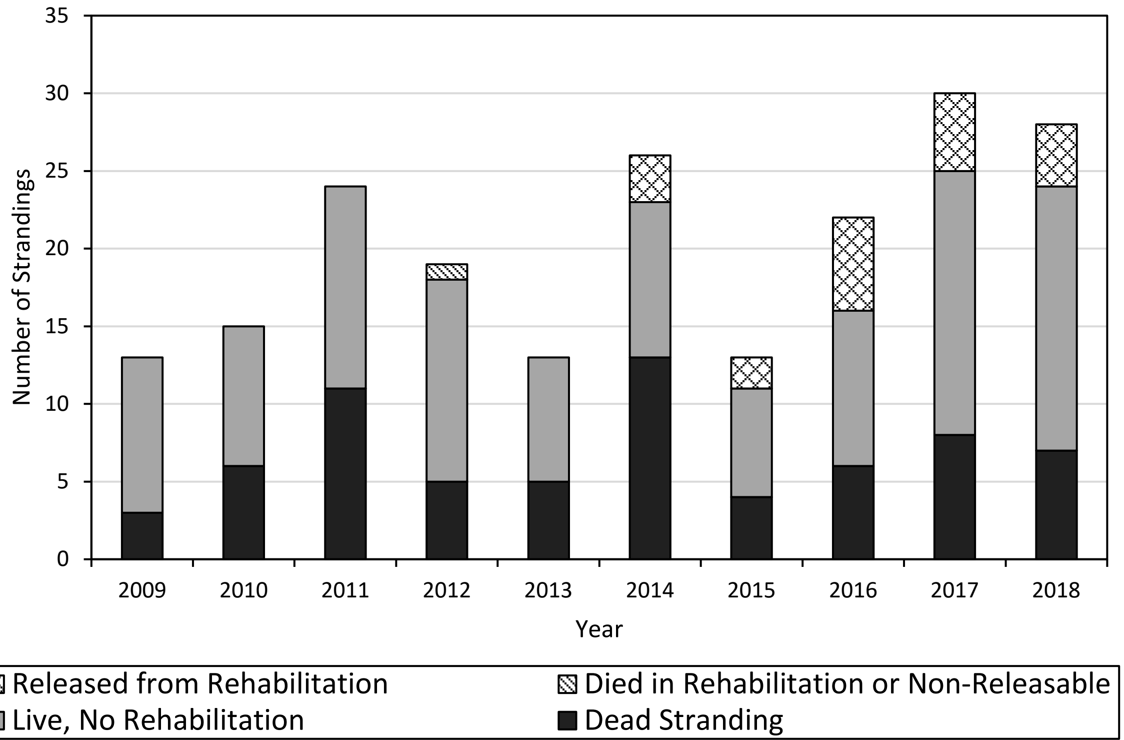

Figure 12. Pacific Islands Region Pinniped Strandings 2009-2018

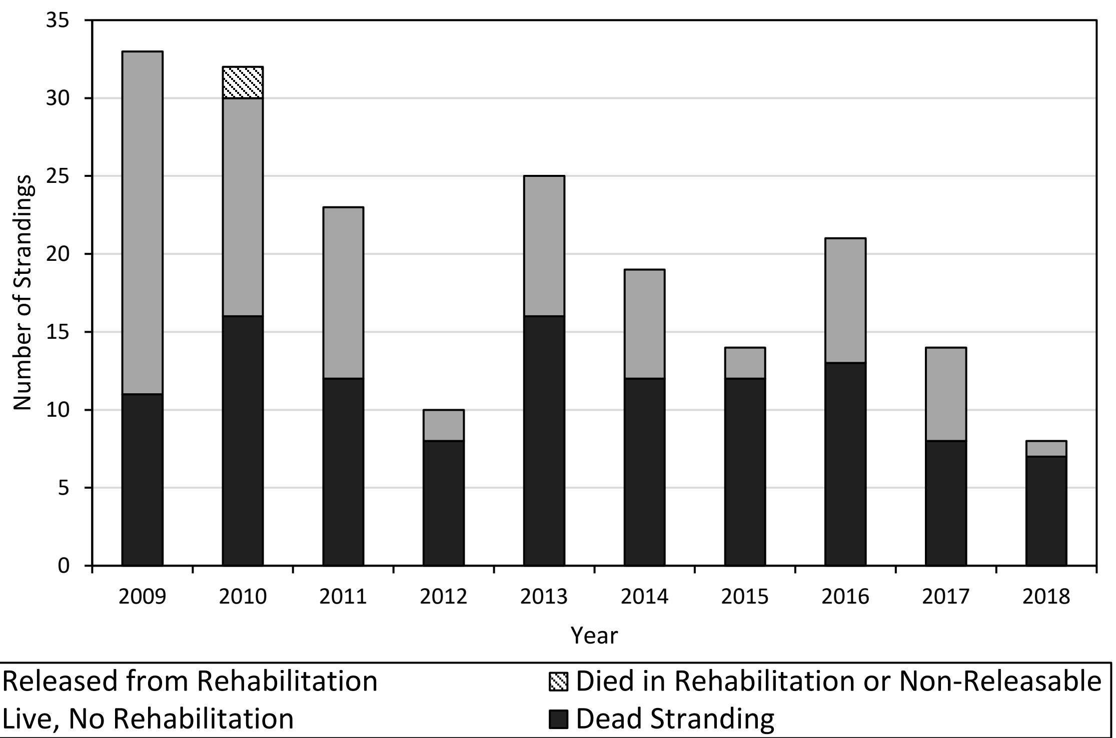

Figure 13. Pacific Islands Region Cetacean Strandings 2009-2018

Mass Strandings. Mass strandings occur infrequently in the Pacific Islands Region. When they do occur, they often involve blackfish such as pygmy killer whales and pilot whales. One mass stranding in 2017 involved a group of seven short-finned pilot whales stranded on Kalapaki Beach, Kaua'i. The animals were returned to deep water after human intervention, however two were later reported to have died.

Human Interaction. In 2016 there were eleven hooked Hawaiian monk seals reported, and two mortalities considered suspect of entanglement in fishing gear or marine debris. Documented human interactions with large whales include vessel strikes and fisheries interactions. From 2009 through 2018, an annual average of ten large whale entanglements have been confirmed in the Pacific Islands Region.

Temporal Changes. No temporal changes in pinniped strandings have been noted in the Pacific Islands Region. However, humpback whale strandings and entanglements are more common in the winter months, as the whales are present around Hawaii from January through March.

Marine Mammal Population Changes. The Hawaiian monk seal population grew at an average rate of approximately 4 percent per year from 2013 to 2016 (Carretta *et al*., 2019). The species remains well below its optimum sustainable population and has not fully recovered from historical declines, but the population trend is positive.

UMEs. UMEs are not common in this region, as the last UME to occur in this region was a Hawaiian monk seal UME from 2001 to 2002 due to starvation.

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Appendix III

Prescott Award Recipients 2002-2020

2002 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Aleut Community of St Paul Island	Assessment of northern fur seal entanglement in marine debris on the Pribilof Islands	$95,945
AK	Seward Association for the Advancement of Marine Science	Improved rehabilitation techniques through monitoring of nutrition and growth rates in free-ranging and rehabilitated harbor seal pups	$100,000
AK	Seward Association for the Advancement of Marine Science	Alaska Sealife Center Rescue and Rehabilitation Program	$99,993
AK	University of Alaska Anchorage	Cellular and subcellular structure of the adrenal medulla of the Atlantic bottlenose dolphin (Tursiops Truncatus) in relation to physiological stress.	$33,591
AK	University of Alaska Fairbanks	Marine mammal tissue and specimen archives - University of Alaska Museum	$100,000
AL	Spring Hill College	Enhancement of Data Collection	$45,785
CA	California Department of Fish and Game (Santa Cruz)	Marine mammal pathology service for the central California coast	$99,998
CA	Marine Animal Rescue Rehabilitation and Release	Diagnostic and Surgery Center (at the Marine Mammal Care Center at Fort MacArthur)	$70,000
CA	Northcoast Marine Mammal Center	Obtain operating funds to improve rehabilitation facility and provide more advanced and comprehensive diagnostic abilities.	$100,000
CA	San Jose State University Foundation	Gray whale and other large whale stranding investigations: A collaboration of marine mammal stranding participants in central California	$95,680
CA	San Jose State University Foundation	Movements, Dive Behavior and Survival of Post Release CA Sea Lions after Rehabilitation for Domoic Acid Toxicity	$95,019
CA	SeaWorld, San Diego	Improved care and monitoring of beached marine mammals in Southern California	$100,000
CA	The Marine Mammal Center	Development of a biomonitoring program to detect novel diseases and changes in prevalence of known diseases in pinnipeds stranded along the central California coast	$100,000
CA	The Marine Mammal Center	Advancement of clinical care of stranded marine mammals at the Marine Mammal Center	$100,000
CA	The Regents of the University of California, Santa Cruz	UCSC Long Marine Lab Stranding Network upgrade of Information Management Systems and capabilities to improve or allow access to the National Database.	$2,500
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Marine mammal stranding program support for Mystic Aquarium	$100,000

CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Prognostic indicators for rehabilitation and survival of stranded harp and hooded seals	$99,924
DE	Delaware Department of Natural Resources and Environmental Conservation	Renovation of a Seal Holding Facility	$27,000
FL	Clearwater Marine Aquarium	Transportation, rehabilitation facilities, and technology for marine mammal stranding events	$94,175
FL	Dynamac Corporation	Marine mammal rescue and stranding program on Florida's space coast	$14,971
FL	Florida Fish and Wildlife Conservation Commission	Development of standardized protocols for stranding networks in Florida	$96,498
FL	Florida Keys Marine Mammal Rescue Team	South Florida cetacean rescue triage and necropsy facility and response enhancement project	$57,430
FL	Gulf World, Inc.	To upgrade the quality of Gulf World Marine Park's existing stranding facility, improve response time and capabilities.	$100,000
FL	Harbor Branch Oceanographic Institution	Marine Mammal Necropsy Facility Enhancement	$69,811
FL	Hubbs-SeaWorld Research Institute	Comprehensive stranding enhancement along the central east coast of Florida	$76,339
FL	Hubbs-SeaWorld Research Institute	Life history and stranding patterns of pygmy and dwarf sperm whales (genus Kogia) as critical tools in interpreting health assessment trends in wild populations	$98,240
FL	Marine Animal Rescue Society (MARS)	Upgrade MARS from a Short-Term Critical Care Facility to a Long-Term Rehabilitation Center	$99,579
FL	Mote Marine Laboratory	Mortality Patterns of Cetaceans Stranded on the Central West Coast of Florida	$100,000
FL	Mote Marine Laboratory	Facility, staff and equipment upgrades for the dolphin and whale hospital	$100,000
FL	Sea World Florida, Inc.	Enhancement of live stranding response capabilities and necropsy of code 2 animals in Northeast and east-central Florida: SeaWorld Florida equipment upgrades	$98,946
FL	University of Florida	Marine Mammal Microbiology Diagnostic and Support Laboratory	$100,000
GA	Georgia Department of Natural Resources	Implement Marine Mammal Stranding Network in Georgia	$43,000
HI	Hawaiian Islands Stranding Response Group	Cooperative partnerships in Hawaii which upgrade the capacity of the region's stranding network, detect, and determine the cause of marine mammal morbidity/mortalities	$99,830
HI	Robert C. Braun, D.V.M.	Incidence of disease and health evaluation of Hawaiian Monk Seals (Monachus schauinslandi)in the Main Hawaiian Islands	$99,650
MA	Cape Cod Stranding Network, Inc.	Health assessment of stranded marine mammals: Interpretation and field applications of blood and tissue analyses	$100,000

MA	Cape Cod Stranding Network, Inc.	Enhanced mass stranding response on Cape Cod: Success through preparation, protocols and cooperation	$100,000
MA	New England Aquarium Corporation	An Analysis of the Special Patterns and Genetic Characteristics of the Harp and Hooded Seals Along the United States Eastern Coast	$99,996
MA	New England Aquarium Corporation	Marine Mammal Stranding Response, Rescue and Rehabilitation at the New England Aquarium in Support of the National Marine Fisheries Service under the Marine Protection Act	$98,671
MA	The Whale Center of New England	A Program to Respond to Stranded Marine Mammals in Northeastern Massachusetts- Evaluation, Rescue, Data Collection, and Public Education	$90,262
MA	Woods Hole Oceanographic Institution	Necropsy enhancement for stranded marine mammals on Cape Cod	$93,897
MD	Maryland Department of Natural Resources	Marine Mammal Stranding Response in Maryland	$47,002
MD	National Aquarium in Baltimore	Stranded Marine Animal Education and Outreach for professionals and the Public Marine Animal Rescue Program of the National Aquarium in Baltimore	$98,425
MD	National Aquarium in Baltimore	Enhanced Operations: Hospital pool restoration and satellite tags. Marine animal rescue program of the National Aquarium in Baltimore	$99,850
ME	College of the Atlantic	Enhancement of the marine mammal stranding response and rescue program for the Maine coastal region, Rockland (ME) east, by creation of a new personnel position, network expansion, equipment upgrades, and acquisitions, and facility improvements	$72,750
ME	College of the Atlantic	Use of stable isotope analysis to determine individual population and ecosystem health of Gulf of Maine Balaenopterids	$63,850
ME	Marine Animal Lifeline	Enhancing seal rehabilitation care through improved isolation and the implementation of dedicated areas for veterinary treatments and necropsy	$87,015
ME	Marine Animal Lifeline	Development and use of a Geographic Information System for analysis of harp, hooded and harbor seal sightings/stranding locations: Adding a spatial dimension to strandings	$30,400
MS	Institute for Marine Mammal Studies, Inc.	Enhancement and Refurbishment of a Pre-Existing Stranding Facility and Development of First Response Capability Including Equipment and Training for Marine Mammal Live Response	$100,000
NC	University of North Carolina Wilmington	Enhanced evaluation of human interaction with bottlenose dolphins (*Tursiops truncatus*) in North Carolina and Virginia	$74,240
NC	University of North Carolina Wilmington	Enhance tissue collection and health monitoring of stranded of marine mammals in NC	$100,000

NJ	Marine Mammal Stranding Center	Operational expenses to support and enhance marine mammal and sea turtle rehabilitation	$100,000
NJ	Marine Mammal Stranding Center	To provide safe water and land transport of marine mammals	$71,250
NY	Riverhead Foundation for Marine Research and Preservation	Characterization of ice seal movements and evaluation of existing treatment protocols employed in the rehabilitation and field assessment through the uses of satellite telemetry and video documentation of stranded pinnipeds	$59,181
NY	Riverhead Foundation for Marine Research and Preservation	Request for operational support to upgrade facilities for the New York State Marine Mammal and Sea Turtle Stranding Program	$81,190
OK	Oklahoma State University	A comprehensive two-year study of the viral, bacterial, mycologic and toxicologic conditions associated with marine mammal strandings in the Gulf coast of the US	$100,000
OR	Oregon State University	Enhancing the capabilities of the Oregon Marine Mammal Stranding Network	$100,000
PA	Trustees of the University of Pennsylvania	Toxicological and Pathoanatomic Stranding response and post-mortem evaluation of stranded marine mammals in San Juan County Washington	$75,206
TX	Texas Marine Mammal Stranding Network	Improved data collection from living and dead marine mammal strandings	$99,904
TX	Texas Marine Mammal Stranding Network	Improved recovery and rehabilitation of stranded marine mammals	$99,936
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Improving Triage and Treatment of Live Stranded Marine Mammals in Virginia	$82,950
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Improving response to and assessments of dead marine mammal stranding in Virginia	$99,000
WA	Cascadia Research Collective	Trends, spatial distribution, health effects of contaminants in Washington harbor seals from stranded animals	$98,448
WA	Cascadia Research Collective	Strandings of large whales in Washington state and examination of contaminant accumulation	$71,535
WA	The Whale Museum	Stranding response and post-mortem evaluation of stranded marine mammals in San Juan County Washington	$89,123
WA	Wolf Hollow Wildlife Rehabilitation Center	Enhancement and Support of Marine Mammal Treatment Facility	$75,053
WA	Wolf Hollow Wildlife Rehabilitation Center	Upgrade of Life Support System for Marine Mammal Holding Pools	$99,400

2003 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	University of Alaska Anchorage	The effects of acute and chronic stress on the Atlantic bottlenose dolphin (*Tursiops Truncatus*) Adrenal gland.	$74,619
CA	City of Malibu	Consistency and improvement in marine mammal stranding response for the City of Malibu coastline	$100,000
CA	Marine Mammal Care Center at Fort MacArthur	Veterinary Fellowship Program at the Marine Mammal Care Center at Fort MacArthur	$100,000
CA	Natural History Museum of Los Angeles County	Development of an Improved Protocol for Examining Stranded Cetaceans: Combining Museum-based Science and Veterinary Medicine	$95,000
CA	Pacific Marine Mammal Center	Pathology enhancement and database development	$97,975
CA	San Jose State University Foundation	Improving the Response to Marine Mammal Strandings by Moss Landing Marine Laboratories in Central CA	$99,716
CA	Santa Barbara Museum of Natural History	Enhancement of Facility, Equipment and Supplies to Recover and Archive Dead, Stranded Cetaceans	$99,989
CA	SeaWorld, San Diego	Improving response, care and diagnostic for stranded marine mammal in Southern CA	$100,000
CA	SeaWorld, San Diego	Enhancement and integration of southern CA stranded marine mammal post-mortem evaluations and materials archives	$100,000
CA	The Marine Mammal Center	Continuation of a biomonitoring program to detect novel diseases and changes in prevalence of know diseases in pinnipeds stranded along the central California coast	$100,000
CA	The Marine Mammal Center	Advancement of clinical care of stranded marine mammals, especially those intoxicated with the algal toxin domoic acid	$100,000
CA	The Regents of the University of California, Davis	Cancer in stranded CA sea lions: answering questions about the role of contaminants, genetics, and diagnostic of herpes virus infection and early cancers	$100,000
CA	The Regents of the University of California, Santa Cruz	Enhancement of Stranding Response at the University of CA Santa Cruz Long Marine Lab	$49,703
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Application and refinement of a prognostic index to evaluate the health, nutritional status, and cause of stranding of stranded harp seals and hooded seals in the Northeastern U.S., with particular emphasis on a disease with epizootic potential	$99,997
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support for the Marine Mammal Stranding Program at Mystic Aquarium	$100,000
CT	University of Connecticut	Evaluation of immune functions are potential diagnostic and prognostic tools in stranded marine mammals	$95,744

DC	Smithsonian Institution	Enhancement and Maintenance of the Smithsonian Institution's Cetacean Distributional Database and Research Collection's (1 Year)	$97,580
DE	Delaware Department of Natural Resources and Environmental Conservation	Outfitting a necropsy lab to improve acquisition, analysis and storage of levels A, B and C data from stranded marine mammals in coastal Delaware and it's inland waterways	$100,000
FL	Florida Fish and Wildlife Conservation Commission	Facilities of Southwest Florida Cetaceans Rescue and Recovery	$90,800
FL	Gulf World, Inc.	Request for equipment to help facilities large animals and to make moving of all animals easier, safer and faster and for financial assistance with stranding facility operations	$45,675
FL	Hubbs-SeaWorld Research Institute	Enhancing live animal stranding response, necropsy procedures and tissue archiving capabilities along the central and northeast coast of FL	$96,826
FL	Marine Animal Rescue Society (MARS)	Improve MARS' impact on live stranding events in South FL, while nurturing existing outreach channels with a better presence	$99,952
FL	Mote Marine Laboratory	Facility expansion for the Dolphin and Whale Hospital	$100,000
FL	University of Florida	Poxvirus Infections in North American Pinnipeds	$38,181
LA	Audubon Nature Institute, Inc.	Enhancement of data collection from stranded marine mammals by the Louisiana Marine Mammal Rescue Program	$74,940
MA	Cape Cod Stranding Network, Inc.	Enhanced stranding response and investigation on Cape Cod: assessment, data, collection, sampling, and disposal	$100,000
MA	New England Aquarium Corporation	Improved field diagnostic and post release monitoring of mass stranded cetaceans	$99,958
MA	New England Aquarium Corporation	Improving marine mammal stranding response and rehabilitation in Massachusetts, New Hampshire, and Southern Maine	$100,000
MA	Woods Hole Oceanographic Institution	2003 Necropsy Enhancement for Stranded Marine Mammals	$99,267
MD	Maryland Department of Natural Resources	Improving Response to and Assessment of Dead Stranded Marine Mammals in Maryland	$99,997
MD	National Aquarium in Baltimore	Enhanced operations of Marine Animal Stranding Rescue and Rehabilitation through the procurement of medical/rescue equipment and a centralized storage facility.	$99,030
ME	College of the Atlantic	A medium-range response vessel to enhance the Marine Mammal Stranding Response Program (MMSRP) for Mid-coast/Downeast Maine	$80,000
ME	Marine Animal Lifeline	Enhancing and supporting marine mammal rescue response and stabilization procedures	$99,734
ME	Marine Animal Lifeline	Improved veterinary care and marine mammal rehabilitation program support	$98,401

ME	University of Southern Maine	Establishing a national resource of marine mammal cell lines for toxicological, infectious disease, and other biomedical research	$100,000
MS	Institute for Marine Mammal Studies, Inc.	Evaluation of trends and possible causes of marine mammal strandings in the Mississippi sound and adjacent waters	$100,000
NC	University of North Carolina Wilmington	Enhancing response to and necropsy of stranded large whales in North Carolina and Virginia	$93,262
NC	University of North Carolina Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammals in North Carolina and Virginia	$94,046
NJ	Marine Mammal Stranding Center	To ensure and support MMSC staffing requirements	$100,000
NY	Mount Sinai School of Medicine	Atlas of mysticete anatomy	$92,181
NY	Riverhead Foundation for Marine Research and Preservation	Facility upgrade to enhance access to veterinary care for marine mammals while collecting valuable supplemental data	$99,711
OR	Oregon State University	Enhancing the capabilities of the Oregon marine mammal stranding network	$99,967
SC	South Carolina Department of Natural Resources	Continuation of South Carolina's Marine Mammal Strandings Network	$86,690
TX	Texas Marine Mammal Stranding Network	Improved data collection from living and dead marine mammal strandings	$99,319
TX	Texas Marine Mammal Stranding Network	Improved Recovery and Treatment of Live Stranded Animals--Rescue, Rehabilitation and Release	$99,648
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Supporting response to dead marine mammal strandings in Virginia	$100,000
WA	The Whale Museum	Stranding response and post-mortem evaluation of stranded marine mammals in San Juan County, Washington	$95,178
WA	Washington Department of Fish and Wildlife	Investigations of marine mammals health parameters and causes of mortality in marine mammals from Washington waters	$72,256

2004 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Aleut Community of St Paul Island	Assessment of northern fur seal entanglement in marine debris on the Pribilof Islands.	$100,000
AK	Seward Association for the Advancement of Marine Science	Rescue and Rehabilitation of Pinnipeds and Cetaceans in AK	$99,815
AK	University of Alaska Fairbanks	Morbidity and mortality of marine mammals on the north coast of Alaska Peninsula	$99,908

AL	Marterra Foundation, Inc.	Enhancement of data collection Phase 2	$99,924
CA	Marine Mammal Care Center at Fort MacArthur	Enhanced Veterinary Medical Program at the Marine Mammal Care Center at Fort MacArthur	$100,000
CA	Northcoast Marine Mammal Center	Enhance diagnostic and treatment abilities, improve facilities for stranded marine mammals; continue employment of facility manager and primary investigating veterinarian to accomplish goals and objectives	$100,000
CA	San Jose State University Foundation	Movements, Dive Behavior and Survival of Post Release CA Sea Lions after Rehabilitation for Domoic Acid Toxicity	$97,322
CA	Santa Barbara Marine Mammal Center	Pinniped Rescue Capture Techniques Training Program	$32,000
CA	The Regents of the University of California, Santa Cruz	Marine Mammal Pathology for the Central CA	$99,980
DC	Smithsonian Institution	Enhancement and Maintenance of the Smithsonian Institution's Cetacean Distributional Database and Research Collection's (Year 2)	$97,467
FL	Dynamac Corporation	Marine Mammal Stranding Program on Florida's Space Coast: Upgrade Rescue and Data Collection	$43,198
FL	Harbor Branch Oceanographic Institution	Stranding Center Pool Enhancement	$97,763
FL	Harbor Branch Oceanographic Institution	Diagnostic Equipment Purchase	$54,964
FL	Hubbs-SeaWorld Research Institute	Cetacean stranding response and the development of a photographic stranding atlas for network education and training	$94,720
FL	Marine Animal Rescue Society (MARS)	Improve MARS' impact on live stranding events in South FL, while nurturing existing outreach channels with a better presence (2nd Year Funding)	$32,602
FL	Mote Marine Laboratory	Enhancement of marine mammal rescue and stranding program for central west FL	$100,000
HI	Hawaiian Islands Stranding Response Group	Collect consistent level A data throughout the jurisdiction, including remote areas, and collect level B and C data from stranding of dead marine mammals	$100,000
HI	Hawaiian Islands Stranding Response Group	Collect consistent level A data throughout the jurisdiction, including remote areas, and collect level B and C data from stranding of dead marine mammals (2nd Year Funding)	$100,000
LA	Audubon Nature Institute, Inc.	Enhancement of data collection from stranded marine mammals by the Louisiana Marine Mammal Rescue Program	$32,740
MA	Cape Cod Stranding Network, Inc.	The science of stranding response: supporting data collection from live and dead stranded marine mammals on Cape Cod	$100,000

MA	The Whale Center of New England	A project to increase the breadth and efficiency of marine mammal stranding response on Massachusetts' North Shore	$86,658
MD	National Aquarium in Baltimore	Enhanced operations of Marine Animal Stranding Rescue and Rehabilitation through the procurement of medical/rescue equipment (2nd Year Funding)	$71,344
ME	College of the Atlantic	Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast Maine	$65,058
NC	North Carolina State University	Improving live marine mammal stranding response in North Carolina through rapid diagnostic capability and short-term holding capacity	$83,195
NJ	Marine Mammal Stranding Center	To ensure and support MMSC staffing requirements (2nd Year Funding)	$100,000
NY	Riverhead Foundation for Marine Research and Preservation	Evaluation of current rescue response protocols and post-rehabilitation monitoring of marine mammals through the enhancement of data collection, satellite and radio tracking, and data on the prevalence of morbilli and herpes in pinnipeds in the northwest	$100,000
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Recovery and treatment of Live Stranded Marine Mammals in Virginia	$100,000
WA	Cascadia Research Collective	Cetacean stranding response in Washington with special attention to gray whales and harbor porpoise	$83,595
WA	Cascadia Research Collective	Trends, spatial distribution, health effects of contaminants in Washington pinnipeds	$96,372
WA	The Whale Museum	Stranding response and post-mortem evaluation of stranded marine mammals in San Juan County, Washington (2nd Year Funding)	$94,378
WA	Wolf Hollow Wildlife Rehabilitation Center	Advancement of Marine Mammal Rehabilitation Program, Facilities, Techniques, Training and Research	$99,980

2005 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Alaska Region Stranding Network coordination and development project	$86,607
AK	University of Alaska Fairbanks	Salvaging beach-dead marine mammals - collaborative effort between UAM, volunteer salvage crews and NOAA	$93,455
CA	Hubbs-SeaWorld Research Institute (CA)	Post-release monitoring of rehabilitated marine mammals in southern California through the use of VHF and UHF (satellite-linked) radio telemetry	$98,699
CA	Marine Mammal Care Center at Fort MacArthur	Support and upgrade of the Veterinary Medical Program at the Marine Mammal Care Center at Fort MacArthur	$100,000

CA	Pacific Marine Mammal Center	Enhancing diagnostic applications for stranded marine mammals and improving operational capabilities	$65,366
CA	San Jose State University Foundation	Body burden assessments of total mercury in stranded Pacific harbor seals, *Phoca vitulina richardii*, in central California	$98,815
CA	SeaWorld San Diego	Equipment and personnel for improving response and care for live stranded marine mammals in southern California	$76,108
CA	The Marine Mammal Center	Development of a biomonitoring program to detect novel diseases and changes in prevalence of known diseases in pinnipeds stranded along the central California coast - year 3	$100,000
CA	The Regents of the University of California, Santa Cruz	Marine Mammal Pathology Service for the central California coast, Part 3	$99,980
CA	The Regents of the University of California, Santa Cruz	Enhancement of stranding response at University of California Santa Cruz Long Marine Lab	$37,581
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and enhancement for the Marine Mammal Stranding Program at Mystic Aquarium	$100,000
DC	Smithsonian Institution	Enhancement of Level A, B and C Cetacean Data: Improving data quality and access to the Smithsonian Institution's Cetacean Distributional Database	$88,685
DE	Delaware Department of Natural Resources and Environmental Conservation	Support staffing and operational needs to facilitate improved stranding response for marine mammals occurring along the Delaware coast and its waterways	$100,000
FL	Dynamac Corporation	Marine Mammal Stranding Program on Florida's space coast	$36,961
FL	Florida Fish and Wildlife Conservation Commission - Jacksonville	Equipping the Northeast Florida Stranding Network for response to cetacean strandings	$65,116
FL	Harbor Branch Oceanographic Institution	Research project on cardiomyopathy of dwarf and pygmy sperm whales	$99,955
FL	Hubbs-SeaWorld Research Institute	An evaluation of demographic and health related factors of the Indian River Lagoon dolphin population following an Unusual Mortality Event	$76,162
FL	Marine Animal Rescue Society (MARS)	Improve MARS' impact on live stranding events in South Florida, while nurturing existing outreach channels with a better presence	$99,996
FL	Mote Marine Laboratory	Support for operation with the increased capacity of the Dolphin and Whale Hospital	$100,000
FL	Mote Marine Laboratory	Enhancement of the marine mammal stranding program and post-release monitoring of rehabilitated cetaceans for central west Florida	$100,000
HI	Robert C. Braun, D.V.M.	Hawaiian monk seal health trend surveillance and captive care response	$100,000
LA	Audubon Nature Institute, Inc.	Enhancement and maintenance of data collection from stranded marine mammals by the Louisiana Marine Mammal Rescue Program: Phase 2	$99,900

MA	Cape Cod Stranding Network, Inc.	Pursuing excellence in marine mammal stranding response: support for basic operational needs and innovative solutions to stranding challenges	$100,000
MA	New England Aquarium Corporation	Strengthening marine mammal stranding response and rehabilitation at the New England Aquarium	$99,596
MA	The Whale Center of New England	Marine mammal stranding response on Massachusetts' north shore: Continuation and expansion of data collection and assistance to stranded animals	$73,377
MA	Woods Hole Oceanographic Institution	Development of necropsy, anatomy, and pathology training materials from stranded marine mammals	$99,969
MD	Maryland Department of Natural Resources	Enhancing the quality and quantity of data collection from dead stranded marine mammals in Maryland	$88,387
ME	College of the Atlantic	Maintenance and enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the midcoast/downeast region of Maine, 2005-2006	$77,388
ME	University of New England	The enhancement of pinniped rehabilitation at Marine Animal Rehabilitation Center	$85,615
ME	University of Southern Maine	Establishing a national resource of marine mammal cell lines for toxicological, infectious disease, and other biomedical research	$100,000
MS	Institute for Marine Mammal Studies, Inc.	Evaluation of trends and possible causes of Atlantic bottlenose dolphin (*Tursiops truncatus*) strandings in the Mississippi Sound and adjacent waters (continuation study)	$100,000
NC	University of North Carolina Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammals in North Carolina and Virginia	$98,587
NJ	Marine Mammal Stranding Center	To enhance and support basic needs for volunteer training and response, treatment and data collection of live and dead stranded marine mammals in New Jersey	$100,000
NY	Riverhead Foundation for Marine Research and Preservation	Facility upgrade to enhance operational support and response to live marine mammal strandings while collecting valuable supplemental data	$100,000
OR	Oregon State University	Enhancing the capabilities of the Oregon Marine Mammal Stranding Network	$99,201
OR	Portland State University	Implementation of an archival system for cetacean tissue and anatomical specimens collected during 10 years of stranding network activity	$76,462
TX	Texas Marine Mammal Stranding Network	Response, treatment and data collection from living and dead stranded marine mammals	$99,905
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Enhancing response to live marine mammal strandings in Virginia	$100,000
WA	Washington Department of Fish and Wildlife	Investigations of marine mammal health parameters and causes of mortality in Washington state	$94,655
WA	Wolf Hollow Wildlife Rehabilitation Center	Advancement of marine mammal rehabilitation program, operations, facilities, training and research	$88,068

2006 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Aleut Community of St Paul Island	Assessment of northern fur seal (*Callorhinus ursinus*) entanglement in marine debris on the Pribilof Islands	$99,083
AK	University of Alaska Fairbanks	Improvements to marine mammal data and specimen archives at UAM	$100,000
AK	University of Alaska Fairbanks	Morbidity and mortality of marine mammals on the north coast of the Alaska Peninsula	$100,000
CA	City of Malibu	Advancement of marine mammal stranding response for the city of Malibu coastline	$87,698
CA	Marine Mammal Care Center at Fort MacArthur	Staffing resources upgrade at the Marine Mammal Care Center at Fort MacArthur	$83,200
CA	Northcoast Marine Mammal Center	Enhance response, rescue and rehabilitation on Northern California's remote coastline	$100,000
CA	Pacific Marine Mammal Center	Enclosure renovation and pool construction project	$58,539
CA	Santa Barbara Museum of Natural History	Support for and enhancement of data collection from Dead-Stranded cetaceans	$63,756
CA	SeaWorld San Diego	Personnel for improving stranded animal response in Southern California	$100,000
CA	The Marine Mammal Center	Development of diagnostic assays to detect lungworm (Otostrongylus circumlitus) infection in stranded northern elephant and Pacific harbor seals	$99,550
CA	The Regents of the University of California, Santa Cruz	Marine Mammal Pathology Service for the Central California Coast, Part 4	$99,946
CA	The Regents of the University of California, Santa Cruz	Enhancement of Stranding Response at University of California Santa Cruz Long Marine Lab	$48,389
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Mystic Aquarium	$99,310
CT	University of Connecticut	Evaluation of immune functions as potential diagnostic and prognostic tools in stranded marine mammal, a regional approach.	$100,000
FL	Florida Fish and Wildlife Conservation Commission	Stranding and Necropsy Training For Increasing Quality of Level A, B, and C Data Collection by the Florida Cetacean Stranding Network	$99,913
FL	Hubbs-SeaWorld Research Institute	Enhancing live animal stranding response, assessing cetacean health trends, and evaluating neonatal mortality trends of the bottlenose dolphin (Tursiops truncatus) along the east coast of Florida	$99,479
FL	Hubbs-SeaWorld Research Institute	Validation of historic marine mammal stranding data from the southeastern United States	$64,474
FL	Marine Animal Rescue Society (MARS)	Improve MARS' mass stranding response capability (immediate triage and necropsy support) and post-	$64,296

		rehabilitation monitoring preparedness for the SEUS stranding region	
FL	Mote Marine Laboratory	Investigating brevetoxin-induced mortality in bottlenose dolphins stranded in central west Florida	$100,000
FL	Nova Southeastern University	An Analysis of Kogia Stranding Data Collected by the Southeast Region Marine Mammal Stranding Network	$28,986
FL	University of Florida	Clinical Pathology and Histopathologic Processing and Analysis of Cetaceans in Northern and Central Florida	$99,955
GA	Georgia Department of Natural Resources	Enhance Georgia Marine Mammal Stranding Network	$55,848
MA	Cape Cod Stranding Network, Inc.	The Next Step: Operational Support to Enhance Stranding Response Capabilities and Promote Data Analysis and Publication	$100,000
MA	New England Aquarium Corporation	Advancement of Clinical Care, Data Collection, and Pathology Training for Marine Mammal Stranding Response	$99,954
MA	The Whale Center of New England	Marine mammal stranding response on Massachusetts' North Shore: Timely assistance for living animals and comprehensive regional data collection	$85,026
MA	Woods Hole Oceanographic Institution	2006 Necropsy of Fresh and Human-Impacted Marine Mammal Strandings in SE Massachusetts and Cape Cod	$98,714
MD	National Aquarium in Baltimore	2006 National Aquarium in Baltimore, Marine Animal Rescue Program Operations	$47,580
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast Region of Maine, 2006-2007	$82,890
ME	Marine Animal Lifeline	Veterinary care staffing and rehabilitation supply expense support for the marine mammal rehabilitation program	$100,000
ME	University of New England	The Enhancement of Cetacean Response, Treatment and Data Collection in Southern Maine	$93,596
ME	University of New England	Composting as a Disposal Option	$60,025
NC	North Carolina State University	Improving live marine mammal stranding response in North Carolina through a rapid diagnostic capability and short-term holding capacity	$56,930
NC	University of North Carolina Wilmington	Enhancing response to and necropsy of large whales in North Carolina, Virginia and South Carolina	$92,830
NC	University of North Carolina Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammals in North Carolina and Virginia	$99,986
NJ	Marine Mammal Stranding Center	To enhance and support Marine Mammal Stranding Center staffing requirements	$100,000
NY	Riverhead Foundation for Marine Research and Preservation	Facility Upgrade to Enhance Operational Support and Response to Marine Mammal Strandings	$100,000

OR	Oregon State University	Enhancing the capabilities of the Oregon Marine Mammal Stranding Network	$99,931
TX	Texas Marine Mammal Stranding Network	Response, treatment and data collection from living and dead stranded marine mammals	$99,998
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Continuing Investigation of Dead Marine Mammal Strandings in Virginia	$100,000
WA	Orca Network	Stranding response and post-mortem examination of stranded marine mammals in Central Puget Sound, Washington	$99,772
WA	Washington Department of Fish and Wildlife	Response to stranded marine mammals and investigating causes of mortality in Washington waters	$99,532
WA	Wolf Hollow Wildlife Rehabilitation Center	Care of Live Stranded Harbor Seals in the Northwest Region: Treatment, Data Management, Research, and Training	$85,638

2007 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Alaska Department of Fish and Game	Reduce Entanglements of Live Stranded Steller Sea Lions in Alaska	$54,000
AK	Alaska Whale Foundation	Improving Alaska Whale Foundation's disentanglement preparedness in Southeast Alaska	$39,540
AK	Seward Association for the Advancement of Marine Science	Basic operations and medical care of rehabilitation patients	$99,803
AK	Seward Association for the Advancement of Marine Science	Alaska Region Stranding Network Development and Training	$40,000
AK	University of Alaska Fairbanks	Improvements to marine mammal data and specimen archives at UAM.	$100,000
CA	Biomimetica	Establishing Auditory Evoked Potential Measurement Capabilities for Stranding Response Teams	$51,979
CA	Marine Mammal Care Center at Fort MacArthur	Improving operational capabilities at the Marine Mammal Care Center at Fort MacArthur	$96,100
CA	Northcoast Marine Mammal Center	Enhance response, rehabilitation and data collection of stranded marine mammals on Northern California's remote coastline	$94,780
CA	Pacific Marine Mammal Center	Diagnostic and Treatment Enhancements for Stranded Marine Mammals	$99,644
CA	San Jose State University Foundation	Enhancing the Response to Marine Mammal Strandings by Moss Landing Marine Laboratories in Central California	$99,838
CA	Santa Barbara Museum of Natural History	Enhancement of Cetacean Bio-Monitoring in Central and Southern California	$75,985

CA	The Marine Mammal Center	Understanding the cyclic dynamics of leptospirosis in California sea lions. (Zalophus californianus)	$99,428
CA	The Marine Mammal Center	Stranded harbor seals as indicators of pathogen prevalence in harbor seals of San Francisco, a heavily urbanized environment.	$95,792
CA	The Regents of the University of California, Santa Cruz	Marine Mammal Pathology Service for the Central California Coast, Part 5	$97,883
CA	The Regents of the University of California, Santa Cruz	Continued Prescott Program Enhancement of Stranding Response at University of California Santa Cruz Long Marine Lab	$90,906
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Mystic Aquarium	$100,000
DE	Delaware Department of Natural Resources and Environmental Conservation	Support staffing and operational needs for comprehensive stranding response and health assessments for marine mammals stranding in Delaware.	$99,680
FL	Florida Fish and Wildlife Conservation Commission	Cetacean Stranding Response and Training in Lee and Collier Counties, Florida	$40,086
FL	Hubbs-SeaWorld Research Institute	Enhancing live animal response, public outreach and education, and improving the assessment of cetacean health trends and interactions between bottlenose dolphins and recreational fishing gear	$99,581
FL	Hubbs-SeaWorld Research Institute	Age, growth, reproduction and feeding ecology of rough-toothed dolphins from single and mass strandings in Florida, with a compilation of voucher materials deposited in various institutions	$91,421
FL	Mote Marine Laboratory	Support for Operation of the Dolphin and Whale Hospital	$100,000
HI	Attractions Hawaii / DBA Sea Life Park by Dolphin Discovery	Development of live cetacean stranding response teams on the main Hawaiian Islands and a long-term cetacean rehabilitation facility on Oahu, Hawaii	$100,000
HI	Hawaii Pacific University	Continuing To Enhance Cetacean Necropsy Capabilities in the Main Hawaiian Islands	$100,000
MA	Cape Cod Stranding Network, Inc.	Maintaining Readiness: Operational Support for Single and Mass Stranding Response and Training on Cape Cod and Southeastern Massachusetts	$100,000
MA	New England Aquarium Corporation	Enhancement of Marine Mammal Response, Rehabilitation and Data Collection with a Focus on Mass Stranding Events	$99,906
MD	Maryland Department of Natural Resources	Continuation of Enhanced Level B and C Data Collection from Dead Stranded Marine Mammals in Maryland.	$65,435
ME	College of the Atlantic	Maintenance and enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast region of Maine, 2007-2008	$97,800

ME	Maine Department of Marine Resources	Support basic needs of organizations for response, treatment, and data collection from living and dead stranded marine mammals.	$100,000
ME	University of New England	Marine Animal Rehabilitation Center Diagnostic Enhancement, Disease Surveillance, and Operational Support	$99,559
MP	Northern Marianas College	Building the capacity of US Insular areas for Marine Mammal Stranding Response	$80,000
NC	University of North Carolina Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammals in North Carolina and Virginia	$98,240
NJ	Marine Mammal Stranding Center	To enhance and support Marine Mammal Stranding Center staffing and veterinary requirements.	$100,000
NY	Riverhead Foundation for Marine Research and Preservation	Program Support to Enhance Operations for Response, Treatment and Data Collection from Living and Dead Stranded Marine Mammals	$100,000
OR	Oregon State University	Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$98,502
OR	Portland State University	DIAGNOSTIC ASSESSMENT OF HEALTH AND INVESTGATION OF PROTENTIAL RELATIONSHIP OF DIET AND EXPOSURE TO BIOTOXINS IN STRANDED MARINE MAMMALS IN OREGON	$98,393
PR	Puerto Rico Department of Natural and Environmental Resources	Puerto Rico Marine Mammal Rescue Network	$100,000
TX	Texas Marine Mammal Stranding Network	Response, treatment and data collection from living and dead marine mammals stranded along the Texas coast	$100,000
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Response, rehabilitation & examination of stranded marine mammals in Virginia	$99,990
WA	Cascadia Research Collective	Stranding response in southern Puget Sound and central outer coast Washington 2007-2009 including large whale stranding response for all Washington	$99,833
WA	Washington Department of Fish and Wildlife	Enhanced response to stranded marine mammals and investigating causes of mortality in Washington waters.	$100,000
WA	Wolf Hollow Wildlife Rehabilitation Center	Care of Live Stranded Harbor Seals in the Northwest Region: Treatment, Data Collection and Compilation, and Training	$85,783

2008 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Alaska Region Stranding Network Annual Meetings and Training	$99,997
AK	Seward Association for the Advancement of Marine Science	Basic Operations and Medical Care of Rehabilitation Patients	$99,994
CA	California Academy of Sciences	Improving marine mammal data collection facilities and specimen archives at the California Academy of Sciences	$100,000
CA	City of Malibu	Marine Mammal Stranding Response and Data Collection for the City of Malibu	$74,740
CA	Marine Mammal Care Center at Fort MacArthur	Facility expansion and Upgrade at the Marine Mammal Care Center at Fort MacArthur	$93,155
CA	Northcoast Marine Mammal Center	Enhanced Stranding Response and Rehabilitation on the Lost Coast: Support for Basic Operational Needs and Development of Written Protocols and Manuals	$94,136
CA	San Jose State University Foundation	A vessel for whale disentanglement in central California	$20,000
CA	Santa Barbara Museum of Natural History	Enhancement of Cetacean Bio-Monitoring in Central and Southern California	$77,297
CA	The Regents of the University of California, Davis	Monitoring post-release movement and survival of rehabilitated harbor seal pups	$97,398
CA	The Regents of the University of California, Santa Cruz	Continued Prescott Program Enhancement of Stranding Response at University of California Santa Cruz Long Marine Lab	$99,106
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Mystic Aquarium	$74,966
FL	Florida Atlantic University Foundation (Harbor Branch Oceanographic Institution)	Further Investigations of the Etiopahogenesis of *Kogia* spp. Cardiomyopathy	$99,997
FL	Hubbs-SeaWorld Research Institute	Enhancing public and network outreach and education in the SEUS stranding network and support for marine mammal stranding response along the east coast of Florida	$99,966
FL	Marine Animal Rescue Society (MARS)	Enhance MARS' stranding support, facility capacity and outreach within the network through continual improvements of proven methods	$100,000
FL	Mote Marine Laboratory	Monitoring natural and human-related mortality of cetaceans along the central West coast of Florida and post-release tracking of rehabilitated animals	$100,000
FL	Mote Marine Laboratory	Facility and Equipment Enhancement at the Dolphin and Whale Hospital	$100,000

GA	Georgia Department of Natural Resources	Enhancing the Georgia Marine Mammal Stranding Network Through Improved Academic Collaboration	$34,877
HI	Hawaii Pacific University	Continuing to Build Capacity for Cetacean Necropsies in the Main Hawaiian Islands and the Greater Pacific	$100,000
LA	Audubon Nature Institute, Inc.	Louisiana Marine Mammal Rescue Program: continued program operations and response for live and dead strandings while increasing Level A, B, and C data collection and samples for analysis	$95,400
MA	New England Aquarium Corporation	Expanding Our Understanding of Marine Mammal Strandings through Enhanced Proficiency of Staff and Volunteers, Increased Sample Collection and Analysis, and More Efficient Manipulation of Data	$99,676
MA	Woods Hole Oceanographic Institution	2008- Examination of Offshore Large Whale Mortalities	$99,918
MD	Maryland Department of Natural Resources	Enhanced Tissue and Data Collection from Dead Stranded Marine Mammals in Maryland	$57,390
MD	National Aquarium in Baltimore	2008 Support and Enhancement of the National Aquarium in Baltimore's Marine Animal Rescue Program	$76,813
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Program (MMSRP) for the Mid-Coast/Downeast Region of Maine, 2008-2009	$92,308
ME	Maine Department of Marine Resources	Prescott Funds for the Maine Department of Marine Resources Marine Mammal Response	$100,000
ME	University of New England	Broadening Observations Through Technology, Continuation of Infectious Disease Monitoring, and Operational Support for the Marine Animal Rehabilitation Center at the University of New England	$99,225
MS	Institute for Marine Mammal Studies, Inc.	Enhancement of marine mammal stranding response, data collection, and tissue analysis in the Mississippi Sound and the adjacent waters of the North-Central Gulf of Mexico	$100,000
NC	University of North Carolina, Wilmington	Enhanced tissue collection and health monitoring of stranded marine mammals in North Carolina and Virginia	$99,974
NJ	Marine Mammal Stranding Center	Support and Enhancement for the Marine Mammal Stranding Program at MMSC	$100,000
NY	Riverhead Foundation for Marine Research and Preservation	Operational Support to Enhance Resources for Response, Treatment, and Date Collection from Living and Dead Stranded Marine Mammals Recovered in New York State	$100,000
OR	Oregon State University	Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,627
OR	Portland State University	Enhancement of Diagnostic Capabilities and Extension of Geographic Coverage for the Northern Oregon/Southern Washington Marine Mammal Stranding Program (NOSWSP)	$100,000

TX	Texas Marine Mammal Stranding Network	Response, Treatment, and Data Collection from Living and Dead Marine Mammals Stranded Along the Texas Coast	$100,000
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Processing archived samples from stranded Tursiops in VA	$99,865
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Supporting Expert Response to Stranded Marine Mammals in Virginia	$100,000
WA	Cascadia Research Collective	Enhanced Reponses to Stranded Marine Mammals in Washington Including Searches of Outer Coast Beaches and Smith Island to Examine Underreporting of Stranding Rates and Follow Up of Unusual Mortalities	$99,903
WA	Makah Tribe	Investigations of Marine Mammal Strandings on the Makah Indian Reservation	$29,288
WA	Orca Network	Enhanced stranding response, post-mortem examination, and diagnostics of stranded marine mammals in Central Puget Sound, Washington.	$94,750
WA	The Whale Museum	Response and postmortem evaluation of marine mammals stranded in San Juan County, Washington	$94,881

2009 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	North Slope Borough	Response to stranded marine mammals in the Chukchi and Beaufort Seas	$99,946
AK	Seward Association for the Advancement of Marine Science	Basic Operations and Medical Care of Rehabilitation Patients	$99,994
AK	University of Alaska Anchorage	Collaborative Approach to Stranding in Alaska	$97,256
CA	City of Malibu	Marine Mammal Stranding Response and Data Collection for the City of Malibu	$80,520
CA	Marine Mammal Care Center at Fort MacArthur	Veterinary Program Support at the Marine Mammal Care Center at Fort MacArthur	$100,000
CA	Natural History Museum of Los Angeles County	Enhancing response and data collection from dead stranded cetaceans in southern California	$69,720
CA	Northcoast Marine Mammal Center	Enhanced Stranding Response on the Lost Coast: Support for Basic Operational Needs and Installation of Rehabilitation Pools	$83,946
CA	Pacific Marine Mammal Center	Diagnostic and Treatment Enhancements for Stranded Marine Mammals	$70,038
CA	San Jose State University Foundation	Large Whale Stranding Investigation	$95,972
CA	Santa Barbara Museum of Natural History	Enhancement of Cetacean Bio-Monitoring in Central and Southern California	$70,804

CA	The Marine Mammal Center	Evaluation of the use of circulatory eosinophilia in California sea lions (Zalophus californianus) as an indicator of chronic health effects due to exposure to domoic acid, and thus releasability.	$78,192
CA	The Regents of the University of California, Santa Cruz	Continued Prescott Program Enhancement of Stranding Response at University of California Santa Cruz Long Marine Lab	$73,831
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Mystic Aquarium	$99,953
DE	Delaware Department of Natural Resources and Environmental Conservation	Support staffing and operational needs to perform comprehensive stranding response, data collection, and health assessment for stranded marine mammals occurring in Delaware	$100,000
FL	Florida Fish and Wildlife Conservation Commission	Necropsy Training for Increasing Quality of Level A, B, and C Data Collection by the Southeast Cetacean Stranding Network	$99,946
FL	Hubbs-SeaWorld Research Institute	Enhancing capacity for marine mammal stranding response and public education along the central east coast of Florida.	$99,975
FL	Mote Marine Laboratory	Rapid detection and response to cetacean mortalities in west central Florida and post-release tracking of rehabilitated cetaceans	$92,000
GA	Georgia Department of Natural Resources	Enhance the GA Marine Mammal Stranding Network	$45,000
HI	Hawaii Pacific University	Improving the quality of stranding data collected in Hawaii and American Samoa	$100,000
IL	Chicago Zoological Society	2009 Chicago Zoological Society Dolphin Research Program Assessing Post-Release Success of Rehabilitated Odontocete Cetaceans	$69,224
MA	Woods Hole Oceanographic Institution	2009 Necropsy of NE Beached, Rehabilitated and Bycaught Stranded Marine Mammals	$99,785
MD	Maryland Department of Natural Resources	Enhanced Sample Collection and Analysis from Dead Stranded Marine Mammals in Maryland	$40,000
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Midcoast/Downeast region of Maine, 2009-2010	$99,974
ME	Maine Department of Marine Resources	Enhancement of Marine Mammal Stranding Response and Public Outreach in Maine	$100,000
ME	The Whale Center of New England	Marine mammal strandings on Massachusetts' North Shore: enhancement of response, data quality, public education, and outreach	$60,004
ME	University of New England	Assessing and Strengthening Husbandry and Quarantine Protocols, and Operational Support for the Marine Animal Rehabilitation Center at the University of New England	$99,999
NC	Duke University	Using marine mammal strandings and observer data to estimate life history parameters and assess demographic impacts of marine fisheries on	$96,172

		odontocete populations in the northwestern Atlantic Ocean	
NC	North Carolina State University	Maintaining marine mammal stranding response capacity in central North Carolina and transitioning to a new stranding response program	$99,661
NC	University of North Carolina Wilmington	Building Stranding Capacity in Northern North Carolina	$99,930
NJ	Marine Mammal Stranding Center	Operational Support to Enhance Resources for Response, Treatment, and Data Collection from Living and Dead Stranded Marine Mammals Recovered in the States of New Jersey and Pennsylvania	$81,625
NY	Riverhead Foundation for Marine Research and Preservation	Operational Support to Enhance Resources for Response, Treatment, and Data Collection from Living and Dead Stranded Marine Mammals Recovered in New York State	$100,000
OR	Oregon State University	Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,993
OR	Portland State University	Sustainable Response, Enhanced Data Collection, Analysis and Educational Outreach for the Northern Oregon/Southern Washington Marine Mammal Stranding Program (NOSWSP)	$99,963
PR	Puerto Rico Department of Natural and Environmental Resources	Training and improvement of the Puerto Rico Department of Natural and Environmental Resources' Marine Mammal Rescue Program	$78,000
SC	Coastal Carolina University	Establishing the South Carolina Marine Mammal Stranding Network: Support for Stranding Response, Necropsies, Data Management, and Outreach	$99,790
TX	Texas Marine Mammal Stranding Network	Support of Operations and Enhancement Needs for Response, Treatment, and Data Collection From Living and Dead Marine Mammals Stranding Along the Texas Coast	$100,000
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Supporting Expert Response to Stranded Marine Mammals in Virginia in 2010	$100,000
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Collaborative Development of Stranded Cetacean Euthanasia Recommendations	$99,978
WA	Cascadia Research Collective	Stranding response in 2009-2011 for Southern Puget Sound, Central Washington Outer Coast, and all Washington (large cetaceans)	$99,815
WA	Makah Tribe	Investigations of Marine Mammal Strandings on the Makah Indian Reservation	$27,500
WA	The Whale Museum	Response and post-mortem evaluation of marine mammals stranded in San Juan County, Washington	$76,971
WA	Washington Department of Fish and Wildlife	WDFW 2009 Prescott Marine Mammal Stranding Response	$100,000
WA	Wolf Hollow Wildlife Rehabilitation Center	Advancement of Pinniped Rehabilitation Program: treatment, facility upgrades, training, data & tissue collection and analysis, post-release monitoring.	$92,909

2010 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Basic Operations and Medical Care of Rehabilitation Patients	$99,948
AK	Seward Association for the Advancement of Marine Science	Alaska Region Stranding Network Annual Meetings and Training	$39,972
AK	University of Alaska Fairbanks	S13105 M.A.P. Response to Marine Mammal Strandings in Alaska	$98,635
CA	California Academy of Sciences	Enhancing response and data collection from dead stranded marine mammals in northern California	$100,000
CA	Channel Islands Marine and Wildlife Institute	Modify and Upgrade the Rehabilitation Facilities to Meet or Exceed the NMFS Standards	$99,952
CA	City of Malibu	Marine Mammal Stranding Response and Data Collection for the City of Malibu	$80,212
CA	Marine Mammal Care Center at Fort MacArthur	Filtration Upgrades at the Marine Mammal Care Center at Fort MacArthur	$98,500
CA	Northcoast Marine Mammal Center	Facility improvements at the Northcoast Marine Mammal Center in Crescent City, California	$100,000
CA	San Jose State University Foundation	Enhancing the Response to Marine Mammal Strandings by Moss Landing Marine Laboratories in Central California	$99,960
CA	Santa Barbara Museum of Natural History	Enhancement of Cetacean Bio-Monitoring in Central and Southern California	$83,705
CA	The Marine Mammal Center	Evaluation of the oncogenic basis for the high prevalence of spontaneous neoplasia in California sea lions (Zalophus californianus)	$97,268
CA	The Regents of the University of California, Los Angeles	Using stranding data to understand the population-wide dynamics of leptospirosis in California sea lions (Zalophus californianus)	$99,880
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Sea Research Foundation's Mystic Aquarium	$99,983
CT	University of Connecticut	Pathogenesis of the American isolate of Phocine Distemper Virus (PDV USA 2006) in harbor, grey and harp seals.	$46,078
FL	Emerald Coast Wildlife Refuge	Enhancing marine mammal stranding response capability, post-release monitoring, and improving public awareness about marine mammal entanglement along the North Central Gulf Coast.	$78,860

FL	Hubbs-SeaWorld Research Institute	Enhancing marine mammal stranding response, public education, and stranding network preparedness along the central east coast of Florida	$99,978
FL	Mote Marine Laboratory	Rapid detection and response to cetacean mortalities and environmental monitoring in west central Florida	$97,378
GA	Georgia Department of Natural Resources	Enhance the Georgia Marine Mammal Stranding Network	$30,000
HI	Hawaii Pacific University	Continuing to improve the quality of stranding data collected in the Main Hawaiian Islands	$100,000
HI	University of Hawaii at Hilo	UHH: Support and Enhancement of the Hawaii Cetacean Rehabilitation Facility	$99,992
IL	Chicago Zoological Society	Post-Release Monitoring of Injured or Stranded Cetaceans in Florida	$94,613
MA	International Fund for Animal Welfare	Utilizing Auditory Evoked Potential to Assess the Auditory Capabilities of Mass and Single Stranded Small Odontocetes on Cape Cod and Southeastern Massachusetts	$97,156
MA	International Fund for Animal Welfare	Advancing Live and Dead Marine Mammal Stranding Response and Investigation on Cape Cod and Southeastern, Massachusetts	$100,000
MA	New England Aquarium Corporation	Enhancing efficiency; quantity of data and samples collected; and documentation in the fringes of the New England Aquarium's response range through training, equipment and outreach	$57,139
MD	Maryland Department of Natural Resources	Enhancing Marine Mammal Sample Collection, Diagnostic Testing, and Outreach in Maryland	$71,128
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Midcoast/Downeast Region of Maine, 2010-2011	$99,978
ME	Maine Department of Marine Resources	Enhancing Marine Mammal Stranding Response, Data Collection and Outreach in Maine	$100,000
ME	University of New England	Operational Support and Otitis Media Investigation for the UNE Marine Animal Rehabilitation Center	$99,745
NC	North Carolina Department of Environment and Natural Resources	Transitioning to a new stranding response program in central North Carolina through the North Carolina Division of Marine Fisheries	$92,117
NC	University of North Carolina Wilmington	Response to and Necropsy of Stranded Large Whales in North Carolina and Virginia	$99,980
NC	University of North Carolina Wilmington	Enhancing Stranding Response in Northern North Carolina	$99,890
NY	Riverhead Foundation for Marine Research and Preservation	Maximizing data collection from marine mammals stranded in New York State.	$100,000

OR	Oregon State University	Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,996
OR	Portland State University	Assessing Area-Specific Stranding Issues in the Northwest Oregon/Southern Washington Marine Mammal Stranding Program with Continued Field Response, Correlative Data Analysis and Increased Community	$99,954
SC	Coastal Carolina University	The South Carolina Marine Mammal Stranding Network: Support for Stranding Response, Necropsies, Data Management, and Outreach	$96,437
TX	Texas Marine Mammal Stranding Network	Support of operations and enhancement needs for response, treatment, and data collection from living and dead marine mammals stranding along the Texas and Western Louisiana coast.	$100,000
TX	Texas State Aquarium Association	Texas State Aquarium Association Rehabilitation Care Facility for Stranded Marine Mammals	$47,995
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Supporting Expert Response to Stranded Marine Mammals in Virginia in 2011	$99,927
WA	Makah Tribe	Investigations of Marine Mammal Strandings on the Makah Indian Reservation	$50,868
WA	Orca Network	Enhanced stranding response, post-mortem examination, and diagnostics of stranded marine mammals in Central Puget Sound, Washington	$84,475
WA	The Whale Museum	Marine mammal strandings and diseases in San Juan County, Washington: implications for marine mammals, domestic animals and humans	$79,177
WA	Washington Department of Fish and Wildlife	Washington Department of Fish and Wildlife's marine mammal health and stranding response program.	$100,000

2011 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Basic Operations and Medical Care of Rehabilitation Patients	$99,948
AK	Seward Association for the Advancement of Marine Science	Alaska Region Stranding Network Annual Meetings and Training	$39,972
AK	University of Alaska Fairbanks	S13105 M.A.P. Response to Marine Mammal Strandings in Alaska	$98,635
CA	California Academy of Sciences	Enhancing response and data collection from dead stranded marine mammals in northern California	$100,000
CA	Channel Islands Marine and Wildlife Institute	Modify and Upgrade the Rehabilitation Facilities to Meet or Exceed the NMFS Standards	$99,952

CA	City of Malibu	Marine Mammal Stranding Response and Data Collection for the City of Malibu	$80,212
CA	Marine Mammal Care Center at Fort MacArthur	Filtration Upgrades at the Marine Mammal Care Center at Fort MacArthur	$98,500
CA	Northcoast Marine Mammal Center	Facility improvements at the Northcoast Marine Mammal Center in Crescent City, California	$100,000
CA	San Jose State University Foundation	Enhancing the Response to Marine Mammal Strandings by Moss Landing Marine Laboratories in Central California	$99,960
CA	Santa Barbara Museum of Natural History	Enhancement of Cetacean Bio-Monitoring in Central and Southern California	$83,705
CA	The Marine Mammal Center	Evaluation of the oncogenic basis for the high prevalence of spontaneous neoplasia in California sea lions (Zalophus californianus)	$97,268
CA	The Regents of the University of California, Los Angeles	Using stranding data to understand the population-wide dynamics of leptospirosis in California sea lions (Zalophus californianus)	$99,880
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Sea Research Foundation's Mystic Aquarium	$99,983
CT	University of Connecticut	Pathogenesis of the American isolate of Phocine Distemper Virus (PDV USA 2006) in harbor, grey and harp seals.	$46,078
FL	Emerald Coast Wildlife Refuge	Enhancing marine mammal stranding response capability, post-release monitoring, and improving public awareness about marine mammal entanglement along the North Central Gulf Coast.	$78,860
FL	Hubbs-SeaWorld Research Institute	Enhancing marine mammal stranding response, public education, and stranding network preparedness along the central east coast of Florida	$99,978
FL	Mote Marine Laboratory	Rapid detection and response to cetacean mortalities and environmental monitoring in west central Florida	$97,378
GA	Georgia Department of Natural Resources	Enhance the Georgia Marine Mammal Stranding Network	$30,000
HI	Hawaii Pacific University	Continuing to improve the quality of stranding data collected in the Main Hawaiian Islands	$100,000
HI	University of Hawaii at Hilo	UHH: Support and Enhancement of the Hawaii Cetacean Rehabilitation Facility	$99,992
IL	Chicago Zoological Society	Post-Release Monitoring of Injured or Stranded Cetaceans in Florida	$94,613
MA	International Fund for Animal Welfare	Utilizing Auditory Evoked Potential to Assess the Auditory Capabilities of Mass and Single Stranded Small Odontocetes on Cape Cod and Southeastern Massachusetts	$97,156
MA	International Fund for Animal Welfare	Advancing Live and Dead Marine Mammal Stranding Response and Investigation on Cape Cod and Southeastern, Massachusetts	$100,000
MA	New England Aquarium Corporation	Enhancing efficiency; quantity of data and samples collected; and documentation in the fringes of the New	$57,139

		England Aquarium's response range through training, equipment and outreach	
MD	Maryland Department of Natural Resources	Enhancing Marine Mammal Sample Collection, Diagnostic Testing, and Outreach in Maryland	$71,128
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Midcoast/Downeast Region of Maine, 2010-2011	$99,978
ME	Maine Department of Marine Resources	Enhancing Marine Mammal Stranding Response, Data Collection and Outreach in Maine	$100,000
ME	University of New England	Operational Support and Otitis Media Investigation for the UNE Marine Animal Rehabilitation Center	$99,745
NC	North Carolina Department of Environment and Natural Resources	Transitioning to a new stranding response program in central North Carolina through the North Carolina Division of Marine Fisheries	$92,117
NC	University of North Carolina Wilmington	Response to and Necropsy of Stranded Large Whales in North Carolina and Virginia	$99,980
NC	University of North Carolina Wilmington	Enhancing Stranding Response in Northern North Carolina	$99,890
NY	Riverhead Foundation for Marine Research and Preservation	Maximizing data collection from marine mammals stranded in New York State.	$100,000
OR	Oregon State University	Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,996
OR	Portland State University	Assessing Area-Specific Stranding Issues in the Northwest Oregon/Southern Washington Marine Mammal Stranding Program with Continued Field Response, Correlative Data Analysis and Increased Community	$99,954
SC	Coastal Carolina University	The South Carolina Marine Mammal Stranding Network: Support for Stranding Response, Necropsies, Data Management, and Outreach	$96,437
TX	Texas Marine Mammal Stranding Network	Support of operations and enhancement needs for response, treatment, and data collection from living and dead marine mammals stranding along the Texas and Western Louisiana coast.	$100,000
TX	Texas State Aquarium Association	Texas State Aquarium Association Rehabilitation Care Facility for Stranded Marine Mammals	$47,995
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Supporting Expert Response to Stranded Marine Mammals in Virginia in 2011	$99,927
WA	Makah Tribe	Investigations of Marine Mammal Strandings on the Makah Indian Reservation	$50,868
WA	Orca Network	Enhanced stranding response, post-mortem examination, and diagnostics of stranded marine mammals in Central Puget Sound, Washington	$84,475
WA	The Whale Museum	Marine mammal strandings and diseases in San Juan County, Washington: implications for marine mammals, domestic animals and humans	$79,177

WA	Washington Department of Fish and Wildlife	Washington Department of Fish and Wildlife's marine mammal health and stranding response program.	$100,000

2012 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Basic Operations and Medical Care of Rehabilitation Patients 2012-13	$99,710
AK	University of Alaska Anchorage	Strengthening Alaska's Marine Mammal Stranding Program through Improved Level B and C Reporting	$99,711
CA	California Academy of Sciences	Improving staff and volunteer qualifications in order to enhance response and data collection from dead stranded marine mammals in northern California	$100,000
CA	Channel Islands Marine and Wildlife Institute	Basic Enhancement Needs for Response, Treatment and Data Collection from Living and Dead Stranded Marine Mammals through Staff Support - Stranding Operations & Animal Care Manager	$96,200
CA	Marine Mammal Care Center at Fort MacArthur	Infrastructure Enhancement at the Marine Mammal Care Center at Fort MacArthur	$50,700
CA	Pacific Marine Mammal Center	Enhance Professional Veterinary Care for Marine Mammal Patients	$99,600
CA	The Marine Mammal Center	Augmentation of ante mortem and post mortem diagnostics, treatment and advanced processes training at The Marine Mammal Center	$98,341
CA	The Regents of the University of California, Davis	Diagnostic Testing Support for the Marine Mammal Health and Stranding Network	$95,614
CA	The Regents of the University of California, Santa Cruz	Continued Prescott Program Enhancement of Stranding Response at University of California Santa Cruz Long Marine Lab	$87,870
CO	Colorado State University	Estimation of prevalence and optimization of diagnostic strategies for Coxiella burnetii in Pacific marine mammals	$100,000
CT	Sea Research Foundation, Inc. (Mystic Aquarium)	Support and Enhancement for the Marine Mammal Stranding Program at Sea Research Foundations Mystic Aquarium	$95,431
CT	University of Connecticut	The role of harmful algal blooms on bottlenose dolphin health: Relationships among biotoxins, eosinophils and immune functions	$70,673
FL	Florida Fish and Wildlife Conservation Commission	Level 1 and Level 2 Necropsy Training for Increasing Quality of Level A, B, and C Data Collection by the Southeast Cetacean Stranding Network	$99,999
FL	Hubbs-SeaWorld Research Institute	Enhancing marine mammal stranding response along the east coast of central Florida and increasing	$99,996

		comprehensive and consistent guidance for public and network response.	
FL	Mote Marine Laboratory	Rapid detection and response to cetacean mortalities, capacity building for large whale response, and post-release monitoring for rehabilitated animals in central west Florida	$99,080
FL	University of Florida	Viral respiratory disease in stranded marine mammals and potential anthroponotic or domestic animal origin	$100,000
HI	Hawaii Pacific University	Enhancing Cetacean Stranding Response in Hawaii and the Greater Pacific	$98,312
IL	Chicago Zoological Society	Dolphin Interventions in the Northeastern Gulf of Mexico	$99,996
LA	Louisiana Department of Wildlife and Fisheries	Louisiana Prescott Grant Program	$98,980
MA	International Fund for Animal Welfare	From Health to Hearing: Enhancing Stranding Response, Diagnostics, and Data Collection on Cape Cod, MA	$85,148
MA	Woods Hole Oceanographic Institution	2012 Pathophysiology of Bubbles in Stranded Odontocetes	$99,823
MD	Maryland Department of Natural Resources	Marine Mammal Stranding Event Response and Analysis in Maryland	$52,459
MD	National Aquarium in Baltimore	Implementation of a Cooperative Marine Mammal Outreach Program	$34,660
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast Region of Maine, 2012-2013	$79,995
ME	University Of New England	Rehabilitation Support and Compost Facility Expansion	$96,398
NC	North Carolina Department of Environment and Natural Resources	Continued Stranding Response in Central and Northern North Carolina through the North Carolina Division of Marine Fisheries	$99,997
NC	North Carolina Department of Environment and Natural Resources	Building Consistent Quality Response to Stranded Marine Mammals in Northern NC	$68,840
NC	University of North Carolina Wilmington	Providing Necropsy Training Workshops for the Southeast and Mid-Atlantic and Stranding Response for North Carolina	$98,765
NJ	Marine Mammal Stranding Center	Operational support for the response, treatment, and data collection from living and dead stranded marine mammals, with emphasis on the harbor porpoise take reduction plan	$98,055
NY	Riverhead Foundation for Marine Research and Preservation	Support for Facility Operations Relating to the Recovery, Treatment and Data Collection from Living and Dead Stranded Marine Mammals in New York State.	$100,000
OR	Oregon State University	Enhancing the capabilities of the Oregon Marine Mammal Stranding Network	$100,000

OR	Portland State University	Stranding Response, Data Collection to Document Trends in Disease and Human Interaction and Improvement of Capacity for Response by the Northern Oregon/Southern Washington Marine Mammal Stranding Program	$99,954
SC	Coastal Carolina University	The South Carolina Marine Mammal Stranding Network: Stranding Response, Necropsies, and Sample Analysis	$79,585
TX	Texas Marine Mammal Stranding Network	Aid of Operations and Increased Capability for Education, Response, Treatment, and Data Collection from Living and Dead Marine Mammals Stranded Along the Texas Coast.	$100,000
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Supporting Expert Response to Stranded Marine Mammals in Virginia and Beyond in 2013	$99,394
WA	Port Townsend Marine Science Society	Marine Mammal Strandings In East Jefferson County, Washington: Support for Network Response, Post-mortem Examinations, and Public Communication	$44,768
WA	The Whale Museum	Stranding Response and Disease Surveillance in San Juan County, WA	$84,112
WA	Washington Department of Fish and Wildlife	Enhanced response to stranded marine mammals and investigating causes of mortality in Washington waters by WDFW	$100,000
WA	Wolf Hollow Wildlife Rehabilitation Center	Stranded Pinniped Rehabilitation Program in Washington State: treatment, facility improvements, training, tissue & data collection	$37,000

2013 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	North Slope Borough	Enhanced Stranded Marine Mammal Response in Northern Alaska	$85,992
AK	Seward Association for the Advancement of Marine Science	Alaska Region Stranding Network Enhancement 2013-2015	$72,683
CA	California Academy of Sciences	Expanding Response to and Data Collection from Dead Stranded Marine Mammals in Northern California, Specifically in Sonoma County	$99,945
CA	The Regents of the University of California, Santa Cruz	Enhanced Stranding Response and Expansion of the Marine Mammal Anatomy and Pathology Library (MMAPL) at U.C. Santa Cruz	$80,494
FL	Hubbs-SeaWorld Research Institute	Supporting Marine Mammal Stranding Response Along the East Coast of Florida and Continuing Comprehensive Guidance for Public and Network Response	$99,996
HI	The Marine Mammal Center	Support for a Hawaiian Monk Seal Health Care Facility: A Critical Tool to Enhance Survival of Critically Endangered Seals	$67,900

MA	International Fund for Animal Welfare	Improved Stranding Response and Data Collection through Collaboration	$71,518
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-Coast/Downeast Region of Maine, 2013-2014	$79,996
NY	Riverhead Foundation for Marine Research and Preservation	Continued support for the development and deployment of the Specially Trained Animal Response Team (S.T.A.R.T)	$99,313
OR	Oregon State University	Oregon Marine Mammal Stranding Network	$100,000
TX	Texas Marine Mammal Stranding Network	Support for Operational and Enhancement Needs of the Texas Marine Mammal Stranding Network for the Recovery and Investigation of Live and Decease Marine Mammal Strandings	$99,778
WA	Cascadia Research Collective	Marine Mammal Stranding Response in Puget Sound and Washington Outer Coast, and for Large Cetaceans throughout Washington State, 2013-2016	$88,802

2014 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Live Marine Mammal Response in Alaska: Rehabilitation & Readiness for Unusual Events 2014-2015	$99,720
CA	California Academy of Sciences	Enhancing response and data collection from dead stranded marine mammals in northern California through complete necropsies including CT scans of Odontocetes	$49,413
CA	California Wildlife Center	Marine Mammal Rehabilitation Facility Upgrades and Consistent Program Coverage	$82,959
CA	Channel Islands Cetacean Research Unit	Establishment of a Cetacean Bio-Surveillance Program in Central and Southern California	$82,150
CA	MAR3INE (on behalf/Marine Mammal Care Center at Fort MacArthur	Husbandry Enhancements at the Marine Mammal Care Center at Fort MacArthur	$95,450
CA	Southern California Coastal Water Research Project	Enhanced cataloguing of bioaccumulative chemicals in stranded marine mammals to assess health impacts	$99,717
CA	The Regents of the University of California, Davis	Diagnostic Testing Support for the Marine Mammal Health and Stranding Network and Unusual Mortality Events	$99,383
CA	The Regents of the University of California, Santa Cruz	Enhanced Stranding Response and A New Response Partnership Between The Long Marine Lab and Moss Landing Stranding Networks	$88,781
CT	Sea Research Foundation, Inc.	Support and Enhancement for the Marine Mammal Stranding Program at Sea Research Foundation's Mystic Aquarium	$46,745

DE	Department of Natural Resources and Environmental Control	Support comprehensive stranding response, data collection and analysis, and health assessment for stranded marine mammals in Delaware	$49,203
FL	Florida Fish & Wildlife Conservation Commission	Northeast Florida Marine Mammal Stranding Network Response Enhancement	$41,895
FL	Florida Fish and Wildlife Conservation Commission	Florida Marine Mammal Stranding Network Coordination and Response in Southwest Florida	$80,593
FL	Hubbs-SeaWorld Research Institute	Supporting marine mammal stranding response along the east coast of central Florida and enhancing first response throughout the southeastern United States	$99,964
FL	Mote Marine Laboratory	Rapid detection, response, upgraded radiograph capabilities, and disentanglement efforts for stranded cetaceans in central west Florida	$99,615
GA	Georgia Aquarium, Inc.	Provide for Specimen Preservation for Marine Mammal Stranding Cases within the Southeast United States region (SEUS)	$10,045
HI	Hawaii Pacific University	Trouble in Paradise: Investigating Emerging Disease While Conducting Stranding Response in Hawaii and the Greater Pacific	$87,500
HI	The Marine Mammal Center	Support for a Hawaiian monk seal rehabilitation program: an essential tool to enhance survival of critically endangered seals	$99,448
IL	Chicago Zoological Society	Post-Release Monitoring of Injured or Stranded Cetaceans in the Southeastern U.S.	$49,933
LA	Audubon Nature Institute, Inc./Audubon Commission	Louisiana Marine Mammal and Sea Turtle Rescue Program (LMMSTRP): continued operations and response for live and dead marine mammal strandings	$32,398
LA	Louisiana Department of Wildlife and Fisheries	Enhanced operations and rapid response for marine mammal strandings and rescues along the Louisiana Coast	$67,602
MA	National Marine Life Center, Inc.	Expansion and Enhancements of Seal Rehabilitation in Massachusetts	$79,861
MD	Maryland Department of Natural Resources	Maryland DNR Marine Mammal Stranding Program - Response, Diagnostic Sample Analysis and Scientific Publication of the Twenty-Year Summary	$55,705
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast Region of Maine, 2014-2015	$99,934
ME	Marine Mammals of Maine	Project On-Call: To provide proven timely support for operations, educational outreach, data collection and data sharing regarding stranded marine mammals in Mid-coast and Southern, Maine	$83,878
NC	North Carolina Department of Environment & Natural Resources	Marine Mammal Stranding Response in Central Coastal and Northern North Carolina	$93,252
NC	University of North Carolina Wilmington	Response to and Coordination of Marine Mammals Strandings in North Carolina	$99,904

NY	Riverhead Foundation for Marine Research and Preservation	Support for Facility Operation to Maintain Response, Treatment and Data Collection of Live and Dead Marine Mammals in New York State	$100,000
OR	Oregon State University	Supporting and enhancing the Oregon Marine Mammal Stranding Network	$99,978
OR	Portland State University	Restoring Comprehensive Response for the Northern Oregon/Southern Washington Marine Mammal Stranding Program (NOSWSP)	$100,000
TX	Texas Marine Mammal Stranding Network	Support for basic operational needs of the Texas Marine Mammal Stranding Network for the recovery and investigation of live and deceased marine mammal strandings	$79,778
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Supporting Expert Stranding Response, Rehabilitation, and Data Collection for Marine Mammals in Virginia	$96,630
WA	Progressive Animal Welfare Society, Inc.	Advancement in Rehabilitative Care of Live Stranded Pinnipeds in the Southern Salish Sea: Treatment-Data Collection and Compilation, Water Quality, and Facility Upgrade	$49,717
WA	The Whale Museum	Stranding Response, Disease Surveillance and Spatial Analysis of Strandings in San Juan County, WA	$62,365
WA	Washington Department of Fish and Wildlife	Investigating causes of mortality and providing response to stranded marine mammals in Washington State	$100,000
WA	Wolf Hollow Wildlife Rehabilitation Center	Stranded Pinniped Rehabilitation Program in Washington State: treatment, facility improvements, training, diagnostic screening & data collection	$37,800

2015 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Live Marine Mammal Response in Alaska: Rehabilitation & Readiness for Unusual Events	$99,945
AK	University of Alaska Anchorage	Continued Strengthening of Alaska's Marine Mammal Stranding Program through Collaborative Level B and C Reporting; Diagnostic Support and Continuing Education for Stranding Network Members	$97,998
CA	California Academy of Sciences	Improving staff and volunteer qualifications in order to enhance response and data collection from dead stranded marine mammals in southern Mendocino and Sonoma counties, California	$79,957
CA	California Wildlife Center	Marine Mammal Rehabilitation Facility Upgrades and Consistent Coverage	$73,667

CA	Channel Islands Cetacean Research Unit	Enhancement to CICRU's Bio-Surveillance and Cetacean Health Monitoring Program	$87,078
CA	Channel Islands Marine and Wildlife Institute	Dedicated Support to Maintain Enhanced Operations and Coverage for Marine Mammal Stranding Response, Rehabilitation and Data Collection in Ventura County	$100,000
CA	Humboldt State University Sponsored Programs Foundation	Vehicle and Programmatic Support for the HSU Marine Mammal Stranding Program serving Del Norte, Humboldt and Mendocino Counties in Northern California	$81,724
CA	The Regents of the University of California, Santa Cruz	Enhanced Stranding Response and a Continued Response Partnership Between The Long Marine Lab and Moss Landing Stranding Networks	$85,983
CT	Sea Research Foundation, Inc.	Support and Enhancement for the Marine Mammal Stranding Program at Sea Research Foundation's Mystic Aquarium	$79,933
FL	Florida Fish and Wildlife Conservation Commission	Level 1 and Level 2 Necropsy Training for Increasing Quality of Level A,B,and C Data Collection by the Southeast Cetacean Stranding Network	$33,080
FL	Hubbs-SeaWorld Research Institute	Supporting marine mammal stranding response, education and outreach along the east coast of central Florida: A region of repeated Unusual Mortality Events	$99,996
FL	Mote Marine Laboratory	Mass stranding capacity building for equipment and training, and rapid detection, response and recovery of stranded cetaceans in Southwest Florida	$80,389
FL	The Florida Institute of Technology	Multi-Regional HAB Toxin Diagnostics for the Marine Mammal Stranding Network	$49,888
HI	Hawaii Pacific University	Investigating Causes of Mortality in Pacific Cetaceans	$90,000
HI	The Marine Mammal Center	Support for Hawaiian monk seal rehabilitation project designed to enhance survival of critically endangered seals	$99,465
IL	Chicago Zoological Society	A National Service Center for Post-Release Monitoring of Small Cetaceans	$58,316
LA	Louisiana Department of Wildlife and Fisheries	Marine Mammal Stranding Response, Rescue and Recovery; Enhancing Operations, Rapid Response, and Sample Collection Along the Louisiana Coast	$99,992
MA	International Fund for Animal Welfare	Pinniped Entanglement Investigation and Response in the Northeastern U.S.	$97,542
MA	National Marine Life Center, Inc.	Continuing the Marine Mammal Morphological Parasite Laboratory	$51,734

MA	National Marine Life Center, Inc.	Programmatic Support for Pinniped Rehabilitation in Northern New England: Enhancing Data Collection and Preparedness for Emergency Events	$70,041
NC	North Carolina Department of Environment & Natural Resources	Marine Mammal Stranding Response in Central Coastal and Inland North Carolina and Continued Bottlenose Dolphin Post-UME Surveillance	$95,385
NC	University of North Carolina at Wilmington	Response to and Coordination of Marine Mammal Strandings in North Carolina with Special Emphasis on Bottlenose Dolphin Post-UME and Human Interaction Monitoring	$98,295
NH	Seacoast Science Center, Inc.	Building on the Success of the Seacoast Science Center's New Stranding Response Program	$15,000
NY	Riverhead Foundation for Marine Research and Preservation	Development and deployment of an Incident Management Team (IMT) through the continued support of the Specially Trained Animal Response Team (START)	$50,000
NY	Riverhead Foundation for Marine Research and Preservation	Support for Facility Operation to Maintain Response, Treatment and Data Collection of Live and Dead Marine Mammals in New York State	$100,000
OR	Oregon State University	Supporting and Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,964
OR	Portland State University	Tracking the Role of Human Interaction and Disease in the Northern Oregon/Southern Washington Marine Mammal Stranding Program	$100,000
SC	Coastal Carolina University	The South Carolina Marine Mammal Stranding Network: Restoring Stranding Response Capacity	$80,661
TX	Texas Marine Mammal Stranding Network	Support of the Texas Marine Mammal Stranding Network (TMMSN) Rehabilitation and Research Program for Enhanced Investigation of Stranding Events along the Texas Coast	$90,407
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Coordinating Expert Response, Rehabilitation, and Data Collection for Stranded Marine Mammals in Virginia	$99,703
WA	Cascadia Research Collective	Marine mammal stranding response in Puget Sound and Washington Outer Coast, and for large cetaceans throughout Washington State, 2016-2018	$99,969
WA	Feiro Marine Life Center	The Juan de Fuca Marine Mammal Stranding Network (JdF MMSN): Response and Volunteer Training	$25,226
WA	The Whale Museum	Stranding Response and Disease Surveillance in San Juan County, Washington	$78,634

WA	Washington Department of Fish and Wildlife	Response and Investigating Causes of Mortality in Washington Marine Mammals	$100,000

2016 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Preparing for Unusual Events Involving Live Marine Mammals in Alaska & Using Deployable Assets for Rehabilitation	$99,991
CA	California Academy of Sciences	A Collaborative Partnership Focused on Outreach, Education, and Improved Response to Stranded Marine Mammals in Sonoma and Mendocino Counties, California: An Area with Limited Coverage	$98,205
CA	California Wildlife Center	Enhanced Level A Data Collection and Dead-Animal Stranding Response	$91,356
CA	Channel Islands Cetacean Research Unit	Enhancement to CICRU's Bio-Surveillance and Cetacean Health Monitoring Program	$77,257
CA	Channel Islands Marine and Wildlife Institute	Support Basic and Enhancement Needs for Ventura and Santa Barbara Counties	$99,921
CA	Humboldt State University Sponsored Programs Foundation	Expansion of Effort-based Marine Mammal Surveys in northern California and southern Oregon based on Multi-Agency Cooperation and Strategic Planning	$69,574
CA	MAR3INE (on behalf of Marine Mammal Care Ctr/Fort MacArthur)	Veterinary Technician Program at the Marine Mammal Care Center at Fort MacArthur	$100,000
CA	Northcoast Marine Mammal Center	Operational Support for Northcoast Marine Mammal Center Pinniped and Cetacean Reporting, Response, and Training: Public Outreach and Education in Humboldt and Del Norte County	$33,665
CA	The Marine Mammal Center	Investigation of Neurologic Disease in California Marine Mammals	$90,971
CT	Sea Research Foundation, Inc.	Support and Enhancement for the Marine Mammal Stranding Program at Sea Research Foundation's Mystic Aquarium	$100,000
FL	Hubbs-SeaWorld Research Institute	Supporting Marine Mammal Stranding Response and Education and Outreach along the East Coast of Central Florida: A Region of Repeated Unusual Mortality Events and Increased Dolphin Entanglements	$98,999
FL	Mote Marine Laboratory	Enhanced Capacity for Live Animal Response and Transport, and Continued High-Level Response,	$96,929

		Recovery, and Analyses of Stranded Cetaceans in Southwest Florida	
FL	The Florida Institute of Technology	Multi-Regional HAB Toxin Diagnostics for the Marine Mammal Stranding Network	$49,974
HI	Hawaii Pacific University	Continuing to Investigate Causes of Mortality in Pacific Cetaceans	$100,000
HI	The Marine Mammal Center	Support for a Hawaiian Monk Seal Rehabilitation Program: An Essential Tool to Enhance Survival of Critically Endangered Seals	$99,730
LA	Louisiana Department of Wildlife and Fisheries	Maintaining and Enhancing Marine Mammal Stranding Response, Rescue and Recovery Along the Louisiana Coast	$99,999
MA	International Fund for Animal Welfare	Large Whale and General Necropsy Support, Readiness, and Capacity Building within the Greater Atlantic Region	$45,553
MA	National Marine Life Center, Inc.	Programmatic Support for Pinniped Rehabilitation in Northern New England: Building Diagnostic Infrastructure and Enhancing Data Collection	$69,361
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-Coast/Downeast Region of Maine 2016-2017	$99,972
ME	Marine Mammals of Maine	Support and Enhancement for Response, Data Collection and Outreach for Stranded Marine Mammals for Mid-coast and Southern Maine	$95,565
MS	Institute for Marine Mammal Studies, Inc.	Conduct Marine Mammal Stranding Response in Mississippi to Continue Data and Tissue Collection, Live Animal Rehabilitation, and Coverage of the Coastline and Barrier Islands	$95,565
NC	North Carolina Department of Environment and Natural Resources	Marine Mammal Stranding Response in Central Coastal and Inland Northern North Carolina and Continued Bottlenose Dolphin Post-UME Surveillance	$97,649
NH	Seacoast Science Center	Strengthening Marine Mammal Stranding Response in New Hampshire, Supporting Network Partners, and Closing the Coverage Gap in North Shore Massachusetts	$47,654
NJ	Marine Mammal Stranding Center	New Jersey Marine Mammal Medical Response, Treatment and Outreach Program (NA16NMF4390348)	$62,656
NY	Riverhead Foundation for Marine Research and Preservation	Operational Support for Comprehensive Response, Treatment and Data Collection of Live and Dead Marine Mammals in New York State	$100,000

OR	Oregon State University	Supporting and Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,971
OR	Portland State University	Response to Marine Mammal Strandings by the Northern Oregon/Southern Washington Stranding Program (NOSWSP)	$98,675
SC	Coastal Carolina University	The South Carolina Marine Mammal Stranding Network: Restoring Stranding Response Capacity	$77,737
TX	Texas Marine Mammal Stranding Network	Provision for Heightened Response and Analysis of Stranding Events Conducted by the Texas Marine Mammal Stranding Network (TMMSN) Rehabilitation and Research Program along the Texas Coast	$99,364
WA	Makah Indian Tribe of the Makah Indian Reservation	Investigations of Marine Mammal Strandings on the Makah Indian Reservation, 2016-2018	$48,086
WA	The Whale Museum	Stranding Response and Disease Surveillance in San Juan County, Washington	$77,482
WA	Washington Department of Fish and Wildlife	Response and Investigating Causes of Mortality in Washington Marine Mammals	$96,560

2017 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Forging Public Connections with Marine Mammals through the Alaska SeaLife Center	$29,365
AK	University of Alaska Anchorage	Continued Strengthening of Alaska's Marine Mammal Stranding Program through Collaborative Level B And C Reporting; Diagnostic Support and Continuing Education For Stranding Network Members	$100,000
AK	University of Alaska Fairbanks	Marine Mammal Stranding Response and Reporting in Western Alaska	$67,149
CA	California Academy of Sciences	Improving Marine Mammal Stranding Response throughout the West Coast Region: A Collaborative Approach to Strandings on Beaches with Endangered Nesting Birds	$90,772
CA	California Academy of Sciences	Stable Isotope Signatures in Sea Lion Vibrissae: Searching for Clues to Explain the Recent California Sea Lion Mortality Event	$22,006
CA	Channel Islands Marine and Wildlife Institute	Facility Enhancements and Operational Support for Santa Barbara and Ventura Counties	$62,400

CA	Northcoast Marine Mammal Center	Going the Distance: Advancing Marine Mammal Response, Data Collection, and Education on the Lost Coast (Humboldt and Del Norte Counties of California)	$74,881
CA	San Jose State University Research Foundation	Large Whale Readiness and Response in Central and Northern California	$91,458
CA	The Marine Mammal Center	Investigation and Treatment of Respiratory Disease in California Sea Lions under Rehabilitation	$96,270
CA	The Regents of the University of California, Davis Campus	Diagnostic Testing Support for the Marine Mammal Health and Stranding Network and Unusual Mortality Events	$99,903
CA	The Regents of the University of California, Davis Campus	Improving National Capacity for Response to Oiled Marine Mammals Through Training	$85,482
CA	The Regents of the University of California, Santa Cruz	Enhanced Stranding Response on the Central California Coast	$99,998
CT	Sea Research Foundation, Inc.	Support and Enhancement for the Marine Mammal Stranding Program at Sea Research Foundation's Mystic Aquarium	$100,000
FL	Florida Fish and Wildlife Conservation Commission	Florida Marine Mammal Stranding Network Coordination, Response, and Sample Analyses in Southwest Florida	$95,275
FL	Hubbs-SeaWorld Research Institute	Critical Support for Marine Mammal Stranding Response along the East Coast of Central Florida: A Region of Repeated Unusual Mortality Events and Increased Dolphin Entanglements	$99,976
FL	Mote Marine Laboratory	Enhanced Capacity for Ultrasound Imaging and Continued High-Level Response, Recovery, and Analyses of Stranded Cetaceans in Southwest Florida	$58,476
FL	The Florida Institute of Technology	Multi-Regional HAB Toxin Diagnostics for the Marine Mammal Stranding Network	$99,990
GA	Georgia Department of Natural Resources	Maintain the Georgia Marine Mammal Stranding Network	$76,380
HI	The Marine Mammal Center	Support for a Hawaiian Monk Seal Rehabilitation Program: An Essential Tool to Species Recovery	$98,951
HI	University of Hawaii	Investigating Causes of Mortality in Pacific Island Cetaceans at the University of Hawaii	$100,000

MA	International Fund for Animal Welfare	Pharmacological Desensitization of Select Large Whale Entanglement Cases to Improve Disentanglement Efficacy and Safety	$98,128
MA	International Fund for Animal Welfare	Enhancing Small Cetacean Field Diagnostics and Treatments	$96,890
MD	Maryland Department of Natural Resources	Maintaining and Enhancing the Maryland Department of Natural Resources Stranding Response Program and Identifying New Pathogens Utilizing Viral Metagenomics	$78,449
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast region of Maine, 2017-2018	$99,970
ME	Marine Mammals of Maine	Increasing Capacity to Understand Marine Mammal Health through Stranding Response, Triage, and Necropsy in Mid-coast and Southern Maine	$99,784
NC	Department of Environmental Quality	Marine Mammal Stranding Response in Central Coastal and Northern Inland North Carolina and Continued Bottlenose Dolphin Post-UME Surveillance	$99,950
NC	University of North Carolina Wilmington	Response to and Coordination of Marine Mammal Strandings in North Carolina with Special Emphasis on Bottlenose Dolphin Post-UME and Enhanced Diagnostic Monitoring	$99,388
OR	Oregon State University	Supporting and Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,950
OR	Portland State University	Documenting Stranding Changes and Issues for the Northern Oregon/Southern Washington Marine Mammal Stranding Program (NOSWSP)	$100,000
TX	Texas Marine Mammal Stranding Network	Support for Live and Dead Marine Mammal Response, Rehabilitation and Data Collection along the Texas Coast	$94,391
WA	Sno-King County Marine Mammal Response	Support and Enhance the Basic Needs of the Sno-King Marine Mammal Response Program in Western Washington	$26,656
WA	The Whale Museum	Continued Stranding Response and Disease Surveillance in San Juan County, WA, and Improved Disentanglement Capabilities for the West Coast Region	$90,988
WA	Washington Department of Fish and Wildlife	Ongoing Response and Investigating Causes of Mortality in Washington Marine Mammals	$97,486

2018 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Alaska Department of Fish & Game	Live Capture and Disentanglement of Steller Sea Lions in Alaska	$100,000
AK	Alaska Whale Foundation	Enhancing Stranding and Entanglement Response Capacity in Southeast Alaska	$20,389
AK	Seward Association for the Advancement of Marine Science	Live Marine Mammal Response in Alaska and Development of Capabilities in Alaska's Remote Areas	$99,995
AK	University of Alaska Fairbanks	Marine Mammal Stranding Response and Reporting in Alaska	$20,573
CA	California Academy of Sciences	Enhancing Capacity for Dead Marine Mammal Stranding Response in Northern California Through Preparedness Remote Training Tools for Rapid Response	$90,551
CA	Channel Islands Marine and Wildlife Institute	Operational Support for Santa Barbara and Ventura Counties	$68,770
CA	Humboldt State University Sponsored Programs Foundation	Critical Support for Strengthening Dead Marine Mammal Response and for Enhancing Level A, B and C Reporting Along Remote Coastlines in Northern California	$99,897
CA	The Regents of the University of California, Santa Cruz	Enhanced Stranding Response and Training for the Future on the Central California Coast	$65,696
CT	Sea Research Foundation, Inc.	Operational Support for Mystic Aquarium's Animal Rescue Program Including Building Regional Supply Inventory for Large Whale Stranding Response	$100,000
DE	Marine Education, Research & Rehabilitation, Inc.	Essential Personnel, Supplies and Resources to Conduct Comprehensive Marine Mammal Stranding Response in Delaware	$48,940
FL	Hubbs-SeaWorld Research Institute	Marine Mammal Stranding Response Along Central Florida's East Coast: enhancing program capacity in a region of repeated Unusual Mortality Events and increased human interaction	$99,966
FL	Mote Marine Laboratory	Collaborative Training, Small Cetacean Disentanglement, and Continued High-Level Response, Recovery and Analyses of Stranded Cetaceans in Southwest Florida	$54,509
HI	The Marine Mammal Center	Continued Support for a Hawaiian Monk Seal Rehabilitation Program: An Essential Tool to Species Recovery	$87,702

HI	University of Hawaii	Stranding Response and Causes of Mortality in Pacific Island Cetaceans	$90,000
IL	Chicago Zoological Society, Inc.	Continuation of a National Service Center for Post-Release Monitoring of Small Cetaceans	$99,945
LA	Louisiana Department of Wildlife and Fisheries	Critical Support for Maintaining Louisiana's Marine Mammal Stranding and Rescue Program	$99,999
ME	College of the Atlantic	Maintenance and Enhancement of the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast region of Maine, 2018-2019	$49,996
ME	Marine Mammals of Maine	Support and Enhancement for Response, Data Collection and Triage to Rehab Operations for Marine Mammals in Mid-coast and Southern Maine	$49,669
ME	University of Maine System	Retrospective Analysis of Marine Mammal Strandings in a Region of Socio-Ecological and Environmental Change	$64,396
MD	National Aquarium, Inc.	Expansion of the Seal Rescue and Rehabilitation Program at the National Aquarium	$38,097
MA	National Marine Life Center, Inc.	Programmatic Support for Pinniped Rehabilitation in Northern New England: Enhancing Data Collection, Analyzing and Publishing Data	$73,778
MA	National Marine Life Center, Inc.	Continuing the Marine Mammal Morphological Parasite Laboratory	$39,702
NH	Seacoast Science Center, Inc.	Closing a Gap in Coverage in Northeastern Massachusetts and Advancing Key Personnel Expertise with Targeted Training and Enhanced Conference Participation	$33,112
NC	Department of Environmental Quality	Marine Mammal Stranding Response in Central Coastal and Northern Inland North Carolina and Continued Bottlenose Dolphin Post-UME Surveillance	$99,982
NC	University of North Carolina Wilmington	Microbiome Characterization as a Potential Health Indicator in Tursiops Truncatus and Kogia spp.	$90,604
NY	Atlantic Marine Conservation Society, Ltd.	Mortality and Entanglement Investigations in New York and the Greater Atlantic Region: A Collaborative Response and Training Initiative to Increasingly Challenging Issues	$100,000
OR	Oregon State University	Supporting and Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,980
OR	Portland State University	Investigating Continuing Changes in Marine Mammal Strandings in the Area Covered by the Northern	$100,000

		Oregon/Southern Washington Marine Mammal Stranding Program	
SC	Coastal Carolina University	The South Carolina Marine Mammal Stranding Network: Stranding Response and Enhanced Diagnostic Testing	$96,650
TX	Texas Marine Mammal Stranding Network	Enhanced Training and Operational Support for Increased Response, Treatment and Data Collection from Living and Dad Marine Mammals along the Texas Coast	$97,249
VA	Virginia Aquarium & Marine Science Center Foundation, Inc.	Coordinating Expert Response, Rehabilitation, and Data Collection for Stranded Marine Mammals in Virginia	$99,621
WA	Cascadia Research Collective	Cascadia Research Response Activities in Washington State: Coverage of Primary Response Areas and Statewide Effort for Large Whales, 2018-2020	$99,713
WA	SR3 Sealife Response, Rehab and Research	Enhancing Large Whale Entanglement Response in the Pacific Northwest	$96,828
WA	State of Washington, Department of Fish and Wildlife	Ongoing Response and Investigating Causes of Mortality in Washington Marine Mammals	$99,999
WA	The Whale Museum	Continued Stranding Response and Disease Surveillance in San Juan County, WA, and Improved Pinniped Entanglement Response for the West Coast Region	$90,570
WA	Wolf Hollow Wildlife Rehabilitation Center	Multiple Year Support for Rehabilitation of Live Stranded Pinnipeds and Education in San Juan County and WA State and Facilities Upgrades to Meet and Exceed NMFS Policies and Best Practices	$41,635

2019 Awards

State	*Applicant*	*Project Title*	*Federal Funding*
AK	Seward Association for the Advancement of Marine Science	Live Marine Mammal Response for Alaska and Training Additional Responders in Alaska's Remote Areas	$92,763
AK	Sun'aq Tribe of Kodiak	Enhancing Marine Mammal Stranding Response on Kodiak	$47,036
AK	University of Alaska Anchorage	Strengthening of Alaska's Marine Mammal Stranding Program Through a Statewide Stranding Coordinator for Level A-C Response with Improved Data and Sample Management	$100,000

AK	University of Alaska Fairbanks	Marine Mammal Stranding Response and Reporting in Alaska	$55,944
CA	California Academy of Sciences	Enhancing Marine Mammal Stranding Response in the San Francisco Bay Area by Improving Cetacean Reporting through Surveillance and Public Outreach and Education	$95,431
CA	California Academy of Sciences	Evaluating Long Term Trends in Marine Mammal Strandings Using Records from Multiple Data Sources	$22,852
CA	Channel Islands Cetacean Research Unit	Support for CICRU's Response Activities	$87,330
CA	Channel Islands Marine and Wildlife Institute	Post-Mortem Capability Enhancement and Staff Support for Ventura and Santa Barbara Counties	$74,545
CA	The Marine Mammal Center	Mitigating Marine Debris and Fisheries Entanglement Mortality of California Sea Lion	$99,462
CA	Northcoast Marine Mammal Center	Facility Enhancements, Operational Support and Community Outreach for Pinniped Rehabilitation and Large Whale Disentanglement	$95,065
CA	The Regents of the University of California, Davis	Diagnostic Testing Support for the Marine Mammal Health and Stranding Network and Unusual Mortality Events	$99,086
CA	The Regents of the University of California, Los Angeles	Investigating the Role of Northern Elephant Seals (Mirounga angustirostris) in Leptospira Transmission Dynamics in the Marine Ecosystem	$99,875
CA	The Regents of the University of California, Santa Cruz	Enhanced Stranding Response in Central California through Advanced Training and Improved Public Outreach	$95,582
CT	Sea Research Foundation, Inc.	Operational Support for Mystic Aquarium's Animal Rescue Program Including Developing an Internal Pinniped Entanglement Response Procedure	$100,000
DE	Marine Education, Research and Rehabilitation Institute, Inc.	Maintain and Improve Essential Stranding Personnel, Resources and Veterinary Capacity for Marine Mammal Strandings in Delaware	$52,260
FL	Clearwater Marine Aquarium, Inc.	Fred Howard Park Necropsy Field Station-Enhancing Cetacean Necropsy for Florida's Gulf Coast Region	$66,611
FL	Florida Institute of Technology	Biotoxin Diagnostic Capabilities for Marine Mammal Stranding Response	$99,972
FL	Florida Fish and Wildlife Commission	Florida Marine Mammal Stranding Network Coordination, Response and Sample Analyses in Southwest Florida	$46,898
FL	Hubbs-SeaWorld Research Institute	Critical Support for Maintaining High level Response Capacity Along Central Florida's East Coast: A region	$99,896

		of repeated Unusual Mortality Events and elevated incidence of human interaction	
FL	Mote Marine Laboratory	Cetacean Stranding Response, and Intervention Training and Tool Development Along Florida's Central West Coast	$77,680
GA	Georgia Department of Natural Resources	Enhance the Georgia Marine Mammal Stranding Network	$93,510
HI	The Marine Mammal Center	Hawaiian Monk Seal Rehabilitation Program: An Essential Tool for Species Recovery	$100,000
HI	University of Hawaii	Investigating Causes of Mortality and Increasing Stranding Awareness in the Pacific Islands Region	$100,000
MA	International Fund for Animal Welfare	Enhancing Brucella Surveillance and Diagnosis of Brucellosis in Short-beaked Common Dolphins (Delphinus delphis) on Cape Cod, Massachusetts	$95,798
MA	National Marine Life Center, Inc.	Programmatic Support for Pinniped Rehabilitation in Northern New England: Enhancing Data Quality, Analysis and Publication	$99,963
MD	Maryland Department of Natural Resources	Enhancing the Quality of Level A, B, and C Data Collected by the MD DNR Stranding Response Program, through the Addition of Disease Diagnostics and Enhanced Training Enforcement Agents	$74,278
MD	National Aquarium, Inc.	Evaluating the Behavioral Effects of Public Viewing on Seals Undergoing Rehabilitation at the National Aquarium	$59,649
ME	Acadia Wildlife Services	A Dedicated Marine Mammal Necropsy Service for the State of Maine	$86,392
ME	College of the Atlantic	Operational Support for the Marine Mammal Stranding Response Program (MMSRP) for the Mid-coast/Downeast Region of Maine, 2019-2020	$99,999
ME	Marine Mammals of Maine	Enhancing Marine Mammal Stranding Response, Data Collection and Triage to Rehab Operations in Mid-coast and Southern Maine, a Region of Ongoing UME Monitoring and Analyses	$99,639
NC	North Carolina Department of Environmental Quality	Marine Mammal Stranding Response in Central Coast North Carolina and Palmico Sounds with Ongoing and Post-Unusual Mortality Event Surveillance	$99,979
NH	Seacoast Science Center, Inc.	Support of Critical Operations for Enhanced Marine Mammal Response, Disease Surveillance, Data Collection and Archiving, and Outreach in New Hampshire and Northeastern Massachusetts	$35,617

NY	Atlantic Marine Conservation Society, Ltd.	Continued Support for Mortality and Entanglement Investigations in New York	$70,025
OR	Oregon State University	Supporting and Enhancing the Capabilities of the Oregon Marine Mammal Stranding Network	$99,952
OR	Portland State University	Continuing to Explore Recent Changes in Strandings in the Area Covered by the Northern Oregon/Southern Washington Marine Mammal Stranding Program (NOSWSP)	$100,000
SC	Coastal Carolina University	The South Carolina Marine Mammal Stranding Network: Stranding Response and Enhanced Diagnostic Testing	$97,125
SC	Low Country Marine Mammal Network	The South Carolina Marine Mammal Stranding Network: outreach and stranding response	$41,266
TX	Texas Marine Mammal Stranding Network	Critical Support for Response, Treatment and Data Collection from Stranded Marine Mammals along the Texas Coast	$100,000
VA	Virginia Aquarium and Marine Science Center Foundation, Inc.	Coordinating Expert Response, Rehabilitation, and Data Collection for Stranded Marine Mammals in Virginia	$84,159
VA	Virginia Aquarium and Marine Science Center Foundation, Inc.	Effects of Environmental Exposure on Wound Vitality Relative to Postmortem Interval, Salinity, and Decomposition in Bottlenose Dolphins	$37,888
WA	Cascadia Research Collective	Enhanced Large Whale Entanglement and Stranding Response Efforts in the Pacific Northwest	$99,914
WA	State of Washington Department of Fish and Wildlife	Ongoing Response and Investigating Causes of Mortality in Washington Marine Mammals	$100,000
WA	The Whale Museum	Continued Stranding Response, Disease Surveillance, and Entanglement Response in San Juan County, WA	$97,085

Appendix IV

Scoping Report For The

Marine Mammal Health And Stranding Response Program 2021

Environmental Impact Statement

TABLE OF CONTENTS

APPENDICES

TABLES

ACRONYMS

CFR	Code of Federal Regulations
ESA	Endangered Species Act
MMHSRP	Marine Mammal Health and Stranding Response Program
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NOAA	National Oceanic and Atmospheric Administration
OSP	Optimal Sustainable Population
PEIS	Programmatic Environmental Impact Statement
SA	Stranding Agreement
UME	Unusual Mortality Event

Introduction

A Notice of Intent (NOI) was published in the *Federal Register* (FR) on April 2, 2018 (Appendix A), and a Correction Notice on April 27, 2018 (Appendix B). The NOI announced NMFS' decision to prepare a Programmatic Environmental Impact Statement (PEIS) on the activities of the Marine Mammal Health and Stranding Response Program (MMHSRP) and conduct public scoping meetings via both webinar and an in-person meeting. The Correction Notice amended the dates and times of the in-person meeting and one of the webinars. The EIS is being prepared in accordance with the National Environmental Policy Act (NEPA). The NOI began the official scoping process for the EIS. This document summarizes the scoping process and the comments received during the process.

EIS Background Information

NMFS coordinates and operates the MMHSRP for response to stranded marine mammals and research on marine mammal health, pursuant to Title IV of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1421). Marine mammal stranding response is primarily conducted by a network of volunteer organizations across the country that are government officials under the authority of §109(h) or other groups that have entered into a Stranding Agreement or Letter of Agreement (SA or LOA) with NMFS pursuant to §112(c) of the MMPA. The MMHSRP operates at the national and regional level to coordinate and facilitate these responses.

Some activities of the MMHSRP are conducted under a permit issued under the MMPA and Section 10(a)(1)(A) of the Endangered Species Act (ESA) by the Permits, Conservation, and Education Division of the NMFS Office of Protected Resources. The permit covers stranding and emergency response activities (including disentanglement) for endangered marine mammal species, health assessment studies, and a variety of other research projects. The current MMPA/ESA permit expires on December 31, 2021. A NEPA analysis of the activities covered under the permit must be completed prior to the issuance of a new permit.

To provide further guidance to marine mammal stranding network members and to nationally standardize the guidelines and protocols of participants in the stranding network, several best practices and guideline documents are being prepared. Additionally, the current *Policies and Best Practices for Marine Mammal Stranding Response, Rehabilitation and Release*, finalized under the last PEIS published by the MMHSRP in 2009, will be updated, as appropriate. A NEPA analysis must also be completed to issue the final version of all policies, best practices, and guideline documents.

Purpose of Scoping

NEPA defines scoping as an “early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action” (40 CFR 1501.7). NMFS is required by NEPA to include scoping as part of the EIS process. The scoping meetings provided NMFS the opportunity to inform the public regarding the MMHSRP’s EIS and to obtain public input on the range of issues to be covered in the EIS. Comments were also collected via e-mail and postal mail during the scoping process.

Scoping Meetings Summary

Public Notices

A NOI was published in the FR on April 2, 2018 (83 FR 13955), and a Correction Notice on April 27, 2018 (83 FR 18507). The NOI announced NMFS’ decision to prepare a PEIS on the activities of the MMHSRP and conduct public scoping meetings via both webinar and an in-person meeting. The Correction Notice amended the dates and times of the in-person meeting and one of the webinars. Webinar and in-person meeting participants were required to register for the meeting via Eventbrite, an online ticketing and meeting planning platform.

Meeting announcements were also sent to the email list for the National Stranding Network, and the NOI was published on the MMHSRP website at: https://www.fisheries.noaa.gov/action/programmatic

-environmental-impact-statement-marine-mammal-health-and-stranding-response.

Public Scoping Meetings

Four public scoping meetings were held in May 2018. Three meetings were held virtually, and one meeting was also held in-person at the National Oceanic and Atmospheric Administration (NOAA) Headquarters in Silver Spring, Maryland. Table 1 lists the meeting locations, date, time, number of attendees, and the number of oral comments received. The number of attendees is an approximation, as not all attendees signed in at the meeting. The number of attendees also includes the NMFS regional stranding coordinators, when applicable.

Attendees that called into webinars were prompted to record their name, and an attendance list was generated at the end of each call. A PowerPoint presentation was delivered by MMHSRP staff, followed by an opportunity for attendees to ask questions and submit oral comments. The PowerPoint presentation used for each of the meetings is in Appendix C. Attendees were also informed that NMFS would accept written comments until June 1, 2018.

Table 1. Public Scoping Meeting Information

Meeting Type	Date/Time	Number of Attendees	Number of Oral Comments
Webinar	May 1, 2018 3:00 pm	25	0
Webinar	May 15, 2018 3:30 pm	13	2
In-person	May 18, 2018 10:30 am	2	1
Webinar	May 21, 2018 3:00 pm	10	0

Scoping Comments

During the scoping period (April 2, 2018 to June 1, 2018) 7 comments were collected regarding the PEIS during public meetings and through e-mail and postal mail (Appendix D). Comments addressed three specific areas: 1) the MMHSRP policy of rehabilitating and releasing ice seals in Alaska as outlined in the previous, PEIS; 2) requests by other government agencies to review preliminary drafts and improve coordination with their staff; and 3) general support for the MMHSRP and the PEIS process

PEIS Comments

The following is a summary of the types of comments received during the scoping process:

General

- Support for the MMHSRP's Proposed Actions, as well as the program as a whole

Response Alternatives

- Requesting better coordination with the National Park Service during response activities

- The No Action alternative should take into consideration the effects on animal welfare, if there will be no more formalized response
- The No Action alternative should take into consideration the economic effect of no longer awarding Prescott Grants for stranding response and rehabilitation

Carcass Disposal/Euthanasia Alternatives

- Requesting better coordination with the National Park Service during carcass disposal activities

Release of Rehabilitated Animals Alternatives

- Several organizations were supportive of the current ice seal rehabilitation and release policy in Alaska (ice seals rehabilitated outside of the arctic cannot be released).
- One organization urged NMFS to revisit this policy in light of recent climatic changes in the Arctic, and to develop more flexibility in deciding which ice seal cases were deemed non-releasable

Biological Resources

- The potential for unintended effects from release of rehabilitated ice seals that can impact wild populations should be considered.
- Consider including specific invasive and endangered species in the “Affected Environment” section

Human Health and Safety

- Consider that personnel may also be exposed to high levels of contaminants when conducting necropsies on apex predators

Conclusion

NMFS has completed the formal public scoping process for the MMHSRP PEIS. The agency will consider the comments received, individually and cumulatively, and will address those comments in the PEIS, to the extent required. Scoping is an iterative process and NMFS will continue to consider all relevant input received throughout the development of the PEIS.

APPENDIX A

FEDERAL REGISTER NOTICE OF INTENT

APRIL 2, 2018

◦ Sulfide inclusion less than or equal to 0.04% (area percentage);
◦ Oxide inclusion less than or equal to 0.05% (area percentage); and
• The mill test certificate must demonstrate that the steel is proprietary grade ''PK'' and specify the following:
◦ The exact tensile strength, which must be greater than or equal to 1600 N/mm2;
• The exact hardness, which must be greater than or equal to 465 Vickers hardness number;
• The exact elongation, which must be between 2.5% and 9.5%; and
• Certified as having residual compressive stress within a range of 100 to 400 N/mm2.

Also excluded from the scope of this order is certain cold-rolled flat-rolled steel meeting the requirements of ASTM A424 Type 1 and having each of the following characteristics:
• Continuous annealed cold-reduced steel in coils with a thickness of between 0.30 mm and 0.36 mm that is in widths either from 875 mm to 940 mm or from 1,168 to 1,232 mm;
• a chemical composition, by weight, of:
◦ Not more than 0.004% carbon;
◦ not more than 0.010% aluminum;
◦ 0.006%–0.010% nitrogen;
◦ 0.012%–0.030% boron;
◦ 0.010%–0.025% oxygen;
◦ less than 0.002% of titanium;
◦ less than 0.002% by weight of vanadium;
◦ less than 0.002% by weight of niobium;
◦ less than 0.002% by weight of antimony;
• a yield strength of from 179.3 MPa to 344.7 MPa;
• a tensile strength of from 303.7 MPa to 413.7 MPa;
• a percent of elongation of from 28% to 46% on a standard ASTM sample with a 5.08 mm gauge length;
• a product shape of flat after annealing, with flat defined as less than or equal to 1 I unit with no coil set as set forth in ASTM A568, Appendix X5 (alternate methods for expressing flatness).

The products subject to this order are currently classified in the Harmonized Tariff Schedule of the United States (HTSUS) under item numbers: 7209.15.0000, 7209.16.0030, 7209.16.0060, 7209.16.0070, 7209.16.0091, 7209.17.0030, 7209.17.0060, 7209.17.0070, 7209.17.0091, 7209.18.1530, 7209.18.1560, 7209.18.2510, 7209.18.2520, 7209.18.2580, 7209.18.6020, 7209.18.6090, 7209.25.0000, 7209.26.0000, 7209.27.0000, 7209.28.0000, 7209.90.0000, 7210.70.3000, 7211.23.1500, 7211.23.2000, 7211.23.3000, 7211.23.4500, 7211.23.6030, 7211.23.6060, 7211.23.6090, 7211.29.2030, 7211.29.2090, 7211.29.4500, 7211.29.6030, 7211.29.6080, 7211.90.0000, 7212.40.1000, 7212.40.5000, 7225.50.6000, 7225.50.8080, 7225.99.0090, 7226.92.5000, 7226.92.7050, and 7226.92.8050. The products subject to the order may also enter under the following HTSUS numbers: 7210.90.9000, 7212.50.0000, 7215.10.0010, 7215.10.0080, 7215.50.0016, 7215.50.0018, 7215.50.0020, 7215.50.0061, 7215.50.0063, 7215.50.0065, 7215.50.0090, 7215.90.5000, 7217.10.1000, 7217.10.2000, 7217.10.3000, 7217.10.7000, 7217.90.1000, 7217.90.5030, 7217.90.5060, 7217.90.5090, 7225.19.0000, 7226.19.1000, 7226.19.9000, 7226.99.0180, 7228.50.5015, 7228.50.5040, 7228.50.5070, 7228.60.8000, and 7229.90.1000. The HTSUS subheadings above are provided for convenience and U.S. Customs and Border Protection purposes only. The written description of the scope of the order is dispositive.

Appendix III—Scope of the AD Order on HFCs From China (A–570–028)

The products subject to this order are HFC blends. HFC blends covered by the scope are R–404A, a zeotropic mixture consisting of 52 percent 1,1,1 Trifluoroethane, 44 percent Pentafluoroethane, and 4 percent 1,1,1,2-Tetrafluoroethane; R–407A, a zeotropic mixture of 20 percent Difluoromethane, 40 percent Pentafluoroethane, and 40 percent 1,1,1,2-Tetrafluoroethane; R–407C, a zeotropic mixture of 23 percent Difluoromethane, 25 percent Pentafluoroethane, and 52 percent 1,1,1,2-Tetrafluoroethane; R–410A, a zeotropic mixture of 50 percent Difluoromethane and 50 percent Pentafluoroethane; and R–507A, an azeotropic mixture of 50 percent Pentafluoroethane and 50 percent 1,1,1-Trifluoroethane also known as R–507. The foregoing percentages are nominal percentages by weight. Actual percentages of single component refrigerants by weight may vary by plus or minus two percent points from the nominal percentage identified above.[11]

Any blend that includes an HFC component other than R–32, R–125, R–143a, or R–134a is excluded from the scope of this order.

Excluded from this order are blends of refrigerant chemicals that include products other than HFCs, such as blends including chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrocarbons (HCs), or hydrofluoroolefins (HFOs).

Also excluded from this order are patented HFC blends, including, but not limited to, ISCEON® blends, including MO99TM (R–438A), MO79 (R–422A), MO59 (R–417A), MO49PlusTM (R–437A) and MO29TM (R–4 22D), Genetron® PerformaxTM LT (R–407F), Choice® R– 421A, and Choice® R–421B.

HFC blends covered by the scope of this order are currently classified in the Harmonized Tariff Schedule of the United States (HTSUS) at subheadings 3824.78.0020 and 3824.78.0050. Although the HTSUS subheadings are provided for convenience and customs purposes, the written description of the scope is dispositive.

[11] R–404A is sold under various trade names, including Forane® 404A, Genetron® 404A, Solkane® 404A, Klea® 404A, and Suva®404A. R–407A is sold under various trade names, including Forane® 407A, Solkane® 407A, Klea®407A, and Suva®407A. R–407C is sold under various trade names, including Forane® 407C, Genetron® 407C, Solkane® 407C, Klea® 407C and Suva® 407C. R–410A is sold under various trade names, including EcoFluor R410, Forane® 410A, Genetron® R410A and AZ–20, Solkane® 410A, Klea® 410A, Suva® 410A, and Puron®. R–507A is sold under various trade names, including Forane® 507, Solkane® 507, Klea®507, Genetron®AZ–50, and Suva®507. R–32 is sold under various trade names, including Solkane®32, Forane®32, and Klea®32. R–125 is sold under various trade names, including Solkane®125, Klea®125, Genetron®125, and Forane®125. R–143a is sold under various trade names, including Solkane®143a, Genetron®143a, and Forane®125.

Appendix IV—Scope of the AD and CVD Orders on Light-Walled Rectangular Pipe and Tube From China (A–570–914 and C–570–915)

The merchandise subject to these orders is certain welded carbon quality light-walled steel pipe and tube, of rectangular (including square) cross section, having a wall thickness of less than 4 mm. The term carbon-quality steel includes both carbon steel and alloy steel which contains only small amounts of alloying elements. Specifically, the term carbon-quality includes products in which none of the elements listed below exceeds the quantity by weight respectively indicated: 1.80 percent of manganese, or 2.25 percent of silicon, or 1.00 percent of copper, or 0.50 percent of aluminum, or 1.25 percent of chromium, or 0.30 percent of cobalt, or 0.40 percent of lead, or 1.25 percent of nickel, or 0.30 percent of tungsten, or 0.10 percent of molybdenum, or 0.10 percent of niobium, or 0.15 percent vanadium, or 0.15 percent of zirconium. The description of carbon-quality is intended to identify carbon-quality products within the scope. The welded carbon-quality rectangular pipe and tube subject to these orders is currently classified under the Harmonized Tariff Schedule of the United States (HTSUS) subheadings 7306.61.50.00 and 7306.61.70.60. While HTSUS subheadings are provided for convenience and Customs purposes, our written description of the scope of these orders is dispositive.

[FR Doc. 2018–06607 Filed 3–30–18; 8:45 am]

BILLING CODE 3510–DS–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XG041

Programmatic Environmental Impact Statement (PEIS) for the Marine Mammal Health and Stranding Response Program

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of intent to prepare a PEIS; request for comments.

SUMMARY: Pursuant to the National Environmental Policy Act (NEPA) and the Council on Environmental Quality Regulations (CEQ), the National Marine Fisheries Service (NMFS) announces its intention to prepare a Programmatic Environmental Impact Statement (PEIS) to evaluate potential environmental effects associated with continued implementation of the Marine Mammal Health and Stranding Response Program

(MMHSRP). In addition, this PEIS will address changes to increase efficiencies made in the program since the initial MMHSRP PEIS was published in 2009. These updates include changes to the Best Practices for Marine Mammal Stranding Response, Rehabilitation and Release (Policies and Practices), as well as other aspects of the program including large whale entanglement response, health surveillance, research, morbidity and mortality investigations, and assessments.

DATES: Comments must be received by June 1, 2018. Scoping meetings are scheduled as follows:

1. May 1, 2018, 3 p.m. EDT—Webinar (Registration Required)
2. May 15, 2018, 3:30 p.m. EDT—Webinar (Registration Required)
3. May 18, 2018, 3 p.m. EDT—(valid ID compliant with the REAL ID Act required)—NOAA Science Center, 1301 East-West Highway, Silver Spring, MD
4. May 21, 2018, 10:30 a.m. EDT—Webinar (Registration Required)

ADDRESSES: Those wishing to attend either the webinars or in-person meeting must register at *https://mmhsrp-peis.eventbrite.com.* Valid ID that is compliant with the REAL ID Act is required to attend the in-person scoping meeting on May 18, 2018. Further information on types of ID that comply with this Act can be found at *https://www.dhs.gov/real-id-public-faqs.* Foreign nationals wishing to attend the in-person meeting must contact Stephen Manley 30 days in advance.

NMFS invites comments from all interested parties regarding the scope and content of a PEIS for changes and updates to the MMHSRP. For additional background and reference, the previous MMHSRP PEIS published in 2009 is available in electronic form via the internet at *https://repository.library.noaa.gov/view/noaa/4939.* Comments may be submitted using either of the following methods:

Federal e-Rulemaking Portal: Go to *www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2018-0036,* click the ''Comment Now!'' icon, complete the required fields and enter or attach your comments.

Mail: Send comments to: Chief, Marine Mammal and Sea Turtle Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3226, Attn: MMHSRP PEIS.

Instructions: NMFS may not consider comments if they are sent by any other method, to any other address or individual, or received after the comment period ends. All comments received are a part of the public record and will generally be posted to *http://www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender is publicly accessible. NMFS will also accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous).

FOR FURTHER INFORMATION CONTACT: Stephen Manley, NMFS, Office of Protected Resources, 301–427–8402, *Stephen.Manley@noaa.gov.*

SUPPLEMENTARY INFORMATION:

Background

Pursuant to Title IV of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1421), NMFS implements the MMHSRP. The mandated goals and purposes of the MMHSRP are to: (1) Facilitate the collection and dissemination of reference data on the health of marine mammals and health trends of marine mammal populations in the wild; (2) correlate the health of marine mammals and marine mammal populations in the wild, with available data on physical, chemical, and biological environmental parameters; and (3) coordinate effective responses to unusual mortality events in accordance with section 404 of the MMPA.

To meet the goals of the MMPA, the MMHSRP carries out several important activities, including: Coordinating the National Marine Mammal Stranding Network, the John H. Prescott Marine Mammal Rescue Assistance Grant Program, the National Marine Mammal Entanglement Response Program, the Marine Mammal Unusual Mortality Event and Emergency Response Programs, the Marine Mammal Biomonitoring Program, the Marine Mammal Tissue Bank, the Marine Mammal Analytical Quality Assurance Program, the MMHSRP Information Management Program, and the facilitation of several regional health assessment programs on wild marine mammals.

Individuals, groups and organizations throughout the country have been responding to stranded marine mammals for decades. After the passage of Title IV of the MMPA in 1992, NMFS began the process of codifying the roles, responsibilities, and activities of participant organizations in the National Marine Mammal Stranding Network through a Stranding Agreement (SA), issued under MMPA section 112(c) (16 U.S.C. 1382) and through the 109(h) authority for Federal, state, and local government employees (16 U.S.C. 1379). By issuing SAs under section 112(c), NMFS allows stranding network response organizations, acting as agents of the government, an exemption to the prohibition on takes of marine mammals established under the MMPA. A standardized national template for SAs was developed, including sections that may be customized by each region in order to maintain flexibility. NMFS also developed a list of minimum criteria for organizations wishing to obtain a SA and participate in the stranding network. NMFS proposes to modify both the template and the list of minimum criteria to become a member of the stranding network. Additionally, NMFS has national protocols to help standardize the stranding network across the country while maintaining regional flexibility where appropriate. These protocols, as well as the SAs and minimum criteria, were analyzed in the initial PEIS and were issued in 2009 as one consolidated manual, titled ''*Policies and Best Practices for Marine Mammal Stranding Response, Rehabilitation and Release*'' (Policies and Practices). The MMHSRP will update these documents to reflect the information gained from and the developments in marine mammal emergency response that have occurred over the past decade, and would like to identify the scope of issues that should be addressed.

Stranded marine mammals undergoing rehabilitation and the facilities conducting rehabilitation activities are not subject to inspection or review by the Animal and Plant Health Inspection Service (APHIS) under the United States Department of Agriculture, if they are not also a public display facility (separate from their rehabilitation activities) or a research facility. These facilities are therefore not subject to APHIS minimum requirements for facilities, husbandry, or veterinary standards. Previously, NMFS developed minimum standards for marine mammal rehabilitation facilities that are required of all facilities operating under a SA with NMFS. Additionally, section 402(a) (16 U.S.C. 1421a) of the MMPA charges NMFS with providing guidance for determining at what point a rehabilitated marine mammal is releasable to the wild. Standards for release of rehabilitated marine mammals were developed by NMFS and are part of the Policies and Practices document. NMFS proposes to review the rehabilitation guidelines, as well as the criteria for release of rehabilitated marine mammals into the wild and update these documents, as necessary.

In addition, the MMHSRP maintains a permit from the NMFS Office of Protected Resources Permits and Conservation, issued under the MMPA (16 U.S.C. 1361 *et seq.*) and the ESA (16 U.S.C. 1531 *et seq.*). The permit authorizes the MMHSRP to carry out stranding and entanglement response, rescue, rehabilitation, and release of threatened and endangered marine mammals and conduct health-related scientific research studies on marine mammals and marine mammal parts. The current permit issued to the MMHSRP will expire on June 30, 2020. For additional information about the MMHSRP, the national stranding network, and other related information, please visit our website at *https://www.fisheries.noaa.gov/national/marine-life-in-distress/marine-mammal-health-and-stranding-response-program*.

NEPA, CEQ Regulations (40 CFR 1500.4(i), 1502.4 and 1502.20) and NOAA Administrative Order (NAO) 216–6A require all proposals for major actions to be reviewed with respect to environmental consequences on the human environment and encourage the use of programmatic NEPA documents and tiering to streamline decision making in a process that progresses from programmatic analyses to site-specific reviews. NMFS determined a programmatic approach is appropriate because multiple activities are conducted in support of the MMHSRP and activities occur nationally, over large geographical areas. Therefore, the analysis in the PEIS will support NMFS planning-level decisions associated with oversight and implementation of the MMHRSP and establish the framework and parameters for subsequent analyses based on the programmatic review. In addition, NMFS will rely on this PEIS for permitted activities as well as the basis for tiering in site-specific NEPA review.

Purpose and Scope of the Action

NMFS is proposing to continue coordinating and implementing the MMHSRP. Using a programmatic approach, NMFS will identify and prepare a qualitative analysis of environmental impacts covering a range of activities conducted in support of the MMHSRP program, including the issuance of revised Policies and Best Practices, revised protocols and procedures, and a new MMPA/ESA permit for this program. Resource areas to be addressed in this analysis include, but are not limited to, biological resources (notably marine mammals, threatened and endangered species, fish and other wildlife species and their habitat), sediments and water quality, historic and cultural resources, socioeconomics and tourism, and public health and safety. This PEIS will supersede the initial PEIS published in 2009 and will assess the potential environmental effects of marine mammal health and stranding response under a range of alternatives characterized by different methods, mitigation measures, and level of response. For all potentially significant impacts, the proposed PEIS will identify avoidance, minimization and mitigation measures to reduce these impacts, where feasible, to a level below significance.

The scoping process will be used to identify public concerns along with national and local issues to be addressed in the PEIS. Federal agencies, state agencies, local agencies, Native American Indian Tribes and Nations, the public, and interested persons are encouraged to identify specific issues or topics of environmental concern that NMFS should consider. Public participation is invited by providing written comments to NMFS and/or attending the scoping meetings and webinars.

Special Accommodations

The in-person meeting is physically accessible to people with disabilities. Requests for sign language interpretation or other auxiliary aids should be directed to Stephen Manley (see **ADDRESSES**) at least 5 days prior to the meeting date.

Dated: March 28, 2018.

Elaine T. Saiz,

Acting Deputy Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2018–06611 Filed 3–30–18; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Proposed Information Collection; Comment Request; Office of National Marine Sanctuaries Visitor Centers Survey

AGENCY: National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice.

SUMMARY: The Department of Commerce, as part of its continuing effort to reduce paperwork and respondent burden, invites the general public and other Federal agencies to take this opportunity to comment on proposed and/or continuing information collections, as required by the Paperwork Reduction Act of 1995.

DATES: Written comments must be submitted on or before June 1, 2018.

ADDRESSES: Direct all written comments to Jennifer Jessup, Departmental Paperwork Clearance Officer, Department of Commerce, Room 6616, 14th and Constitution Avenue NW, Washington, DC 20230 (or via the internet at *pracomments@doc.gov*).

FOR FURTHER INFORMATION CONTACT: Requests for additional information or copies of the information collection instrument and instructions should be directed to Dr. Danielle Schwarzmann 240–533–0706 or *danielle.schwarzmann@noaa.gov*

SUPPLEMENTARY INFORMATION:

I. Abstract

This request is for a new collection of information. NOAA's Office of National Marine Sanctuaries (ONMS) is conducting research to measure the public's opinions about sanctuary visitor centers, exhibits, and kiosks. Exhibits and kiosks covered under the survey can be permanent or traveling/temporary. The survey will be administered annually both within an ONMS visitor center as well as at partner venues that host an exhibit or kiosk on a national marine sanctuary or marine national monument. The survey will cover visitor centers, exhibits, and kiosks system-wide across all the national marine sanctuaries and marine national monuments managed or co-managed by NOAA's ONMS.

The visitor survey will be conducted to obtain an objective analysis of visitor experiences within a sanctuary visitor center or at a partner venue that includes an exhibit or kiosk with information on a national marine sanctuary or marine national monument. Information will be obtained on visitor satisfaction with the overall exhibits or kiosks, graphics, multi-media products, interactives, along with the overall feelings about the facilities and services offered at the centers/venues. The survey will acquire data on the effectiveness of sanctuary/monument messaging, awareness about and use of sanctuary/monument resources, as well as additional recreational and/or educational opportunities available to the public. Lastly, the survey will include questions about visitor demographics.

The information will aid NOAA's Office of National Marine Sanctuaries budget allocation and prioritization, strategic planning, and management

APPENDIX B

FEDERAL REGISTER CORRECTION NOTICE

APRIL 27, 2018

ADDRESSES: The meeting will be held via conference call and webinar. Public access is available at 1315 East-West Highway, Bldg.3, Room #01303, Silver Spring, MD 20910. In order to attend in person or via conference call/webinar, please R.S.V.P to Donna Brown (contact information below) by Friday, May 4, 2018.

FOR FURTHER INFORMATION CONTACT: For any questions concerning the meeting, please contact Ms. Donna Brown, National Sea Grant College Program, National Oceanic and Atmospheric Administration, 1315 East-West Highway, Room 11717, Silver Spring, Maryland, 20910, 301–734–1088 or *Donna.Brown@noaa.gov.*

SUPPLEMENTARY INFORMATION:

Status: The meeting will be open to public participation with a 10-minute public comment period on Monday, May 14, 2018 at 4:10 p.m. ET. (check agenda using link in the Summary section to confirm time.)

The NSGAB expects that public statements presented at its meetings will not be repetitive of previously submitted verbal or written statements. In general, each individual or group making a verbal presentation will be limited to a total time of three (3) minutes. Written comments should be received by Ms. Donna Brown by Monday, May 7, 2018 to provide sufficient time for NSGAB review. Written comments received after the deadline will be distributed to the NSGAB, but may not be reviewed prior to the meeting date. Seats will be available on a first-come, first-serve basis.

Special Accommodations: These meetings are physically accessible to people with disabilities. Requests for sign language interpretation or other auxiliary aids should be directed to Ms. Donna Brown by Friday, May 4, 2018. The NSGAB, which consists of a balanced representation from academia, industry, state government and citizens groups, was established in 1976 by Section 209 of the Sea Grant Improvement Act (Pub. L. 94–461, 33 U.S.C. 1128). The NSGAB advises the Secretary of Commerce and the Director of Sea Grant with respect to operations under the Act, and such other matters as the Secretary refers to them for review and advice.

Dated: April 19, 2018.

David Holst,

Chief Financial Officer/Administrative Officer, Office of Oceanic and Atmospheric Research, National Oceanic and Atmospheric Administration.

[FR Doc. 2018–08931 Filed 4–26–18; 8:45 am]

BILLING CODE 3510–KA–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XG041

Programmatic Environmental Impact Statement for the Marine Mammal Health and Stranding Response Program

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of intent to prepare a Programmatic Environmental Impact Statement (PEIS); request for comments; correction.

SUMMARY: This notice contains corrections to the scoping meeting times published on April 2, 2018, in the **DATES** section of a notice of intent for the Marine Mammal Health and Stranding Response Program (MMHSRP) to prepare a PEIS. This action is necessary to correct an error in the times of the in-person scoping meeting and webinars published in the **Federal Register**.

DATES: This correction is applicable as of April 27, 2018.

FOR FURTHER INFORMATION CONTACT: Stephen Manley, NMFS, Office of Protected Resources, 301–427–8402, *Stephen.Manley@noaa.gov.*

SUPPLEMENTARY INFORMATION:

Background

A notice of intent for the MMHSRP to prepare a PEIS published on April 2, 2018 (83 FR 13955). This correction replaces the meeting times in the notice.

Need for Correction

As published, in the **DATES** section, on page 13956 of the **Federal Register**, the times of the in-person scoping meeting on May 18, 2018, and scoping webinar on May 21, 2018, were incorrect. This correction does not change NMFS' intent to prepare a PEIS for the MMHSRP. The correct dates and times of the public scoping meeting and webinars are as follows:

DATES: Comments must be received by June 1, 2018. Those wishing to attend either the webinars or in-person meeting must register at *https://mmhsrp-peis.eventbrite.com.* Scoping meetings are scheduled as follows:

1. May 1, 2018, 3 p.m. EDT—Webinar (Registration Required)
2. May 15, 2018, 3:30 p.m. EDT—Webinar (Registration Required)
3. May 18, 2018, 10:30 a.m. EDT—(valid ID compliant with the REAL ID Act required)—NOAA Science Center, 1301 East West Highway, Silver Spring, MD
4. May 21, 2018, 3:00 p.m. EDT—Webinar (Registration Required)

Dated: April 24, 2018.

Donna S. Wieting,

Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 2018–08892 Filed 4–26–18; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648–XG132

Takes of Marine Mammals Incidental To Specified Activities; Taking Marine Mammals Incidental to the South Basin Improvements Project at the San Francisco Ferry Terminal

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; proposed incidental harassment authorization; request for comments.

SUMMARY: NMFS has received a request from the San Francisco Bay Area Water Emergency Transportation Authority (WETA) for authorization to take marine mammals incidental to Downtown San Francisco Ferry Terminal Expansion Project, South Basin Improvements Project in San Francisco, California. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than May 29, 2018.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.Fowler@noaa.gov.*

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-

APPENDIX C

SCOPING MEETING PRESENTATION

MAY 2018

Call-in Information:

Phone Number: 888-324-3187

Passcode: 3575107

NOAA FISHERIES

A Programmatic Environmental Impact Statement (PEIS) for the Marine Mammal Health and Stranding Response Program (MMHSRP)

Introduction: Scoping Meeting Purpose

- To allow for early public notification of a proposed federal action
- Provides the National Marine Fisheries Service (NMFS) the opportunity to present proposed actions
- Seek public input on proposed actions and alternatives

Background: The MMHSRP

Entanglement Response

Rehabilitation & Release

Disease/UME Investigations

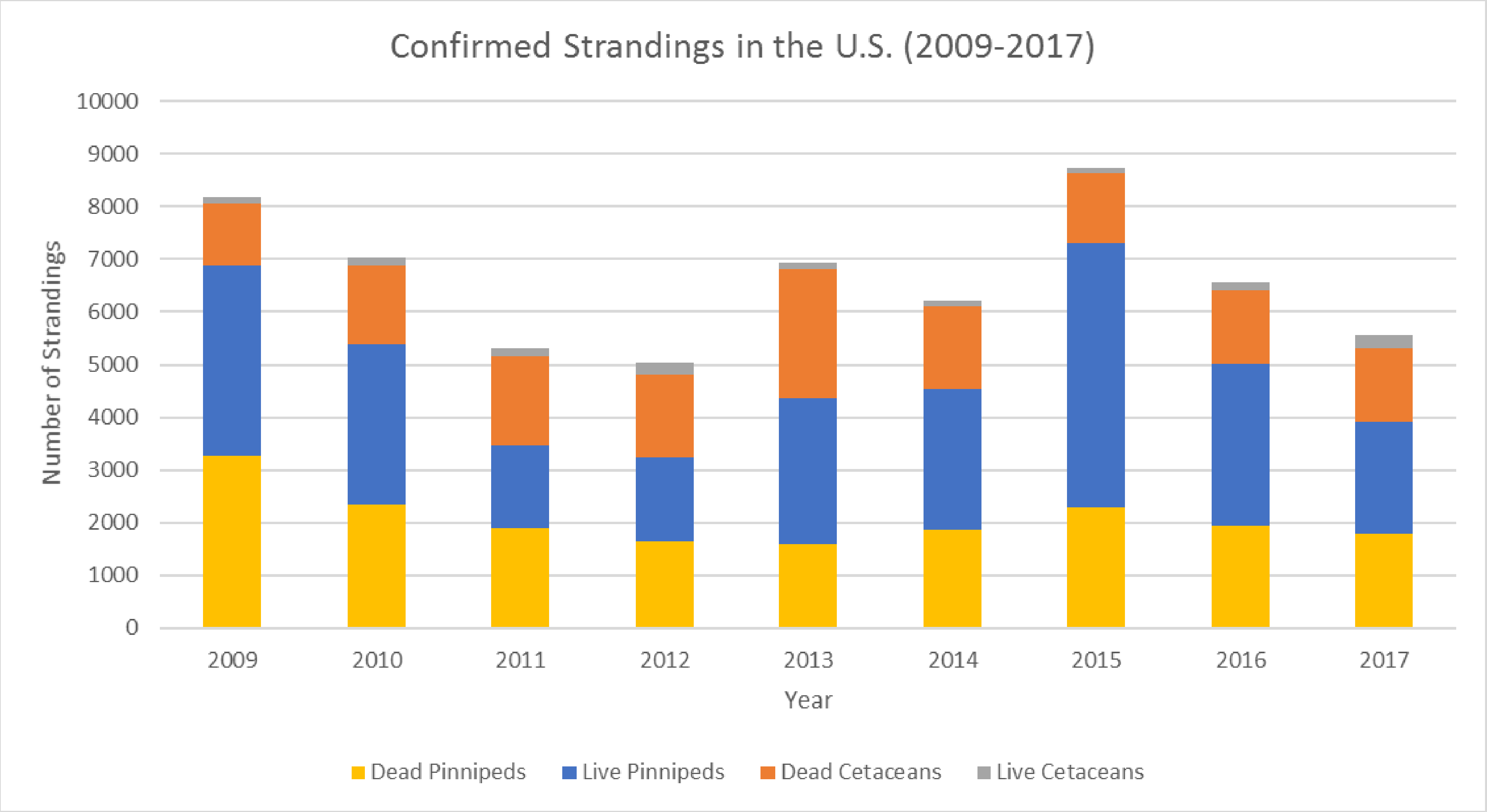
Health and Injury Assessments and Research

Tissue Bank/Quality Assurance

The Stranding Network and Stranding Response

- A network of over 100 groups that respond to marine mammal strandings
  - The network is comprised of state and local governments, non-profit groups, and academic institutions
- The MMHSRP provides coordination and consistency across the country
- Administers the Prescott Grant Program

Confirmed Strandings in the U.S.

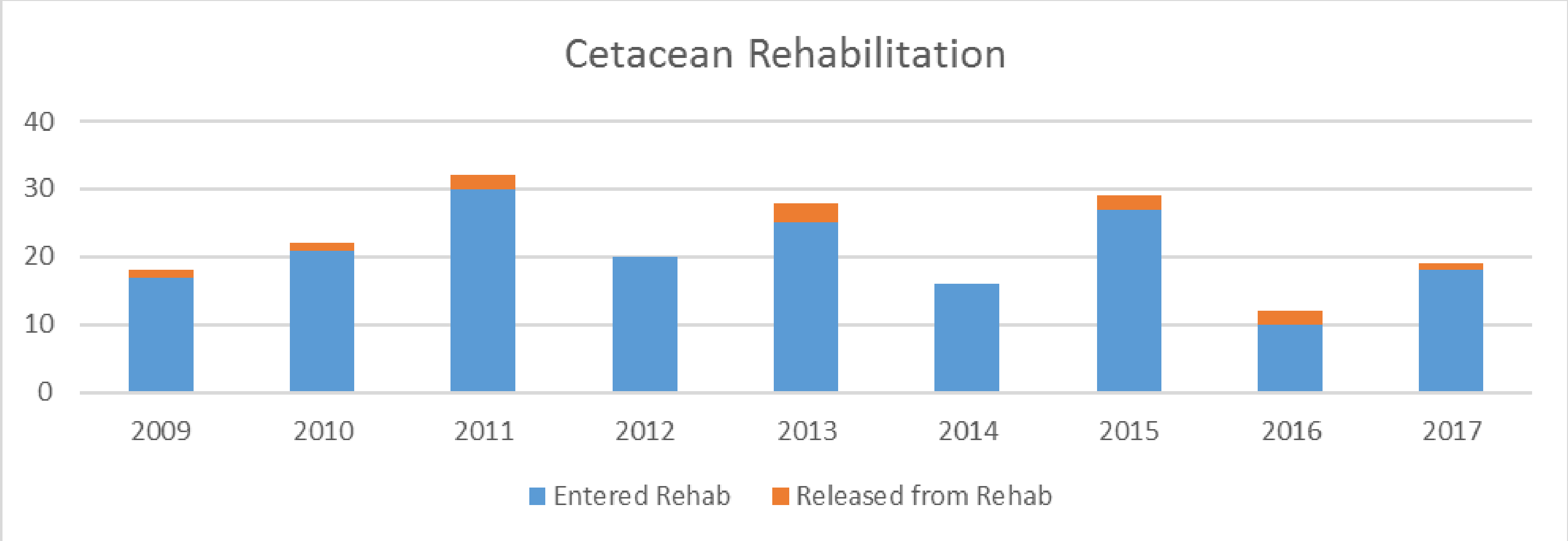


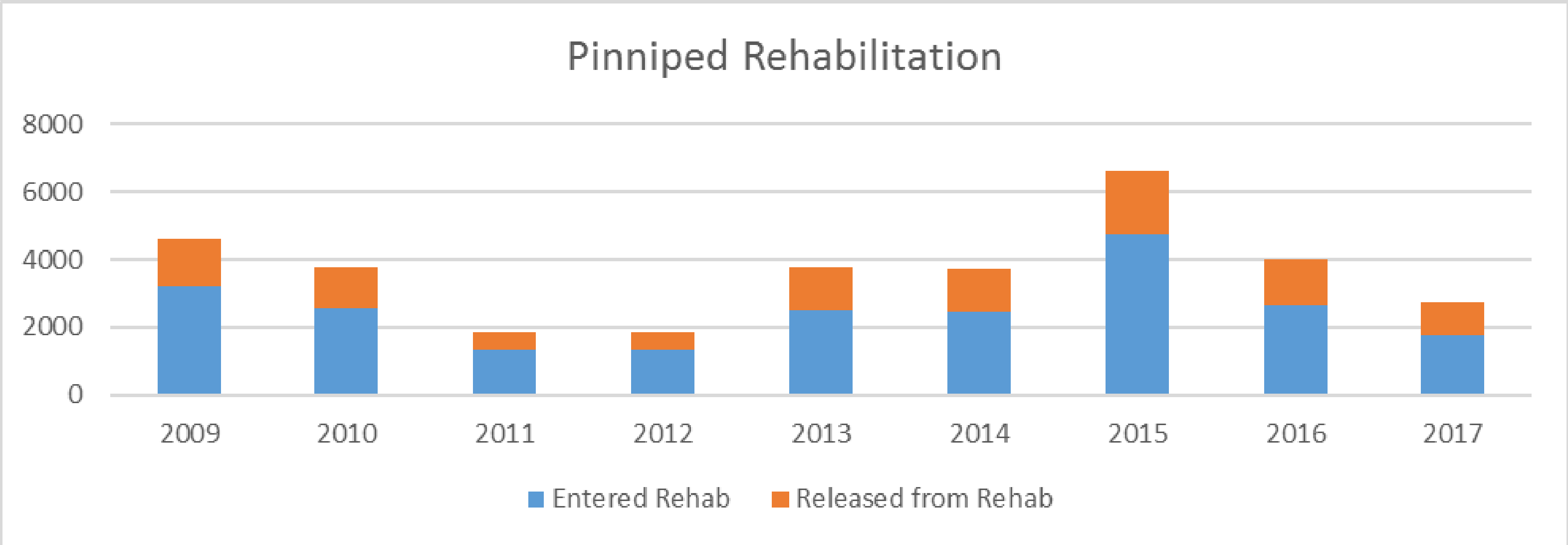
Rehabilitation and Release

- Some members of the stranding network also rehabilitate and release live stranded marine mammals
- The MMHSRP provides guidelines and helps to coordinate between these groups

Credit: Mystic Aquarium

Rehabilitation and Release (2009-2017)





The Entanglement Response Network

- The MMHSRP provides training and coordinates responses to entangled large whales, small cetaceans, and pinnipeds
  - Some response networks are more formalized than others
- The MMHSRP maintains a permit issued by NMFS allowing our partners to conduct these activities

Research and Biomonitoring

- The MMHSRP investigates Unusual Mortality Events (UMEs)
- Conducts research on marine mammal health issues
  - The MMHSRP maintains a research permit to conduct these activities
- With NIST, maintains the Marine Mammal Tissue Bank

NEPA and the PEIS Process

- The National Environmental Policy Act (NEPA) - 1970
- Programmatic Environmental Impact Statement (PEIS) - impacts of proposed actions

- NEPA's goals are to:
- Inform agency decision-making
- Inform the public
- Consider environmental and other impacts

- NEPA establishes:
- An information gathering and disclosure process

What Does a PEIS Include?

- Purpose and Need
- Proposed Actions
- Alternatives Description
- Affected Environment
- Impacts Analysis
  - Biological Resources
  - Water and Sediment Quality
  - Health and Human Safety
  - Socio-economics
  - Cultural Resources

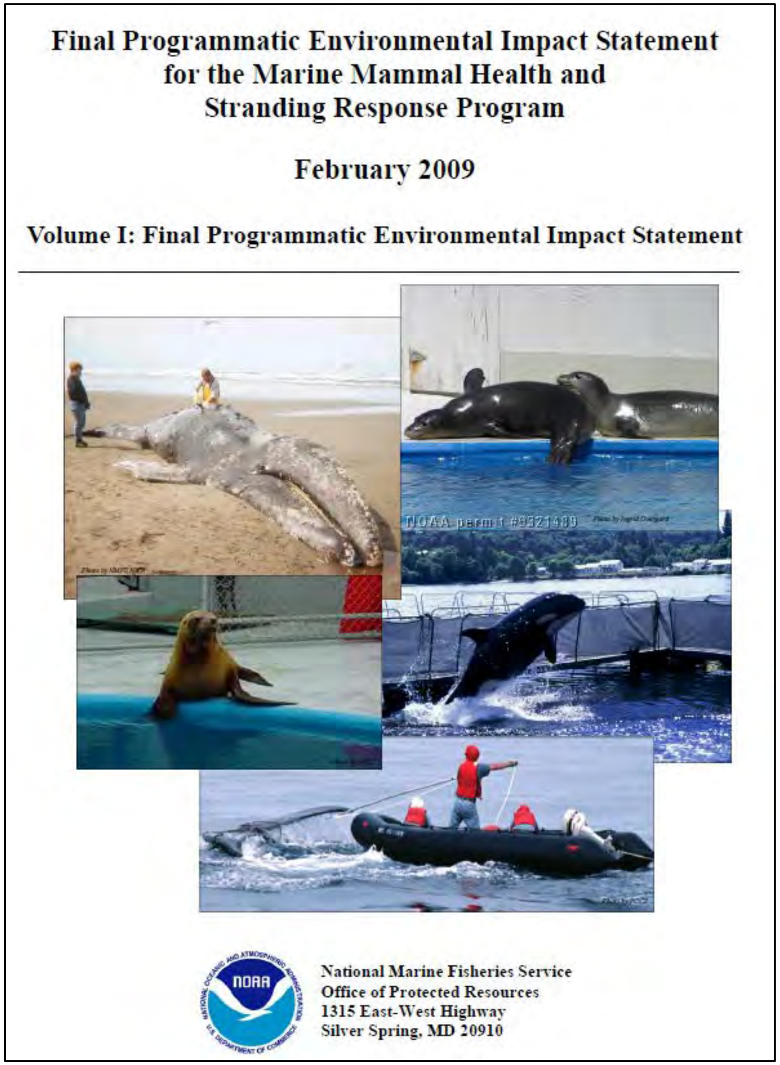
PEIS Timeline and Public Comment Periods

Notice of Intent to Prepare a Programmatic Environmental Impact Statement (PEIS) * 60 Day Comment Period	Published April 2, 2018
Scoping Meetings * <u>Public Comments Due June 1st</u>	May 2018
Review Public Comments and Develop Actions, Alternatives, and Mitigations	June 2018 - August 2019
Draft PEIS released * 60 Day Comment Period	August 2019
Review Public Comments and Incorporate into Draft	November 2019 - June 2020
Final PEIS Draft Released * Available for 30 days for Public Review	June 2020
Record of Decision	July 2020

* Indicates opportunities for public input

Doesn't the MMHSRP Already Have a PEIS?

- The MMHSRP finalized the current PEIS in 2009
  - https://repository.library.noaa.gov/view/noaa/4939
- New information, techniques, and issues have become apparent since publication of the current PEIS
- This process allows the MMHSRP to build upon the current PEIS



The Current MMHSRP PEIS (Finalized 2009)

- 6 categories analyzed
  - Stranding Response
  - Entanglement Response
  - Rehabilitation of Stranded Marine Mammals
  - Release of Rehabilitated Marine Mammals
  - Carcass Disposal
  - Biomonitoring and Research

Stranding Agreements and Response

- Current PEIS:
  - Standard stranding agreement and criteria are used nationwide
  - Outlines general best practices for stranding response
- Possible new activities to analyze:
  - New stranding agreement articles and criteria may include temporary holding, short term holding, oil spill response, and entanglement response
  - New best practices which may include large whale stranding and necropsy protocols, euthanasia, mass stranding, and out of habitat animals

Entanglement Response

- Current PEIS:
  - Outlines how the large whale entanglement response network is organized
  - Small cetacean and pinniped disentanglement is to be addressed on a case-by-case basis
- Possible new activities to analyze:
  - Update large whale entanglement response guidelines
  - New best practices for small cetacean and pinniped entanglement response
  - May analyze the use of sedation drugs in entanglement response


Credit: TMMC


GA-DNR

Rehabilitation of Stranded Marine Mammals

- Current PEIS:
  - Outlines rehabilitation facility standards
- Possible new activities to analyze:
  - May review current rehabilitation facility guidelines and include updates to the program since 2009

Release of Rehabilitated Marine Mammals

- Current PEIS:
  - Establishes the criteria for release of animals from rehabilitation
- Possible new activities to analyze:
  - Review the current guidelines on releasing rehabilitated marine mammals
  - Revised release plan template

Carcass Disposal

- Current PEIS:
  - Analyzes carcass disposal methods and recommends that the stranding network remove chemically euthanized carcasses offsite
- Possible new activities to analyze:
  - Guidelines on different methods of carcass disposal with recommendations on preferred methods

Biomonitoring and Research

- Current PEIS:
  - The MMHSRP maintains a research permit to conduct research on marine mammal health
- Possible new activities to analyze:
  - The MMHSRP continues to maintain a research permit, which includes novel research methods not analyzed in 2009

Summary of Categories

- 6 categories of activities
  - Stranding Response
  - Entanglement Response
  - Rehabilitation of Stranded Marine Mammals
  - Release of Rehabilitated Marine Mammals
  - Carcass Disposal
  - Biomonitoring and Research

Public Comments

- Solicit your input on what other ways the MMHSRP impacts the human environment
- You can comment in 3 ways:
  - Online – https://www.regulations.gov/docket?D=NOAA-NMFS-2018-0036
  - **In writing** – Mail written comments to: Chief, Marine Mammal and Sea Turtle Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910-3226, Attn: MMHSRP PEIS.
  - Today!
- Scoping comments **MUST** be received by June 1st
- Your comments will become part of the public record and will be recorded

APPENDIX D

COMMENTS RECVEIVED

BRISTOL BAY NATIVE ASSOCIATION

PO Box 310
Dillingham, Alaska 99576-0310
Tel: (907) 842-5257
Fax: (907) 842-5932

June 1, 2018

Chief, Marine Mammal and Sea Turtle Conservation Division
Office of Protected Resources
National Marine Mammal Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

ATTN: MMHSRP PEIS

On behalf of the Qayassiq Walrus Commission, and the Bristol Bay Marine Mammal Council, we thank you for the opportunity to comment on the Draft Programmatic Environmental Impact Statement (DPEIS) on the 'Rehabilitation and Release of Marine Mammals.' I also work for the Bristol Bay Native Association's Marine Mammal Program which serves thirty (30) federally recognized tribal/village councils from Togiak to the Nushagak Bay and Nushagak River watershed communities, the Lake Iliamna sub-region, the Naknek area, and the Alaska Peninsula Region to Ivanoff Bay area.

The BBMMC Council and the Qayassiq Walrus Commission still support the BBMMC Council Resolution 2007:01-Resolution Against the Release of Rehabilitated Seals to the Wild,' passed at their May 2, 2017 annual Spring face-to-face meeting. (Attached).

At the Ice Seal Committee recently held their Spring 2018 face-to-face meeting May 22-24, 2018, and this was the first time the Bristol Bay Native Association heard about the Marine Mammal Health and Stranding Response Program (MMHSRP) scoping comment deadline by June 1, 2018 re: marine mammal organization's and the general public's input on what other ways the MMHSRP impacts the human environment. In this case, for all of the Bristol Bay tribal marine coastal marine mammal ecosystem habitat areas, this will have a serious impact on the healthy marine mammal ecosystem habitat for food security reasons, as marine mammals are harvested year round in coastal Alaska communities. The National Marine Fisheries Service (NMFS), the National Oceanic Atmospheric Administration (NOAA) Protected Resource Division, both Nationally, and the Alaska Region needs to provide advance public communication of these very important public comments, and impacts of federal regulatory partner's decisions they will make that will affect the health, safety, and welfare of the Alaska marine ecosystem habitat areas of marine mammals harvested by Alaska Native tribes. Individual Alaska Native Tribal Consultation needs to take place, prior to making any federal regulatory decisions based on state-wide marine mammal organization's issues, concerns for continued food security, and continued tribal access to traditional marine mammal hunting areas in coastal Alaska communities. To the Bristol Bay tribes, federal tribal consultation means federal agencies contacting individual federally recognized Alaska Tribes to consult with them on these type of issues. The state-wide Alaska Native Marine Mammal Organization representatives are not Tribal Representatives, but ANO representatives nominated by regional ANO full board of Director. For in this instance, the Bristol Bay Native Association (BBNA) Full Board of Directors representing 31-federally Alaska Native tribes nominated me, Helen Aderman, BBNA Marine Mammal Program Manager to represent Bristol Bay, and I am only a sole staff for the BBNA's Marine Mammal Program, and a tribal member of Aleknagik Traditional Council. I believe you see what I mean, by recommending federal agencies to conduct individual tribal consultation, for example with Aleknagik Traditional Council, Curyung Tribal Council, Manokotak Village Council, Native Village of Port Heiden, Clarks Point Village Council, Ekuk Village Council, Togiak Traditional Council, Twin Hills Village Council, and other Bristol Bay federally recognized tribes who are prime marine mammal harvesters.

The Bristol Bay and the Alaska Peninsula coastal and inland communities totally rely heavily on Alaska Native traditional harvest of the food resources which include marine mammals (bearded seals, ringed seals, spotted seals, harbor seals, beluga whales, Steller sea lions, Northern sea otters, and walrus). The marine mammals are an integral part of the culture and economy in Native communities and have been since time immemorial. Traditionally, Native hunters have never looked to just one of these species for sustenance and still do not today. Native communities depend on everything the marine ecosystem can provide including seabirds, waterfowl, salmon, herring, clams, and other shellfish species found in the marine environment. The Alaska Native way of life consists of a year-round cycle in harvesting the marine mammals, seabirds, waterfowl eggs, salmon, herring, smelts, hooligans, Northern pike, whitefish, Dolly varden, trout, Arctic char, blackfish, tomcod fish, herring eggs, clams and other shellfish. Hunting for large land animals, trapping for furbearing animals, and gathering edible berries, plants, and medicinal plants is part of the Native way of life. There are oral traditional Native customs, values, and ways the hunters and gatherers adhere to continue to be provided by Mother Nature. For example, Alaska Native people were taught by their ancestors to treat the land and the sea they harvested from with respect; to get only what they needed and leaving enough eggs, fish, and animals behind so more will be available next season. This is still a part of conserving the natural resources by the Alaska Native people. The Alaska Native people were taught not to leave the place where they harvested traditional foods disturbed and messy. They were taught to properly dispose of unedible animal parts either to designated land and sea areas. Today, hunt captains have a process they go by in screening their hunt crew to ensure a successful harvest by abiding by the Alaska Native traditions. One of the practices, the Alaska Native's was taught was not to play or treat animals disrespectfully. This is one of the reasons, the majority of Alaska Native communities do not support some of the Western scientists, and institutions research projects. The animals are not to be touched or played with was one of the traditional Alaska Native customs, otherwise if the hunter hunted, slowly, the animals or game he hunted will eventually become scarce. These very important Alaska Native traditions or customs need to be respected by researchers. Cooperatively working with the respected communities of any proposed projects need to be presented to the village council's for their approval. One of Bristol Bay Native Association's goals is to build local capacity. One information and or way of doing this is to hire local people to provide expertise in a project because they are knowledgeable about their environment and their traditional hunting areas. A simple courtesy can go a long ways.

The main concerns I would like to address include release of marine mammals after they have been rehabilitated; freeze branding or marking marine mammals for research purposes; and prescribing medicines to marine mammals. My other comment will be recommendations of this Program to conduct statewide/regional marine mammal stranding workshops in coastal Alaskan sub-regional hub communities in the Bristol Bay, and the Alaska Peninsula.

Release of Marine Mammals After Rehabilitation
We do not support releasing marine mammals after they have been rehabilitated to a different area than from where they originally came from. One of the Bristol Bay Marine Mammals concern is if the Alaska SeaLife Center or agencies rehabilitating a marine mammal, and releases it to a different location than where it originally came from, various diseases, parasites, and new illnesses can be spread to the marine mammals and other marine resources. The recommended process for agencies that rehabilitate marine mammals from communities is to work with the local village council where the call originated from. The Alaska Native traditions is if a baby marine mammal is observed, do not touch it thinking it is orphaned, because usually the mother is nearby feeding and sometimes they feed up to a day. The majority of coastal communities recommend leaving the orphaned baby animal alone, and let nature take care of it. An educational flyer needs to be made about observing marine mammals that may be orphaned, stranded or ill and be sent to all Alaskan coastal communities. I have received some calls from Bristol Bay communities of marine mammals thinking they were orphaned, and they went ahead and called, for example, the Alaska SeaLife Center, or the local National Wildlife Refuge offices without contacting the local village or traditional councils. The recommended procedure is if a call is made to, for example, the Alaska SeaLife Cent to rehabilitate a baby animal, contact the village council. Find out who the Village Council President or Vice-President is and follow their recommendations. If they approve to have the animal rehabilitated, then the person can also contact their regional Native Association marine mammal program, the Refuge, and Fish & Game offices to cooperatively rehabilitate the animal upon approval of the Council. These types of protocols need to be developed.

Freeze Branding or Marking of Marine Mammals
Another procedure that researchers, federal and state agencies have conducted is branding/marking marine mammal's skin and hides for research tracking purposes. This was a revocation of the federal trust responsibility between the Alaska Natives and the Federal Government. The main Federal Trust Responsibility between the Federal Government and the Alaska Natives is to protect their traditional way of life to ensure it will continue on into the millenium and beyond. This includes harvesting marine mammals for food, to use the fur for parkas, hats, and hide for footwear or for covering the traditional *qayaq* or boat. These so called freezed branding or marking of Sea lions was done without the permission of the local coastal Alaska Native people that traditionally harvest seals. There have been studies done by so

Western science 'experts' including marine mammal population trends, genetic research and collecting skin samples. These are good as long as the marine mammal is not 'played' with meaning, treating the animal disrespectfully. Some of the marine mammal studies have concluded a decline in various species. One of the reason is Alaska Native traditional customs are not being adhered to which includes 'freeze branding or marking *any* animals in the sea, the land, and any location they haulout at. Thus, a population of an animal can misteriously decline, or in the Alaska Native culture, an animal can become scarce for an unknown reason. These are important Native traditional advice to consider before Western scientists touch the animals eaten. Just like the beef rib-eye steaks eaten in the lower '48 and relished by a majority of Americans, coastal Alaska Natives relish and cherish their seal oil, dried seal meat, and traditional delicacies that cannot be replaced by damaged or spoiled goods. Therefore, we do not support any freeze branding or marking of any marine mammals in coastal Alaskan waters. It would be beneficial for researchers and scientists to contact local Alaska Native Organizations or Village Councils or Traditional Councils or IRA's to present them with any proposed research projects including marking, tagging, sampling of any animals.

<u>Prescribing and/or Injecting Medicines to Marine Mammals</u>
Another concern of the Bristol Bay Marine Mammal Council, the Qayassiq Walrus Commission, and Bristol Bay communities is researchers prescribing or injecting medication to marine mammals while in the field. The hunters want to ensure the marine mammals they harvest are healthy and drug free, as well as disease free. They understand and trust agencies which get samples of marine mammals in their area, that the animals will be analyzed and results will be send back to their communities in a timely manner. Due to the high cost of fuel, and oil, the majority of the hunters are staying out longer until they harvest marine mammals. For example, for the Dillingham walrus hunt, it costs approximately $ 10,000 to traditionally harvest walrus at Round Island. The hunt captain and crew will try to get their quota of four walrus. The walrus will be brought back to Dillingham and will be shared with the surrounding Nushagak Bay communities. The value of hunting a healthy animal is essential for the survival of several communities in Bristol Bay. We want to continue to hunt and harvest healthy marine mammals and know they are drug free.

<u>Other Recommendations</u>
I would like to recommend future federal agency regulators, provide statewide Alaska Native Marine Mammal Organization's 90-day notice for any public comment scoping deadlines.

The timing of public comments needs to be tailored to the availability of state-wide regional Alaska Native Marine Mammal Organization's Executive or Board of Director's so they can provide input at annual spring, fall, or winter meetings. The annual face-to-face meeting of the Bristol Bay Marine Mammal Council (BBMMC) is held May every year. The annual face-to-face meeting of the Qayassiq Walrus Commission (QWC) is held September every year.

I am enclosing the Bristol Bay Native Association's Policy Guidelines for Research In Bristol Bay, Alaska adopted by the BBNA Board of Directors for your information. BBMMC Resolution 2007:01; Overviews of both the Bristol Bay Marine Mammal Council, and the

Qayassiq Walrus Commission.

For further information on the communities served by the Bristol Bay Native Association, you may connect to the following BBNA web link site at: http://www.bbna.com.

Thank you for considering our public programmatic EIS comments and we look forward in working with you in the future.

Sincerely,

Bristol Bay Native Association

Helen M. Aderman

Helen M. Aderman
Marine Mammal Program Manager

Enclosure: Bristol Bay Native Association Policy Guidelines for Research in Bristol Bay
BBMMC Resolution 2007-01
Overviews of BBMMC and QWC

cc: BBMMC Council
BBNA Marine Mammal Program files
QWC Commission
Ice Seal Committee

Letters

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Rehabilitation and release of marine mammals in the United States: Concerns from Alaska

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The release of rehabilitated marine mammals has become more common as marine mammal medicine and husbandry have advanced and as anthropogenic activities have impacted marine mammals and their habitats resulting in more injured or otherwise distressed marine mammals brought into captivity for rehabilitation and their subsequent release back to the wild. Moore *et al.* (2007) published an extensive review of the historic, legal, conservation, educational, philosophical, and moral aspects of rehabilitation and release. Further, Moore *et al.* included a good, but incomplete, discussion of the risks and benefits of rehabilitation and release of marine mammals in the United States. Of the 50 United States only Alaska has coastal communities (close to 100) of indigenous peoples who rely on marine mammals for food, clothing, materials, art objects, and activities that sustain them and their cultural identity. Because of this reliance on marine mammals, the action of releasing rehabilitated marine mammals carries a much greater significance to the people of Alaska, which needs to be addressed in a review of the risks and benefits in the United States. The objective of this paper is to expand the discussion presented by Moore *et al.* by including the concerns of people who have much to lose if marine mammals that have been held and treated in captivity become vectors of disease or parasites to wild populations upon their release.

Importance of Marine Mammals to Alaska Natives

Alaska Natives in coastal villages along Alaska's entire coastline harvest marine mammals including seals (*Erignathus barbatus, Pusa hispida, Histriophoca fasciata, Phoca largha, and P. vitulina*), walruses (*Odobenus rosmarus divergens*), Steller sea lions (*Eumetopias jubatus*), northern fur seals (*Callorhinus ursinus*), sea otters (*Enhydra lutris*), polar bears (*Ursus maritimus*), beluga whales (*Delphinapterus leucas*), and bowhead whales (*Balaena mysticetus*). In addition to the nutritional importance of meat and oil, many materials used for hunting and for clothing are also obtained from marine mammals. For example, in northwestern and western Alaska, *umiaqs* (wood-frame boats covered with bearded seal or walrus skin) are used for bowhead whaling. Oil from ringed seal blubber is used to soften the skins before stretching them over the boat frame. Although little comprehensive harvest data are available, a few reports show the importance of seals to coastal people. Three villages representing approximately 2,000 people of the Yukon-Kuskokwim Delta region harvested approximately 1,400 seals of four species during the 12 mo between March 1997 and February 1998 (Coffing *et al.* 1998) and approximately 800 during the same time period in 1998–1999 (Coffing *et al.* 1999). More recently, the village of Kotzebue (representing approximately 2,500 people) was estimated to have harvested an average of 1,045 seals annually from 2002 to 2004 (Whiting 2006). Harvests are variable from year to year due to ice, weather, and job opportunities. It is expected that the island villages (*i.e.*, Diomede, Gambell, Savoonga, and Mekoryuk) have higher seal harvests because there are few or no terrestrial species available.

Risk

The greatest negative potential impact resulting from the release of rehabilitated arctic and subarctic marine mammals is the transmission of infectious diseases acquired while in captivity at lower latitudes to wild populations (Griffith *et al.* 1993, St. Aubin *et al.* 1996, Daszak *et al.* 2000). Diseases can be acquired or modified while in captivity and introduced into a naïve wild population (St. Aubin *et al.* 1996, Harder *et al.* 1997). Captive facilities also provide an environment to allow pathogens from terrestrial hosts to be transferred to the arctic marine environment; for example, canine distemper, leptospirosis (Stamper *et al.* 1998, Kik *et al.* 2006), and influenza (Mos *et al.* 2003). Except for spotted seals, northern phocids do not haul out on land (Kelly 1988*a*, *b*, Quakenbush 1988); therefore, direct exposure to pathogens from terrestrial hosts is limited in the wild. Novel environments, novel hosts, and treatments with antibiotics during rehabilitation can alter pathogens and make them more virulent (Daszak *et al.* 2000). The warming arctic climate may increase the chances for an introduced disease to become established (Burek *et al.* 2008). There may also be genetic consequences to the wild population caused by releasing animals that would not have survived without aid (Wilkinson and Worthy 1999).

Translocation

In most of the United States, rehabilitation facilities are located near where distressed marine mammals are found and transportation between oceans does not occur. In Alaska, the only marine mammal rehabilitation facility is located near Seward in the Gulf of Alaska (North Pacific Ocean). Marine mammals eligible for release, however, come from the Chukchi, Beaufort, and Bering seas; two arctic oceans and one subarctic ocean, respectively. Currently, once marine mammals are rehabilitated and deemed releasable they are returned to the ocean of origin. This has not always been true, as in at least one case a sick ringed seal pup from Nome (northern Bering Sea) was held for rehabilitation for 12 mo in the Gulf of Alaska and then flown to Prudhoe Bay and released in the Beaufort Sea. Translocating animals that are sick with unknown diseases or parasites to the warmer southern waters of the Gulf of Alaska potentially puts species living there (*e.g.*, sea lions, sea otters, harbor seals) in contact with northern species that they would not normally encounter. Translocation again upon release provides another opportunity for any disease picked up during rehabilitation to be transmitted to northern waters. There are five species of phocids in Alaskan waters so there is also a risk of a disease crossing species within the phocid family, in addition to the potential for transmission to other pinnipeds and possibly cetaceans.

In 2007 in Alaska, 11 marine mammals were taken into captivity and seven were released. Two (one sea otter and one Steller sea lion) died, two (a walrus and a sea otter) were transferred to zoos, and the rest (one fur seal and one ribbon seal, two spotted seals, and three harbor seals) were released.

Current Regulations

The Marine Mammal Health and Stranding Response Program established by an amendment to the Marine Mammal Protection Act is conducted by the National Marine Fisheries Service (NMFS) and includes policies and best practices for marine mammal stranding response, rehabilitation, and release for pinnipeds (except walruses) and cetaceans. The U.S. Fish and Wildlife Service requires that the release of species under their jurisdiction (*i.e.*, polar bears, walrus, sea otters, and manatees) be conducted by individual permit on a case-by-case basis in coordination with the local field office and their Division on Management Authority (Whaley and Borkowski 2006). Current practices established by NMFS require that marine mammals under their jurisdiction be released if they meet the established standards for release, which include a historical, developmental, behavioral, and medical status assessment by the facility's attending veterinarian. Although medical assessments are conducted prior to release, such assessments can only minimize risk, not eliminate it. Although improvements are being made and tests are being developed specifically for marine mammals, testing for new diseases is not possible and many tests used for marine mammals were developed for domestic animals and their effectiveness for marine mammals is unknown. False negatives using these tests do occur. Release of any rehabilitated marine mammals carrying an undetected disease or parasite that infects the wild populations could eliminate or reduce the ability of many Alaska Natives to obtain marine mammals for food, boat covers, rope, clothing, artwork, and cultural activities. Food and materials purchased from local stores are extremely expensive due to fuel costs for air or barge transportation and would be a hardship for many families.

NMFS prepared a draft Programmatic Environmental Impact Statement (PEIS) in March 2007 and requested comments on current practices. Several Alaska Native Organizations and the State of Alaska provided recommendations regarding the current policy during the PEIS process. "Due to the importance of marine mammals to residents of Alaska and the risk to the wild populations, we recommend that the release of any translocated marine mammal (*i.e.*, one that has been transported and placed into captivity for any length of time) into marine waters adjacent to Alaska be prohibited." (Letter from M. Robus, Director, Division of Wildlife Conservation, State of Alaska to D. Cottingham, Office of Protected Resources NMFS dated 25 May 2007.) The Alaska Native Organization responsible for the comanagement of northern "ice" seals in Alaska also passed a Resolution to disallow the release of rehabilitated ice seals due to the risks involved (Resolution 01–2006, Ice Seal Committee). A letter, dated 3 June 2008, from D. Cottingham, acknowledged the concerns expressed and agreed that "screening an animal for all potential diseases is difficult." NMFS agreed to not authorize the transport of stranded ice seals (ringed, bearded, ribbon, and spotted seals) beyond the geographical areas where they strand for the purposes of rehabilitation and release back to the wild. Certain situations, however, would be considered on a case-by-case basis (*i.e.*, an ice seal out of its habitat; ice seals that are part of an unusual mortality event, and spotted seals in Bristol Bay) and NMFS may reevaluate this decision at any time.

Although valuable research has been accomplished working with marine mammals in captivity (*e.g.*, Mashburn and Atkinson 2004, 2006, Myers *et al.* 2006, Petrauskas and Atkinson 2006, Petrauskas *et al.* 2006) and some movement information has been collected after captive animals have been released (Alaska SeaLife Center website), there are no marine mammal populations in Alaska where the release of small numbers of rehabilitated individuals will benefit a population; however, each individual that is released presents a risk to the wild populations. The risk versus benefit should be considered at the level of the greater good for the population and the ecosystem, which includes the indigenous people who subsist on them.

Acknowledgments

We thank Michael Moore and Doug DeMaster for valuable discussions on this issue and the Alaska SeaLife Center staff for attending Ice Seal Committee meetings to answer questions and discuss the concerns of the hunters and their communities.

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1 June 2018

Marine Mammal Health and Stranding Response Program
National Marine Fisheries Service

Dear MMHSRP:

This letter is in response to the Marine Mammal Health and Stranding Response Program's request for comments to update the Programmatic Environmental Impact Statement (PEIS) that was finalized 10 years ago. At that time, the State of Alaska expressed concerns about the release of rehabilitated ice-associated seals (i.e. ringed, bearded, spotted, and ribbon seals) because of several concerns that are still valid. These species are important to coastal Alaska Natives for food, clothing, boat skins, and material for cultural and art objects. Although the State of Alaska has no formal responsibility for the harvest management of marine mammals it does have an obligation to the residents of Alaska to keep marine mammal populations and their ecosystems healthy.

Pathogens could mutate in a rehabilitation hospital setting into a novel organism that could be introduced into the naïve wild population upon the release of an infected animal following rehabilitation, regardless of whether the animal was thoroughly evaluated prior to release. Medical assessments with hands-on physical examination and a review of the animal's complete history, diagnostic test results, and medical and husbandry records are precautions that can minimize the risk, but they cannot eliminate it. Testing is not possible for new diseases because tests are not developed until the disease is known. Many tests used for marine mammals are developed for domestic animal use and the effectiveness for marine mammals is not known. False negatives from these tests are common.

The cost of food and materials is extremely high in remote villages due to fuel costs for air transportation. Therefore the ability for coastal Alaska Natives to obtain marine mammals for food, boat covers, rope, clothing, artwork, and cultural objects could be severely affected by the release of a rehabilitated marine mammal that infects wild populations with an undetected disease or parasite.

The benefit to releasing a small number of rehabilitated marine mammals into healthy Alaskan populations does not outweigh the risk to wild marine mammal populations or Alaskans dependent on marine mammal resources. Even though ringed and bearded seals were listed as threatened under the Endangered Species Act since our last comments, they were not listed due to declines in their populations but due to anticipated future declines due to decreasing ice and snow. No such declines have been detected to date and thus their ESA status should not change the current policy of not releasing ice-associated seals that were translocated for rehabilitation to a center outside of their natural range. Due to the importance of marine mammals to residents of Alaska and the risk to the wild populations, we must continue to recommend that the release of any translocated marine mammal (i.e., one that has been transported and placed into captivity for any length of time) into marine waters adjacent to Alaska be prohibited. We have no objection to marine mammals that can be rehabilitated or assisted in situ and released.

Attached please find a publication that provides additional detail regarding concerns related to release after rehabilitation from an Alaska perspective.

Sincerely,

Lori Quakenbush
Biologist, Alaska Department of Fish and Game
Lori.quakenbush@alaska.gov

Sincerely,

[First and Last Name]
[Title]

General about the MMHSRP:

The Alaska SeaLife Center would like to extend its support for continuation of the Marine Mammal Health and Stranding Response Program (MMHSRP). This program is vital for the management of the marine mammals in the Alaska region, and provides the backbone for the oversight and cooperation between stakeholders throughout the region. Strandings of rare species, such as endangered species or out of habitat animals, and unique events, such as unusual mortality events or oil spills, by their nature happen less frequently than stranding of common species, but are often far more important. The National Marine Mammal Health and Stranding Program helps to maintain the infrastructure, in terms of physical assets, experienced staff, and protocols that not only respond to the common events but are prepared for the rare ones too when it really matters.

The Alaskan region requires more NMFS resources for the administration of the MMHSRP. According to NOAA, Alaska has 33,904 miles of coastline, the most of any state within the US, which is more than four times more coastline than its nearest coastline competitor, Florida. Even with the vast coastline, the Alaska region has only 17 organized stranding agreement holders, and only one facility permitted to admit live marine animal strandings. Additionally, unlike any other area of the US, tribal populations consume Alaskan marine mammals as a major part of their diet, making disease surveillance equivocal to ensuring food safety. Communication in Alaska takes time: cell phone coverage is poor and intermittent, text messages are delayed hours due to small band width in communities being overwhelmed by tourists in the stranding season, and many rural communities are so remote that it is difficult to provide ongoing monitoring of animals or carcasses once the initial caller leaves the stranding site. All of these factors indicate that there are a very small number of people trying to cover vast distances, bridge cultural differences and communication modalities, and communicate effectively in rural areas. This situation is not sustainable as the invent of social media and the common use of cell phones has increased the number of stranding reports and expectations of a stranding response by four fold in five years as seen by the total number of animal stranding cases reported to the ASLC in 2012 as 102 and over 400 cases in 2017.

The Alaska region needs additional NMFS resources such as additional personnel or existing personnel time to aid in the timely communication between stakeholders about marine animal strandings and mortalities. Additionally, due to the current sensitivities toward native subsistence hunters and the wishes of many tribal groups to prevent the release of any rehabilitated marine animals, there is a strong need for experienced, informed government voices to lead the conversation about NMFS policy in the Alaska region and address the layers of complexity that exist when working with stranded marine animals in these regions.

In addition to more resources at the administrative level, the Alaska region needs more resources for the development of additional Stranding Agreement holders and increased communication between stranding areas. The size of the state of Alaska is four times that of Texas, and Stranding Agreement holders can easily feel isolated, especially when regional stranding agreement meetings only occur every few years. The Alaska SeaLife Center started using internet technology, like Go To Meeting, to broadcast local meetings in Homer to include guest speakers and virtual attendants in the state thousands of miles away to create a greater feeling of community. While the problem of recruiting additional participants and retention of current participants may seem daunting, the solutions likely include the use of social media, virtual meeting spaces, and other technological advancements- all which require some funding.

Best Practices: Release-

With the recent ESA status change of bearded seals and ringed seals, the Alaska SeaLife Center would like to remind the national NMFS office about the current policy in the Alaska Region concerning the non-releasability of ice seals (bearded, ringed, spotted, and ribbon seals). The Alaska region is changing rapidly. Over the last five years, ice seals have been noted to travel to previously un-used areas such as the 49 ringed seals showing up in Dutch Harbor, the bald ice seal UME was completed with locals still finding affected animals, and generalized loss of sea ice has been attributed as the reason for increased numbers of ice seal pups being born/ found on shore.

The ASLC would like to encourage NMFS to re-visit the management of ice seals in Alaska to ensure that a conversation including the well informed voices of all stakeholders (native Ice Seal Commission, researchers and scientists, and stranding agreement holders, subsistence hunters, and the general public) takes place as part of this process. Additionally the ASLC would like to ensure that the scope of the conversation includes not only the topic of the releasablility of the individually stranding animals presenting due to disease or trauma, but also policy which would affect large numbers of ice seals in situations where they are negatively impacted by man-made or natural disaster such as an oil spill in Alaskan waters.

The ASLC would like to recommend against the policy of a pre-defined decision, and instead have the recommendations listed into the Release Best Practices document. Incorporation into the document would allow for pre-defined conditions where release is permitted, and considerations for unusual or extreme situations to have the flexibility to be evaluated on a case-by-case basis.

Large Whale Entanglement response

The Alaska Region requires more NMFS resources for the support of the Large Whale Entanglement responses. The Alaska SeaLife Center has paired with regional NMFS officers and NMSF consult, Ed Lyman, to train personnel for response. All of the satellite tag, specialized rope cutting equipment, and human safety equipment has been purchased by the ASLC and is used for all of the entangled whale responses throughout the entire south central region, an area roughly half the size of Pennsylvania. The only satellite tag is shipped to Ed Lyman in Hawaii annually to follow the humpback whales.

Regional Health Surveillance Programs on Wild Marine Mammals-

In this age of financial cuts, marine animal capture operations have been severely limited. The Alaska marine ecosystem is currently experiencing unprecedented changes in sea ice and ocean conditions with unknown effects on the marine populations. Climate change is occurring twice as fast in Alaska as compared to change at lower latitudes, and we continue to see new and unusual animals and diseases. As such, we believe that marine animal capture operations are extremely relevant in Alaska. Additionally, residual biological samples should be made readily available for bona fide marine mammal researchers in order to analyze and understand this rapidly changing environment and predict its impacts. The Bristol Bay beluga capture projects could be incorporated in to a portion of the MMHSRP. The Cook Inlet harbor seals and both Eastern and Western stock of Steller sea lions remain important populations requiring additional monitoring. Advances in drone aircraft and breath analysis technology suggest that these methodologies may be a viable way to better address the challenges of studying large cetaceans.

Morbidity and Mortality Investigations

Cook Inlet is a unique area and is in great need of more expedient and efficient protocols for response, especially due to the endangered status of the Cook Inlet beluga whale. Some specific suggestions recommended by ASLC necropsy lead personnel include:

1. Pre-purchased/Pre OAS -approved helicopter time. Alpine air pilot mentioned that this is a strategy employed by other federal agencies and speeds up response time because you don't have to wait on the tarmac for approvals. This could be done each summer and especially should be done in the fall.
2. Pre-identified, on-call, at the ready, in-town (or near town) staff for rapid response during times of the highest likelihood of stranding events in CI. This includes higher ups at NMFS/NOAA for approvals, vets and technicians, pilots, boat captains and tribal partners. Necropsy leads at ASLC recommend that staff be prepared two weeks before and 6 weeks after the extreme high tides of August and September and buffering any other time that we see a 30+ foot tide in Cook Inlet.
3. Established compensation benefit for tribal partners. This could be a small amount of money to simply to keep a lookout for whales, and an established amount for help on the ground during response. This could go a long way in getting Cook Inlet Beluga reports in particular, and provides for use of 4-wheelers, experienced prosectors etc.
4. A written document for NMFS/NOAA and other responders to refer to with resources and partners in each area. This information is all word-of-mouth for now, and can get missed in all the multilayered phone conversations during a response.
5. Established funding experienced technicians to respond and lead necropsies when vets are not available.
6. Continuing to do the Google Doc that keeps track of necropsy lead availability over the summer.

Prescott Grant

In the past, the ASLC has received Prescott grants to support basic operations and Alaska network enhancement activities. In recent years we have raised over 95% of the support for the program through funding from industry and the state, who view us as important partners in the event of anthropogenic catastrophes that may affect marine mammals. Philanthropic avenues to support our operations are limited in part due to our small home community, its distance from a major metropolitan area, and a weak local economy based on falling oil prices. Prescott funding is essential to close the gap between these sources of funds, but more importantly, is the seed money that helps stimulating additional funding. While the overall cost of funding the annual awards from the Prescott fund may seem expensive, they allow for non-government organizations like the Alaska SeaLife Center to pull funding from a multitude of resources to responsibly and efficiently help the Alaska Region fulfill its mandate to protect America's marine animal resources, and to use the ASLC's veterinary staff, professional educators, and scientists to continue the region's mission to spread knowledge about Alaska's changing marine ecosystems.

The availability of the Emergency Response Grant is essential for helping to fund unusual, out of cycle events, whether it is an Unusual Mortality Event, such as the Arctic Pinniped, or a discrete event, such as a live stranded endangered Cook Inlet beluga whale. Both events were unexpected, but when they did happen, those involved predicted that they would quickly wipe out routinely available funds. Knowing that it was possible to get emergency funding to cover expenses made it possible to proceed with the stranding response rather than just giving up or not fully responding.

Thank you for considering our opinions, interests, and suggestions during this review process.

Sincerely,

Kathy Woodie, DVM

Alaska SeaLife Center

Clinical Veterinarian & Wildlife Response Manager

WDC, 7 Nelson Street, Plymouth, MA, 02360
T +(508) 746-2522 **F** +(508)746-2537 **E** contact@whales.org **W** whales.org
WDC is a registered 501(c)3 non-profit organization.

June 1, 2018

Chief, Marine Mammal and Sea Turtle Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226
Attn: MMHSRP PEIS

Re: Programmatic Environmental Impact Statement (PEIS) for the Marine Mammal Health and Stranding Response Program (83 FR 13955)

Whale and Dolphin Conservation (WDC) is the leading global charity dedicated to the conservation and protection of whales, dolphins, and their habitats. We are submitting comments in support of the continued operation of the Marine Mammal Health and Stranding Response Program (MMHSRP), a vital process for collecting information on the health of marine mammal populations and elements in their environment – anthropogenic or natural – impacting health and survival.

Partnerships
The MMHSRP is responsible for coordinating the National Marine Mammal Stranding Network, which largely consists of non-profit and volunteer groups acting under permits to respond to and assess stranded marine mammals. These partnerships are essential to the success of the MMHSRP and for collecting and sharing relevant data on individual marine mammals and local populations. These independent organizations rely on the coordination, leadership, and consistency facilitated by the MMHSRP, as well as on the funding and support dedicated to stranding response through the Prescott Grant and Unusual Mortality Event (UME) programs. Stranding Network partners are responsible for the majority of their funding, with limited but critical resources available to each member organization from these grant programs. Additional support from these federal programs, facilitated through the MMHSRP, is especially crucial for emergency response and in times of elevated stranding occurrences.

Stranding Networks may also include, or involve partnerships or collaborations with, other local, regional, or federal agencies, including municipal responders, state parks, U.S. Fish and Wildlife Service, and the National Park Service. The responsibilities of Stranding Network members and the MMHSRP include developing, maintaining, and supporting these partnerships.

Marine Mammal Health
With recent changes in ocean conditions and human activities on all coasts of the U.S., impacts on marine mammals have been widespread and diverse. Warming water in the Pacific has been linked to increased strandings of California sea lion pups and yearlings, with the declaration of a UME in 2013[1], and has been associated with increased cases of domoic acid toxicosis in sea lions and cetaceans. There are currently seven additional active UMEs in the U.S., including UMEs for several Endangered Species Act (ESA) listed species[2]. The MMHSRP is critical for coordinating effective responses to UMEs and for collecting the information necessary to determine their cause or understand the short- and long-term impacts. The Marine Mammal UME Contingency Fund was developed in 1992 to dedicate resources specifically for the investigation and response to UMEs, but incoming funds are currently dependent on private donations. Federal support for UME response should be increased, particularly with the number of active UMEs.

[1] NOAA Fisheries: 2013-2017 California Sea Lion Unusual Mortality Event in California. https://www.fisheries.noaa.gov/national/marine-life-distress/2013-2017-california-sea-lion-unusual-mortality-event-california
[2] NOAA Fisheries: Active and Closed Unusual Mortality Events. https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events

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WDC is a registered 501(c)3 non-profit organization.

Changes in the California Current ecosystem and prey distribution are also the likely cause of the recent increase in numbers of observed whale entanglements off the U.S. West Coast. Prior to 2014, confirmed entanglements in the U.S. coastal Pacific averaged fewer than 10 per year. In 2014, the number of confirmed entanglements doubled and has remained high, with blue whale entanglements were observed for the first time in 2015.[3] The MMHSRP is responsible for recording entanglements, training disentanglement volunteers, and gathering and maintaining equipment necessary to disentangle whales. The information collected by this program, including the health of whales and long-term impacts of entanglement, identifying gear to determine when and where whales become entangled, and the configuration of entanglements have broad implications for the development of policy to reduce entanglements and ensure the survival of marine mammals in the U.S.

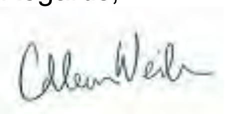
Public Concern for Marine Mammals and Ocean Health
In addition, this program is of great importance to the American public. The National Oceanic and Atmospheric Administration and Stranding Network members receive thousands of calls per year regarding marine mammals on the beach, which not only yield important information to Stranding Network members, but provides an opportunity to educate and engage the public on safe and responsible behavior around marine mammals. In a recent poll, 76% of Americans expressed support for protecting marine mammals from threats caused by human activities.[4] The MMHSRP is crucial for collecting information on impacts from those threats and for guiding the development of policies to reduce the effects of human activities.

The MMHSRP is essential for collecting information on long-term health trends of marine mammals in the wild, responding to short-term changes in the health of populations, identifying emerging issues, and correlating data with changes in the environment. As indicator species, changes to marine mammal populations are often the first sign of changing conditions in the marine environment, which can have widespread effects on humans and human activities – from fishing and tourism industries to the health of coastal residents and communities.

Importance of the MMHSRP
The Stranding Network members operating in partnership with the MMHSRP rely on the program to codify the roles and responsibilities of individual organizations, standardize the response process nationwide, and to facilitate data-sharing to better understand regional changes to marine mammal populations.

As a member of the New England Region Stranding Network, WDC supports the continued operation of the MMHSRP. Thank you for the opportunity to provide comments and please do not hesitate to contact us with any questions or for additional information.

Regards,



Colleen Weiler
Jessica Rekos Fellow for Orca Conservation
Whale and Dolphin Conservation

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[3] NOAA West Coast Region 2017 Entanglement Report. http://www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/5.2.2018_wcr_2018_entanglement_report_508.pdf

[4] 2017 poll conducted by Beekeeper Group and Lincoln Park Strategies; see: http://thehill.com/opinion/energy-environment/360294-congress-cant-seriously-consider-rolling-back-protections-for

United States Department of the Interior

NATIONAL PARK SERVICE
Biological Resources Division
1201 Oakridge Drive, Suite 200
Fort Collins, CO 80525

IN REPLY REFER TO:
ER-18/0162

ELECTRONIC TRANSMISSION ONLY – NO HARD COPY TO FOLLOW

Date: May 31, 2018

To: Chief, Marine Mammal and Sea Turtle Conservation Division, Office of Protected Resources, National Marine Fisheries Service

From: Elaine F. Leslie, Chief, Biological Resources, National Park Service /s/

Subject: Federal Register Notice on "Notice of Intent To Prepare a Programmatic Environmental Impact Statement (PEIS) for the Marine Mammal Health and Stranding Response Program"

The National Park Service (NPS) appreciates the opportunity to provide comments on the above Notice by the National Marine Fisheries Service (NMFS) and National Oceanic and Atmospheric Administration (NOAA) following their notice of intent to prepare an updated PEIS (83 FR 13955).

As stewards of protected lands and waters, the National Park Service protects marine wildlife species through a number of internal programs, but also strives to be an active conservation partner with the National Marine Fisheries Service and other federal and non-federal agencies, states, and organizations that act toward the conservation of marine species and their habitat on the larger landscape. The ocean and coastal units of the NPS span diverse habitats across 18 states and four territories, encompassing over 11,000 miles of shoreline and over 2 million acres of ocean. National parks and other protected areas provide essential habitat for resting, foraging, and breeding marine wildlife and vulnerable ecosystems and the marine wildlife would therein serve as indicator species reflecting the overall health of the coastal and marine environment. Park managers are confronted with multiple threats to natural and cultural resources from inside and outside park boundaries. The NPS has adopted strategies to increase the agency's organizational and scientific capacity to address ocean and coastal issues in partnership with state and federal agencies and organizations.

Marine wildlife health, particularly changes in wildlife diseases and survivability of rare species and populations, are of particular interest to the NPS, and pursuance of rigorous science is critical to conservation of the resources we are mandated to preserve through the Organic Act of 1916 and legislation of individual parks (such as Channel Islands National Park and Glacier Bay National Park and Preserve). NPS takes a One Health approach, recognizing that the health of people is connected to the health of animals and the environment. National parks offer a unique opportunity to practice and promote One Health, monitoring and managing harmful algal blooms, changing ocean conditions, marine debris, and zoonotic diseases that can be detrimental to park resources, park visitors and neighboring communities, as well as marine wildlife.

In addition, marine mammal health is directly and indirectly affected by human actions including, but not limited to, ship strikes, oil spills, entanglement in fishing gear and marine debris, and harassment. NPS management actions in response to injury or mortality of marine mammals are based on scientific information derived from many sources including the NMFS Stranding Networks. NPS supports long-term monitoring of marine mammals within boundaries of several national parks as part of a larger program as indicator species of marine ecosystem health under the NPS Inventory and Monitoring Program (see https://www.nps.gov/im/vital-signs.htm). Data and reports derived from this program inform the NMFS Stranding Networks of unusual mortality events and of emerging issues that affect marine mammal health.

The NPS is supportive of the activities outlined in the PEIS. We look forward to seeing the new inclusions of efficiencies that have been made to the program since the initial PEIS was published in 2009.

Please see specific comments below:

cc Nicole Brandt
cc Dave Trevino
cc Michelle Verant

Table 2. Line-Specific Comments			
Page	**Line(s)**	**Text**	**Comments**
185	13-18	When response activities occur in these areas, the proper authorities MUST be contacted to coordinate the response activities, to determine the manner in which a response may occur (if it is permitted at all), and to minimize impacts of a response. Nesting sea turtles and birds, AS WELL AS SENSITIVE BIOLOGICAL AND CULTURAL RESOURCES, AND WILDERNESS VALUES, would be avoided during responses, and response activities would be coordinated with the USFWS and/or appropriate FEDERAL, state, OR LOCAL agency/agencies to ensure there would be no adverse impacts.	Recommend changes to require contacting appropriate authorities for the coordination of response activities prior to response occurring if the strandings occur in protected areas under the jurisdiction of a federal, state, or local agency/agencies. These protected areas may include sensitive biological resources (in addition to nesting sea turtles and birds) as well as sensitive cultural resources that may need to be avoided or approached with special care. Areas that are designated as wilderness may have limitations on the types of activities and access that may occur within the wilderness bounds.
200	10-15	If activities would occur within the boundaries of a federally protected area, the appropriate personnel MUST	The NPS is responsible for the natural and cultural resources as well as visitor safety on the lands and waters under NPS jurisdiction. Response activities (including but not limited to: euthanasia, transfer to rehabilitation, necropsy, release, and media outreach) should be coordinated with appropriate personnel prior to the response occurring. Response activities

		be notified. Notification would include specific dates, locations, INTENDED ACTIVITIES, and participants involved in the activities. If necessary, permits would be obtained to conduct research in these areas. Nesting sea turtles and birds, AS WELL AS OTHER SENSITIVE BIOLOGICAL AND CULTURAL RESOURCES, AND WILDERNESS VALUES would be avoided during activities. If necessary, activities would be coordinated with the appropriate FEDERAL, state, OR LOCAL agency/agencies to ensure there would be no adverse impacts.	should include subsequent communication on response outcome, particularly if there may have been a potential zoonotic disease or the stranding was related to human interaction. Many parks have an informal understanding with local stranding programs, but a change in personnel could mean the cooperative understanding may not be continued. Specifically listing activities that should be coordinated when occurring within the boundaries of another land management agency (federal, state, tribal, or local) may help ensure that these efforts will continue to be cooperative and coordinated.
200	25-29	Carcass burial on beaches and disposal in State waters would occur after FEDERAL, state and/or local authorities have given permission to conduct such activities. CARCASS BURIAL ON BEACHES OR OTHER LANDS MANAGED BY A FEDERAL AGENCY WOULD OCCUR ONLY AFTER APPROPRIATE FEDERAL AUTHORITIES HAVE GIVEN PERMISSION TO	The NPS is responsible for the natural and cultural resources as well as visitor safety on the lands and waters under NPS jurisdiction. Carcass disposal or burial on lands or waters within NPS jurisdiction should be coordinated with appropriate personnel prior to occurring. NPS staff may advise additional consultation with cultural resources staff or local tribes depending upon the location and possibility of disturbing sensitive artifacts or culturally important locations.

		CONDUCT SUCH ACTIVITIES. Stranding network members, in coordination with NMFS (if necessary), would obtain any permits necessary and follow any conditions or mitigation set forth in the permits. Approval from FEDERAL, state, and/or local authorities would ensure that impacts to water and sediment quality would be minimal.	
58	Section 3		One consideration for inclusion in Section 3 (“Affected Environment”) would be terrestrial threatened and endangered species, and species of concern that occur in the coastal habitat. Handling stranded dead or live species in dune habitat should be done with care to avoid negatively impacting these resources. Actions such as excavation or trampling that might injure these species should be avoided. Examples of listed species from coastal and dune habitat include vertebrate species like the Perdido Key beach mouse, California least tern, and Western snowy plover, invertebrate species like the Myrtle’s silverspot butterfly and tiger beetle, and plants like the Tidestrome lupine and Coastal Dunes Milkvetch.
63	Section 3.2.2.1	Ex. “Atlantic Coast federally protected and sensitive habitats include 14 National Estuarine Research Reserves (NERRs), 69 National Wildlife Refuges (NWRs), 5 National Marine Sanctuaries (NMSs), 5 national parks, 8 national seashores, 10 wilderness areas, and 1 ecological preserve.” Also includes	NPS units include national parks and preserves, national recreational areas, national seashores, national historical parks and historic sites, national monuments, and national memorials; Each region of the United States has several marine and coastal NPS units, including the territories. Reference to “National Park Service units” might be a better way to categorizing these units then breaking them out into parks, seashores, etc. The individual counts of federally protected and sensitive habitats referred to in 3.2.2.1 by region leaves out several important park units.

		numbers for Gulf of Mexico, Pacific Coast, and Pacific Islands.	
65	Section 3.2.2.2		Consider the addition of invasive algae in the Pacific, *Sargassum hornii* and Asian Kelp (*Undaria pinnatifida*). These invasive algae are emerging in Southern California and can change habitats significantly when established
103	Section 3.5.2.1; Line 15	Reports of human illness from contact with marine mammals are rare, but have occurred.	May want to include exposure to pollutant concentrations above the normal limit, such as those that might be found during exposure to tissues of marine mammals such as orcas. See also pg 104, Line 1 regarding exposure to biotoxins.
151	Section 4.3.2.2; Line 6-7	Carcasses left on the beach to naturally decompose would not cause an impact, unless the animal had been chemically euthanized or contains contaminants.	If including an alternate of carcass disposal where carcasses are left en situ, then consider including potential impacts to other wildlife foraging on carcasses. In the Pacific, mercury levels in invertebrates that feed on dead marine mammals left on beaches are high due to high levels of contaminants found in the marine mammal populations. Endangered western snowy plovers feed on these invertebrates, ingesting mercury, and the elevated dose contributes to reproductive failure. In areas where threatened or endangered species, or species of concern are found, burial of remains may limit mercury exposure through the consumption of carcasses and/or detritivores. The issue to bury or leave en situ may warrant further examination since the carcasses provide a food source for many scavengers, including the California condor. Kurle, C.M., Bakker, V.J., Copeland, H., Burnett, J., Jones Scherbinski, J., Brandt, J. and Finkelstein, M.E., 2016. Terrestrial scavenging of marine mammals: Cross-ecosystem contaminant transfer and potential risks to endangered California condors (Gymnogyps californianus). *Environmental science & technology*, *50*(17), pp.9114-9123. Gunderson D. T., D. A. Duffield, T. Randell, N. Wintle, D.N. D'Alessandro, J. M. Rice, and D. Shepherdson. 2013. Organochlorine contaminants in blubber from stranded marine mammals collected from the northern Oregon and southern Washington coasts: Implications for re-introducing California condor *Gymnogyps californianus* in Oregon. Bulletin of Environmental Contamination & Toxicology 90:269-273. Schwarzbach SE, Stephenson M, Ruhlen T, Abbott S, Page GW, Adams D. Elevated mercury concentrations in failed eggs of Snowy Plovers at Point Reyes National Seashore. Mar Pollut Bull. 2005; 50(11):1444–1447. Wintle, N.J., Duffield, D.A., Barros, N.B., Jones, R.D. and Rice, J.M., 2011. Total mercury in stranded marine mammals from the Oregon and southern Washington coasts. *Marine Mammal Science*, *27*(4), pp.E268-E278.

157	Section 4.4; Line 2-6	Cultural Resources: This section evaluates the potential impacts on cultural resources as a result of the alternatives. Section 5.4 of this PEIS describes mitigation measures that would be taken to protect cultural resources under certain alternatives. These mitigation measures include contacting the appropriate SHPO prior to undertaking actions, such as carcass burial, in areas where there is a potential for submerged or buried cultural resources to be present.	Recommend changing text to "These mitigation measures include contacting appropriate authorities for the coordination of response activities prior to undertaking actions if the strandings occur in protected areas under the jurisdiction of a federal, state, or local agency/agencies. If outside of the jurisdiction of a protected area, but in an area with a potential for submerged or buried cultural resources, responders should contact the appropriate SHPO prior to undertaking actions."

United States Department of the Interior

FISH AND WILDLIFE SERVICE

MAY 2 1 2018

In Reply Refer To:
FWS/AES/DRR/BERR/068120

Dr. Shannon Bettridge
Chief, Marine Mammal and Sea Turtle Conservation Division
(Attn: MMHSRP PEIS)
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910-3226

Subject: National Marine Fisheries Service's Notice of Intent to Prepare a Programmatic Environmental Impact Statement for its Marine Mammal Health and Stranding Response Program [Docket No. NOAA-NMFS-2018-0036]

The U.S. Fish and Wildlife Service (Service) has reviewed the NOAA-National Marine Fisheries Service's (NMFS) Notice of Intent to Prepare a Programmatic Environmental Impact Statement (PEIS) for its Marine Mammal Health and Stranding Response Program (83 FR 13955), published on April 2, 2018. The PEIS will evaluate potential environmental effects associated with continued implementation of NMFS' Marine Mammal Health and Stranding Response Program (MMHSRP), including changes to the Best Practices for Marine Mammal Stranding Response, Rehabilitation and Release (Policies and Practices) and other aspects of the program (large whale entanglement response, health surveillance, research, morbidity and mortality investigations, and assessments).

NMFS' MMHSRP activities occur in waters throughout the U.S., including areas within the range of marine mammals under the jurisdiction of the Service. Activities involving NMFS trust marine mammals can affect West Indian manatees in the southeastern U.S., Puerto Rico, and the U.S Virgin Islands; southern sea otters in California; northern sea otters in Washington and Alaska; and Pacific walruses and polar bears in Alaska. NMFS' planned evaluation of its MMHSRP, including continued implementation and changes to Policies and Practices, should consider potential impacts to these species as well as potential impacts to other species listed under the U.S. Endangered Species Act (ESA).

The Service is available to provide technical assistance concerning these marine mammal species as NMFS prepares the PEIS and updates other program elements. Please feel free to contact the

Fish and Wildlife Offices listed below for any new, significant sources of information that should be considered during this evaluation:

West Indian manatee:
Jim Valade, Regional Florida Manatee Coordinator at jim_valade@fws.gov or 904-731-3116 or Jan Zegarra, Caribbean Ecological Services Field Office at jan_zegarra@fws.gov or 787-851-7297; ext. 220

Southern sea otter:
Lilian Carswell, Southern Sea Otter Recovery & Marine Conservation Coordinator at lilian_carswell@fws.gov or 805-677-3325

Northern sea otter in the Northwest:
Deanna Lynch, Washington Fish & Wildlife Office at deanna_lynch@fws.gov or 360-753-9545

Northern sea otter in Alaska, Pacific walrus, and polar bear:
Patrick Lemons, Chief, Marine Mammals Management at patrick_lemons@fws.gov or 907-786-3668 or Charles S. Hamilton, Special Assistant, Marine Mammals Management at charles_hamilton@fws.gov or 907-786-3804

For information relative to species listed under the ESA, the Service has a digital project planning tool, Information for Planning and Consultation (IPaC), which can be accessed at https://ecos.fws.gov/ipac. IPaC allows the user to identify Service-managed resources based on user-drawn locations and automatically provides resource lists and information such as conservation measures.

If you have questions regarding these comments, please contact Diane Bowen, National Marine Mammal Coordinator, Division of Restoration and Recovery, at diane_bowen@fws.gov or 703-358-1709.

Thank you for the opportunity to provide these comments

Sincerely,

Craig Aubrey

Craig Aubrey
Chief, Division of Environmental Review
Ecological Services

cc: Natural Resources Management, Office of Environmental Policy and Compliance, DOI

Appendix V

Standards for Release of Marine Mammals Following Rehabilitation

Executive Summary

Rescue, rehabilitation, and release of wild marine mammals is allowed for authorized individuals under listed conditions by the Marine Mammal Protection Act (MMPA) [16 U.S.C. 1379 § 109(h)]. Section 402(a) of Title IV of the MMPA specifically mandates that "The Secretary shall… provide guidance for determining at what point a rehabilitated marine mammal is releasable to the wild" [16 USC 1421 §402(a)]. This document fulfills the statutory mandate and is not intended to replace marine mammal laws or regulations.

Historically, these Release Standards were developed by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS), in consultation with marine mammal experts, and were included in the 2009 Final Polices and Best Practices Marine Mammal Stranding Response, Rehabilitation and Release, Standards for Release that were part of the 2009 NMFS Marine Mammal Health and Stranding Response Program Programmatic Environmental Impact Statement process. This current document encompasses revisions and updates to the 2009 Standards for Release published in the 2009 Programmatic Environmental Impact Statement.

These Standards provide an evaluative process to help determine if a stranded wild marine mammal, following a course of treatment and rehabilitation, is suitable for release to the wild. These guidelines describe "Release Categories" for rehabilitated marine mammals of each taxonomic group (i.e., cetaceans, pinnipeds, manatees, sea otters and polar bears). After completing a thorough assessment as prescribed, the release candidates are to be assigned to a Release Category as follows: "Releasable", "Conditionally Releasable", "Conditionally Non-Releasable (Manatees only)", and "Non-Releasable". This document establishes essential release criteria that trained experts should use to determine whether or not individual animals are healthy enough to release into the wild. The essential release criteria are assessed in the following categories:

1. Situational Assessment and Clearance
2. Developmental and Life History Assessment and Clearance
3. Behavior Assessment and Clearance
4. Medical Assessment and Clearance
5. Release Logistics
6. Post-Release Monitoring

By using clearly defined Release Categories for rehabilitated marine mammals, NMFS and FWS can evaluate and support the professional discretion of the attending veterinarian and their assessment team (i.e., biologists, veterinarians, animal care supervisors, and other team members of the marine mammal stranding networks). Based on these Release Categories, NMFS and FWS can consult experts on challenging cases in which the survival of the rehabilitated marine mammal or its potential to pose a health risk to wild marine mammals is in question.

Refinement of requirements and standards for release of rehabilitated marine mammals to the wild is a dynamic process. Use of these standardized guidelines will also aid in the evaluation of rehabilitation

procedures and will allow for on-going improvement of such protocols. These Standards are based on the best available science and thus will be revised periodically.

Table of Contents

1 Introduction

1.1 Acknowledgements

These Standards for Release have been revised from 2009 Standards originally written by Drs. Janet Whaley and Rose Borkowski. We want to thank Drs. Whaley and Borkowski for their contributions to the Release Standards. We would also like to thank the many people who contributed information and review of these revised Standards especially the staff of the FWS who provided substantive revisions for their trust species.

1.2 Background

Prior to the early 1990s, release decisions for marine mammal species under the jurisdiction of the National Marine Fisheries Service (NMFS) were made by individual rehabilitation facilities without much direction or input from NMFS. Decisions were inconsistent and invoked controversy, especially for cetacean cases. The Marine Mammal Commission and NMFS sponsored several workshops focusing on procedures and needs regarding marine mammal strandings, rehabilitation, and release. Discussions at these workshops provided starting points for establishing objective release criteria. A stronger impetus to formalize these release guidelines came in 1992 when, as part of the Marine Mammal Health and Stranding Response Act, Congress mandated establishing objective guidelines for determining releasability of rehabilitated marine mammals. The Marine Mammal Protection Act (MMPA) was amended to include Title IV, Section 402(a) which states that: *"The Secretary [of Commerce] shall, in consultation with the Secretary of Interior, the Marine Mammal Commission, and individuals with knowledge and experience in marine science, marine mammal science, marine stranding network participants, develop objective criteria, after an opportunity for public review and comment, to provide guidance for determining at what point a rehabilitated marine mammal is releasable to the wild*."

Historically, in accordance with the MMPA, these Standards were initially developed by the National Oceanic and Atmospheric Administration's (NOAA) NMFS and the U.S. Fish and Wildlife Service (FWS) in consultation with marine mammal experts through review and public comment on the 1997 draft NOAA Technical Memorandum "Release of Stranded Marine Mammals to the Wild: Background, Preparation, and Release Criteria". Subsequently, these Standards were further developed and included in the 2009 Final Polices and Best Practices Marine Mammal Stranding Response, Rehabilitation and Release, Standards for Release that were part of the 2009 Marine Mammal Health and Stranding Response Program (MMHSRP) Programmatic Environmental Impact Statement process. Comments from the public review process and other outstanding issues were compiled by NMFS and FWS. This current document encompasses revisions and updates to the 2009 Standards for Release published in the 2009 Programmatic Environmental Impact Statement.

The purposes of this document are as follows:

- To provide guidance for determining release of rehabilitated marine mammals to the wild including marine mammal species under the jurisdiction of the NMFS (Department of Commerce) and those under the jurisdiction of the FWS (Department of the Interior);
- To state the NMFS and FWS legal requirements and provide recommendations for medical, behavioral, and developmental assessment of rehabilitated marine mammals prior to release;
- To identify the persons and agencies responsible for completing an assessment of a rehabilitated marine mammal for a release determination and to describe the communication requirements and process with NMFS or FWS;

- To state the NMFS and FWS requirements and recommendations for identification of "Releasable" rehabilitated marine mammal, selection of a release site (including appropriate communication and coordination with authorities) , and post-release monitoring; and
- This document does not include guidance for the following situations:
    - o Immediate release following health assessment and/or emergency triage typically associated with mass stranding events, out of habitat rescues, and entangled response efforts; and
    - o Release following relocation of healthy marine mammals.

1.3 Review of Key Legislation Pertinent to Marine Mammal Rehabilitation and Release to the Wild

Congress delegates the responsibility for implementing the MMPA to the Secretary of Commerce and the Secretary of the Interior. Cetaceans and pinnipeds, exclusive of walruses (*Odobenus rosmarus*), are the responsibility of NMFS (*i.e.,* NMFS species). Walruses, polar bears (*Ursus maritimus*), manatees (*Trichechus manatus*), and sea otters (*Enhydra lutris*) are the responsibility of FWS (*i.e.,* FWS species). NMFS and FWS responsibilities for these species are regulated under 50 CFR.

Rehabilitation and release of wild marine mammals is authorized by key statements within the MMPA (16 U.S.C. 1379 §109(h)) entitled "Taking of Marine Mammals as Part of Official Duties." This section allows for the humane taking of a marine mammal, by a federal, state, or local government official or employee or a person designated under section 112(c) of the MMPA, for its protection or welfare and states that an animal so taken is to be returned to its natural habitat whenever feasible.

Regulations that implement the MMPA for NMFS species (50 CFR 216.27(a)(1)) require that a marine mammal held for rehabilitation be released within six months unless "…the attending veterinarian determines that:
(i) The marine mammal might adversely affect marine mammals in the wild;
(ii) Release of the marine mammal to the wild will not likely be successful given the physical condition and behavior of the marine mammal; or
(iii) More time is needed to determine whether the release of the marine mammal in the wild will likely be successful…"; and
(b)(1) "The attending veterinarian shall provide the Regional Director or Office Director with a written report setting forth the basis of any determination".
Also, (a)(iii) "releasability must be re- evaluated at intervals of no less than six months until 24 months from capture or import, at which time there will be a rebuttable presumption that release into the wild is not feasible".

For NMFS species, the MMPA section 112(c) Stranding Agreements are formally established between the NMFS Regions and Stranding Network Participants. Understanding and following the MMPA and implementing regulations, policies, and guidelines, is the responsibility of all persons involved in marine mammal rescue, rehabilitation, and release. These guidelines are founded on and support the MMPA and related regulations. The laws and regulations outlined below are therefore fundamental to proper enactment of marine mammal rehabilitation and release.

1.4 Structure of the Document

This document is organized as follows: General Procedures (Section 2); Guidelines for Release of Rehabilitated Cetaceans (Section 3); Guidelines for Release of Rehabilitated Pinnipeds (Section 4); Guidelines for Release of Rehabilitated Manatees (Section 5); Guidelines for Release of Rehabilitated Sea

Otter (Section 6); Policies Regarding Release of Rehabilitated Polar Bears (Section 7); References (Section 8); and Appendices (Section 9).

The approach developed in this document primarily involves a complete assessment of an animal's health and behavior and release logistics. The assessment is completed by the attending veterinarian and their Assessment Team following this standardized guidance for determining the disposition of a marine mammal after treatment and rehabilitation. Section 2, "General Procedures," summarizes the pertinent laws and regulations and outlines the release requirements and recommendations for all species of rehabilitated marine mammals. This section provides an overview of documentation required throughout rehabilitation and release. Parties responsible for release determinations are identified. General principles for developmental, behavioral, and medical assessments of rehabilitated marine mammals are described, as well as methods for post-release identification (i.e., marking and tagging), monitoring, and selection of appropriate release sites.

There are several critical variables among each taxonomic group, such as natural history, social organization, and species-specific rehabilitation and release considerations. These variables are addressed in separate chapters (Sections 3-7) for cetaceans, pinnipeds, manatees, sea otters, and polar bears. These chapters provide greater detail and rationale for the release guidelines for each marine mammal group.

The reference section lists current literature on marine mammal biology, medicine, rehabilitation, and release. The appendices provide access to release checklists and a release plan template.

1.5 Funding

Funding of marine mammal rehabilitation is the responsibility of the rehabilitation facility. Specific resources, such as freezers for serum banking, histopathology services, equipment, and personnel for post-release monitoring may be provided through NMFS and FWS to support the biomonitoring program. Some costs associated with response and rehabilitation during a Marine Mammal Unusual Mortality Event (UME) may be reimbursed through the UME National Contingency Fund (in accordance with section 405 of the MMPA). For additional information regarding expense reimbursement, contact the appropriate NMFS or FWS coordinator. For NMFS species, the John H. Prescott Marine Mammal Rescue Assistance Grant Program is also available as a funding source for marine mammal stranding response and rehabilitation. More information on this program can be found on the following website: https://www.fisheries.noaa.gov/grant/john-h-prescott-marine-mammal-rescue-assistance-grant-program

2 General Procedures

2.1 Stranding Agreements, MMPA 109(h) Authority, and Permits for Stranding Response for ESA species

2.1.1 NMFS Policies

NMFS may enter into a Stranding Agreement (SA) with a person or organization for stranding response and rehabilitation. The NMFS SA states that the Stranding Network Participant will obey laws, regulations, and guidelines governing marine mammal stranding response and rehabilitation. This includes requirements for communications with NMFS, humane care, husbandry and veterinary care of rehabilitated marine mammals, and documentation of each stranding response and rehabilitation activity. The SA does not authorize the taking of any marine mammal species listed as endangered or threatened under the Endangered Species Act of 1973 (ESA), as amended. However, authorization to take ESA-listed species by the Stranding Network is currently provided under MMPA/ESA Permit No.18786-04, as amended, and requires authorization and direction from the NMFS Regional Stranding Coordinator (RSC) or Marine Mammal Health and Stranding Response Headquarters staff in the event of a stranding involving a threatened or endangered marine mammal (for contacts see: https://www.fisheries.noaa.gov/contact-directory/marine-mammal-stranding-network-coordinators).

2.1.2 FWS Policies

Rescue, rehabilitation, and release of non ESA-listed marine mammal species under FWS responsibility is typically authorized with a Letter of Authorization (LOA) issued by the FWS; a permit issued under section 104c of the MMPA is another option. Rescue, rehabilitation, and release of ESA-listed species, is authorized under a permit issued by the FWS. The FWS Field Offices in the lower 48 states or the Marine Mammals Management Office in Alaska coordinate with LOA and permit holders for all rescue, rehabilitation, and release activities for species under their jurisdiction.

2.2 Parties Responsible for Release Determinations and Overview of Agency Approval

The attending veterinarian and their Assessment Team (*i.e.,* veterinarians, lead animal care supervisor, and/or consulting biologist with knowledge of species behavior and life history) representing the Stranding Network Participant, Designee, LOA holder, or 109(h) Stranding Participant will assess the animal and make a written recommendation for release or non-release. For NMFS species, the recommendations are sent to the NMFS Regional Administrator via the RSC. For FWS species, the recommendations are sent to the FWS Field Office and any recommendations for non-release are coordinated with the FWS.

In general, for NMFS species that are deemed "Releasable," a 15-day advance written notification is necessary. The release determination recommendation includes a signed statement from the attending veterinarian, in consultation with their Assessment Team, stating that the marine mammal is medically and behaviorally suitable for release in accordance with the release criteria (i.e., similar to a health certificate) and includes a written release plan and timeline. The Regional Administrator via the RSC will review the recommendation and release plan and provide a signed written notification to the Stranding Network Participant indicating concurrence and authorization to release or direct an alternate disposition (letter of concurrence from the Regional Administrator) (50 CFR 216.27). For general release guidance for NMFS species, see Appendices A and B for a Recommended Standard Checklist for Release Determination. A NMFS release plan template is also available in Appendix C. NMFS may also require a concurrence signature from the "Authorized Representative" or Signatory of the SA.

In certain cases, 50 CFR 216.27 (a)(2)(i)(A) allows for waiving this 15-day advance notification for release in writing by the Regional Administrator via the RSC. Generally, these waiver cases are anticipated and can be appropriately planned (*e.g.,* the typical species and time of year, presenting with known etiologies, and with routine diagnosis and treatment). For such release waivers, the Stranding Network Participant should submit a protocol for such cases, including location of release. These waivers will require pre-approval by the NMFS Regional Administrator via the RSC on a schedule as prescribed in the SA.

For more challenging and potential “Conditionally Releasable” cases, plans for release should be submitted well in advance of the 15-day period to provide adequate time for evaluation. In addition, it is highly recommended that dissenting opinions among members of the Assessment Team regarding an animal’s suitability for release and/or the release plan be communicated to NMFS well in advance of the required 15-day advance notice so that additional consultation can be arranged for resolution and planning.

By regulation (50 CFR 216.27 (a)(3)), the NMFS Regional Administrator (or Office Director of Protected Resources) has the authority to modify requests for release of rehabilitated marine mammals. In accordance with 50 CFR 216.27 (a)(1), any marine mammal held for rehabilitation must be evaluated for releasability within six months of collection unless the “attending veterinarian determines that the marine mammal might adversely affect other marine mammals in the wild, release of the marine mammal to the wild will not likely be successful given the physical condition and behavior of the marine mammal, or more time is needed to determine whether the release of the marine mammal will likely be successful.” If more time is needed, then NMFS will require periodic reporting in writing from the attending veterinarian, including a description of the condition(s) of the animal that precludes release and a prognosis of release. NMFS may require that the marine mammal remain at the original rehabilitation facility or be transferred to another rehabilitation facility for an additional period of time, be placed in permanent captivity, or be euthanized. NMFS may also require a change of conditions of the release plan including the release site and post-release monitoring. An expanded release plan may be required including a justification and detailed description of the logistics, tagging, location, timing, crowd control, media coordination (if applicable), and post release monitoring. NMFS may require contingency plans should the release be unsuccessful including recapture of the animal following a specified time after release. Expanded release and contingency plans are required for the release of ESA species.

Generally for animals deemed “Non-Releasable” and with the concurrence from the NMFS Regional Administrator via the RSC, the animal can be permanently placed in a public display or research facility or euthanized. If the animals is to be placed in permanent captivity, the receiving facility must be registered or hold a license from the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service (APHIS) [7 U.S.C. 2131 *et seq*.] and comply with MMPA (16 U.S.C. 1374 §104(c)(7)). Facilities wishing to obtain Non-Releasable animals (*i.e.,* the rehabilitation facility or another authorized facility) are required to send a Letter of Intent to the Office of Protected Resources, Permits, Conservation and Education Division (NMFS PR1) to permanently retain or acquire the animal (more information available at https://www.fisheries.noaa.gov/national/marine-mammal-protection/non-releasable-marine-mammals). This letter should include a signature of the “Responsible Party of Record”. As part of the placement decision making process, NMFS will consult with APHIS and may review the qualifications and experience of staff, transport protocols, and placement plans (*i.e.,* integration based on appropriate composition of species, sex, and age and the intended proposed plan for public display or scientific research). Once approved, NMFS PR1 will respond with a Transfer Authorization Letter and include Marine Mammal Datasheets (MMDS), OMB Form 0648-0084, to be returned to NMFS PR1 within 30 days of transfer. Upon receipt of the MMDS, NMFS PR1 will acknowledge the transfer in writing and return updated MMDS to the receiving facility.

For FWS species, LOA and permit holders provide recommendations to the FWS Field Offices for decisions regarding releasability of rehabilitated marine mammals (see Appendices D and E). The FWS retains the authority to make the final determination on the disposition of these animals. If FWS determines that a marine mammal is Non-Releasable, the holding facility may request a permit for permanent placement in captivity as prescribed in section 104(c)(7) of the MMPA for non-depleted species, or section 104(c)(3) or section 104(c)(4) and section 10(a)(1)(A) of the ESA for depleted species.

Manatee releases require a minimum 30-day advance notice (although exceptions may be made in the event of extenuating circumstances) and must also include a signed statement from the attending veterinarian that the animal is medically and behaviorally suitable for release in accordance with the release criteria (*i.e.,* similar to a health certificate) and include a written release plan and timeline. Upon receipt, FWS will evaluate and determine the suitability of the release site and release conditions (see taxa specific sections for further guidance).

For cases involving declared UMEs, the Working Group on Marine Mammal Unusual Mortality Events will be consulted to determine if event specific release standards should be implemented as stated in the 1996 NOAA Technical Memorandum – National Contingency Plan for Response to Unusual Marine Mammal Mortality Events (NOAA Tech. Mem. NMFS-OPR-9). Priority will be given to protecting the health of wild populations over the disposition of an individual animal. Provisions may require monitoring a representative subset of released animals to determine survivability impact on the affected population or holding rehabilitated animals beyond the projected release time to determine long-term health effects.

2.3 Documentation for Rehabilitation and Release of Marine Mammals

2.3.1 NMFS

Pursuant to the SA between the Stranding Network Participant and appropriate NMFS Regional Office that allows a stranding organization to respond to and/or rehabilitate marine mammals, the Stranding Network Participant must provide documentation to NMFS regarding their activities that involve the taking and disposition of marine mammals as described below. The same holds true for actions under MMPA section 109(h). Figure 2.1 presents the documentation and procedures following submission of the written "release determination recommendation."

Marine Mammal Stranding Report Level A Data, NOAA Form 89-864, OMB No. 0648- 0178
NMFS Forms may be found here: https://www.fisheries.noaa.gov/national/marine-life-distress/level-data-collection-marine-mammal-stranding-events

This report is mandatory for all stranding events and includes basic information regarding the site and nature of the stranding event, a statement that the animal was found alive or a description of the condition of its carcass, morphologic information, photo or video documentation, initial disposition of any live animal, tag data, and information on disposal, disposition, and necropsy of dead animals. This report must be sent to the appropriate NMFS Regional Office or uploaded into the National Database within the time stated in the SA.

Marine Mammal Rehabilitation Disposition Report, NOAA Form 89-878, OMB No. 0648-0178
This report is mandatory for all rehabilitation cases (*i.e.,* long-term and short-term holding) and includes a brief history of the stranding and related findings of an individual marine mammal. It also includes the disposition of samples taken from the animal and disposition of the animal including release site and tagging information. This report includes verification and date that a pre-release health screen was done on the animal. This document must be sent to the appropriate NMFS Regional Office or uploaded into the

National Database no later than 30 days following the final disposition (*e.g.,* released or non-released) of the marine mammal or as prescribed in the SA. NMFS compiles these data annually to monitor rehabilitation and identify where changes and enhancements should be made.

Release Determination Recommendation 50 CFR 216.27 (a)(2)
This regulation states that the custodian of a rehabilitated marine mammal must provide the appropriate NMFS Regional Office with written notification at least 15 days prior to the release of any marine mammal to the wild, including a release plan. The required notification (release determination recommendation) should provide information sufficient for determining the appropriateness of the release plan, including a description of the marine mammal (i.e., physical condition and estimated age), the date and location of release, and the method and duration of transport prior to release (50 CFR 216.27(a)(2)(ii)). The release recommendation should include a signed report or statement from the attending veterinarian that the marine mammal is medically and behaviorally suitable for release in accordance with NMFS release criteria (*i.e.,* similar to a health certificate under the Animal Welfare Act). NMFS may also require a concurrence signature from the "Authorized Representative" or Signatory of the Stranding Agreement. The pre-notification requirement may be waived in writing for certain circumstances ((*e.g.,* the typical species and time of year, presenting with known etiologies, and with routine diagnosis and treatment)) by the NMFS Regional Administrator via the RSC in accordance with specific requirements as stated in the SA.

In the case of more challenging releases such as animals considered "Conditionally Releasable," requests for release should be submitted well in advance of the 15-day period to provide adequate time for review and planning. NMFS reserves the right to request additional information and impose additional requirements in any release plan to improve the likelihood of success or to protect wild populations (50 CFR 216.27 (a)(3)). NMFS also can order other disposition as authorized upon receipt of the report (release determination recommendation) (50 CFR 216.27 (b)(2)). Expanded release and contingency plans are required for the release of ESA species. For guidance, see Appendices A and B for a Recommended Standard Checklist for Release Determination. A NMFS release plan template is also available in Appendix C.

Notification of Non-release/Transfer of Custody
For animals deemed "Non-Releasable," and with the concurrence from the NMFS Regional Administrator, the animal can be permanently placed in a public display or research facility or be euthanized. If the animal is to be placed in permanent captivity, the receiving facility must be registered or hold a license from APHIS [7 U.S.C. 2131 et seq.] and comply with MMPA (16 U.S.C. 1374 §104(c)(7)). Facilities wishing to obtain Non-Releasable animals should send a Letter of Intent to NMFS PR1 to permanently retain (*i.e.,* if affiliated with the rehabilitation facility) or acquire the animal. This letter should include a signature of the "Responsible Party of Record". As part of the decision making process NMFS will consult with APHIS and may review the, qualifications and experience of staff, transport, and placement plans (*i.e.,* integration based on appropriate composition of species, sex, and age and the intended proposed plan for public display or scientific research). Once approved, NMFS PR1 will respond with a Transfer Authorization Letter and include MMDS, OMB Form 0648-0084, to be returned to NMFS PR1 within 30 days of transfer. Upon receipt of the MMDS, NMFS PR1 will acknowledge the transfer in writing and return updated MMDS to the receiving facility. More information can be found here: [https://www.fisheries.noaa.gov/national/marine-mammal-protection/non-releasable-marine-mammals.](https://www.fisheries.noaa.gov/national/marine-mammal-protection/non-releasable-marine-mammals)

2.3.2 FWS

Requirements for the rehabilitation and release of marine mammals under FWS jurisdiction are specified under individual permits or LOAs. These requirements are specific to the species, the organization, and the activity being conducted. The required documentation for manatee rescue, rehabilitation, and release activities is provided in Appendix D.

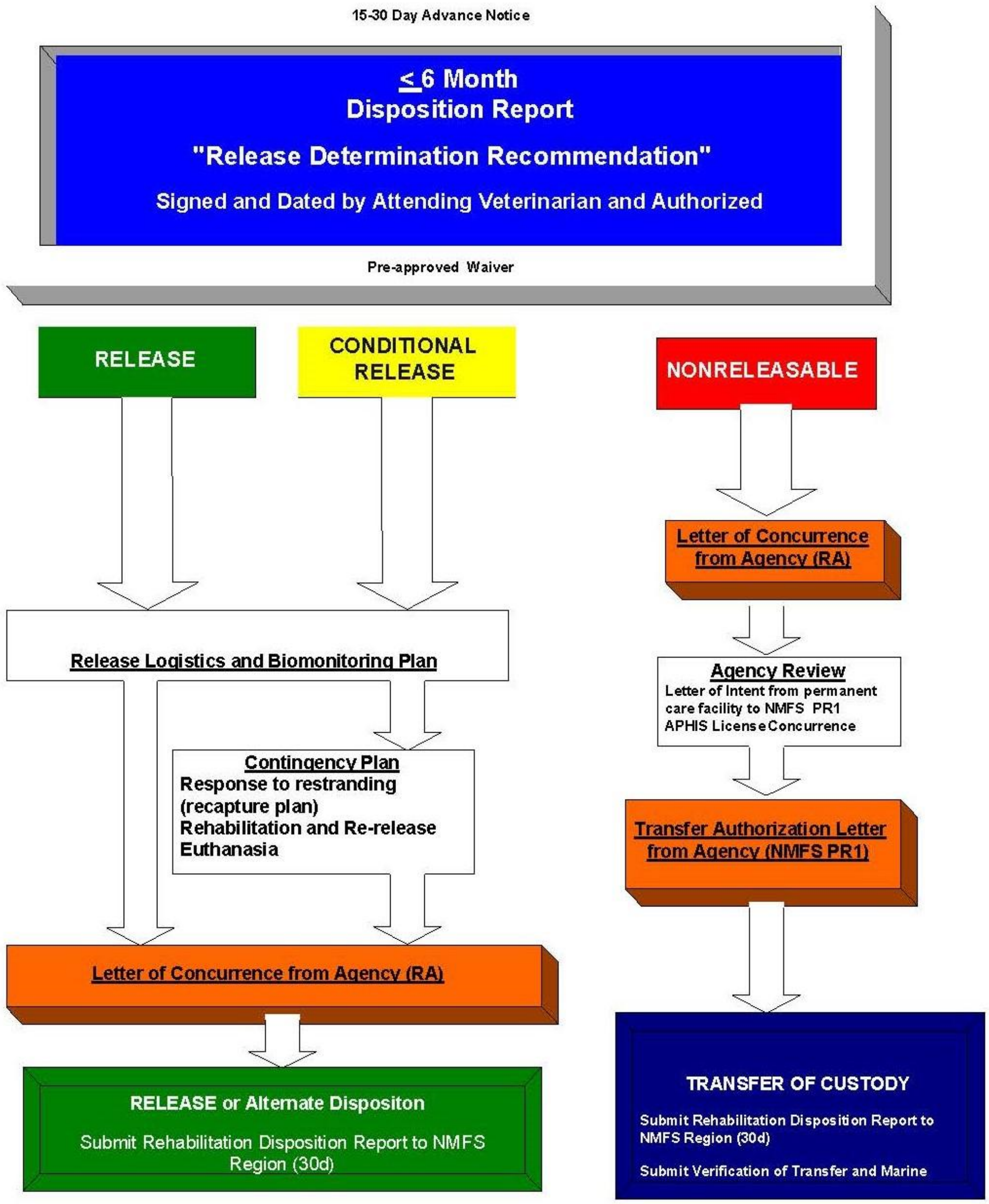

Figure 2.1 Documentation and Procedures Following Submission of the Written “Release Determination Recommendation.”

2.4 Assessment Process for a Release Determination

These guidelines provide an evaluative process to determine if a stranded wild marine mammal, following a course of treatment and rehabilitation, is suitable for release to the wild. The basic format for these guidelines provides assignments for each taxonomic group (*e.g.,* cetaceans, pinnipeds, manatees, sea otters, walrus, and polar bears) of rehabilitated marine mammals into “Release Categories.” Release potential is characterized and categorized based on a thorough assessment of the health, behavior, and ecological status of the animal, as well as the release plan. It is critical that detailed medical and husbandry records are maintained and reviewed. Following a complete evaluation, the attending veterinarian and Assessment Team should categorize the animal into one of the following Release Categories: “Releasable”, “Conditionally Releasable”, “Conditionally Non-Releasable (for manatees only)”, and “Non-Releasable”. “Conditionally Non-Releasable” is only a category for manatees because the FWS has had success releasing manatees that have been in captivity in excess of 20 years. NMFS species are deemed “Non-Releasable” if they have been in captivity for over two years (see 50 CFR 216.27(a)(1)(iii)) and therefore a “Conditionally Non- releasable” category is not necessary. Based on the findings from the Assessment Team, the attending veterinarian provides a recommendation on releasability to NMFS or FWS. The Agencies will review and consider this information as a part of the release determination review process.

In most release cases, NMFS requires the release of marine mammals within six months of admission to rehabilitation (50 CFR 216.27(a)). This assessment can be done at more frequent intervals or earlier in the process of rehabilitation such as for obvious non-release cases (*e.g.,* neonatal cetaceans, blind or deaf animals, etc.). Rather than staying in a rehabilitation situation for up to six months, it may be in the best interest of the animal to immediately assess, determine releasability, and transfer to a more suitable permanent care facility. This is particularly important for all marine mammals that need socialization or expert care.

The Assessment should include the following steps and general parameters (see Figure 2.2):

1. **Situational Assessment**. The Assessment Team should complete a situational evaluation that includes information gathered from the time of stranding through the duration of rehabilitation. Such information can impact the management of the case and determination of release. Circumstances such as an ongoing epidemic among other wild marine mammals, presence of environmental events such as a harmful algal bloom (HAB) or hazardous waste spill, acoustic insult; and special weather conditions (*e.g.,* El Niño, hurricane, extreme cold, extreme heat, changes in oceanographic parameters, etc.) should be documented. It should also be noted if the animal had previously stranded and been released or was part of an official UME. This assessment should also include if the animal is evidence and part of a human interaction or criminal investigation. Such information can help guide the diagnostic and treatment strategy during rehabilitation and may impact the plan for post-release monitoring. Other considerations that should be taken into account include whether the animal was transferred from another facility (*i.e.,* short-term triage/holding facility or rehabilitation facility) and the quality of care and treatment received at each rehabilitation facility.

2. **Developmental and Life History Assessment.** In order to be deemed “Releasable,” all rehabilitated marine mammals should have achieved a developmental stage wherein they are nutritionally independent. Nursing nutritionally dependent animals should not be released in the absence of their mothers. The ability of a young marine mammal to hunt and feed itself independently of its mother is critical to successful integration into the wild. Also of great importance is achievement of a robust, seasonally appropriate body condition such that the animal has adequate reserves for survival. Other developmental issues, such as reproductive status and advanced age, seldom stand alone as determinants of release candidacy, but are evaluated in conjunction with the overall health assessment. The Assessment Team should seriously consider information concerning the natural life history for the species. Therefore, it is important that the makeup of the team include someone with expertise or working understanding of the species behavior and life history. Important questions to be addressed include:
   1. Does the species depend on a social unit for survival or does it exist solitarily in the wild;
   2. Has the animal developed the skills necessary to find and capture food in the wild;

3. Has the animal developed the social skills required to successfully integrate into wild societies;
4. Is there knowledge of their home range or migratory routes; and
5. Does the animal have skills in predator recognition and avoidance?

In other words, how important is it to the survival of the animal to be released with or near other conspecifics? The Assessment Team can work with NMFS to consult with outside experts to evaluate the animal and address these questions. Greater details regarding developmental assessment are included in the appropriate section for each taxonomic group.

3. **Behavioral and Ecological Assessment and Clearance.** In order to be deemed "Releasable," a marine mammal should meet basic behavioral criteria, some of which are specific for taxa. Across taxonomic groups, behavioral requirements for release include demonstration of normal breathing, swimming, and diving with absence of aberrant (*i.e.,* abnormal) behavior, auditory, and/or visual dysfunction that may significantly compromise survival in the wild and/or suggest diseases of concern. The rehabilitated animal should also demonstrate the ability to recognize, capture, and consume live prey prior to its release when access to live natural prey is feasible, or, in the case of manatees, the ability to identify and feed on appropriate forage types. Because abnormal behavior may reflect illness or injury, this evaluation should be done in concert with the attending veterinarian and the medical assessment. The behavioral clearance should be part of the overall recommendation for release that is passed on to NMFS or FWS. Outstanding concerns regarding the behavioral suitability of the marine mammal for release are to be discussed with NMFS or FWS. Additional information is included in the behavioral assessment section for each taxonomic group.

Also included in this thought process, is the concept of ecological status. This concept attempts to integrate the medical and behavioral evaluations into an extrapolation of how the animal would likely do in the wild when exposed to typical ecological pressures (personal comm. Wells 2005). It goes beyond the assessment of the current condition of the animal in an artificial environment at the rehabilitation facility relative to a limited set of immediately observable or measurable parameters. It places the animal in its current rehabilitated condition in the context of life in the wild. This process recognizes the importance of a team approach, involving complementary expertise, to evaluate the probability that a rehabilitated animal will survive and thrive back in the wild. It would be useful to include in the deliberations a behavioral ecologist with knowledge of the specific species (or closely related species) solutions to ecological challenges in the wild. The behavioral ecologist would be familiar with the species habitat, including oceanographic parameters, ranging patterns, life history, feeding ecology, potential predators, social structure, and anthropogenic threats likely to be faced by the animal once it is released.

4. **Medical Assessment and Clearance.** Although this document focuses on the evaluation and preparation of rehabilitated marine mammals for release, the medical assessment spans the entire time the animal is in rehabilitation and is critical to understanding the animal's health prior to release. The medical assessment includes information related to any health trend and diagnostic testing, treatment, and response to treatment. The attending veterinarian should perform a hands-on physical examination upon or near admission and prior to the release determination. The attending veterinarian should review the animal's complete history including all stranding information, diagnostic test results (*i.e.,* required by NMFS or FWS), and medical and husbandry records including whether the animal had been exposed to other wild or domestic animals just prior to and/or during rehabilitation or had attacked and/or bitten a human while being handled. It should be noted that strict measures are to be in place to prevent any disease transmission from other wild and domestic animals and humans during the rehabilitation process. The goal of required testing requested by NMFS or FWS is to safeguard the health of wild marine mammal populations and this is achieved by testing for diseases that pose a significant morbidity or mortality risk to wild populations.

Other diseases include those that are of zoonotic or public health and safety concern and the agencies will require immediate notification to assure proper protocols are put into place. The agencies may request testing for other emerging diseases as part of a surveillance program to identify potential epidemics of concern or to determine health trends. Additional testing may be required if the animal was part of an official UME. Specific testing requirements (*i.e.,* pre-release health screen) will come from the NMFS MMHSRP through the RSC, National Stranding Coordinator, or National Veterinary Medical Officer and follows the term and responsibilities stated in the NMFS SA (for contacts see: https://www.fisheries.noaa.gov/contact-directory/marine-mammal-stranding-network-coordinators). For FWS species, contact the appropriate Field Office for guidance (Appendix E).

Throughout the rehabilitation period, the frequency of physical exams and decisions for performance of additional diagnostic testing are determined by the attending veterinarian. The animal should be closely monitored for disease throughout rehabilitation. Regardless of the precise cause of the animal's stranding, the stranding event itself and the animal's abrupt transition to a captive environment can cause significant stress, which may increase its susceptibility to disease. Should the animal become infected with such a pathogen during rehabilitation, it could become ill or become a carrier of that pathogen, and may pose a threat to a naïve wild population or even public health if it is released.

The attending veterinarian is urged to utilize the full spectrum of diagnostic modalities available for health assessment of the animal. In addition to basic blood work, serology, microbial culture, cytology, urinalysis, and fecal exam, advanced techniques for pathogen detection such as polymerase chain reaction (PCR), microarrays, and toxicology assessments are also available. A number of imaging techniques including various radiology modalities, bronchoscopy, and laparoscopy may also be utilized. The marine mammal literature has expanded to include numerous references on the performance and interpretation of diagnostic tests (Gulland *et al.* 2018).

Except as otherwise noted, acquisition of blood for a complete blood count (CBC) and chemistry profile will be required by NMFS and FWS upon admission of a marine mammal to a rehabilitation facility. Such blood work should generally be repeated by the original laboratory, to avoid problems with inter-laboratory variability, prior to release of the marine mammal. Microbial culture and isolation (*i.e.,* aerobic and anaerobic bacterial, viral, fungal) may be a part of the medical evaluation and done upon admission and before exit from rehabilitation centers. Such paired tests help determine the types of pathogens that a marine mammal may have acquired in the wild and those that may have been acquired during its rehabilitation. Because the number of pinnipeds entering a rehabilitation facility annually may be quite high and presenting with similar diagnosis, particularly in El Niño years, NMFS may waive additional clinical evaluation as mentioned above for each pinniped but instead require that a percentage of these animals entering a facility have a thorough clinical work- up. This will be dependent on several factors, such as the stranding location, time of year, the clinical diagnosis upon admission, and disease status of the wild population (*e.g.,* ongoing outbreaks, UMEs, etc.). For walrus and polar bears, testing requirements will be on a case-by- case basis. The NMFS or FWS stranding coordinators can provide guidance on this and other recommendations mentioned above.

The attending veterinarian interprets the results of blood work and additional diagnostic tests in light of physical exam findings, the animal's age, reproductive status, molt status, behavior, and other relevant or situational factors. Circumstances surrounding the stranding, recent environmental events, and known health issues of resident wild marine mammals are factors that may provide information regarding the health status of the stranded marine mammal. The attending veterinarian should also consider if the animal was held in close proximity to other animals (*e.g.,* pen/pool mates) undergoing rehabilitation and the disease history of those animals (*e.g.,* within facility transmission). A number of references provide data useful for the interpretation of marine mammal diagnostic tests (Gulland *et al.* 2018).

5. **Release Considerations.**
   a. **Required Identification Prior to Release.** Marine mammals must be marked (unless they have natural markings that are distinctive for photo identification, *e.g.,* distinct dorsal fin notches) prior to release for individual identification in the wild (see 50 CFR Sec. 216.27(a)(5) for species under NMFS jurisdiction). Examples of identification systems include bleach or dye marking or fin notching, head tags, flipper or fin roto tags, passive integrated transponder tags (PIT tags), radio tags, satellite tags, life-history tags, and freeze or hot branding (Geraci and Lounsbury 2005). Invasive surgical tag procedures (*e.g.,* life-history tags) should be done under the direct supervision of the attending veterinarian, will need prior approval from NMFS and FWS, and may require a monitoring period following the procedure. Proper photo identification for some species should also be considered part of the protocol. Standard identification protocols exist for various groups of marine mammals that detail the methods and procedures for marking for future identification in the wild, and are included in the appropriate section for each taxonomic group. Contact the Agency stranding coordinators for additional information.

As described, roto tags or flipper/fin tags (basic tags) for cetaceans and pinnipeds (except walrus) are to be obtained from or coordinated through the NMFS RSC. For FWS species, tags for polar bears are obtained from FWS. Tags for manatees and sea otters are obtained by each individual LOA or permit holder. For walruses, contact the appropriate FWS staff for guidance (see Appendix E).

Depending on the species, if the animal re-strands or the tag is found, this information should be reported to the appropriate NMFS or FWS and/or USGS Stranding Coordinator. The NMFS National Marine Mammal Stranding Database centrally archives tag data for NMFS species. The FWS and/or USGS track these data for walruses, northern sea otters, and polar bears. The California Department of Fish and Wildlife maintains the stranding base for southern sea otter. For manatees, the State agencies maintain the PIT tag data, and satellite tag data is maintained by the individual LOA or permit holder.

   b. **Release Site Requirements and Recommendations.** Rehabilitated marine mammals are to be released to the wild under circumstances that reflect the natural history of their species and maximize the likelihood for their survival. This will vary with age and sex of the individual. Timing of release should maximize foraging success and ease of social acceptance with conspecifics, and minimize additional energetic and social demands. For NMFS species, information regarding the date, location, and logistics of the release and any other information requested are included in the required 15-day advance notification of the Agency prior to release as cited in 50 CFR 216.27 (a)(2). Key factors in determining a release site include specific habitat, geographic and environmental factors such as weather and oceanographic states, past successful releases, public use, potential for predators, availability of prey, and transport time. Maintenance of stock fidelity, proximity of conspecifics, timing in relation to breeding seasons, and migration activities are also crucial considerations. As the natural history of each species provides the framework for planning a release, more details for each taxonomic group are provided in the appropriate section of this document. Additionally, consultation and communication with local authorities, land management agencies, or those with jurisdiction over proposed release sites, should be conducted prior to conducting release activities to minimize potential impacts associated with the release to other species.

6. **Post-Release Monitoring.** Post-release monitoring is a key method by which the efficacy of rehabilitation efforts can be assessed and revised. Such monitoring may also provide an opportunity to recover individuals that are unable to readjust to the wild. Simple post-release monitoring plans include such methods as visually tracking tagged or marked animals by land, air, or sea. More costly radio-telemetry and satellite tracking are highly desirable methods of post-release monitoring as they

provide detailed information of the movement and behavior of released marine mammals. Post-release monitoring is recommended for all rehabilitated marine mammals and is required for some taxonomic groups, such as cetaceans, depending on release category. The intensity of post-release monitoring efforts is determined by such factors as the age and species of the marine mammal, its status as threatened or endangered, and concerns regarding its health or developmental issues that may impact its ability to readjust to the wild. Advanced post-release monitoring techniques may be required for "Conditionally Releasable" animals when significant concerns regarding their chances of survival exist. All post-release monitoring plans for rehabilitated marine mammals are to be approved in writing by, and coordinated with, NMFS or FWS. NMFS may require the submission of follow-up monitoring summaries at specified intervals post- release (*e.g.,* weekly, monthly), until such time as contact with the animal has ended. The final update should include tracking data and an evaluation of the success of the release along with recommendations for future cases. NMFS may use these data in order to make future revisions to marine mammal rehabilitation and release guidelines. In order to compare individual cases, standardization of data collection protocols for monitoring released animals is highly recommended and may be required by NMFS. Formal study of post-release monitoring data and its dissemination to the Stranding Network will aid in the assessment of marine mammal rehabilitation and release programs.

2.5 Emergency or Special Situations

NMFS and FWS are responsible for monitoring and protecting the health of wild marine mammal populations. To fulfill this responsibility, and as stated in the NMFS SA these agencies may require or recommend increased documentation, testing, and/or post-release monitoring of rehabilitated marine mammals when a stranding event appears to be related to widespread environmental events such as algal blooms, hazardous waste spills, outbreaks of disease, UMEs, etc. An increased incidence of illness or injury to marine mammals may prompt NMFS or FWS to require specific diagnostic testing as part of a surveillance program and additional communication regarding case outcomes. NMFS and FWS personnel are to provide Stranding Network Participants and rehabilitation facilities with this information and may be able to provide additional funding and other support regarding such circumstances. For example, NMFS holds contracts with specific diagnostic labs that may provide services for rehabilitation facilities free of charge under certain circumstances.

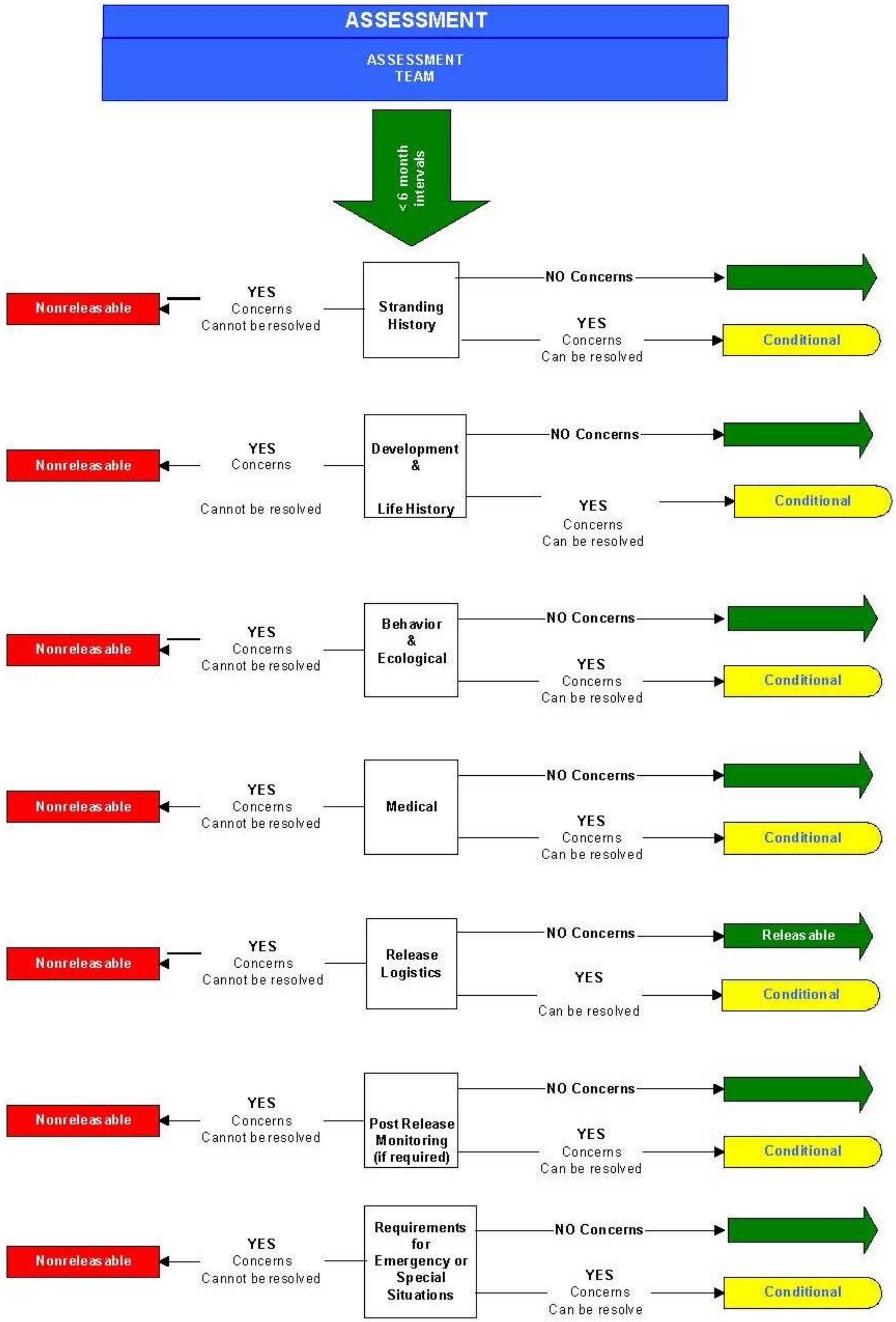

Figure 2.2 Steps and General Parameters for Animal Release Assessment

3 Guidelines for Release of Rehabilitated Cetaceans

3.1 Introduction

Nationally, few species of cetaceans (*i.e.,* primarily bottlenose dolphins, *Tursiops truncatus*, rough-toothed dolphins, *Steno bredanensis*, Risso's dolphins, *Grampus griseus*, and harbor porpoise, *Phocoena phocoena*) are rehabilitated in the United States (U.S.) each year. Although the natural history of cetaceans differs among the various species, the general release criteria set forth in this document are applicable to all cetaceans in the U.S. Prior to the release of any cetacean, NMFS requires that a thorough evaluation of the situational, developmental, behavioral, and medical records and animal status be completed by the Assessment Team (*i.e.,* Stranding Network Participant, attending veterinarian, animal care supervisor, and biologist with knowledge of species behavior, ecology, and life history). For all cetacean cases, a release determination recommendation must be sent to the NMFS Regional Administrator via the RSC at least 15 days (typically 30 days) in advance of a proposed release date. Waivers for advanced notice are not generally considered in cetacean cases. The release determination recommendation must include a signed statement from the attending veterinarian in consultation with their Assessment Team that the animal is medically and behaviorally suitable for release in accordance with the release criteria and include a written release plan and timeline. See Appendix A - Recommended Standard Checklist for Cetacean Release Determination. The release request should also include a statement(s) from an expert biologist(s) with knowledge of the species or similar species that is being considered for release and should state that the animal meets behavioral and ecological criteria for release in accordance with the release criteria. NMFS may recommend or require additional testing beyond these guidelines for infectious or emerging diseases in light of new findings regarding various disease and health issues. A release plan will require a justification statement and detailed description of the logistics for transporting, tagging, location, timing, crowd control, media coordination (if applicable), post-release monitoring, and recovery should the animal fail to thrive. A release plan template is also available in Appendix C. NMFS may require a recapture contingency plan if the animal appears to be in distress or poses a risk following a specified time after release. NMFS may consult with individual experts for further guidance. NMFS reserves the right to impose additional requirements in the release plan as stated in 50 CFR 216.27 (a)(3).

3.2 Overview of "Release Categories" for Cetaceans

Cetaceans evaluated at rehabilitation facilities can be grouped into one of three "Release Categories" based on situational, developmental, behavioral, and medical criteria set forth in a standardized checklist. It is recommended that the standardized checklist (see Appendix A) be used to assess and document the release candidacy of rehabilitated cetaceans. The checklist includes a health statement (*i.e.,* health certificate) to be signed by the attending veterinarian and authorized representative, which verifies that a cetacean meets appropriate Standards for Release. This checklist could be used to determine and document releasability (*i.e.,* as part of the required documentation sent to NMFS – refer to Figure 2.1) and as a final check just prior to release.

The case should fit into one of three **"RELEASE CATEGORIES":**

- **"RELEASABLE":** This category indicates that there are no significant concerns related to the likelihood of survival in the wild and/or risk of introducing disease into the wild population. In addition, the animal meets basic situational, developmental, behavioral, and medical release criteria. The release plan has been approved in writing by NMFS Regional Administrator via the RSC by a letter of concurrence to the applicant. For the cetacean to be deemed "Releasable", all items on the checklist should be answered as "Yes." The attending veterinarian signs the checklist confirming the information and the assessment.

- **"CONDITIONALLY RELEASABLE":** One or more items on the standardized checklist have been marked "No" for cetaceans in this category. This category indicates that there are concerns about the situational, developmental, behavioral, and/or medical status of the animal, raising a question of survival or health risk to wild marine mammals. A cetacean may be deemed "Conditionally Releasable" if requirements for release cannot be currently met but may be met in the future without compromising the health and welfare of the individual animal or in certain cases where requirements may never be met. In such cases, more time may be needed to determine the feasibility of release (see 50 CFR 216.27(a)(1)(iii)).

  All "Conditionally Releasable" cetaceans must be discussed with NMFS. For some cases, NMFS may consult with individual experts to seek additional advice. The experts may include scientists and veterinarians with expertise in cetacean biology and medicine (*i.e.,* particularly experts with species-specific knowledge). These discussions may reveal that additional medical testing or rehabilitative therapy may be required to release a "Conditionally Releasable" cetacean; or animals may be released, knowing that there are concerns about potential survival. Additional requirements may be placed upon the release plan, and enhanced post-release monitoring is usually required for a "Conditionally Releasable" cetacean.

- **"NON-RELEASABLE":** This category indicates that there are significant situational, developmental, behavioral, and/or medical concerns regarding a cetacean's release to the wild. The cetacean has a documented condition demonstrating little chance for survival in the wild and/or a diagnosed health risk to wild marine mammals. This category also includes animals that have been in rehabilitation greater than two years (see 50 CFR 216.27(a)(1)(iii)). Additionally, a cetacean may be deemed "Non-Releasable" if an appropriate release site or post-release monitoring plan cannot be arranged.

  For animals deemed "Non-Releasable", and with the concurrence from the NMFS Regional Administrator via the RSC, the animal can be permanently placed in a public display or research facility or euthanized. If the animal is to be placed in permanent captivity, the receiving facility must be registered or hold a license from APHIS [7 U.S.C. 2131 *et seq*.] and comply with MMPA (16 U.S.C. 1374 §104(c)(7)). Facilities wishing to obtain Non-Releasable animals should send a Letter of Intent to NMFS PR1 to permanently retain (*i.e.,* if affiliated with the rehabilitation facility) or acquire the animal. This letter should include a signature of the Responsible Party of Record. As part of the decision making process (procedural directive) NMFS will consult with APHIS and may review the qualifications and experience of staff, transport, and placement plans (*i.e.,* integration based on appropriate composition of species, sex, and age and the intended proposed plan for public display or scientific research). Once approved, NMFS PR1 will respond with a *Transfer* Authorization Letter and include MMDS and OMB Form 0648-0084, to be returned to NMFS PR1 within 30 days of transfer. Upon receipt of the MMDS, NMFS PR1 will acknowledge the transfer in writing and return updated MMDS to the receiving facility. More information can be found here: https://www.fisheries.noaa.gov/national/marine-mammal-protection/non-releasable-marine-mammals.

3.3 Situational Assessment of Cetaceans

Stranding information may guide the management of rehabilitation and the plan for post- release monitoring. Important stranding situational information should include:

- **A record of previous stranding –** Stranded cetaceans that have previously stranded and been released, and subsequently strand again, are deemed "Conditionally Releasable" for further release attempts pending consultation with NMFS. Such animals should be reassessed and as they may have underlying health issues requiring additional evaluation, diagnostic testing, and advanced post-release monitoring. Alternatively, such cetaceans may be assessed as "Non-Releasable" and be transferred to permanent captivity or euthanized.

- **Environmental and logistical considerations** – Release planning ideally should occur within the species/stock range of the cetacean. Conditions around the original stranding as well as the existing environmental conditions should be taken into consideration when planning for the release. Examples for when a species can be released outside of its species/stock range include UMEs, HABs, and other logistical constraints (*e.g.,* oceanic species cannot be taken offshore due to logistical constraints).

3.4 Developmental Assessment of Cetaceans

A fundamental criterion for developmental clearance of a rehabilitated cetacean is that it has attained a sufficient age to be nutritionally independent, including the ability to forage and hunt. Sub-adult and adult cetaceans are both nutritionally and socially independent, and these developmental considerations will not impact release determinations. The cetacean calf grows from a state of total nutritional dependence through nursing to partial maternal dependence as it learns to forage for prey. Eventually the young cetacean achieves total nutritional independence and forages completely on its own. Social learning is an important component of calf development, and includes things such as social interactions, learning how to forage, predator avoidance, navigation, etc. Social independence may take longer, depending on species. A calf's social independence needs to be evaluated prior to release. Factors including individual and species variations, rehabilitation practices, health status, plus environmental factors influences the rate at which such social development occurs (see Appendix F for Developmental Stages by Cetacean Species).

- Sub-adult and adult cetaceans are considered socially and nutritionally independent and should be considered to meet the developmental criteria for releasability.
- Very young nursing calves, that strand alone or whose mothers die, are considered nutritionally and socially dependent. Nutritionally and socially dependent (neonatal and very young nursing) calves will be deemed "Non- Releasable" (case-by-case review for ESA species may be conducted). Cases involving older calves and juveniles that may have some foraging skills may be considered nutritionally independent, but may still be socially dependent. These age classes will be considered "Conditionally Releasable" or "Non-Releasable" on a case-by-case basis. If "Conditionally Releasable", a thorough assessment, optimum release planning, and subsequent post-release monitoring is required.

Reproductive status in and of itself does not impact release candidacy unless a female strands with its calf or gives birth during rehabilitation. A single pregnant female should be returned to the wild as soon as both medical and behavioral clearance has been achieved and NMFS approves of the release plan.

Considerations for cow/calf cetacean pairs - All mother-calf cetacean pairs are deemed "Conditionally Releasable" and must be fully discussed with NMFS. The well-being of both the mother and the calf is to be carefully considered in such cases. Efforts should be made to reduce their time in captivity and to keep the mother-calf pair together, yet allow for continued treatment and rehabilitation of both individuals, if warranted. In situations where a nursing, dependent calf strands with its mother and both animals achieve medical and behavioral clearance, the calf should be released with its mother, assuming it meets all of the other criteria for release. A stranding of a mother/calf pair may be the result of illness or injury to either the mother, calf, or both. If the calf dies or is euthanized, the mother could be considered for release following a thorough and appropriate assessment. If the mother dies or is euthanized, the calf (if nutritionally and socially dependent) will be considered "Non-Releasable" or be euthanized.

3.5 Behavioral Assessment of Cetaceans

Complete assessment of the behavior and ecological potential may be limited by the confines of a temporary captive environment and behavior of the animal will differ from that displayed in the wild. A full understanding of what constitutes "normal" for a given cetacean species also may be lacking. Behavioral and ecological clearance is thus founded on evaluation of basic criteria necessary for the survival of the animal in the wild. Behavioral evaluation often overlaps with medical evaluation as abnormal behavior may indicate an underlying disease process. Experts with species-specific knowledge of cetacean behavior and ecology, in addition to the attending veterinarian, should assess the behavior of the rehabilitated cetacean. These assessments should involve closely evaluating and documenting behavior throughout rehabilitation (*i.e.,* ethogram), and relating the behavioral, sensory, and physical capabilities of the animal to its prospects of surviving and thriving in the wild.

To achieve basic behavioral clearance, a cetacean should breathe normally, including rate, pattern, quality, and absence of respiratory noise. A cetacean should swim and dive effectively without evidence of aberrant behavior or auditory or visual dysfunction that may compromise its survival in the wild or suggest underlying disease that may threaten wild marine mammals. Behavioral clearance also should include confirmation that the cetacean is able to recognize, capture, and consume live prey when such tests are practical (for example, it may not be possible to obtain live prey for offshore or deep-water species). Documented dependency on or attraction to humans and human activities in the wild would warrant special consideration as a possible conditional release or non-release decision.

3.5.1 Breathing, Swimming, and Diving

The Assessment Team should evaluate respiration at the pre-release exam to determine that the animal does not exhibit abnormal breathing patterns or labored breathing. Respiratory measurements should be standardized to record the number of breaths per five-minute intervals. Evaluation of swimming and diving should confirm that the cetacean moves effectively and does not display abnormalities such as listing, difficulty submerging, asymmetrical motor patterns, or other potentially disabling conditions. In small pools (*i.e.,* less than 50 feet diameter), cetaceans may not be able to demonstrate a full range of locomotor and maneuvering abilities; therefore, evaluation in larger pools is highly recommended. Cetaceans exhibiting persistent abnormalities of breathing, swimming, or diving, are to be considered "Conditionally Releasable" or "Non-Releasable" and must be discussed with NMFS.

3.5.2 Aberrant Behavior

The behavioral clearance of the cetacean should include confirmation that the animal does not exhibit aberrant behavior. Examples of aberrant behavior include, but are not limited to, regurgitation, head pressing, postural abnormalities such as repetitive arching or tucking, decreased range of motion, abnormal swimming or breathing as described above, or excessive interest in interaction with humans. Cetaceans displaying abnormal behavior may have an underlying disease process or may have permanent injury or tendencies that will decrease their chance of survival in the wild. Cetaceans displaying aberrant behavior are considered "Conditionally Releasable" or "Non-Releasable" and thus are to be discussed with NMFS

3.5.3 Auditory Acuity

The behavioral and ecological clearance of the cetacean should include evaluation of auditory acuity. Auditory dysfunction, involving production or reception of typical sounds or signals occurring in the wild, may be a reflection of active disease, permanent injury, or degenerative changes associated with aging. Evaluators may suspect that a cetacean has compromised auditory function if it appears to have difficulty locating prey items or various objects via echolocation, or if it minimally responds to novel noises. Reduced auditory abilities can compromise the ecological functionality and social abilities of some species, thus reducing the probability of survival in the wild. It is important to evaluate hearing; especially if there are signs of compromised auditory function. Diagnostic testing such as auditory evoked potential (AEP) is strongly encouraged to further evaluate the animal. Such testing requires approval and coordination with NMFS. Cetaceans with less than perfect hearing may be considered "Conditionally Releasable" or "Non-Releasable" and thus are to be discussed with NMFS.

3.5.4 Visual Acuity

The behavioral and ecological clearance of the cetacean should include evaluation of visual acuity. Visual dysfunction may be a reflection of active disease, permanent injury, or degenerative changes associated with aging. Cetaceans having discoloration, swelling, abnormal shape, position, or appearance of the eye or eyelids may have visual dysfunction and require discussion with NMFS. Animals suspected of having visual dysfunction should have a complete eye exam and/or consultation with an ophthalmologist. Cetaceans with some visual loss may be considered "Conditionally Releasable" or "Non-Releasable" and thus are to be discussed with NMFS.

3.5.5 Prey Capture

The rehabilitated cetacean should demonstrate foraging behavior (*i.e.,* the ability to hunt and capture live prey) prior to its release when practical. Normal consumption of solid food should also be part of the medical assessment. This demonstrates the ability to swallow and that there is no pharyngeal and/or gastrointestinal abnormalities. This evaluation is especially important for young and geriatric animals. Prey items normally found in the animal's environment and of good quality should be used whenever possible. Natural prey items may not be available for rehabilitating pelagic cetacean species; evaluators may try to utilize other prey species. However, many cetaceans often will not consume non-prey species. For social species, it may be just as important to look for cooperative or coordinated feeding behavior. NMFS should be notified if a rehabilitated cetacean appears compromised in its ability to recognize and/or capture live prey or if logistical issues preclude assessment of this behavior. Cetaceans with compromised prey capture abilities may be considered "Conditionally Releasable" or "Non-Releasable" and thus are to be discussed with NMFS. Cetaceans that are believed to have had limited foraging experience prior to stranding (*i.e.,* young juveniles) require particularly careful assessment of prey capture ability. This behavior is learned and cetaceans that strand at a young age may not have gained adequate foraging skills to sustain themselves in the wild. In addition, knowledge of the natural history of the species may be useful. If the species forages and hunts as a social unit, this may affect its ability to survive in the wild if released as a solitary animal. Similarly, amputated appendages may preclude the use of some specialized feeding techniques or attainment of sufficient speed or maneuverability for prey capture, or diminished auditory function may prevent individuals that prey on soniferous (*i.e.,* noise-producing) fishes from locating sufficient prey to survive (*e.g.,* coastal bottlenose dolphins).

3.6 Medical and Rehabilitation Assessment of Cetaceans

The medical assessment includes information related to any diagnostic testing, treatment, and response to treatment. The attending veterinarian should perform a hands-on-physical examination upon admission and prior to the release determination. The attending veterinarian should review the animal's complete history including all stranding information, diagnostic testing, medical, and husbandry records. The primary goal of the testing required by NMFS is to determine the risk to the health of wild marine mammal populations. This is achieved by testing for diseases that pose a significant morbidity or mortality risk to wild populations (*i.e.,* infectious diseases). Those that are zoonotic or a public health and safety concern require immediate NMFS notification to assure proper protocols are put into place. Additional testing may be required if the animal was part of an official UME or suspected anthropogenic exposure (*e.g.,* acoustic insult, hazardous waste spill, etc.). NMFS may request testing for other emerging diseases to support surveillance for potential epidemics of concern and to monitor changes in disease status due to rehabilitation practices. The directive for the pre-release health screen will come from the NMFS RSC through the MMHSRP.

A complete health screen should be completed upon admission and just prior to release including basic blood collection for a CBC and chemistry profile, and may also include serology, microbial and fungal culture (*i.e.,* blow hole, ocular, oral rectal, and lesions), cytology, urinalysis, and fecal exam. If the animal is female and at reproductive age, it is advisable that pregnancy be determined (*e.g.,* ultrasound, hormones) as soon as possible to avoid potentially fetal toxic medication. Serum is encouraged to be banked at the time of admission and just prior to release for retrospective studies. Cessation of antibiotics should occur two weeks prior to release examination to assure that the animal is no longer dependent on the medication. When this recommendation cannot be met, seek advice from NMFS, and the animal may be deemed “Conditionally Releasable”. The attending veterinarian should provide written notification to the NMFS RSC that a health screen and assessment of the cetacean has been performed. The notification must also include the final release plan and a plan for hands-on evaluation by the veterinary or husbandry staff within 72 hours of its release. The required documentation and signed release determination will be part of the administrative record along with the signed (by the NMFS Regional Administrator) letter of concurrence approval for release. If there are any deviations from the medical release criteria, please consult with NMFS to determine if the cetacean is “Conditionally Releasable” or “Non-Releasable”.

It is of extreme importance that the cetacean be monitored closely for disease throughout its rehabilitation. Regardless of the stranding etiology, handling and care can stress the animal increasing its susceptibility to disease. If not properly managed, rehabilitation facilities provide an environment where mutated or novel pathogens not typically encountered in the wild can easily be transmitted from animal to animal. This scenario can become problematic if an animal is exposed during rehabilitation and may carry a pathogen to a naïve wild population upon release. During rehabilitation, infectious agents may become altered (*i.e.,* change in virulence and infectivity) as they pass through new hosts or mix with other microbes and potentially result in a multi-antibiotic resistance strain.

The attending veterinarian is urged to utilize the full spectrum of diagnostic modalities available for health assessment of the cetacean. In addition to the complete health screen analyses, advanced techniques for pathogen detection such as PCR and toxicology analyses are available. A number of diagnostic imaging techniques including various radiology modalities may be used as well as bronchoscopy and laparoscopy. The cetacean literature has expanded to include numerous references on the performance and interpretation of diagnostic tests (Gulland *et al.* 2018).

3.7 Release Planning for Cetaceans

Ideally, the rehabilitated cetacean is released into its species/stock range. For species such as coastal resident bottlenose dolphins, returning the animal to its exact home range if known, may be extremely important. For widely ranging species such as the pilot whale, specificity of the release site may be less critical. Returning the animal to its home range or species range may increase the likelihood that the animal will have a knowledge of available resources, potential predators, environmental features, and social relationships that would support its successful return to the wild. Cetaceans that live in social groups do not necessarily require conspecifics for release, as long as they are released into an appropriate habitat where conspecifics are likely to occur. Consideration should also be given to the time of year, since the range of the animal may change based on season and where conspecifics are located along their migration route at a given point in time.

In many cases, the precise home range of the individual will not be known. There may not be any information regarding the animal’s social unit or its individual ranging patterns prior to its stranding. In some cases, photographic identification records may help identify the home range or social group for some species. When the home range of the cetacean is unknown, the animal should be released at a location near to its stranding site that is occupied regularly by its conspecifics, ideally those of the same genetic stock. Genetic analyses of a tissue sample via a qualified laboratory and appropriate tissue archive may aid with determining the appropriate stock of origin. Pelagic cetaceans ideally are to be released offshore into a habitat occupied by conspecifics at that time of year. Animals that mass strand, depending on the life history, should be released together as a group, when possible. Because much of cetacean behavior is learned, mass stranded juveniles should be released with adults, or in the presence of conspecifics, when feasible.

Other factors to be considered in release site selection are availability of resources and condition of the habitat. NMFS and the Stranding Network Participant should ensure that severely depleted resources or degraded habitat at the release site do not pose an obvious threat to the released animal. Release plans should identify alternative release sites or schedules if there are insufficient resources or habitat quality such as massive fish kills, significant declines in commercial and/or recreational fish landings, HABs, or high concentrations of environmental contaminants at the preferred release site. Additionally, consultation and communication with local authorities, land management agencies, or those with jurisdiction over proposed release sites, should be conducted prior to conducting release activities to minimize potential impacts associated with the release to other species. NMFS may approve release of animals outside of their species/stock range or at an alternative release site, but those cetaceans will be deemed "Conditionally Releasable". Released ceteaceans should never be fed post-release.

3.8 Marking for Individual Identification of Cetaceans Prior to Release

Three forms of identification have routinely been used for cetaceans including photo-identification (documenting individual identifying physical characteristics such as scars, color pattern, dorsal fin shape, etc.), freeze branding, and dorsal fin tags. NMFS recommends the use of all three forms of identification for all releases when feasible. For delphinids, photo-identification should include body, face, dorsal fin, flukes, and pectoral flippers. Numerical freeze brands should be at least 2" high and may be placed on both sides of the dorsal fin and/or on the animal's side just below the dorsal fin, except for species that lack a dorsal fin or have small dorsal fins such as the harbor porpoise. Roto tags can be attached on the trailing edge of the dorsal fin. Tag application and freeze branding should only be done by experienced personnel, as improper tagging may cause excessive tissue damage, infection, or premature loss of the tag or mark. Marking of non-delphinid cetaceans can be more challenging due to unique anatomical features and should be determined in consultation with NMFS. NMFS must receive advance notification of and approve any additional forms of identification that a rehabilitation facility voluntarily wants to place on a cetacean besides those mentioned above. NMFS authorization is required prior to placement of VHF radio or satellite-linked radio tag.

The identification system to be used on cetaceans deemed "Conditionally Releasable" must be approved by NMFS. As these animals are required to have an advanced post-release monitoring plan, "Conditionally Releasable" cetaceans will often require VHF or satellite tagging in addition to photo-identification, and freeze branding.

3.9 Post-Release Monitoring of Cetaceans

Few data are currently available regarding the long-term fates of released cetaceans (Wells *et al.* 2013). Post-release monitoring provides essential information to develop and refine marine mammal rehabilitation and release practices. "Conditionally Releasable" cetaceans should be monitored as frequently as possible for at least six weeks after release. The specific post-release monitoring plan for each cetacean is to be coordinated through NMFS. Post-release monitoring methods may include visual observations from land, sea, or air, and/or radio or satellite-linked monitoring. It is understood that post-release monitoring of cetaceans, particularly pelagic species, is an extensive undertaking for which significant support is required, often from multiple sources. In a few instances, NMFS has provided resources such as financial support, personnel, and equipment for post-release monitoring but it is not standard practice. Therefore, the rehabilitation facility is encouraged to seek funding to enhance their post-release monitoring program.

The first month after release is a particularly critical period during which it will become evident whether the animal is thriving, including avoiding predators, capturing sufficient prey, and being accepted by conspecifics. For coastal species that can be re-sighted using boat surveys it is recommended that monitoring continue on a regular basis for as long as possible. Funding resources, such as the Prescott Grant Program, may be able to assist with the financial burden of such endeavors. NMFS requires periodic and final reports on released animals. These reports will facilitate future revisions to the marine mammal rehabilitation and release guidelines. In order to compare individual cases, standardization of data collection protocols for monitoring released cetaceans will be required. NMFS will provide the stranding network with the desired format for receipt of tracking data in reports. Presentation, discussion, and formal study of monitoring data and its dissemination to the stranding network will aid in the assessment of cetacean rehabilitation and release programs.

Release plans should include discussion of contingency plans for recovering the animal, should monitoring indicate its failure to thrive. The release plans should also address treatment and euthanasia if the animal is retrieved or re-strands. In addition, NMFS may require such contingency plans for "Conditionally Releasable" cetaceans, depending on the circumstances.

3.10 Decision Tree – Cetacean Release Categories

3.10.1 Releasable

The cetacean is cleared for release by the attending veterinarian (including the Assessment Team) and the NMFS Regional Administrator via the RSC concurs in writing. This means that the requirements for the health and behavior assessment, marking/tagging, and release plan have been met and both veterinary and biological opinions regarding release have been received (see text for details). For an animal to be considered "Releasable" the response to all of the essential release criteria below should be met.

<u>Situational Clearance</u>
Cetacean has no situational information requiring consultation with NMFS such as previous stranding, or will be released outside of species/stock range due to environmental factors such as an oil spill, HAB or UME.

<u>Developmental Stage/Life History</u>
a) Cetacean is a sub-adult/adult and is nutritionally and socially independent.
b) Cetacean is a calf that is nutritionally independent and forages completely on its own.
c) Cetacean is a calf that is socially independent (stock/species-specific).

<u>Behavioral Clearance</u>
a) Cetacean demonstrates acceptable breathing, swimming and diving.
b) Cetacean does not exhibit aberrant behavior (regurgitation, head pressing, postural abnormalities, and decreased range of motion).
c) Cetacean exhibits full auditory function.
d) Cetacean exhibits full visual function.
e) Cetacean demonstrates foraging behavior or the ability to hunt and capture live prey.

<u>Medical Clearance</u>

a) Attending veterinarian has reviewed the cetacean's situation and medical records and has deemed it appropriate for release.
b) Attending veterinarian has examined the cetacean within two weeks of release.
c) Required health screen and assessments were conducted (following conclusion of medical treatment) with appropriate results for the age and species of the animal.
d) Veterinary or husbandry staff performed a hands-on exam within 72 hours of release to assess for any medical or condition changes.
e) Cetacean has no known congenital defects.
f) Cetacean's appendages are functional.
g) Cetacean is sufficiently robust, having adequate reserves to survive readjustments in the wild.
h) Cetacean has no active infection from exposure to domestic/terrestrial animals (*e.g.,* dog, fox, coyote, etc.)
i) Cetacean has not inflicted a bite on a human(s) during rehabilitation; or a bite has occurred that broke the skin but the animal has passed the quarantine period.
j) CBC results are generally within normal ranges for the age and species of the animal (within two weeks of release).
k) Chemistry profile results are generally within normal ranges for the age and species of the animal (within two weeks or release).
l) Additional testing requested by NMFS has been reviewed and is not concerning.
m) Medications have not been administered in the two weeks prior to release.
n) Attending veterinarian signed health statement.

<u>Release Logistics</u>

a) Release site selection rationale is appropriate, including return to appropriate stock and geographical site under favorable environmental conditions and social species will be released into areas with conspecifics.
b) Consultation and communication with local authorities, land management agencies, or those with jurisdiction over proposed release sites, should be conducted prior to conducting release activities to minimize potential impacts associated with the release to other species.
c) Research and/or monitoring plan is appropriate, including tracking for a minimum of six weeks post-release coordinated with NMFS (including providing NMFS with regular tracking updates). A report will be provided to NMFS at the end of the tracking period.
d) Contingency plan is appropriate, including monitoring stress during transport; recapture if necessary for relocation, placement or euthanasia.

3.10.2 Conditionally Releasable

The cetacean did not meet one or more of the essential release criteria but may be "Releasable" in the future pending resolution of the problems identified by the attending veterinarian and Assessment Team. This may involve discussion with outside experts in consultation with NMFS. After discussion with experts and NMFS, the animal may be deemed "Conditionally Releasable" even if one or more criteria cannot be resolved but the animal has a reasonable chance (>50%) of surviving in the wild. Contingency plans for recapture, treatment, permanent care, and euthanasia should be required if release is unsuccessful and the animal re-strands. The following may be true for one or more assessment points.

<u>Situational Clearance</u>

a) Cetacean has previously stranded.
b) Cetacean release is planned to occur outside of species/stock range due to factors such as environmental and logistical concerns (*e.g.,* oil spill, HAB, UME, etc.)

Developmental Stage

a) Cetacean is nutritionally independent and forages completely on its own, but is a younger, socially dependent calf (requires expert consultation based upon specific stock/species).
b) Cetacean is a calf that was stranded, rehabilitated, and released with its mother.

Behavioral Assessment

a) Cetacean exhibits deficiency in breathing, swimming, and diving (requires expert consultation).
b) Cetacean demonstrates aberrant behavior (regurgitation, head pressing, postural abnormalities, decreased range of motion, etc.) including excessive interest in interaction with humans or husbandry behaviors that were conditioned during rehabilitation. These behaviors could be counter-conditioned or have modified release plan.
c) Cetacean exhibits some hearing impairment.
d) Cetacean exhibits some vision loss.
e) Cetacean demonstrates deficiency in foraging behavior or the ability to hunt and capture live prey (requires expert consultation).

Medical Assessment - The attending veterinarian determines that the health status of the cetacean is uncertain regarding suitability for release, and the review of uncertain health status requires an expert consultation.

a) The veterinarian arrives at a determination of “Conditionally Releasable” through performance and interpretation of physical examinations (*e.g.,* partial damage to appendages, low release weight)
b) Interpretations of tests such as CBC, chemistry profile, cultures, and other tests required by NMFS, plus any other diagnostic tests deemed necessary to fully evaluate the animal, may have abnormalities that make the cetacean “Conditionally Releasable.
c) Response of the cetacean to therapy and the clinical judgment of the veterinarian may also contribute to a determination of “Conditionally Releasable.”
d) Further tests may be required including ultrasound or radiographs to clarify medical issues.
e) Animals may also be considered “Conditionally releasable” if they received medications within two weeks of release.

Release Logistics

a) Tagging, marking, post-release monitoring - Extensive post-release monitoring of cetaceans deemed "Conditionally Releasable" is required and is to be approved and coordinated through NMFS. Post-release monitoring of such animals should be at least six weeks duration, likely longer. Monitoring is likely to include advanced tracking techniques, such as photographic identification surveys, or radio or satellite tagging if the animal is likely to move outside of the range of monitoring.
b) Plan for recapture - NMFS may request a contingency plan for recapture if feasible for a "Conditionally Releasable" cetacean prior to its release should the animal appear to be unable to readjust to the wild. This should include plans for follow up treatment, permanent care, and/or euthanasia.

3.10.3 Non-Releasable

The cetacean is determined to be unsuitable for release by the attending veterinarian and Assessment Team, and the NMFS Regional Administrator concurs via the RSC. The animal did not meet the essential release criteria, and thus does not have a reasonable chance of survival in the wild or poses health risks to wild marine mammals.

Situational Clearance

a) Cetacean has previously stranded and is determined to not be a good candidate for release due to the reasons for re-stranding (includes assessment of previous strandings).
b) Release is planned to occur outside of species/stock range due to factors such as environmental and logistical concerns (*e.g.,* oil spill, HAB, UME, etc.). After expert consultation, the cetacean needs to be held until the above factors remedy, if this takes longer than two years the cetacean may be declared “Non-Releasable”.

Developmental Stage

a) Cetacean is nutritionally and socially dependent (neonate and young nursing calf without foraging skills).

Behavioral Clearance

a) Cetacean does not demonstrate acceptable breathing, swimming, and diving behavior.
b) Cetacean demonstrates aberrant behavior (regurgitation, head pressing, postural abnormalities, and decreased range of motion, etc.) including excessive interest in interaction with humans that cannot be de-conditioned.
c) Cetacean exhibits significant auditory dysfunction that would compromise survival in the wild or is completely deaf.
d) Cetacean exhibits significant visual dysfunction that would compromise survival in the wild or is fully blind.
e) Cetacean demonstrates inability to forage or the inability to hunt and capture live prey.

Medical Clearance - The attending veterinarian determines that the health of the cetacean precludes release.

a) In such cases, the medical condition of the animal prevents normal function to a degree that would compromise its survival in the wild or pose a health risk to wild marine mammals and is therefore, “Non-Releasable”.
b) The veterinarian supports the determination of “Non-Releasable” status with significant abnormalities present in the required physical examinations and tests such as CBC, chemistry profile, cultures, and those required by NMFS, plus any other tests deemed necessary to fully evaluate the animal.
c) Further tests may be required including ultrasound or radiographs, to clarify medical issues.
d) The veterinarian presents their findings to the NMFS RSC and recommends that the cetacean is “Non-Releasable” and be maintained in captivity or be euthanized.

4 Guidelines for Release of Rehabilitated Pinnipeds

4.1 Introduction

Each year in the U.S., several different species of pinnipeds from three taxonomic families, Phocidae (true seals), Otariidae (eared seals), and Odobenidae (walrus), are rescued and rehabilitated. As walrus are under the jurisdiction of FWS, these guidelines should be generally applied but there are a few exceptions. Close consultation with FWS is required with each walrus case.

Except as otherwise noted, each pinniped is required to have a complete situational, developmental, behavioral, and medical status assessment by the attending veterinarian and animal care supervisor and be properly marked for identification prior to release. The release determination recommendation must include a signed statement from the attending veterinarian in consultation with the Assessment Team that the animal is medically and behaviorally suitable for release in accordance with the release criteria and include a written release plan and timeline. NMFS or FWS may require additional testing for infectious diseases in light of new findings regarding various disease and health issues and this information should be included in the release request. See Appendix B - Recommended Standard Checklist for Pinniped Release Determination. A release plan will require a justification statement and detailed description of the logistics for transporting, tagging, location, timing, crowd control, media coordination (if applicable), post release monitoring, and recovery should the animal fail to thrive (*e.g.,* restrands). A release plan template is also available in Appendix C. NMFS or FWS may require recapture if the animal appears to be in distress following a specified time after release. Recapture will require special authorization from NMFS or FWS prior to this activity. NMFS or FWS may consult with individual experts for further guidance. NMFS reserves the right to impose additional requirements in the release plan as stated in 50 CFR 216.27 (a)(3).

The NMFS Regional Administrator may allow for pre-approved waivers for routine pinniped cases as stated in 50 CFR 216.27(a)(2)(i)(A). Typically, these cases are anticipated and can be appropriately planned (*e.g.,* the typical species and time of year, presenting with known etiologies, and with routine diagnosis and treatment). For such waivers, the Stranding Network Participant should submit a protocol for such cases including location of release. These waivers will require pre-approval by the NMFS Regional Administrator via the RSC on a schedule as prescribed in the SA. NMFS may require that a certain percentage of these cases that present with similar clinical signs and diagnosis be thoroughly tested and assessed each year. Similarly, NMFS may give blanket authorization for pre- approved release sites and for post-release monitoring plans.

4.2 Overview of Release Categories for Pinnipeds

Pinnipeds evaluated at rehabilitation facilities can be grouped into one of three “Release Categories” based on situational, developmental, behavioral, and medical criteria set forth in a standardized checklist. It is recommended that the standardized checklist (see Appendix B) should be used to assess and document the release candidacy of rehabilitated pinnipeds. The checklist includes a health statement (*i.e.,* health certificate) to be signed by the attending veterinarian and authorized representative, which verifies that a pinniped meets appropriate Standards for Release. This checklist could be used to determine and document releasability (*i.e.,* as part of the required documentation sent to NMFS) and as a final check just prior to release.

The majority of walrus typically strand as calves and are not good release candidates due to the extended period of maternal dependency. FWS generally considers walrus calves to be “Non-Releasable” and considers all stranded walrus on a case-by-case basis for permanent placement. If the walrus is placed in permanent captivity, the receiving facility must hold an Exhibitor’s License from APHIS [7 U.S.C. 2131 *et seq*.] and comply with MMPA (16 U.S.C. 1374 §104(c)(7)). Questions regarding disposition of stranded walrus should be directed to the FWS contacts.

The case should fit into one of three **"RELEASE CATEGORIES:"**

- **"RELEASABLE":** There are no significant concerns and the animal meets basic situational, developmental, behavioral, and medical criteria, supporting the likelihood of survival and a lack of risk to the health of wild marine mammals. The release plan (post-release identification, release site, contingency plans, and post-release monitoring) has been approved in writing by NMFS via the letter of concurrence. For the pinniped to be deemed "Releasable," all items on the checklist should be answered as "Yes." The attending veterinarian signs the checklist confirming the information and the assessment.

- **"CONDITIONALLY RELEASABLE":** One or more items on the standardized checklist have been marked "No" for pinnipeds in this category. This may pertain to situational, developmental, behavioral, and/or medical status concerns regarding the potential ability of the animal to survive in the wild and/or its potential to pose a health risk to other marine mammals. A pinniped may also be deemed "Conditionally Releasable" if requirements for release cannot be met at present but may be met in the future and without compromising the health and welfare of the individual animal. In such cases, more time may be needed to determine the feasibility of release (see 50 CFR 216.27(a)(1)(iii) for species under NMFS jurisdiction).

  All "Conditionally Releasable" pinnipeds must be discussed with NMFS or FWS. NMFS or FWS may consult with individual experts to discuss specific cases. Experts include scientists and veterinarians with expertise in pinniped biology and medicine (particularly experts with species-specific knowledge). Such discussions will clarify the most appropriate disposition. For example, additional medical testing, rehabilitative therapy, and additional strategies for post-release monitoring may be required to release a "Conditionally Releasable" pinniped.

- **"NON-RELEASABLE":** One or more items on the standardized checklist have been marked "No" for pinnipeds in this category. This may pertain to situational, developmental, behavioral, and/or medical status concerns that preclude release to the wild. The pinniped has a documented condition demonstrating little chance for survival in the wild and/or a diagnosed health risk to wild marine mammals. For NMFS species, this category also includes animals that have been in rehabilitation greater than two years (see 50 CFR 216.27(a)(1)(iii)). Additionally, a pinniped may be deemed "Non-Releasable" if an appropriate release site or post-release monitoring plan cannot be arranged. Rehabilitation facilities that believe that they may have a walrus that is "Non-Releasable" must contact the FWS Marine Mammals Management Office for concurrence on this finding and eventual disposition of the animal. If FWS determines that a walrus is "Non-Releasable", the holding facility may request a permit for permanent placement of the animal as long as the facility meets the requirements under section 104(c)(7) of the MMPA.

  For animals deemed "Non-Releasable" and with the concurrence from the NMFS Regional Administrator, the animal can be permanently placed in a public display or research facility or euthanized. If the animal is to be placed in permanent captivity, the receiving facility must be registered or hold a license from APHIS [7 USC 2131 et seq.] and comply with MMPA (16 USC 1374 Section 104(c)(7)). Facilities wishing to obtain Non-Releasable animals should send a Letter of Intent to NMFS PR1 to permanently retain (*i.e.,* if affiliated with the rehabilitation facility) or acquire the animal. This letter should include a signature of the "Responsible Party of Record". As part of the decision making process will consult with APHIS and may review the qualifications and experience of staff, transport, and placement plans (*i.e.,* integration based on appropriate composition of species, sex, and age and the intended proposed plan for public display or scientific research). Once approved, NMFS PR1 will respond with a *Transfer* Authorization Letter and include MMDS, OMB Form 0648-0084, to be returned to NMFS PR1 within 30 days of transfer. Upon receipt of the MMDS, NMFS PR1 will acknowledge the transfer in writing and return updated MMDS to the receiving facility. More information can be found here: https://www.fisheries.noaa.gov/national/marine-mammal-protection/non-releasable-marine-mammals.

4.3 Situational Assessment of Pinnipeds

Situational stranding information may guide the management of rehabilitation and the plan for post-release monitoring. Important historical information should include:

- **A record of previous stranding -** Pinnipeds that have previously stranded and been released, and subsequently strand again, are deemed "Conditionally Releasable" pending consultation with NMFS or FWS. Such animals should be reassessed as they may have underlying health issues requiring additional evaluation, diagnostic testing, and advanced post-release monitoring. Alternatively, such pinnipeds may be assessed as "Non-Releasable" and be transferred to permanent captivity or euthanized.
- **Environmental and logistical considerations** – Release planning ideally should occur within the species/stock range of the pinniped. Conditions around the original stranding as well as the existing environmental conditions should be taken into consideration when planning for the release. Examples for when a species can be released outside of its species/stock range include UMEs, HABs, and other logistical constraints (*e.g.,* oceanic species cannot be taken offshore due to logistical constraints). During an El Niño event, the rehabilitation center should consult with NMFS regarding management and release of the animal because unfavorable environmental conditions may persist once an animal is ready for release and thus the animal could be deemed "Conditionally Releasable."

4.4 Developmental Assessment of Pinnipeds

In order to be deemed "Releasable," a young pinniped should be able to feed itself and have adequate body condition to survive readjustment to the wild. Generally, pups are to be held in rehabilitation centers for roughly the normal duration of lactation, some social species of Otariid pinnipeds (*e.g.,* California sea lion, *Zalophus californianus*; Steller sea lion, *Eumetopias jubatus*) may require social maternal care and training to successfully forage in the wild. For these species of pinnipeds, pups admitted prior to weaning (<6 months of age) may be considered "Conditionally Releasable" or "Non-Releasable" and require consultation with NMFS. Because maternal dependence may vary greatly in some species, it is recommended that the straight length and weight of each pinniped pup be taken at admission and again when evaluating the animal for release to aid in the assessment of the animal's body condition. Such measurements may be compared to known weaning lengths and weights of appropriate wild pinniped species or to data from successfully rehabilitated and released stranded pups (see Appendix G, for species-specific developmental stages and pupping information). The risk of altered behavior can be related to both the length of treatment and the age of the animal at the time of stranding. Pups stranded as maternally dependent neonates and animals spending an extended time in rehabilitation being at highest risk. Special care should be taken with these more socially dependent species, especially if rehabilitating very young pups and should be considered "Conditionally Releasable".

Reproductive status in and of itself does not impact release candidacy of a pinniped unless a female strands with her pup or gives birth during rehabilitation. The birth of a pup in rehabilitation requires immediate notification to NMFS of the birth. Such females and their offspring are "Conditionally Releasable" and must be discussed with NMFS or FWS. The natural history of the pinniped species involved and factors related to maternal relationship may impact the timing and conditions of release for mother or pup. For instance, a pup that has not reached weaning weight may be "Conditionally

Releasable" with its mother, but not alone. Additionally, a pup born in rehabilitation that cannot be released with its mother (*i.e.,* mother dies) may be considered "Conditionally Releasable" or "Non-Releasable" and requires immediate consultation with NMFS on the death of its mother. Additionally, premature parturition from domoic acid intoxication is a common finding for California sea lions along the west coast and can result in pups that may have underlying neurological deficiencies that could impact their ability to be released (Brodie *et al.* 2006, Goldstein *et al.* 2008, Simeone *et al.* 2019). A healthy mother may be kept in rehabilitation to assist its sick or injured pup; however, this should be weighed against the risk of habituation that could minimize the chance of a successful release. Female pinnipeds in estrus or late pregnancy are "Releasable" unless the attending veterinarian believes that the health history of the animal warrants extra precautions to minimize stress during its return to the wild. Such animals then may be considered "Conditionally Releasable" due to health concerns and are to be discussed with NMFS or FWS.

4.5 Behavioral Assessment of Pinnipeds

The limitations imposed by the captive environment of rehabilitation may preclude a detailed behavioral assessment where behavior of the captive animal may differ from that displayed in the wild. Also, there lacks a set of behavioral and functional tests that relate to behavior in the wild and there are limitations on the complete knowledge of "normal" behavioral parameters of each species. Behavioral clearance is thus founded on basic criteria necessary for survival of the animal in the wild. The behavioral evaluation often overlaps with the medical evaluation as abnormal behavior may indicate an underlying illness. Biologists and animal care supervisors with expertise in pinniped behavior and the attending veterinarian should jointly assess the behavior of the animal.

To achieve behavioral clearance, a pinniped should breathe normally and demonstrate effective swimming, diving, and locomotion on land (if appropriate for its species). The animal should not display aberrant behavior or auditory or visual dysfunction that may compromise its survival in the wild or suggest an underlying disease of concern to wild marine mammals. Behavioral clearance also includes confirmation that the animal can respond to, and is able to capture and consume, live prey when feasible.

4.5.1 Breathing, Swimming, Diving, and Locomotion on Land

Evaluation of respiration is done to determine that the pinniped does not exhibit abnormal breathing patterns or labored breathing during exertion. Evaluation of swimming, diving, and locomotion on land is done to confirm that the pinniped moves effectively and does not exhibit abnormalities such as listing to one side, decreased capacity to submerge, asymmetrical motor patterns, etc. Pinnipeds that display abnormalities of breathing, swimming, diving, or locomotion on land are deemed "Conditionally Releasable" or "Non-Releasable," depending on the nature and degree of their dysfunction.

4.5.2 Aberrant Behavior

Behavioral clearance of the pinniped includes confirmation that the animal does not exhibit aberrant behavior that may compromise survival in the wild or suggest an underlying disease of concern to wild marine mammals. Examples of aberrant behavior include, but are not limited to, regurgitation, head pressing, postural abnormalities such as repetitive arching or tucking, head swaying, stereotypic or idiosyncratic pacing, decreased or unusual range of motion, and abnormalities of breathing, swimming, diving, and locomotion on land as previously discussed. Other examples include attraction to or desensitization to the presence of humans such as in the case of pups imprinting on humans. Pinnipeds displaying aberrant behavior are deemed "Conditionally Releasable" or "Non-Releasable" depending on the nature and degree of the behavior.

4.5.3 Auditory and Visual Function

Behavioral clearance of the pinniped includes evaluation of auditory and visual function. Auditory dysfunction may be a reflection of active disease, permanent injury, or degenerative changes associated with aging. Evaluators may suspect that a pinniped has compromised auditory function if it responds minimally to loud noises created above or below water. Pinnipeds that have visual dysfunction may show difficulty locating prey items, tendency to collide with boundaries of their enclosure, or difficulty maneuvering about objects placed in their path. Discoloration, swelling, abnormal shape, position, or appearance of the eye or eyelids may suggest visual dysfunction. Pinnipeds with auditory or visual dysfunction should be deemed "Conditionally Releasable" or "Non-Releasable" depending on the degree and nature of their condition.

4.5.4 Prey Capture

Rehabilitated pinnipeds should demonstrate the ability to hunt and capture live prey prior to their release, when feasible. Prey items found in the animal's natural environment should be used whenever possible. If natural prey items are not available, evaluators may utilize other prey species. However, many pinnipeds often will not consume non-prey species. Evaluation of the pinniped includes assessment of each component of feeding behavior including the ability to chase prey, to actually capture prey, and to consume prey without assistance from humans. Pinnipeds that display ineffective prey capture and consumption are deemed "Conditionally Releasable" or "Non-Releasable." If logistical issues preclude evaluation of prey capture and consumption or there is a question about the quality of live prey, NMFS or FWS should be consulted.

Rehabilitated pinnipeds that have been in captivity longer than one year, ESA species pinnipeds, and young pinnipeds having little or no previous foraging experience in the wild require particularly careful assessment of feeding behavior. Repeated feeding trials using live prey with concurrent assessment of the animal's ability to maintain good body condition are helpful in thoroughly evaluating such animals.

4.6 Medical Assessment of Pinnipeds

The medical assessment includes information related to any diagnostic testing, treatment, and response to treatment. The attending veterinarian should perform a hands-on-physical examination upon or near admission and prior to the release determination. The attending veterinarian should review the animal's complete history including all stranding information, diagnostic testing, medical, and husbandry records (including food consumption and weight and length progression). The primary goal of testing required by NMFS or FWS is to safeguard the health of wild marine mammal populations. This is achieved by testing for diseases that pose a significant morbidity or mortality risk to wild populations (*i.e.,* certain infectious diseases). Those diseases that are zoonotic or of public health and safety concern require immediate NMFS notification to assure proper protocols are put into place. Additional testing may be required if the animal was part of an official UME. NMFS may request testing for other emerging diseases as part of a surveillance program to identify potential epidemics of concern and to monitor changes in disease status that may have occurred due to rehabilitation practices. The directive for any specific pre-release health screening will come from the NMFS RSC through the MMHSRP.

A complete health screen should be completed upon or near admission and just prior to release including basic blood collection for a CBC, chemistry profile, and may include serology, microbial and fungal culture (*i.e.,* nasal, ocular, oral, rectal, and lesions), cytology, urinalysis, and fecal exam. If the animal is female and at reproductive age, it is advisable that pregnancy is ruled out (via ultrasound or hormones) prior to prescribing potentially fetal toxic medication. Serum is encouraged to be banked at the time of admission and just prior to release for retrospective studies. Cessation of antibiotics should occur two weeks prior to release examination to assure that the animals is no longer dependent on the medication.

When this recommendation cannot be met, seek advice from NMFS, and the animal may be deemed "Conditionally Releasable". The attending veterinarian should provide written notification to the NMFS RSC that a health screen and assessment of the pinniped has been performed. The notification must also include the final release plan and a plan for hands-on evaluation by the veterinary or husbandry staff within 72 hours of its release. The required documentation and signed release determination will be part of the administrative record along with the signed letter (by the NMFS Regional Administrator) of concurrence approval for release. 50 CFR 216.27 (a)(2)(i)(A) allows for waiving this advance release notification in writing by the Regional Administrator via the RSC. Generally, these waiver cases are anticipated and can be appropriately planned (*e.g.,* the typical species and time of year, presenting with known etiologies, and with routine diagnosis and treatment). For such waivers, the Stranding Network Participant should submit a protocol for such cases, including location of release. These waivers will require pre-approval by the NMFS Regional Administrator via the RSC on a schedule as prescribed in the SA. If there are any deviations from the medical release criteria, please consult with NMFS to determine if the pinniped is "Conditionally Releasable" or "Non-Releasable".

It is of extreme importance that the pinniped be monitored closely for disease throughout its rehabilitation. Regardless of the stranding etiology, handling and care can cause significant stress increasing susceptibility to disease. If not properly managed, rehabilitation facilities provide an environment where genetically altered or novel pathogens not typically encountered in the wild can easily be transmitted from animal to animal. This scenario can be problematic when an animal is exposed and becomes a carrier of that pathogen to a naïve wild population if released. Infectious agents may become more pathogenic as they pass through new individuals and naïve species or genetically altered from indiscriminant use of antibiotics.

The attending veterinarian is urged to utilize the full spectrum of diagnostic modalities available for health assessment of the pinniped. In addition to basic blood work, serology, microbial culture, cytology, urinalysis, and fecal exam, advanced techniques for pathogen detection such as PCR and toxicology analyses are available. A number of diagnostic imaging modalities may be used as well as bronchoscopy and laparoscopy. The pinniped literature has expanded to include numerous references on the performance and interpretation of diagnostic tests (Gulland *et al.* 2018).

Both agencies may request testing for other emerging diseases as part of a surveillance program to identify potential epidemics of concern and identify health trends. Additional testing may be required if the animal was part of an official UME. Specific testing requirements (*i.e.,* pre-release health screen) will come from the NMFS RSC through the MMHSRP and follows the term and responsibilities stated in the NMFS SA.

4.7 Release Site Selection for Pinnipeds

The release of a rehabilitated pinniped should be planned to maximize its chances for survival in the wild. The release should be timed and staged to increase its likelihood of foraging success and acceptance by conspecifics. Factors including its species, age, reproductive status, previous home range, social unit, and migratory patterns should be considered. Weather conditions at the release site and other environmental factors impacting the habitat and food availability should also be evaluated.

The rehabilitated pinniped is to be released into its species/stock range whenever possible. Return of the animal to its species range is preferable, as the acclimating pinniped would presumably have familiarity with available resources, potential predators, environmental features, and social relationships. In many cases, this can be accomplished by releasing the pinniped at its stranding site through a simple hard-release process (*i.e.,* the animal is released directly after transport to the release site without acclimation through holding in a temporary enclosure at the site).

For wide ranging species, the release site selection is considered on a case-by-case basis. Consultation with NMFS is required for these cases. If the range of conspecifics is distant form the original stranding site, rehabilitators may consider various options depending on the natural history of the species and the temporal relationship of release to seasonal distribution. The pinniped may be released to migrate on its own or with conspecifics still in the vicinity. Alternatively, the pinniped may be held in captivity until conspecifics return or it may be transported to the location of its migrated cohorts. The risks of extended time for the pinniped in captivity, logistics of transport to a migration site, and costs associated with the extended stay are examples of factors to be considered. As explained later in this section, movement of pinnipeds recovering from infectious disease to other sites should be carefully considered regarding disease risk to wild pinnipeds.

When information on the animals ranging patterns or social unit prior to stranding is not known, or when a pinniped strands outside of the previously known range of its species, NMFS is to be consulted regarding an appropriate release strategy. For pinniped species that have vast territorial ranges, such as those that naturally traverse the length of the North American continent, knowledge of the animal's specific ranging patterns before stranding may not be necessary. Such pinnipeds may be released in the general vicinity of their stranding site or anywhere within the vast range inhabited by that species with the following important exception (see below).

When a pinniped has recovered from an infectious disease, it may be preferable to release the animal near its original stranding site in order to minimize disease risks to wild pinnipeds. For example, even if the entire population of a far-ranging pinniped species has been exposed to a particular infectious agent, changes in the virulence of the pathogen may initially occur at distinct geographical sites. Additionally, the clinical signs of many infectious diseases mimic each other. As rehabilitation centers cannot always perform definitive diagnostic tests for all viral agents, moving rehabilitated pinnipeds from the general region of their stranding to distant locations for release may pose some risk to wild marine mammals. NMFS is to be consulted regarding the preferred release site when pinnipeds recovering from an infectious disease cannot be released near their original stranding site. Another important consideration is the location of the rehabilitation facility to the normal habitat range for the species, *e.g.,* the rehabilitation of an ice seal in the Caribbean. The decision to release in the normal habitat range would need to be thoroughly discussed with NMFS.

It is important to ensure that conditions at the release site do not pose any obvious immediate threat to the released animal, such as areas where resources and habitat is severely depleted or degraded. If evidence exists of a substantial decline in resources or habitat quality such as massive fish kills, significant declines in commercial and/or recreational fish landings, red tides, etc., it may not be appropriate to release the pinniped until conditions at the release site improve or a different release site is found. Also, release in areas of dense public use and/or high commercial and recreational fishing activity should be avoided. Additionally, consultation and communication with local authorities, land management agencies, or those with jurisdiction over proposed release sites, should be conducted prior to conducting release activities to minimize potential impacts associated with the release to other species.

4.8 Identification of Rehabilitated Pinnipeds Prior to Release

NMFS and FWS have determined that all pinnipeds must be flipper tagged for identification prior to release to the wild. Tags and placement instructions are to be obtained from NMFS or FWS and/or USGS (for walrus) as appropriate for the pinniped species. Although re-sightings of flipper-tagged individuals may provide some information regarding the relative success of a rehabilitation effort, flipper tags are not reliable for long-term monitoring. They may be difficult to read from a distance and may become damaged or lost. Other methods for identification such as freeze or hot branding, glue tags, etc. may be used in addition to flipper tags to increase resights (Geraci and Lounsbury 2005).

4.9 Post-Release Monitoring of Pinnipeds

Post-release monitoring of pinnipeds provides essential information for the development and refinement of marine mammal rehabilitation and release practices. Post-release monitoring methods may include visual observations of tagged or freeze or hot branded pinnipeds from land, sea, or air, as well as radio or satellite-linked monitoring. Radio and satellite-linked tag monitoring programs are highly desirable as they provide a wealth of information regarding the activities and fates of released animals. NMFS or FWS may require and coordinate post-release monitoring plans for “Conditionally Releasable” or ESA pinnipeds. Additionally, rehabilitation centers may voluntarily provide post-release monitoring plans for routinely released pinnipeds. When such monitoring will be performed voluntarily, the rehabilitation center is required to inform NMFS or FWS of the intent to implement post-release monitoring when seeking authorization for release of the pinniped.

The first month after release of the pinniped is a particularly critical period during which it will become evident whether the animal is thriving, including capturing sufficient prey and being accepted by conspecifics. It is recommended that monitoring continue on a regular basis via field observations, radio, or satellite-linked tag monitoring for the duration of the tag. Funding resources such as the Prescott Grant Program may assist with the financial burden of such endeavors. NMFS may request these data in order to make future revisions to pinniped rehabilitation and release guidelines. In order to compare individual cases, standardization of data collection protocols for monitoring released pinnipeds may be helpful, and this should include the length of the tracking time, the type of tracking equipment, and assessment of outcome. Formal study of monitoring data and its dissemination to the stranding network can aid in the assessment of pinniped rehabilitation and release programs.

Release plans should include contingency plans for recovering the released pinniped, should monitoring indicate its failure to thrive and especially if it re-strands, including options for treatment, permanent care, or euthanasia. In addition, NMFS will request such contingency plans for “Conditionally Releasable” and ESA pinnipeds, depending on the circumstances.

4.10 Decision Tree – Pinniped Release Categories

4.10.1 Releasable

The pinniped is cleared for release by the attending veterinarian (including the Assessment Team) and the NMFS Regional Administrator via the RSC concurs in writing, unless a waiver is in place. This means that the requirements for the health and behavior assessment, marking/tagging, and release plan have been met and both veterinary and biological opinions regarding release have been received (see text for details). For an animal to be considered “Releasable” the response to all of the essential release criteria below should be met.

<u>Situational Clearance</u>

a) Pinniped has no situational information requiring consultation with NMFS such as previous stranding or will be released outside of species/stock range due to environmental factors such as an oil spill, HAB or UME.

<u>Developmental Stage/Life History</u>

a) Pinniped is a sub-adult/adult and is nutritionally and socially independent.
b) Pinniped is a pup that is nutritionally independent and forages completely on its own.
c) Pinniped is a pup that is socially independent (stock/species-specific).

Behavioral Clearance

a) Pinniped demonstrates acceptable breathing, swimming, diving and locomotion on land.
b) Pinniped does not exhibit aberrant behavior (regurgitation, head pressing, postural abnormalities, and decreased range of motion).
c) Pinniped exhibits full auditory function.
d) Pinniped exhibits full visual function.
e) Pinniped demonstrates foraging behavior or the ability to hunt and capture live prey.

Medical Clearance

a) Attending veterinarian has reviewed the pinniped's situation and medical records and has deemed it appropriate for release.
b) Attending veterinarian has examined the pinniped within two weeks of release.
c) Required health screen and assessments were conducted (following conclusion of medical treatment) with appropriate results for the age and species of the animal.
d) Veterinary or husbandry staff performed a hands-on exam within 72 hours of release to assess for any medical or condition changes.
e) Pinniped has no known congenital defects.
f) Pinniped's appendages are functional.
g) Pinniped is sufficiently robust, having adequate reserves to survive readjustments in the wild.
h) Pinniped has no active infection from exposure to domestic/terrestrial animals (*e.g.,* dog, fox, coyote, etc.)
i) Pinniped has not inflicted a bite on a human(s) during rehabilitation; or a bite has occurred that broke the skin but the animal has passed the quarantine period.
j) CBC results are generally within normal ranges for the age and species of the animal (within two weeks of release).
k) Chemistry profile results are generally within normal ranges for the age and species of the animal (within two weeks or release).
l) Additional testing requested by NMFS has been reviewed and is not concerning.
m) Medications have not been administered in the two weeks prior to release.
n) Attending veterinarian signed health statement.

Release Logistics

a) Release site selection rationale includes return to appropriate stock and geographical site under favorable environmental conditions, and for social species, released into areas with conspecifics, if feasible.
b) Consultation and communication with local authorities, land management agencies, or those with jurisdiction over proposed release sites, should be conducted prior to conducting release activities to minimize potential impacts associated with the release to other species.

4.10.2 Conditionally Releasable

The pinniped did not meet one or more of the essential release criteria but may be "Releasable" in the future pending resolution of the problems identified by the attending veterinarian and Assessment Team. This will involve discussion with NMFS and possible consultation with outside experts. After discussion with NMFS and experts, the animal may be deemed "Conditionally Releasable" even if one or more criteria cannot be resolved but the animal has a reasonable chance (>50%) of surviving in the wild. Contingency plans for recapture, treatment, permanent care, and euthanasia may be required if release is unsuccessful and the animal re-strands. The following may be true for one or more assessment points.

<u>Situational Clearance</u>

a) Pinniped has previously stranded.
b) Pinniped release is planned to occur outside of species/stock range due to factors such as environmental and logistical concerns (*e.g.,* oil spill, HAB, UME, etc.)

<u>Developmental Stage</u>

a) Pinniped is nutritionally independent and forages completely on its own, but stranded as a younger, socially dependent unweaned Otariid pup (requires NMFS consultation based upon specific stock/species, *e.g.*, California sea lion, Steller sea lion).
b) Pinniped is a pup that was born in rehabilitation, was rehabilitated, and is being released with its mother (requires NMFS consultation).
c) Pinniped is a pup that was born in rehabilitation and cannot be released with its mother (requires NMFS consultation).

<u>Behavioral Assessment</u>

a) Pinniped exhibits deficiency in breathing, swimming, diving, and locomotion on land (*e.g.*, loss of an appendage, requires NMFS consultation).
b) Pinniped demonstrates aberrant behavior (regurgitation, head pressing, postural abnormalities, decreased range of motion, etc.) including excessive interest in interaction with humans or husbandry behaviors that were conditioned during rehabilitation. These behaviors could be counter-conditioned or have a modified release plan.
c) Pinniped exhibits some hearing impairment.
d) Pinniped exhibits some vision loss (*e.g.,* non-visual or loss on one eye).
e) Pinniped demonstrates deficiency in foraging behavior or the ability to hunt and capture live prey (requires NMFS consultation).

<u>Medical Assessment</u> - The attending veterinarian determines that the health status of the pinniped is uncertain regarding suitability for release; review of uncertain health status requires NMFS consultation.

a) The veterinarian arrives at a determination of "Conditionally Releasable" through performance and interpretation of physical examinations (*e.g.,* partial damage to appendages, low release weight, etc.)
b) Interpretations of tests such as CBC, chemistry profile, cultures, and other tests required by NMFS, plus any other diagnostic tests deemed necessary to fully evaluate the animal, may have abnormalities that make the pinniped "Conditionally Releasable.
c) Response of the pinniped to therapy and the clinical judgment of the veterinarian may also contribute to a determination of "Conditionally Releasable."
d) Further tests may be required including ultrasound or radiographs to clarify medical issues.
e) Animals may also be considered "Conditionally Releasable" if they received medications within two weeks of release.

<u>Release Logistics</u>

a) Tagging, marking, post-release monitoring - Extensive post-release monitoring of pinnipeds deemed "Conditionally Releasable" is required when feasible and is to be approved and coordinated through NMFS. Post-release monitoring of such animals should be at least six weeks duration, likely longer. Monitoring is likely to include advanced tracking techniques, such as flipper tag surveys, or radio or satellite tagging if the animal is likely to move outside of the range of monitoring.
c) Plan for recapture - NMFS may request a contingency plan for recapture if feasible for a "Conditionally Releasable" pinniped prior to its release should the animal appear to be unable to readjust to the wild. This should include plans for follow up treatment, permanent care, and/or euthanasia.

4.10.3 Non-Releasable

The pinniped is determined to be unsuitable for release by the attending veterinarian and Assessment Team and the NMFS Regional Administrator via the RSC concurs. The animal did not meet the essential release criteria, and thus does not have a reasonable chance of survival in the wild or poses health risks to wild marine mammals.

<u>Situational Clearance</u>

a) Pinniped has previously stranded and is determined to not be a candidate for release due to reasons for re-stranding (includes assessment of previous strandings).
b) Release is planned to occur outside of species/stock range due to factors such as environmental and logistical concerns (*e.g.,* oil spill, HAB, UME, etc.). After expert consultation, the pinniped needs to be held until the above factors remedy, if this takes longer than two years the pinniped may be declared "Non-Releasable".

<u>Developmental Stage</u>

a) Pinniped is nutritionally independent and forages completely on its own, but stranded as a younger, socially dependent unweaned Otariid pup (requires NMFS consultation based upon specific stock/species, *e.g.,* California sea lion, Steller sea lion).
b) Pinniped is a pup that was born in rehabilitation and cannot be released with its mother (requires NMFS consultation).

<u>Behavioral Clearance</u>

a) Pinniped does not demonstrate acceptable breathing, swimming, diving, or locomotion on land.
b) Pinniped demonstrates aberrant behavior (regurgitation, head pressing, postural abnormalities, and decreased range of motion, etc.) including excessive interest in interaction with humans that cannot be de-conditioned.
c) Pinniped exhibits significant auditory dysfunction that would compromise survival in the wild or is completely deaf.
d) Pinniped exhibits significant visual dysfunction that would compromise survival in the wild or is fully blind.
e) Pinniped demonstrates inability to forage or the inability to hunt and capture live prey.

<u>Medical Clearance</u> - The attending veterinarian determines that the health of the pinniped precludes release.

a) In such cases, the medical condition of the animal prevents normal function to a degree that would compromise its survival in the wild or pose a health risk to wild marine mammals.
b) The veterinarian supports the determination of "Non-Releasable" status with required physical examinations and tests such as CBC, chemistry profile, cultures, and those required by NMFS plus any other tests deemed necessary to fully evaluate the animal.
c) Further tests may be required including ultrasound or radiographs, to clarify medical issues.
d) The veterinarian presents their findings to the NMFS RSC and recommends that the pinniped is "Non-Releasable" and be maintained in captivity or be euthanized.

5 Guidelines for Release of Rehabilitated Manatees

5.1 Introduction

West Indian manatees inhabit areas throughout the Caribbean basin and consist of two subspecies: the Florida manatee (*Trichechus manatus latirostris*) and the Antillean manatee (*Trichechus manatus manatus*). In the U.S., the Florida subspecies can be found in southeastern coastal waters and the Gulf of Mexico, with Florida at the core of its range. The Antillean subspecies is found outside of Florida throughout the Caribbean basin (including Puerto Rico).

Reports of distressed manatees include animals compromised by human activities and natural causes. Human causes of distress include collisions with watercraft, entrapment in structures, entanglement in, and ingestion of, fishing gear and debris, and other sources. Natural causes of distress include exposure to cold or brevetoxins, mother/calf separation, seasonal disorientation, intentional beaching, etc.

The FWS is the management authority for the threatened West Indian manatee. The North Florida Ecological Services Field Office (NFESFO) has the recovery lead and coordinates the daily management for the Florida subspecies. Numerous efforts are underway to assist with the manatee recovery, including the implementation of the Manatee Rescue, Rehabilitation and Release Program (Rehab Program). Since its inception in 1973, this program has conducted rescue and release activities to promote the conservation of wild manatee populations. The Rehab Program consists of various partners from oceanaria, Federal, State and local agencies, NGO’s and academia. The goal of the Rehab Program is to rescue and rehabilitate injured and distressed manatees and release them back into the wild when medically feasible. The NFESFO conducts this program according to provisions of the ESA and MMPA; authorization is given through the issuance of a Marine Mammal Enhancement Permit from the Service’s Division of Management Authority (DMA). The permit authorizes take activities for an unspecified number of manatees for the purpose of enhancing its survival and recovery, consistent with the current version of the Florida Manatee Recovery Plan (2001), developed pursuant to the ESA. The NFESFO coordinates a network of individuals, facilities, and agencies through Letters of Authorization for Cooperators (LOAFC) to rescue, rehabilitate, and release manatees.

For Antillean manatees, all rescue-related communications and the day-to-day decision making process in the field are generally handled by the Puerto Rico Department of Natural and Environmental Resources (PRDNER) Marine Mammal Program in conjunction with reports from the public utilizing their PRDNER Ranger's main line (787) 724-5700 or through the Puerto Rico Manatee Conservation Center (PRMCC) contacts. If in the U.S. Virgin Islands (rare cases), efforts can be coordinated with the Virgin Islands Department of Planning and Natural Resources, the National Park Service, and the PRMCC. In Puerto Rico, all activities related to the verification of a report of a manatee in trouble, subsequent rescue, and transport to rehabilitation facilities are communicated through the PRDNER, the FWS, and the PRMCC, according to established protocols. The FWS’s Caribbean Ecological Services Field Office (CESFO) coordinates a manatee rescue, rehabilitation, and release program to assist these animals in Puerto Rico and U.S. Virgin Islands. The CESFO conducts this program according to the provisions of an ESA/MMPA marine mammal enhancement permit issued by the FWS’s DMA. The permit authorizes “take” activities for an unspecified number of manatees for the purpose of enhancing its survival and recovery, consistent with the FWS’s manatee recovery plan developed pursuant to the ESA. Rescue-related communications and efforts have also been coordinated with other Caribbean countries (*e.g.,* Cuba and Turks & Caicos Islands) and would include coordination with FWS’s International Affairs for a permit issued under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The CESFO coordinates with the PRMCC as the only facility in Puerto Rico with an LOA issued under section 109(h) and section 112(c) of the MMPA [16 U.S.C. 1379(h) and 16 U.S.C. 1382(c)] to authorize activities related to the rescue (including temporary capture, possession, transport, and transfer), rehabilitation, and post-release monitoring of manatees.

Release guidelines were first developed by Rehab Program participants in 1991 and subsequently revised in 2001 and again in 2009. The release guidelines are based on more than thirty years of program history and include the experiences, advice, and expertise of resource managers, field biologists, veterinarians, behavioral experts, animal keepers, and other dedicated individuals.

These guidelines are to be used by all authorized Rehab Program participants to ensure the proper release of rehabilitated manatees and provide the greatest chance of survival and adaptation to the wild for these animals. In certain parts of this document, the term “must” has been replaced with “should” to reflect the flexibility, which has been incorporated into these guidelines to account for atypical circumstances where this guidance cannot be strictly followed.

5.2 Overview of Release Categories for Manatees

Manatees undergoing rehabilitation are evaluated by program participants and placed into one of three categories: “Releasable”, “Conditionally Releasable”, and “Conditionally Non-Releasable”. The categories are as follows:

"RELEASABLE": Manatees that have been successfully treated, medically cleared, are of an appropriate size, demonstrate appropriate behaviors, have the skills necessary to thrive in the wild, and do not pose a threat to wild populations will be considered ”Releasable”. Additionally, distressed manatees that are assisted in the wild and then released on-site are characterized as "Releasable". These individuals that are assisted and released in the wild usually include healthy, non-injured manatees: superficially entangled in fishing gear; isolated by high water or detained by structures such as water control structures, sheet pile walls, booms, and other barriers; or seasonally disoriented (*i.e.,* manatees that fail to migrate to appropriate winter habitats during the periods of cold weather and typically are relocated to warm water sites within their region of origin). “Releasable” manatees must be released to a suitable site at the earliest time possible.

"CONDITIONALLY RELEASABLE": Manatees currently with a condition and/or circumstance that present a question regarding their likely success after release or the inability to thrive in the wild, but will not likely pose a threat to wild populations, will be considered “Conditionally Releasable”. Animals described as "Conditionally Releasable" may include individuals undergoing medical treatment, born in captivity, or held long-term (*i.e.,* > 10 years). The status of animals considered to be "Conditionally Releasable" may change to "Releasable" if their condition or circumstance improves or to "Conditionally Non-Releasable" if their condition or circumstance does not resolve or deteriorates.

"CONDITIONALLY NON-RELEASABLE": Manatees that currently cannot be released because their condition and/or circumstance threaten the well-being of the animal and/or may pose a threat to the wild population, or those individuals where evidence has been found that precludes breeding and/or compromised reproductive fitness will be considered “Conditionally Non-Releasable.” This category may include individuals that are medically characterized by a disease process, which proves to be a significant risk to the wild population, and/or by significant physical injuries (*e.g.,* the loss of a paddle, spinal trauma) precluding the ability of an animal to thrive in the wild. The status of animals considered to be “Conditionally Non-Releasable” may change to "Releasable" or "Conditionally Releasable" if their condition or circumstance improves over time. Should a Florida manatee be deemed “Conditionally Non-Releasable” by the FWS, the receiving facility may continue to hold the animal under the NFESFO ESA

10(a)(1)(a) permit and the facility's MMPA LOAFC or apply for an addendum to its LOAFC to hold the animal up to five years; or apply for a scientific research permit or an enhancement permit pending the fulfillment of all necessary requirements under section 104(c) of the MMPA [16 U.S.C. 1374(c)], section 10(a) of the ESA [16 U.S.C. 1539(a)], and the FWS's issuance criteria, as designated in 50 CFR 18.31 and 50 CFR 17.22. The facility must also be registered or hold a license from APHIS [7 U.S.C. 2131 *et seq*.]. For Antillean manatees deemed "Conditionally Non-Releasable" by the FWS, contact the CESFO for instructions on obtaining the appropriate authorization to continue holding the animal.

Note: The U.S. captive manatee population currently includes four Florida manatees brought into captivity prior to the adoption of Federal prohibitions preventing the display of captive endangered marine mammals. The FWS does not have management authority over these individuals. The care and disposition of these "Pre-Act" animals are the responsibility of their respective owners; however, all progeny of "Pre-Act" animals fall under the jurisdiction of the FWS. Currently all facilities comply with the FWS's Captive Breeding Policy, established by the FWS in 1992, prohibiting the intentional breeding of captive manatees.

5.3 Situational Historical Assessment of Manatees

Efforts are made to maintain complete, detailed records that document rescued manatees from the time of initial rescue to their eventual disposition. These records generally include information describing the rescue event, circumstances surrounding the cause of rescue (*e.g.,* watercraft injury, cold weather exposure, entanglement), medical treatment(s) administered, rehabilitative care provided, and resolution of the case (*e.g.,* death, euthanasia, release). Records from previously known wild individuals can include documentation of behavioral and reproductive patterns, migratory habits, site fidelity, and in certain cases, post-release monitoring information. The information contained in individual manatee records guide the treatment of rescued manatees and provide an evaluative tool for program managers and Rehab Program participants to assess and improve guidelines and procedures to better ensure success.

5.4 Developmental Assessment of Manatees

The developmental assessment of manatees focuses on the ability of an animal to feed and grow to an appropriate size in order to have the highest chance of survival in the wild.

"Releasable" manatees should be nutritionally independent (weaned and off of supplemental nutritional support), greater than 200 cm in total length and weigh more than 600 pounds (generally around two years of age) for Florida manatees, 450 pounds in weight for Antillean manatees. Exceptions to this include dependent/nursing calves that are released with their mothers to ensure the dam's wild experience is passed on to her calf. Based on observations of cow/calf bonding behavior, this will help to improve the calf's wild skills and ability to persist and survive in the wild.

"Conditionally Releasable" manatees consist of individuals that may or may not demonstrate nutritional independence, and do not yet meet the minimum requirement for length and weight. Manatees that have spent lengthy periods of time in rehabilitation (> 10 years) also fall into this category; concern has been expressed that these individuals may have a diminished ability to thrive in the wild. Long-term captive animals are considered on a case-by-case basis for release.

"Conditionally Non-Releasable" manatees may or may not demonstrate nutritional independence, and may or may not yet meet the minimum requirement for length and weight. Manatees in this category have a medical condition or physical injury, which precludes them from being released into the wild.

5.5 Behavioral Assessment of Manatees

The behavioral assessment of manatees focuses on the ability of a manatee to exhibit what has been determined as 'normal wild manatee behaviors'. These include, but are not limited to, the ability to breathe, swim, forage, dive, surface, and avoid dehydration without assistance.

"Releasable" manatees must exhibit 'normal behaviors' while in rehabilitation and are, therefore, expected to be able to meet behavioral challenges when in the wild. Normal behaviors include, but are not limited to, the ability to breathe, swim, forage, dive, surface and avoid dehydration without assistance. Manatees must demonstrate the ability to adapt to the appropriate water environment types (*i.e.,* salt, brackish, or fresh water) without becoming dehydrated or emaciated. Manatees must also demonstrate an ability to feed on natural vegetation located at various levels in the water column.

"Conditionally Releasable" and "Conditionally Non-Releasable" manatees need assistance when conducting 'normal behavior' or simply do not exhibit 'normal behavior'. Abnormal behaviors in manatees have not been defined; however, animals that exhibit atypical behaviors (as determined by the FWS and its advisors) while in rehabilitation will be considered for release on a case-by-case basis. Behaviors that may elicit concerns include stereotypic displays (*e.g.,* swimming in circles), adaptability, or sensitivity to change (*e.g.,* going off feed, physically shutting down), and perceived affinities for humans and human activities while in rehabilitation. These affinities should not be confused with the manatee's innate ability to explore their environment, including humans, especially in the absence of other engaging stimuli. Manatees that possess behaviors that can be conditioned or extinguished (depending on applicability) are placed into the "Conditionally Releasable" category. Those individuals with behaviors that cannot be modified or extinguished and pose a threat to themselves or to the wild population will be considered "Conditionally Non-Releasable".

5.6 Medical Assessment of Manatees

Medical assessments of manatees are conducted by veterinarians experienced in clinical manatee medicine to determine if an animal is "medically cleared". A "medically cleared" manatee will be free of medical problems, not limited in its ability to thrive in the wild, and not pose a threat to wild populations. Information reviewed for this assessment includes: medical history, current health status, blood work parameters, physical or sensory dysfunctions, breeding capability, and reproductive fitness.

"Releasable" manatees are those individuals that are medically cleared. The animal will have no current health issues, possess a 'normal' range for blood values, does not possess any physical or sensory dysfunctions and has no evidence of an inability to breed or compromised reproductive fitness.

"Conditionally Releasable" manatees are those individuals who have not been medically cleared and are currently receiving medical treatment or undergoing additional rehabilitation; it is believed that further treatment and rehabilitation will result in future medical clearance. These manatees may have a current health issue or injury that is unresolved (*e.g.,* malnutrition, dehydration, active/infectious disease process), abnormal blood values, or possess a physical or sensory dysfunction (*e.g.*, an injury that significantly affects mobility and/or range of motion).

"Conditionally Non-Releasable" manatees are not medically cleared and it is believed their current health condition will not change with further treatment and rehabilitation. These individuals possess what is believed to be a permanent incurable medical condition or physical or sensory dysfunctions (*e.g.*, the loss of a paddle, failure to adapt appropriate buoyancy control), which may preclude survival in the wild or may pose a threat to the wild population, and/or evidence has been found that precludes breeding capability and/or exhibits compromised reproductive fitness.

5.7 Release Categories for Manatees

The following is background information, a list of criteria and discussion points used to help determine the release status of manatees following medical intervention, treatment, and rehabilitation. Release status of an animal may change as various criteria are met. Specific criteria for each release category are represented in italicized text.

5.7.1 Releasable

1. Background Information

i. Manatee name(s) and identification number(s)

ii. Rescue History

a) Date of rescue
b) Reason for rescue
c) Location of rescue-county, city and waterway
d) Size/age class at time of rescue: *Florida manatees must have a minimum length of 200cm and weighs more than 600lbs (unless being released with dam). Antillean manatees must have a minimum length of 200cm and weighs more than 450lbs (unless being released with dam).*
e) Prior information on MIPS sightings of this individual while in the wild, if any.

iii. Rehabilitation History

a) Length of time in rehabilitation
b) Current facility and length of time at present location
c) Other holding facilities and length of time in each
d) Method of rearing: *The animal does not have an affinity for humans or this behavior has been extinguished.*

iv. Reproductive status: *No evidence of inability to breed and does not exhibit compromised reproductive fitness.*

2. Evaluation Criteria

i. Medical Information

a) Current medical status/evaluation: *No concerns and the animal is medically cleared.*
b) Does this animal pose a current threat to the wild population? *No concerns that the animal poses a threat to wild population.*
c) Are blood values compatible with good health standards? *The blood values are within normal ranges and compatible with good health standards*
d) Summary of medical history and treatment plans: *No concerns with medical history precluding animal from surviving in wild or posing a threat to wild population; medical treatment is complete.*
e) Any notable significant physical or sensory dysfunctions that could threaten survival in the wild? *No significant physical or sensory dysfunctions that could threaten survival in the wild.*
f) Are there known animals in the wild with similar conditions? *If applicable, yes there are animals in the wild with similar conditions.*
g) Does the animal possess limitations that would preclude it from breeding in the wild? *There are no limitations, which preclude animal from breeding in wild.*

h) Has genetic analysis indicated any concerns with reproductive fitness? *There is no genetic evidence regarding concerns with reproductive fitness.*

ii. Behavioral Assessment:

a) Can the animal surface and breath without impediments? *There are no concerns regarding the animals' ability to surface and breathe.*
b) Can the animal swim without impediments? *There are no concerns regarding the animals' ability to swim.*
c) Can the animal dive without impediments? *There are no concerns regarding the animals' ability to dive.*
d) Can the animal forage at various levels of the water column? *The animal can forage at various levels within the water column.*
e) Does the animal exhibit 'normal manatee behavior'? *The animal exhibits 'normal manatee behavior', which do not preclude survival in the wild.*
f) Does the animal have problems with water balance and dehydration? *The animal has successfully adapted to appropriate water type in which it will be released.*
g) Is the animal nutritionally independent? *The animal is nutritionally independent and forages on natural vegetation (except with a dependent/nursing calf being released with mother).*

3. Information from the Attending Veterinarian

i. In your professional opinion does the animal possess any physical or medical handicaps that will preclude it from survival in the wild? *The attending veterinarian does not have any concerns for survival in the wild.*
ii. In your professional opinion would the release of this animal put the wild population at risk? *The attending veterinarian does not have any concerns with the animal being a risk to the wild population.*
iii. Statement from the attending veterinarian on recommended release status of the animal, including recommended care, treatment plan, and follow-up monitoring to bring the animal to "Releasable" status: *Recommended care and treatment plans are not applicable; monitoring may or may not be applicable.*

5.7.2 Conditionally Releasable

1. Background Information

i. Manatee name and identification number

ii. Rescue History

a) Date of rescue
b) Reason for rescue
c) Location of rescue-city and waterway
d) Size/age class at time of rescue: *For Florida manatees, has not yet met the minimum length of 200cm and does not weigh more than 600lbs (unless being released with dam). For Antillean manatees, has not yet met the minimum length of 200cm and does not weigh more than 450lbs (unless being released with dam).*
e) Prior information on MIPS sightings of this individual while in the wild, if any.

iii. Rehabilitation History

a) Length of time in rehabilitation: *Animal has been in rehabilitation for >10 years and concerns exist regarding its ability to survive in the wild.*
b) Current facility and length of time at present location.

c) Other holding facilities and length of time in each.
d) Method of rearing: *The animal has a behavioral affinity for humans that is not yet extinguished.*

iv. Reproductive status: E*vidence suggests the inability to breed or compromised reproductive fitness.*

2. Evaluation Criteria

i. Medical Information

a) Current medical status/evaluation: *The animal is not medically cleared and is currently undergoing medical treatment or further rehabilitation.*
b) Does this animal pose a current threat to the wild population? *The current condition of the animal may pose a threat to wild population.*
c) Are blood values compatible with good health standards? *The current blood values are abnormal and not compatible with good health standards.*
d) Summary of medical history and treatment plans: *Concerns currently exist with medical history questioning survival in the wild or posing a threat to wild population; or the animal is still undergoing medical treatment.*
e) Any notable significant physical or sensory dysfunctions that could threaten survival in the wild? *The animal has a significant physical and/or sensory dysfunctions, which in its current state could threaten survival in the wild.*
f) Are there known animals in the wild with similar conditions? *If applicable, there may or may not be animals in the wild with similar conditions.*
g) Does the animal possess limitations that would preclude it from breeding in the wild? *There are temporary limitations, which preclude breeding in the wild; however, these limitations can be resolved with further medical treatment and rehabilitation.*
h) Has genetic analysis indicated any concerns with reproductive fitness? *Evidence suggests there may be concerns with reproductive fitness.*

ii. Behavioral Assessment

a) Can the animal surface and breath without impediments? *There are concerns regarding the animals' ability to surface and breathe and these concerns can be resolved with further medical treatment and rehabilitation.*
b) Can the animal swim without impediments? *There are concerns regarding the animals' ability to swim and these concerns can be resolved with further medical treatment and rehabilitation.*
c) Can the animal dive without impediments? *There are concerns regarding the animals' ability to dive and these concerns can be resolved with further medical treatment and rehabilitation.*
d) Can the animal forage at various levels of the water column? *The animal cannot forage at various levels within the water column; however, it can be resolved with further medical treatment and rehabilitation.*
e) Does the animal exhibit 'normal manatee behavior'? *The animal does exhibit abnormal manatee behavior which may preclude its ability to survive in the wild; however, further medical treatment and rehabilitation can extinguish this behavior.*
f) Does the animal have problems with water balance and dehydration? *The animal has not yet successfully adapted to appropriate water type in which it will be released; however, it can be resolved with further medical treatment and rehabilitation.*
g) Is the animal nutritionally independent? *The animal is not yet nutritionally independent and/or it does not forage on natural vegetation.*

3. Information from the Attending Veterinarian

i. In your professional opinion does the animal possess any physical or medical handicaps that will preclude it from survival in the wild? *The attending veterinarian has concerns for survival in the wild in its current state.*

ii. In your professional opinion would the release of this animal put the wild population at risk? *The attending veterinarian has concerns that the current state of the animal may put the wild population at risk.*

iii. Statement from the attending veterinarian on recommended release status of the animal, including recommended care, treatment plan, and follow-up monitoring to bring the animal to "Releasable" status: *Recommended care and treatment plan is presented along with suggested monitoring if animal becomes releasable.*

5.7.3 Conditionally Non-Releasable

1. Background Information

i. Manatee name and identification number

ii. Rescue History

a) Date of rescue
b) Reason for rescue
c) Location of rescue-city and waterway
d) Size/age class at time of rescue
e) Prior information on MIPS sightings of this individual while in the wild, if any.

iii. Rehabilitation History

a) Length of time in rehabilitation: *Animal has been in rehabilitation for >10 years and concerns exist regarding its ability to survive in the wild.*
b) Current facility and length of time at present location.
c) Other holding facilities and length of time in each.
d) Method of rearing: *The animal has a behavioral affinity for humans which cannot be extinguished or conditioned and evidence suggests the behavior may preclude survival in the wild or/and pose a threat to the wild population.*

iv. Reproductive status: *Scientific* e*vidence exists supporting the inability to breed or compromised reproductive fitness.*

2. Evaluation Criteria

i. Medical Information

a) Current medical status/evaluation: *The animal is not medically cleared and is currently undergoing medical treatment or further rehabilitation; evidence suggests the current medical condition cannot be resolved and will preclude survival in the wild or/and pose a threat to the wild population.*
b) Does this animal pose a current threat to the wild population? *Evidence suggests the animal poses a threat to wild population.*
c) Are blood values compatible with good health standards? *The blood work values are abnormal and not compatible with good health standards.*
d) Summary of medical history and medical treatment plans: *Evidence from medical history suggest animal may not survive in the wild or may pose a threat to wild population; or it is believed medical treatment for the animal is necessary for perpetuity.*

e) Any notable significant physical or sensory dysfunctions that could threaten survival in the wild? *The animal has significant physical and/or sensory dysfunctions, which are believed to threaten survival in the wild.*
f) Are there known animals in the wild with similar conditions? *It is believed no animals can exist in the wild with similar conditions.*
g) Does the animal possess limitations that would preclude it from breeding in the wild? *The animal has limitations that preclude it from breeding in the wild.*
h) Has genetic analysis indicated any concerns with reproductive fitness? *Scientific evidence supports compromised reproductive fitness.*

ii. Behavioral Assessment

a) Can the animal surface and breathe without impediments? *Evidence supports the animal cannot surface and breathe without impediments, and further medical treatment and rehabilitation will not correct the condition.*
b) Can the animal swim without impediments? *Evidence supports the animal cannot swim without impediments and further medical treatment and rehabilitation will not correct the condition.*
c) Can the animal dive without impediments? *Evidence supports the animal cannot dive without impediments, and further medical treatment and rehabilitation will not correct the condition.*
d) Can the animal forage at various levels of the water column? *The animal cannot forage at various levels within the water column and it is believed further medical treatment and rehabilitation will not resolve this issue.*
e) Does the animal exhibit 'normal manatee behavior'? *The animal does exhibit abnormal behavior, which is thought to preclude its ability to survive in the wild; it is believed further medical treatment and rehabilitation will not extinguish the abnormal behavior.*
f) Does the animal have problems with water balance and dehydration? *The animal has not successfully adapted to appropriate water type in which it will be released and evidence supports this condition will not change.*
g) Is the animal nutritionally independent? *The animal is not nutritionally independent and evidence supports this condition will not change.*

3. Information from the Attending Veterinarian

i. In your professional opinion does the animal possess any physical or medical handicaps that will preclude it from survival in the wild? *The attending veterinarian has evidence supporting the animal may not survive in the wild.*
ii. In your professional opinion would the release of this animal put the wild population at risk? *The attending veterinarian has evidence supporting the animal will put the wild population at risk.*
iii. Statement from the attending veterinarian on recommended release status of the animal, including recommended care, treatment plan, and follow-up monitoring to bring the animal to "Releasable" status: *The attending veterinarian recommends this animal be "Conditionally Non-Releasable" and includes an ongoing treatment plan.*

5.8 Pre-release Requirements for Manatees

Naïve Manatee Releases:

Naïve manatees are considered those individuals born in captivity, rescued as young dependent calves, or in rehabilitation for long periods of time (> 10 years). It is believed the lack (minimal) of wild experience or length of time in rehabilitation may compromise the ability of an animal to thrive in the wild. The Rehab Program has currently released over 723 rehabilitated manatees in the southeast continental U.S. (Manatee Database, U.S. Fish and Wildlife Service, unpublished data), resulting in the development of specific requirements believed to better prepare naïve animals for release and ensure the greatest chance of survival in the wild. These requirements are as follows:

Manatees should meet the minimum requirements of 200 cm total straight-line length and 600 lbs total body weight for Florida manatees and 450 lbs total body weight for Antillean manatees prior to release. Animals should be exposed to water salinity similar to what will be encountered at the release site. It is recommended an individual should be allotted 60 days to adapt to a saline environment to achieve the appropriate level of salinity for physiological adaption; however, the process may be quicker, depending on the individual. For those individuals in a saline environment, a source of fresh water should be available to the animal, either directly or through fresh water vegetation to avoid dehydration.

Offered vegetation should be the same type as what will be encountered at the release site and in the general release area. A variety of wild vegetation (*i.e.,* freshwater or saltwater) should be given to the animal as often as possible throughout its time in rehabilitation. In circumstances where wild vegetation has not been available on a regular basis, every effort should be made to offer wild vegetation at least 60 days prior to release and ensure feeding has occurred. Attempts also should be made to adjust tank temperatures to mirror those at the release site for at least two weeks prior to release (even if it means lowering the tank temperature only a couple of degrees).

Several months prior to release, exposure to humans, except for medical evaluations, should be minimized to reduce or eliminate any affinity the animal may possess or had developed toward humans and human activity. Trained/learned behaviors must be extinguished to the greatest extent possible prior to release. Those high risk individuals identified for post-release monitoring may be "clicker trained" (upon prior FWS approval) to facilitate the ability to obtain information on overall body condition and conduct field health assessments in areas where water clarity is an issue or re-capture is problematic.

<u>All Animal Releases:</u>
Prior to release, all individuals must be examined by a veterinarian experienced in clinical manatee medicine. Examination requirements include: a review of the animal's history; a hands-on physical examination; morphometrics including straight line length, weight, and peduncle girth for individuals proposed for radio tagging; minimum CBC panel; chemistry (serology/culture when necessary); fecal (direct/float); and cytology. Results of analyses should be consistent with known baseline values for manatees of similar age, size, and sex and consistent with historical values for that specific individual. Blood and/or tissue samples also must be taken prior to release for serum banking and genetics. When feasible, ultrasound measurement of standardized blubber thickness layers also should be taken to determine baseline body condition and the amount of subcutaneous fat. Additional information that can be collected includes: serum amyloid A (SAA) testing, protein electrophoresis, fibrinogen analysis, and fecal culture screen for enteric pathogens.

- All animals must be individually recognizable prior to release. Manatees without distinctive markings or scars from encounters with boat propellers may be freeze-branded with a unique number/letter combination (the selection of the sequential number/letter combination must be made beforehand in consultation with the FWS). Freeze brands should be applied well in advance of release to ensure the brand is legible. Detailed photographs of all distinct features on each manatee must be taken and, for Florida manatees, these must be submitted into the Manatee Individual Photo-identification System (MIPS) catalog; when feasible, all markings also should be sketched and submitted. Trovan PIT tags (one on each side of the manatee, at shoulder level just cranial to each scapula) must be implanted for all manatees that are released into the wild.

5.9 Release and Post-release Logistics for Manatees

In the case of Florida manatees, every effort should be made to release manatees in close proximity to the rescue site. For naïve animals, release sites must be located at natural warm-water areas or known aggregation areas during the winter to encourage winter site fidelity, familiarity with local conditions and association with wild manatees. To maximize the amount of time naïve animals spend associating with wild manatees, and increase the possibility of naïve animals imprinting on a specific site, they should be released during the onset of cold fronts when wild manatees are moving into natural warm-water areas for thermal refuge. Naïve animals must also be released at a location where natural vegetation is in close proximity and the potential for human disturbance is minimal. Release sites should be free of HABs and other compromising factors.

In the case of Antillean manatees, animals should be released on the same coast where they were found, preferably near their point of origin if this is suitable manatee habitat. Antillean manatees should be released within the same haplotype population based on mDNA. Naive animals should be released in areas that harbor a high population of manatees. There is no best time of the year for Antillean manatees, except trying to avoid a release during the hurricane season.

When appropriate, radio tracking gear for post-release monitoring may be applied, pursuant to approval from the FWS. Current tagging methodologies make it difficult to radio tag and belt manatees with a peduncle girth less than 100 cm. Post-release monitoring includes equipping manatees with transmitters (satellite, VHF, and/or sonic, as appropriate) for both remote and onsite monitoring. Biomedical assessments (*i.e.,* health assessments) are generally conducted on an as needed basis, based on the target animal's behavior observed from field biologists and in consultation with the attending veterinarian of record, the FWS, and Rehab program partners. Biomedical monitoring includes an examination of overall body condition, morphometrics (including straight line length, weight and peduncle girth), blubber thickness, collection of blood and fecal material, urine, milk, semen and other tissues when possible. Results of analyses should be consistent with known values for manatees of similar age, size, and sex and consistent with historical values for that specific individual. Maladaptive behavior, or a significant reduction in health status, may require an animal to be returned to a critical care facility for additional medical treatment and rehabilitation.

5.10 Manatee Rescue, Rehabilitation, and Rescue Program Reporting/Requesting Requirements

The FWS uses an electronic database for Florida manatees that requires program participants to report rescue, release, birth, death, and transfer events within 24 hours of occurrence. Pre-Release and transfers requests require prior approval from the FWS; requests should be submitted electronically two weeks prior to the proposed event. The Rescue Reporting Requirements are listed in Appendix D.

6 Guidelines for Release of Rehabilitated Sea Otters

6.1 Introduction

Sea otters are found in near shore waters of the North Pacific. Several subspecies and stocks have been identified in California, Washington, Alaska, Canada, and Russia. Sea otters may strand for a variety of reasons including trauma, disease, and the inability to forage. Guidelines for the release of rehabilitated sea otters are intended to address the welfare of these animals and any impacts the rehabilitated animals may have on wild otter populations.

Like many other marine mammals, stranded sea otters are often reported on beaches frequented by humans. In some cases, humans intercede and otherwise healthy pups are removed from the wild. The sea otter's small size makes it relatively easy to transport. However, there are currently few facilities capable of meeting the requirements for successful rehabilitation. These guidelines are intended to be used by facilities authorized to rehabilitate marine mammals under the MMPA and ESA, if applicable, and that are actively involved in the rehabilitation of sea otters for subsequent return to the wild. Questions regarding disposition and release approval of stranded sea otters must be directed to the appropriate FWS specialist (Appendix E).

6.2 Developmental Assessment of Sea Otter Pups

Sea otter pups are generally dependent on their mothers for the first six to 12 months of life. Newborn pups are readily distinguished by their natal pelage, small size (generally less than 6 pounds), and inability to care for themselves. Pups prematurely separated from their mothers or found stranded on a beach shortly after weaning are generally less than 20 pounds in weight and typically lack foraging skills necessary for survival.

Successful rehabilitation of stranded sea otter pups for release to the wild requires a significant commitment of time and resources. Facilities that receive a stranded pup and are unable to rear the pup for possible release to the wild must immediately contact the FWS to determine the disposition of the animal.

Rehabilitated sea otter pups that are at least 6 months of age, weigh at least 20 pounds, demonstrate adequate foraging, grooming, and social skills may be released to the wild. Rehabilitated sea otter pups must be monitored closely post-release to determine if their transition to the wild is successful (see post-release monitoring below).

6.3 Behavioral Assessment of Sea Otters

Certain behaviors are necessary for survival of rehabilitated sea otters. In addition, aberrant behaviors may preclude release to the wild. Rehabilitated sea otters may be released to the wild if the following behavioral criteria are met in the opinion of rehabilitation personnel familiar with normal sea otter behavior:

- The rehabilitated sea otter must demonstrate the ability and willingness to forage and capture live prey. This includes the use of tools such as rocks used to pound shelled prey;
- The rehabilitated sea otter must demonstrate basic survival skills and activities including active foraging, pelage management, diving, and resting;
- The rehabilitated sea otter must demonstrate "normal" social skills including interest in other sea otters and should exhibit a wariness of humans and anthropogenic activities; and

- The rehabilitated sea otter must not exhibit any aberrant behavior including behavior that may pose an unusual threat to human health and safety, wild sea otter populations, or other marine mammal populations.

6.4 Medical Assessment of Sea Otters

All rehabilitated sea otters must have a comprehensive, hands-on physical examination by a veterinarian experienced in sea otter medicine prior to release. The attending veterinarian must determine that the sea otter is likely to survive in the wild and must certify that:

- Blood sampling performed within two weeks of the proposed release date, including a CBC and serum chemistry profile, falls within normal ranges for the species;
- Medical diagnostic tests performed within two weeks of the proposed release date (*e.g.,* cultures, biopsies, urinalysis, serology, virology, parasitology, immunology, etc.) fall within normal parameters for the species or indicate a satisfactory state of health (reference CRC Handbook of Marine Mammal Medicine, 3rd Edition, Gulland *et al.* 2018);
- The rehabilitated sea otter should be free of drug residues (excluding sedatives used for transport or to facilitate physical examinations) and maintain good clinical health for two weeks prior to release or for a period that satisfies the attending veterinarian that the animal is healthy;
- The rehabilitated sea otter must have functional vision and hearing, reasonable dental health, and good control and function of all appendages, at least to the degree that its survival in the wild is not compromised; and
- The rehabilitated sea otter does not pose a known threat (*e.g.,* transmission of pathogens, congenital defects) to the wild sea otter populations or human health and safety.

6.5 Release Categories for Sea Otters

Despite the best efforts to rehabilitate stranded sea otters, many animals die or can never be released to the wild. The following categories have been identified to help determine the status of sea otters being held for rehabilitation:

1. **"RELEASABLE":** All rehabilitated sea otters meeting the medical and behavioral criteria listed above shall be considered "Releasable". Every effort should be made to release these animals to the wild as soon as they are deemed fit for release.

2. **"CONDITIONALLY RELEASABLE":** All live-stranded sea otters admitted to a rehabilitation program shall be considered "Conditionally Releasable" pending the outcome of rehabilitative treatments and a full medical examination and behavioral evaluation.

3. **"NON-RELEASABLE":** Sea otters that fail to meet one or more of the required criteria for release may be considered "Non-Releasable". Rehabilitation facilities that believe that they may have an animal that is "Non-Releasable" must contact FWS for concurrence on this finding and eventual disposition of the animal. Once FWS has determined that a sea otter is "Non-Releasable", the holding facility may request a permit for permanent placement of the animal as long as the facility meets the requirements under section 104(c)(7) of the MMPA for non-depleted species, or section 104(c)(3) or (c)(4) and section 10 of the ESA for depleted species. The facility must also be registered or hold a license from APHIS [7 U.S.C. 2131 *et seq*.].

6.6 Identification of Sea Otters Prior to Release

Rehabilitation facilities must affix colored and numbered "Temple" tags to the rear flippers of each sea otter prior to release. In addition, a PIT tag must be implanted in the right inguinal area of each otter. With an appropriate scientific research permit issued by FWS, the rehabilitation facility may implant an abdominal VHF transmitter to facilitate post-release tracking and monitoring of the animals. In all cases, the selection of identification numbers, tag colors/positions, and VHF frequencies must be coordinated with other facilities and researchers in the area that sea otters are released.

6.7 Release Site Selection for Sea Otters

All rehabilitated sea otters should be released at or near the site where they originally stranded. In cases where this is not feasible, or where other considerations support the release of rehabilitated sea otters in alternate locations, other release sites may be considered under existing federal permits, letters of authorization, or through consultation with personnel from the FWS (as identified in Appendix E). Rehabilitated sea otters must be released into the same stock or population from which they originated unless FWS determines that an exception is warranted.

6.8 Post-Release Monitoring of Sea Otters

All facilities releasing rehabilitated sea otters must establish a post-release monitoring program appropriate for each sea otter. The purpose of post-release monitoring is to determine the success of rehabilitation efforts and provide an opportunity for rescue of animals not able to make the transition back to the wild. Sea otters brought into rehabilitation as young pups must be tracked intensively immediately after release. Juveniles or sub-adults may require a focused effort while adult animals may be tracked opportunistically. Sea otters implanted with VHF transmitters should be tracked and monitored periodically for the duration of the battery life of the transmitters (*i.e.,* 1-3 years).

7 Policies Regarding Release of Rehabilitated Polar Bears

Polar bears occur in most ice-covered seas of the Northern Hemisphere and are circumpolar in distribution, although not continuously. Off the Alaskan coast, they normally occur as far south as the Bering Strait. In the Beaufort and Chukchi seas, polar bears make extensive migrations between the U.S. and Canada or Russian territories, respectively. These movements are thought to be related to seasonal and annual changes in ice position and condition.

Polar bears normally found stranded in Alaska and subsequently recovered are generally orphaned cubs-of-the-year that are either incapable of fending for themselves or have not yet developed the skills to adequately survive in the wild. While these animals are temporarily placed in facilities for the purposes of rehabilitation and release, in the long term, it is highly unlikely that such cubs would be suitable for release back into the wild. Hunting and survival skills are learned during the 2 ½ year dependence on the mother, are not innate to polar bear cubs, and will not be developed in captivity.

For the reasons noted above, the FWS considers polar bear cubs to be poor candidates for release into the wild. If releases were to occur, the predicted likely outcomes would be death by starvation or death caused by a predacious attack of another polar bear. Further, adoption by another family group is unlikely or impractical due to the low probability of encountering a receptive family group. Adoption of cubs into family groups has been attempted in Canada with very poor success and Canada is re-evaluating the feasibility of adoption as a management technique. The process of adoption requires substantial investment in searching out a family group in the wild, capture of the group (assisted by helicopter), and placement and follow-up on the fate of the adoptee. In Alaska, holding facilities co-located near release sites are not available. Therefore, FWS does not consider adoption to be a viable alternative and generally considers polar bear cubs to be “Non-Releasable” and more suitable for permanent placement in public display facilities. In these cases, the holding facility may request a permit for permanent placement of the animal as long as the facility meets the requirements under section 104(c)(7) of the MMPA, and is registered or holds a license from APHIS [7 U.S.C. 2131 *et seq*.]. However, FWS will continue to evaluate potential release into the wild or permanent placement in public display facilities on a case-by-case basis. Questions regarding disposition of stranded polar bears must be directed to the appropriate FWS contact (Appendix E).

8 References

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9 Appendices

Appendix A - “Recommended” Standard Checklists to Determine Release Category of All Rehabilitated Cetaceans
Appendix B - “Recommended” Standard Checklists to Determine Release Category of All Rehabilitated Pinnipeds (except walrus)
Appendix C – NMFS Release Plan Template
Appendix D – Manatee Rescue, Rehabilitation, and Required Report Fields
Appendix E – U.S. Fish and Wildlife Service Contacts
Appendix F - Cetacean-Species Specific Developmental Stages (Age-Length) and Social Dynamics
Appendix G - Pinniped-Species Specific Developmental Stages (Age-Length) and Social Dynamics

9.1 Appendix A -“Recommended” Standard Checklists to Determine Release Category of All Rehabilitated Cetaceans

Recommended Standard Checklist to Determine Release Category of all Rehabilitated Cetaceans

CETACEANS	**Release Determination Assessment (within 2 weeks of release)**		
Situational Clearance	**Yes (Releasable)**	**No (*Conditionally Releasable or Non-Releasable)**	**Conditionally Releasable or Non-releasable Comments**
1. The release candidate has NOT previously stranded.			If NO, either “Conditionally Releasable” or “Non-Releasable”
2. Release is NOT planned to occur outside of species/stock range due to factors such as environmental and logistical concerns (e.g., oil spill, HAB, UME, etc.).			If NO “Conditionally Releasable” or “Non-Releasable” (hold on longer)
Developmental Stage			
3. The cetacean is a sub-adult/adult and nutritionally and socially independent.			If NO, see below for calf
4. The calf is nutritionally independent, and forages completely on its own.			If NO, “Non-Releasable”* or “Conditionally Releasable” if stranded, rehabbed and released with its mother
5. The calf is socially independent (stock/species-specific).			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS and expert consultation)
Behavioral Clearance			
6. The release candidate demonstrates acceptable breathing, swimming, and, diving.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS and expert consultation)
7. The release candidate demonstrates an absence of aberrant behavior (regurgitation, head pressing, postural abnormalities, and decreased range of motion,) including excessive interest in interaction with humans.			If NO, “Conditionally Releasable” or “Non-Releasable” (work to counter-condition; modify release plan to be offshore, etc.)
8. The release candidate exhibits full auditory function.			If NO, “Conditionally Releasable” (some hearing impairment) or “Non-Releasable” (significant hearing impairment across ranges of frequencies)

	Yes (Releasable)	No (*Conditionally Releasable or Non-Releasable)	Conditionally Releasable or Non-releasable Comments
9. The release candidate exhibits full visual function.			If NO, “Conditionally Releasable” (some vision loss including loss of one eye) or “Non-Releasable” (fully blind)
10. The release candidate demonstrates foraging behavior or the ability to hunt and capture live prey.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS and expert consultation)
Medical Clearance			
11. The attending veterinarian has reviewed the release candidate’s history and medical records, including records from other facilities that have previously held the animal.			If NO, records need to be reviewed
12. The attending veterinarian has examined the release candidate within two weeks of release.			If NO, exam needs to take place
13. The required health screen and assessments (consider freshwater skin lesions) were conducted [following conclusion of medical treatment] with appropriate results for the age and species of the animal.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS and expert consultation)
14. Hands-on exam to be performed by veterinary or husbandry staff within 72 hours of release to assess for any medical or condition changes.			If NO, schedule exam
15. No known congenital defects.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS and expert consultation)
16. All appendages are functional.			If NO, “Conditionally Releasable” (partial function of fluke or fin) or “Non-Releasable” (NMFS and expert consultation)
17. The release candidate is sufficiently robust, having adequate reserves to survive readjustment in the wild.			If NO, increase mass (hold longer) or “Conditionally Releasable” (if behavioral reason for low release weight requires expert consultation) or “Non-Releasable” (medical condition)

	Yes (Releasable)	No (*Conditionally Releasable or Non-Releasable)	Conditionally Releasable or Non-releasable Comments
18. No active infection from exposure to domestic/terrestrial animals (dog, fox, coyote, etc.).			If NO, continue treatment until infection is cleared
19. The release candidate is NOT known to have inflicted a bite on human(s) during rehabilitation; or a bite occurred that broke the skin but animal has passed the quarantine period (in the previous).			If NO, “Non-Releasable” (until quarantine period is completed)
20. CBC results are generally within normal ranges for the age and species of the animal (within 2 weeks of release).			If NO, continue treatment until CBC within normal range or “Conditionally Releasable” (NMFS consultation)
21. Chemistry profile results are generally within normal ranges for the age and species of the animal (within 2 weeks of release).			If NO, continue treatment until Chemistry profile within normal range or “Conditionally Releasable” (NMFS consultation)
22. Additional testing requested by NMFS has been reviewed and there are NO apparent concerns.			If NO, Conditionally Releasable” or “Non-Releasable” (NMFS and expert consultation)
23. Medications have not been administered for a minimum of 2 weeks prior to release (excluding sedatives for transport).			If NO, hold until two week mark or may be “Conditionally Releasable” (NMFS and expert consultation if behavioral or other reason for early release)
24. Veterinarian’s signature on health statement.			If NO, acquire veterinarian signature
If All Yes Marks	**Releasable**		
If some No Marks		**Conditional Releasable or Non-Releasable see comments for directions**	

Health Statement
I have examined the cetacean (Species and ID#) ______ on (Date) _________ and have determined that the animal is medically and behaviorally suitable for release in accordance with the release criteria in that the animal will not pose a risk to the wild population and is likely to survive upon reintroduction to the wild.

Signature of the Attending Veterinarian   Printed Name of the Attending Veterinarian

Signature of the Authorized Representative   Printed Name of the Authorized Representative

9.2 Appendix B -“Recommended” Standard Checklists to Determine Release Category of All Rehabilitated Pinnipeds (except for walrus)

Recommended” Standard Checklist to Determine Release Category of all Rehabilitated Pinnipeds (except walrus)

PINNIPEDS	Release Determination Assessment (within 2 weeks of release)		
Situational Clearance	**Yes (Releasable)**	**No (*Conditionally Releasable or Non-Releasable)**	**Conditionally Releasable or Non-releasable Comments**
1. The release candidate has NOT previously stranded.			If NO, either “Conditionally Releasable” or “Non-Releasable”
2. Release is NOT planned to occur outside of species/stock range due to factors such as environmental and logistical concerns (e.g., oil spill, HAB, UME, etc.).			If NO “Conditionally Releasable” or “Non-Releasable”
Developmental Stage			
3. The pinniped is a sub-adult/adult and nutritionally and socially independent.			If NO, see below for pups
4. The pinniped pup is nutritionally independent and has proven ability to forage on its own.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS consultation)
5. The pinniped pup is socially independent (stock/species-specific).			If NO, “Conditionally Releasable” or “Non-Releasable” (*e.g.,* California or Steller sea lion pup stranded at <6 months of age or pup born in rehabilitation; NMFS consultation)
Behavioral Clearance			
6. The pinniped demonstrates appropriate breathing, swimming, diving and locomotion on land.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS consultation)
7. The pinniped demonstrates an absence of aberrant behavior (regurgitation, head pressing, postural abnormalities such as repetitive arching or tucking, head swaying, stereotypic or idiosyncratic pacing, decreased or unusual range of motion, etc.) including attraction to or desensitization to the presence of humans.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS consultation)

	Yes (Releasable)	No (*Conditionally Releasable or Non-Releasable)	Conditionally Releasable or Non-releasable Comments
8. The pinniped exhibits acceptable auditory function.			If NO, “Conditionally Releasable” (some hearing impairment) or “Non-Releasable” (significant hearing impairment)
9. The pinniped exhibits full visual function.			If NO, “Conditionally Releasable” (some vision loss including loss of one eye) or “Non-Releasable” (fully blind)
10. The pinniped demonstrates a capacity to hunt and capture live prey.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS consultation)
Medical Clearance			
11. The attending veterinarian has reviewed the pinnipeds history and medical records, including records from other facilities that have previously held the animal.			If NO, records need to be reviewed
12. The attending veterinarian has examined the release candidate within two weeks of release.			If NO, exam needs to take place
13. The required health screen and assessments (consider molt stage) were conducted [following conclusion of medical treatment] with appropriate results for the age and species of the animal.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS consultation)
14. Hands-on exam to be performed by veterinary or husbandry staff within 72 hours of release to assess for any medical or condition changes.			If NO, schedule exam
15. No known congenital defects.			If NO, “Conditionally Releasable” or “Non-Releasable” (NMFS consultation)
16. All appendages are functional.			If NO, “Conditionally Releasable” (missing or partial function of one flipper) or “Non-Releasable” (NMFS consultation)
17. The release candidate is sufficiently robust, having adequate reserves to survive readjustment in the wild.			If NO, increase mass (hold longer) or “Conditionally Releasable” (if behavioral reason for low release weight requires NMFS consultation) or “Non-Releasable” (medical condition)
18. No active infection from exposure to domestic/terrestrial animals (dog, fox, coyote, etc.).			If NO, continue treatment until infection is cleared

	Yes (Releasable)	No (*Conditionally Releasable or Non-Releasable)	Conditionally Releasable or Non-releasable Comments
19. The release candidate is NOT known to have inflicted a bite on human(s) during rehabilitation; or a bite occurred that broke the skin but animal has passed the quarantine period (in the previous).			If NO, "Non-Releasable" (until quarantine period is completed)
20. CBC results are generally within normal ranges for the age and species of the animal (within 2 weeks of release).			If NO, continue treatment until CBC within normal range or "Conditionally Releasable" (NMFS consultation)
21. Chemistry profile results are generally within normal ranges for the age and species of the animal (within 2 weeks of release).			If NO, continue treatment until Chemistry profile within normal range or "Conditionally Releasable" (NMFS consultation)
22. Additional testing requested by NMFS has been reviewed and there are NO apparent concerns.			If NO, Conditionally Releasable" or "Non-Releasable" (NMFS consultation)
23. Medications have not been administered for a minimum of 2 weeks prior to release (excluding sedatives for transport).			If NO, hold until two week mark or may be "Conditionally Releasable" (NMFS consultation if behavioral or other reason for early release)
24. Veterinarian's signature on health statement.			If NO, acquire veterinarian signature
If All Yes Marks	**Releasable**		
If some No Marks		**Conditional Releasable or Non-Releasable see comments for directions**	

Health Statement

I have examined the cetacean (Species and ID#) _____________ on (Date) ________________ and have determined that the animal is medically and behaviorally suitable for release in accordance with the release criteria in that the animal will not pose a risk to the wild population and is likely to survive upon reintroduction to the wild.

Signature of the Attending Veterinarian 		Printed Name of the Attending Veterinarian

Signature of the Authorized Representative 		Printed Name of the Authorized Representative

9.3 Appendix C – NMFS Release Plan Template

Proposed Release, Research, Monitoring and Contingency Plan for (Species, Animal ID, "Name")

Contact(s):
Proposed Release Date and Time:

I. Release Logistics: (*add short descriptions for the bulleted list*)
Upon medical and permit clearance of Animal (ID):

- Transport logistics to release site
- Personnel for transport
- Release method/description from land and/or vessel

II. Release Site selection rationale: (*add short descriptions for the bulleted list*)

- Suitability of release site (accessibility, safety)
- Animal (ID) home range (if known) with seasonality considerations (if unknown, discuss with experts) and potential for occurrence of conspecifics
- Visual Monitoring availability (if applicable)
- Consultation and communication with local authorities, land management agencies, or those with jurisdiction over proposed release sites

III. Research and Monitoring Plan: (*add short descriptions for the bulleted list*)

- Objective
- Marking and Tagging, etc. (*include training and expertise*)
- Long-term (remote) monitoring (if possible) including visual or radio tracking capabilities
- Visual monitoring and assessment plan (if applicable)
- Follow-up response and/or recapture triggers

IV. Contingency Plan: (*add short descriptions for the bulleted list*)
Pre-release

Signs of stress during transport (intervention, abort transport, euthanasia)

Post-release

- Re-strand due to physical or behavioral distress
- Re-capture/relocation? (if possible)
- Placement?
- Euthanasia?

V. Media and Social Media Plan: (*add short descriptions for the bulleted list*)

- Social media pre-release notification/announcement
- Public Information or Outreach Personnel at release site
- Crowd control if applicable (Rope or tape off observation areas)
- Social media post-release notification/web story

9.4 Appendix D - Manatee Rescue, Rehabilitation, and Release Report Fields

Rescue: Reporting Requirements	**Release: Request Information**	**Transfer: Request Information**	**Death: Reporting Requirements**	**Captive Birth: Reporting Requirements**
Name of Reporting Organization Date Report Filed Date Event Occurred Type of Rescue Identification ▪ Name (if any) ▪ Studbook Number ▪ Identification Numbers (in the case of multiple numbers, all numbers should be entered) PIT Tag ▪ Right (identifying number) ▪ Left (identifying number) Freeze Brand (yes/no) ▪ Number Sex Weight (lbs/kg) ▪ Actual/estimated Length (cm/inches) ▪ Actual/estimated Ultrasound (yes/no) County Nearest Town/Community Waterbody Latitude/Longitude Probable Cause for Rescue ▪ (Drop down list includes various common causes; additional information is required for entangled animals) Health Status at Time of Report Rehabilitation Facility (if any) Veterinarian Facility Supervisor Rescue Participants Name of Reporter Telephone Number	Name of Requesting Organization Date Request Filed Date Event Proposed Identification ▪ Name (if any) ▪ Studbook Number ▪ Identification Numbers (in the case of multiple numbers, all numbers should be entered) PIT Tag ▪ Right (identifying number) ▪ Left (identifying number) Freeze Brand (yes/no) ▪ Number Other Tags Name of Tracker/Affiliation Tracker Telephone Number Sex Weight (lbs/kg) ▪ Actual ▪ Date Taken Length (cm/inches) ▪ Actual ▪ Date Taken Peduncle Girth (cm) ▪ Date Taken Ultrasound (yes/no) County Where Rescued Nearest Town/Community Waterbody Latitude/Longitude Date of Rescue Weight at Time of Rescue Length at Time of Rescue Proposed Date of Release Actual Date of Release County Where Released Nearest Town/Community Where Released Waterbody Where Released Veterinarian Facility Supervisor Release Participants Name of Reporter Telephone Number	Name of Requesting Organization Date Request Filed Date Event Proposed Identification ▪ Name (if any) ▪ Studbook Number ▪ Identification Numbers (in the case of multiple numbers, all numbers should be entered) Sex Weight (lbs/kg) ▪ Actual ▪ Date Taken Length (cm/inches) ▪ Actual ▪ Date Taken Date Brought Into Captivity Date of Proposed Transfer Actual Date of Transfer Veterinarian Facility Supervisor Release Participants Name of Reporter Telephone Number	Name of Reporting Organization Date Report Filed Date Died Identification ▪ Name (if any) ▪ Studbook Number ▪ Identification Numbers (in the case of multiple numbers, all numbers should be entered) Sex Date Rescued Probable Cause of Death (or Euthanized) Disposition of Carcass Veterinarian Facility Supervisor Name of Reporter Telephone Number	Name of Reporting Organization Date Report Filed Date Born Identification ▪ Name (if any) ▪ Studbook Number ▪ Identification Numbers (in the case of multiple numbers, all numbers should be entered) Sex Weight (lbs/kg) ▪ Actual ▪ Date Taken Length (cm/inches) ▪ Actual ▪ Date Taken Present Health Status Origin of Dam Circumstances of Birth Dam Identification ▪ Name (if any) ▪ Studbook Number (if any) ▪ Identification Numbers (in the case of multiple numbers, all numbers should be entered) Sire Identification ▪ Name (if any) ▪ Studbook Number (if any) ▪ Identification Numbers (in the case of multiple numbers, all numbers should be entered)

9.5 Appendix E – U.S. Fish and Wildlife Service Contacts

OFFICE	ADDRESS	PHONE
Headquarters	Ecological Services Division of Restoration and Recovery 5275 Leesburg Pike, MS: ES Falls Church, VA 22041	Phone: (703) 358-2171 Fax: (703) 358-1735
LOAs and Permits	International Affairs Division of Management Authority 5275 Leesburg Pike, MS: IA Falls Church, VA 22041	Phone: (703) 358-2104 Fax: (703) 358-2281
Florida Manatees	North Florida Ecological Services Field Office 7915 Baymeadows Way, Suite 200 Jacksonville, FL 32256	Phone: (904) 731-3336 Fax: (904) 731-3045
Antillean Manatees	Caribbean Ecological Services Field Office CARR 301, KM 5.1 P.O. Box 491 Boquerón, Puerto Rico 00622	Phone: (787) 851-7297 Fax: (787) 851-7440
Southern Sea Otters in California	Ventura Fish and Wildlife Office 2493 Portola Road, Suite B Ventura, CA 93003	Phone: (805) 644-1766 Fax: (805) 644-3958
Northern Sea Otters in Washington	Washington Fish and Wildlife Office 510 Desmond Drive SE, Suite 102 Lacey, WA 98503	Phone: (360) 753-9440 Fax: (360) 753-9405
Polar Bears, Pacific Walrus, and Northern Sea Otters in Alaska	Marine Mammals Management Office 1011 E. Tudor Road Anchorage, AK 99503	Phone: (907) 786-3800 Fax: (907) 786-3816

9.6 Appendix F - Cetacean-Species Specific Developmental Stages (Age-Length) and Social Dynamics

Scientific Name	Common Name	Length at Birth (cm)	Neonate length (cm)	Length at 1 Year of Age (cm)	Length at 2 Years of Age (cm)	Age at Weaning (yrs)	Length at Weaning (cm)	Adult Length (cm)	Typical Group Size	Freq. of Occurrence of Single Individuals
Delphinapterus leucas	Beluga Whale	160	130-160	216	250	2	250	F 300-400; M 400-450	up to 100s	uncommon
Delphinus capensis	Long-beaked Saddleback Dolphin	< 100	NA	NA	NA	NA	NA	NA	up to 1000s	uncommon
Delphinus delphis	Common Dolphin	80-90	80-100	NA	NA	NA	110-120	230-250	up to 1000s	uncommon
Feresa attenuata	Pygmy Killer Whale	80	NA	NA	NA	NA	NA	240-270	up to 10s	occasional
Globicephala macrorhynchus	Short-finned Pilot Whale	140-185	150	NA	NA	2-3	NA	F 400-500: M 500-600	up to 100s	rare
Globicephala melas	Long-finned Pilot Whale	177	160-200	NA	NA	2-3	240	F 450-500; M 450-600	up to 100s	rare
Grampus griseus	Risso's Dolphin	110-150	120-160	NA	NA	NA	NA	300-400	up to 100s	occasional
Kogia breviceps	Pygmy Sperm Whale	120	100-120	NA	NA	1	NA	300 - 370	up to 10s	not uncommon
Kogia sima	Dwarf Sperm Whale	95	100	NA	NA	1	NA	210-270	up to 10s	not uncommon
Lagenodelphis hosei	Fraser's Dolphins	100	100	NA	NA	NA	NA	240	100s to 1000s	uncommon
Lagenorhynchus acutus	Atlantic White- sided Dolphin	108-122	100-130	142-156	176-190	1.5	180	240-270	up to 100s	uncommon
Lagenorhynchus albirostris	White Beaked Dolphin	110-120	110-130	NA	NA	NA	NA	300-320	100s to 1000s	occasional
Lagenorhynhchu s obliquidens	Pacific White- sided Dolphin	92	80-100	NA	NA	NA	NA	220-230	10s to 1000s	uncommon
Lissodelphis borealis	Northern Right Whale Dolphin	80-100	80-100	NA	NA	NA	NA	F 220-230; M 260-300	up to 100s	occasional
Mesoplodon densirostris	Blainville's Beaked Whale	200	NA	NA	NA	NA	NA	450-470	up to 10s	occasional
Mesoplodon europaeus	Gervais' Beaked Whale	210	210	NA	NA	NA	NA	450-520	up to 10s	uncommon
Orcinus orca	Killer Whale	183-228	210-250	NA	NA	1.5-2	400	F 700-800; M 800-950	up to 100s	infrequent - adult males
Peponocephala electra	Melon- Headed Whale	100	NA	NA	NA	NA	NA	270	100s to 1000s	uncommon
Phocoena phocoena	Harbor Porpoise	70	70-90	110-135	115-155	0.3-1	100 - 110	140-170	up to 10s	not uncommon
Phocoenoides dalli	Dall's Porpoise	100	100	NA	NA	0.3-2	NA	180-220	up to 10s	uncommon

Scientific Name	**Common Name**	**Length at Birth (cm)**	**Neonate length (cm)**	**Length at 1 Year of Age (cm)**	**Length at 2 Years of Age (cm)**	**Age at Weaning (yrs)**	**Length at Weaning (cm)**	**Adult Length (cm)**	**Typical Group Size**	**Freq. of Occurrence of Single Individuals**
Physeter macrocephalus	Sperm Whale	400	350-500	NA	670	2+	670	F 1100-1300; M1500-1800	up to 10s	adult males
Pseudorca crassidens	False Killer Whale	160	170-200	NA	NA	1.5-2	NA	F 500; M 550-600	up to 10s	rare
Stenella attenuata	Pantropical Spotted Dolphin	85	80-100	129-142	NA	1-2	140	120	100s to 1000s	uncommon
Stenella clymene	Clymene Dolphin	NA	NA	NA	NA	NA	NA	180-200	up to 10s	occasional
Stenella coeruleoalba	Striped Dolphin	93-100	100	166	180	NA	170	220-260	10s to 100s	uncommon
Stenella frontalis	Atlantic Spotted Dolphin	100	80-120	NA	NA	NA	140	200-230	up to 10s	uncommon
Stenella longirostris	Spinner Dolphin	75	70-80	133-137	NA	1-2	NA	180-220	up to 1000s	uncommon
Steno bredanensis	Rough-toothed Dolphin	100	NA	NA	NA	NA	NA	240-270	up to 10s	uncommon
Tursiops truncatus	Bottlenose Dolphin	100-110	100-130	170-200	170-225	1.5-2	170-225	Coastal 220-300; Offshore 250-650	up to 10s	occasional
Ziphius cavirostris	Cuvier's Beaked Whale	270	200-300	NA	NA	NA	NA	670 - 700	up to 10s	not uncommon

9.7 Appendix G - Pinniped-Species Specific Developmental Stages (Age-Length) and Social Dynamics

Scientific Name	Common Name	Length at Birth (cm)	Neonate Length (cm)	Age at Weaning	Length at Weaning (cm)	Adult Length (cm)	Pups Born	Peak of Pupping
Arctocephalus townsendi	Guadalupe Fur Seal	60	60	9-11 mos	NA	F 140-170; M 180-240	June	June
Callorhinus ursinus	Northern Fur Seal	60-65	60	3-4 mos	NA	F 100-150; M 190-230	June-July	June-July
Cystophora cristata	Hooded Seal	90-100	90-110	4-12 days	NA	F 200-230; M 230-290	Late March	Late March
Erignathus barbatus	Bearded Seal	130	130	12-18 days	150	210-250	Mid-Oct to Mid-Nov	Mid-June
Eumetopias jubatus	Steller Sea Lion	100	100	~1 yr	180	F 220-290; M 240-330	Mid-May to Mid-June	Mid-June
Halichoerus grypus	Gray Seal	90-110	80-110	16-21 days	110	F 180-210; M 220-250	January- February	January
Histriophoca fasciata	Ribbon Seal	80-90	80-90	3-4 weeks	90-110	150-180	April-May	Early April
Mirounga angustirostris	Northern Elephant Seal	125	120-140	28 days	150	F 200-320: M 380-410	January	End of January
Monachus schauinslandi	Hawaiian Monk Seal	100	100	3-7 weeks	100	F 230-240; M 210-220	December- August	March-May
Odobenus rosmarus	Walrus	100-120	100-140	2+ years	200	F 230-260; M 270-320	April-June	May
Pagophilus groenlandicus	Harp Seal	85	80-110	12 days	100	160-190	February- March	March
Phoca larga	Spotted Seal	77-92	80-90	4-6 weeks	110	160-170	Early April- Early May	Early April
Phoca vitulina	Harbor Seal	70-100	70-90	3-6 weeks	90	150-190	May-June	May
Pusa hispida	Ringed Seal	60-65	60-70	6-8 weeks	80	120-150	Mid-March to Mid-April	Early April
Zalophus californianus	California Sea Lion	75	70	10-12 mos	NA	F 150-200; M 200-240	June	June

Appendix VI

Biological Resources

(Note: All biological resources listed in this appendix are correct as of October 2020)

Table 1. Protected and Sensitive Habitats on the U.S. Atlantic Coast

Protected and Sensitive Habitat	Type	State/ Territory
Acadia National Park	NP	ME
Alligator River National Wildlife Refuge	NWR	NC
Amagansett National Wildlife Refuge	NWR	NY
Ashepoo-Combahee-Edisto Basin NERR	NERR	SC
Assateague Island National Seashore	NS	VA
Back Bay National Wildlife Refuge	NWR	VA
Blackbeard Island National Wildlife Refuge	NWR	GA
Blackwater National Wildlife Refuge	NWR	MD
Block Island National Wildlife Refuge	NWR	RI
Bombay Hook National Wildlife Refuge	NWR	DE
Canaveral National Seashore	NS	FL
Cape Cod Bay Northern Right Whale Critical Habitat	CH	MA
Cape Cod National Seashore	NS	MA
Cape Hatteras National Seashore	NS	NC
Cape Lookout National Seashore	NS	NC
Cape May National Wildlife Refuge	NWR	NJ
Cape Romain National Wildlife Refuge	NWR	SC
Cedar Island National Wildlife Refuge	NWR	NC
Chesapeake Bay National Estuarine Research Reserve - Maryland	NERR	MD
Chesapeake Bay National Estuarine Research Reserve - Virginia	NERR	VA

Chincoteague National Wildlife Refuge	NWR	VA
Conscience Point National Wildlife Refuge	NWR	NY
Cross Island National Wildlife Refuge	NWR	ME
Cumberland Island National Seashore	NS	GA
Currituck National Wildlife Refuge	NWR	NC
Delaware National Estuarine Research Reserve	NERR	DE
Eastern Neck National Wildlife Refuge	NWR	MD
Eastern Shore of Virginia National Wildlife Refuge	NWR	VA
Edwin B. Forsythe National Wildlife Refuge	NWR	NJ
Elizabeth Alexandra Morton National Wildlife Refuge	NWR	NY
Ernest F. Hollings Ace Basin National Wildlife Refuge	NWR	SC
Fire Island National Seashore	NS	NY
Fisherman Island National Wildlife Refuge	NWR	VA
Fort Pulaski National Monument	NM	GA
Fort Sumter National Monument	NM	SC
Franklin Island National Wildlife Refuge	NWR	ME
Gateway National Recreation Area	NRA	NJ
Gerry E. Studds/Stellwagen Bank National Marine Sanctuary	NMS	MA
Gray's Reef National Marine Sanctuary	NMS	GA
Great Bay National Estuarine Research Reserve	NERR	NH
Great Bay National Wildlife Refuge	NWR	NH
Great South Channel Northern Right Whale Critical Habitat	CH	MA
Guana Tolomato Matanzas National Estuarine Research Reserve	NERR	FL
Harris Neck National Wildlife Refuge	NWR	GA
Hawksbill Sea Turtle Critical Habitat	CH	IM
Hudson River National Estuarine Research Reserve	NERR	NY
Jacques Cousteau National Estuarine Research Reserve	NERR	NJ
John H. Chafee National Wildlife Refuge	NWR	RI
Johnson’s Seagrass Critical Habitat	CH	FL

Mackay Island National Wildlife Refuge	NWR	NC
Martin National Wildlife Refuge	NWR	MD
Mashpee National Wildlife Refuge	NWR	MA
Merritt Island National Wildlife Refuge	NWR	FL
Monitor National Marine Sanctuary	NMS	VA
Monomoy National Wildlife Refuge	NWR	MA
Moosehorn National Wildlife Refuge	NWR	ME
Nansemond National Wildlife Refuge	NWR	VA
Nantucket National Wildlife Refuge	NWR	MA
Narragansett Bay National Estuarine Research Reserve	NERR	RI
Ninigret National Wildlife Refuge	NWR	RI
Nomans Land Island National Wildlife Refuge	NWR	MA
North Carolina National Estuarine Research Reserve	NERR	NC
North Inlet-Winyah Bay National Estuarine Research Reserve	NERR	SC
Oyster Bay National Wildlife Refuge	NWR	NY
Parker River National Wildlife Refuge	NWR	MA
Pea Island National Wildlife Refuge	NWR	NC
Petit Manan National Wildlife Refuge	NWR	ME
Pinckney Island National Wildlife Refuge	NWR	SC
Piping Plover Critical Habitat	CH	NC-FL
Plum Tree Island National Wildlife Refuge	NWR	VA
Pond Island National Wildlife Refuge	NWR	ME
Prime Hook National Wildlife Refuge	NWR	DE
Rachel Carson National Wildlife Refuge	NWR	ME
Rappahannock River Valley National Wildlife Refuge	NWR	VA
Sachuest Point National Wildlife Refuge	NWR	RI
Sapelo Island National Estuarine Research Reserve	NERR	GA
Seal Island National Wildlife Refuge	NWR	ME
Seatuck National Wildlife Refuge	NWR	NY

Southeastern Right Whale Critical Habitat	CH	GA-FL
Stewart B. McKinney National Wildlife Refuge	NWR	CT
Supawna Meadows National Wildlife Refuge	NWR	NJ
Susquehanna National Wildlife Refuge	NWR	MD
Swanquarter National Wildlife Refuge	NWR	NC
Target Rock National Wildlife Refuge	NWR	NY
Thacher Island National Wildlife Refuge	NWR	MA
Timucuan Ecological & Historic Preserve	NP	FL
Trustom Pond National Wildlife Refuge	NWR	RI
Tybee National Wildlife Refuge	NWR	SC
Wallops Island National Wildlife Refuge	NWR	VA
Waquoit Bay National Estuarine Research Reserve	NERR	MA
Wassaw National Wildlife Refuge	NWR	GA
Wells National Estuarine Research Reserve	NERR	ME
Wertheim National Wildlife Refuge	NWR	NY
West Indian Manatee Critical Habitat	CH	FL
Wolf Island National Wildlife Refuge	NWR	GA

Source: DOC/NOAA and DOI 2017
Notes: CH – Critical Habitat
NERR – National Estuarine Research Reserve
NP – National Park
NRA – National Recreation Area
NS – National Seashore
NWR – National Wildlife Refuge

Table 2. Protected and Sensitive Habitats in the Caribbean

Protected and Sensitive Habitat	Type	State/Territory
Cabo Rojo National Wildlife Refuge	NWR	PR
Culebra National Wildlife Refuge	NWR	PR
Desecho National Wildlife Refuge	NWR	PR
Green Sea Turtle Critical Habitat	CH	PR
Jobos Bay National Estuarine Research Reserve	NERR	PR

Leatherback Sea Turtle Critical Habitat	CH	USVI
Salt River Bay National Historic Park and Ecological Preserve	NP	USVI
Sandy Point National Wildlife Refuge	NWR	USVI
Vieques National Wildlife Refuge	NWR	PR
Virgin Islands Coral Reef National Monument	NM	USVI
Virgin Islands National Park	NP	USVI
Yellow-shouldered Blackbird Critical Habitat	CH	PR

Source: DOC/NOAA and DOI 2017
Notes: CH – Critical Habitat
NERR – National Estuarine Research Reserve
NP – National Park
NWR – National Wildlife Refuge

Table 3. Protected and Sensitive Habitats in the Gulf of Mexico

Protected and Sensitive Habitat	Type	State/Territory
Anahuac National Wildlife Refuge	NWR	TX
Apalachicola National Estuarine Research Reserve	NERR	FL
Aransas National Wildlife Refuge	NWR	TX
Archie Carr National Wildlife Refuge	NWR	FL
Bayou Savage National Wildlife Refuge	NWR	LA
Big Boggy National Wildlife Refuge	NWR	TX
Big Branch Marsh National Wildlife Refuge	NWR	LA
Biscayne National Park	NP	FL
Brazoria National Wildlife Refuge	NWR	TX
Breton National Wildlife Refuge	NWR	LA
Caloosahatchee National Wildlife Refuge	NWR	FL
Cedar Keys National Wildlife Refuge	NWR	FL
Chassahowitzka National Wildlife Refuge	NWR	FL
Crocodile Lake National Wildlife Refuge	NWR	FL
Crystal River National Wildlife Refuge	NWR	FL
Delta National Wildlife Refuge	NWR	LA

Dry Tortugas National Park	NP	FL
Egmont Key National Wildlife Refuge	NWR	FL
Everglades National Park	NP	FL
Florida Keys National Marine Sanctuary	NMS	FL
Flower Garden Banks National Marine Sanctuary	NMS	TX
Grand Bay National Estuarine Research Reserve	NERR	MS
Grand Bay National Wildlife Refuge	NWR	AL
Great White Heron National Wildlife Refuge	NWR	FL
Gulf Islands National Seashore	NS	FL
Gulf Islands National Seashore	NS	MS
Gulf Sturgeon Critical Habitat	CH	FL-LA
Hobe Sound National Wildlife Refuge	NWR	FL
Island Bay National Wildlife Refuge	NWR	FL
J.N. Ding Darling National Wildlife Refuge	NWR	FL
Jean Lafitte National Historical Park	NP	LA
Key West National Wildlife Refuge	NWR	FL
Laguna Atascosa National Wildlife Refuge	NWR	TX
Lower Rio Grande Valley National Wildlife Refuge	NWR	TX
Lower Suwannee National Wildlife Refuge	NWR	FL
Matlacha Pass National Wildlife Refuge	NWR	FL
McFaddin National Wildlife Refuge	NWR	TX
Mission-Aransas National Estuarine Research Reserve	NERR	TX
Mississippi Sandhill Crane National Wildlife Refuge	NWR	MS
Moody National Wildlife Refuge	NWR	TX
National Key Deer Refuge	NWR	FL
Padre Island National Seashore	NS	TX
Passage Key National Wildlife Refuge	NWR	FL
Pelican Island National Wildlife Refuge	NWR	FL

Pine Island National Wildlife Refuge	NWR	FL
Pinellas National Wildlife Refuge	NWR	FL
Piping Plover Critical Habitat	CH	FL-TX
Rookery Bay National Estuarine Research Reserve	NERR	FL
Sabine National Wildlife Refuge	NWR	LA
San Bernard National Wildlife Refuge	NWR	TX
Shell Keys National Wildlife Refuge	NWR	LA
St. Marks National Wildlife Refuge	NWR	FL
St. Vincent National Wildlife Refuge	NWR	FL
Ten Thousand Islands National Wildlife Refuge	NWR	FL
Texas Point National Wildlife Refuge	NWR	TX
Weeks Bay National Estuarine Research Reserve	NERR	AL
West Indian Manatee Critical Habitat	CH	FL
Whooping Crane Critical Habitat	CH	TX

Source: DOC/NOAA and DOI 2017
Notes: CH – Critical Habitat
NERR – National Estuarine Research Reserve
NP – National Park
NS – National Seashore
NWR – National Wildlife Refuge

Table 4. Protected and Sensitive Habitats on the U.S. Pacific Coast

Protected and Sensitive Habitat	Type	State/Territory
Alaska Maritime National Wildlife Refuge	NWR	AK
Arctic National Wildlife Refuge	NWR	AK
Bandon Marsh National Wildlife Refuge	NWR	OR
Bering Land Bridge National Park and Preserve	NP	AK
Black Abalone	CH	CA
Bocaccio	CH	WA
Cabrillo National Monument	NM	CA
California Central Valley Steelhead ESU Critical Habitat	CH	CA
California Coastal Chinook Salmon ESU Critical Habitat	CH	CA
California Coastal National Monument - Point Arena-Stornetta Unit	NM	CA
Cape Krusenstern National Monument	NM	AK
Castle Rock National Wildlife Refuge	NWR	CA
Central America Humpback DPS Proposed Critical Habitat	CH (proposed)	CA/OR
Central California Coast Coho Salmon ESU Critical Habitat	CH	CA
Central California Steelhead ESU Critical Habitat	CH	CA
Central Valley Spring-run Chinook Salmon ESU Critical Habitat	CH	CA
Channel Islands National Marine Sanctuary	NMS	CA
Channel Islands National Park	NP	CA
Coastal California Gnatcatcher Critical Habitat	CH	CA
Columbia River Chum Salmon ESU Critical Habitat	CH	OR/WA
Cordell Bank National Marine Sanctuary	NMS	CA
Don Edwards San Francisco Bay National Wildlife Refuge	NWR	CA
Dungeness National Wildlife Refuge	NWR	WA
Ebey's Landing National Historical Reserve	NP	WA
Elkhorn Slough National Estuarine Research Reserve	NERR	CA

Eulachon	CH	OR-WA
Farallon National Wildlife Refuge	NWR	CA
Glacier Bay National Park & Preserve	NP	AK
Golden Gate National Recreation Area	NRA	CA
Grays Harbor National Wildlife Refuge	NWR	WA
Greater Farallones National Marine Sanctuary	NMS	CA
Hood Canal Summer-run Chum Salmon ESU Critical Habitat	CH	WA
Humboldt Bay National Wildlife Refuge	NWR	CA
Kachemak Bay National Estuarine Research Reserve	NERR	AK
Leatherback Seaturtle	CH	CA-WA
Lewis and Clark National Wildlife Refuge	NWR	OR
Lower Columbia River Chinook Salmon ESU Critical Habitat	CH	OR/WA
Lower Columbia River Coho Salmon ESU Critical Habitat	CH	OR-WA
Lower Columbia River Steelhead ESU Critical Habitat	CH	OR-WA
Marbled Murrelet Critical Habitat	CH	AK
Marin Islands National Wildlife Refuge	NWR	CA
Mexico Humpback DPS Proposed Critical Habitat	CH (proposed)	CA-WA, AK
Middle Columbia River Steelhead ESU Critical Habitat	CH	OR-WA
Monterey Bay National Marine Sanctuary	NMS	CA
Nestucca Bay National Wildlife Refuge	NWR	OR
Nisqually National Wildlife Refuge	NWR	WA
North Pacific Right Whale	CH	AK
Northern California Steelhead ESU Critical Habitat	CH	CA
Olympic Coast National Marine Sanctuary	NMS	WA
Olympic National Park	NP	WA
Oregon Coast Coho Salmon ESU Critical Habitat	CH	OR
Ozette Lake Sockeye Salmon ESU Critical Habitat	CH	WA
Padilla Bay National Estuarine Research Reserve	NERR	WA

Point Reyes National Seashore	NS	CA
Protection Island National Wildlife Refuge	NWR	WA
Puget Sound Chinook Salmon ESU Critical Habitat	CH	WA
Puget Sound Steelhead ESU Critical Habitat	CH	WA
Redwood National Park	NP	CA
Sacramento River Winter-run Chinook Salmon ESU Critical Habitat	CH	CA
Salinas River National Wildlife Refuge	NWR	CA
San Diego Bay National Wildlife Refuge	NWR	CA
San Francisco Bay National Estuarine Research Reserve	NERR	CA
San Juan Island National Historical Park	NP	WA
San Juan Islands National Wildlife Refuge	NWR	WA
San Pablo Bay National Wildlife Refuge	NWR	CA
Seal Beach National Wildlife Refuge	NWR	CA
Siletz Bay National Wildlife Refuge	NWR	OR
Sitka National Historical Park	NP	AK
Snake River Basin Steelhead ESU Critical Habitat	CH	OR-WA
Snake River fall-run Chinook Salmon ESU Critical Habitat	CH	OR-WA
Snake River Sockeye Salmon ESU Critical Habitat	CH	OR-WA
South Slough National Estuarine Research Reserve	NERR	OR
South-Central California Coast Steelhead ESU Critical Habitat	CH	CA
Southern California Steelhead ESU Critical Habitat	CH	CA
Southern Oregon/Northern California Coasts Coho Salmon ESU Critical Habitat	CH	CA/OR
Southern Resident Killer Whale	CH (including proposed revision)	WA
Spectacled Eider Critical Habitat	CH	AK
Steller Sea Lion Conservation Area	Conservation Area	AK
Steller Sea Lion Critical Habitat	CH	CA/OR/AK

Steller's Eider Critical Habitat	CH	AK
Tidewater Goby Critical Habitat	CH	CA
Tijuana River National Estuarine Research Reserve	NERR	CA
Tijuana Slough National Wildlife Refuge	NWR	CA
Upper Columbia River spring-run Chinook Salmon ESU Critical Habitat	CH	OR-WA
Upper Columbia River Steelhead ESU Critical Habitat	CH	OR-WA
Upper Willamette River Chinook Salmon ESU Critical Habitat	CH	OR
Upper Willamette River Steelhead ESU Critical Habitat	CH	OR
Wake Atoll National Wildlife Refuge	NWR	AK
Western North Pacifc Humpback DPS Proposed Critical Habitat	CH (proposed)	AK
Western Snowy Plover Critical Habitat	CH	CA-WA
Willapa National Wildlife Refuge	NWR	WA
Yelloweye Rockfish	CH	WA
Yukon Delta National Wildlife Refuge	NWR	AK

Source: DOC/NOAA and DOI 2017

Notes: CH – Critical Habitat

NERR – National Estuarine Research Reserve

NM – National Monument

NMS – National Marine Sanctuary

NP – National Park

NS – National Seashore

NWR – National Wildlife Refuge

Table 5. Protected and Sensitive Habitats in the Pacific Islands

Protected and Sensitive Habitat	Type	State/Territory
Hawaiian Monk Seal Critical Habitat	CH	HI
Rose Atoll Marine National Monument	NM	AS
National Marine Sanctuary of American Samoa	NMS	AS
National Park of American Samoa	NP	AS
Rose Atoll National Wildlife Refuge/Marine National Monument	NWR/NM	AS
Marianas Trench Marine National Monument	NM	CNMI
War in the Pacific National Historical Park	NP	GU
Guam National Wildlife Refuge	NWR	GU
Papahānaumokuākea Marine National Monument	NM	HI
Pearl Harbor National Wildlife Refuge	NWR	HI
Midway Atoll National Wildlife Refuge	NWR	HI
Huleia National Wildlife Refuge	NWR	HI
James Campbell National Wildlife Refuge	NWR	HI
Kakahaia National Wildlife Refuge	NWR	HI
Kilauea Point National Wildlife Refuge	NWR	HI
He'eia National Estuarine Research Reserve	NERR	HI
Hawaiian Islands Humpback Whale National Marine Sanctuary	NMS	HI
Kalaupapa National Historical Park	NP	HI
Kaloko-Honokohau National Historical Park	NP	HI
Hawaii Volcanoes National Park	NP	HI

Source: DOC/NOAA and DOI 2017

Notes: AS – American Samoa
CH – Critical Habitat
CNMI – Commonwealth of the Northern Marianas Islands
GU - Guam
NERR – National Estuarine Research Reserve
NM – National Monument
NMS – National Marine Sanctuary
NP – National Park

NWR – National Wildlife Refuge

Table 6. Sea Turtles Inhabiting the Action Area

Common Name	Scientific Name	Federal Status under ESA	Action Area Occurrence
Loggerhead	*Caretta caretta gigas*	T/E	Entire
Green	*Chelonia mydas*	E/T/CH	Entire
Leatherback	*Dermochelvs coriacea schlegelii*	E/CH	Entire
Olive ridley	*Lepidochelys olivacea*	T	South Atlantic Coast, Pacific Coast (rare in OR, WA, AK), Pacific Islands
Kemp's ridley	*Lepidochelys kempii*	E	Atlantic Coast
Hawksbill	*Eretmochelys imbricate*	E/CH	South Atlantic Coast, Gulf of Mexico, Pacific Area Islands

Source: NOAA/NMFS 2019

Notes: CH – Critical habitat in the Action Area

E – Federally listed as endangered

T – Federally listed as threatened

Table 7. Protected Fisheries Resources on the U.S. Atlantic Coast

Common Name	Scientific Name	Federal Status under ESA	Occurrence
Atlantic salmon	*Salmo salar*	E/CH	ME
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E/CH	Entire Atlantic Coast
Nassau grouper	*Epinephelus striatus*	T	FL, PR, USVI
Smalltooth sawfish	*Acipenser oxyrinchus desotoi*	E	NC-FL
Shortnose sturgeon	*Acipenser brevirostrum*	E	Entire Atlantic Coast

Source: NOAA/NMFS 2019
Notes: E – Federally listed as endangered
CH – Critical habitat in the Action Area
PR – Puerto Rico
USVI – U.S. Virgin Islands

Table 8. Protected Fisheries Resources in the Gulf of Mexico

Common Name	Scientific Name	Federal Status under ESA
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T/CH
Smalltooth sawfish	*Acipenser oxyrinchus desotoi*	E

Source: NOAA/NMFS 2019
Notes: CH – Critical Habitat
E – Federally listed as endangered
T – Federally listed as threatened

Table 9. Protected Fisheries Resources on the U.S. Pacific Coast

Common Name	Scientific Name	Federal Status under ESA
Black abalone	*Haliotis cracherodii*	E/CH
Bocaccio	*Sebastes paucispinis*	E/CH
Chinook salmon	*Onchorhynchus tshawytscha*	E/T/CH
Chum salmon	*Onchorhynchus keta*	E/T/CH
Coho salmon	*Onchorhynchus kisucth*	E/T/CH
Eulachon	*Thaleichthys pacificus*	T/CH
Green sturgeon	*Acipenser medirostris*	T*
Sockeye salmon	*Onchorhynchus nerka*	E/T/CH
Steelhead	*Onchorhynchus mykiss*	E/T/CH
Tidewater goby	*Eucyclogobius newberryi*	E/CH
White abalone	*Haliostis sorenseni*	E
Yelloweye rockfish	*Sebastes ruberrimus*	T/CH

Source: NOAA/NMFS 2019
Notes: CH – Critical habitat
E – Federally listed as endangered
T – Federally listed as threatened
* only the Southern Distinct Population Segment of the green sturgeon is Federally listed as threatened.

Table 10. Protected Birds of the U.S. Atlantic Coast

Common Name	Scientific Name	Federal Status under ESA	Distribution
Piping plover	*Charadrius melodus*	T/CH	Atlantic coast, Great Lakes, Northern Great Plains, Gulf coast, and Caribbean. Critical habitat for wintering populations from North Carolina south to Florida.
Red knot	*Calidris canutus rufa*	T	Atlantic coast, Great Lakes, Northern Great Plains, Gulf coast, and Caribbean.
Roseate tern	*Sterna dougallii dougallii*	E	Atlantic coast and Caribbean
Whooping crane	*Grus Americana*	NEP	Virginia to Florida
Wood stork	*Mycteria americana*	E	South Carolina to Florida
Yellow-shouldered blackbird	*Agelains xanthomus*	E/CH*	Critical habitat areas in southwest Puerto Rico and Isla Mona

Source: USFWS 2019
Notes: CH – Critical habitat
NEP – Non-Essential Population
E – Federally listed as endangered
T – Federally listed as threatened
* The Yellow-shouldered blackbird is only listed in Puerto Rico

Table 11. Protected Birds of the Gulf of Mexico

Common Name	Scientific Name	Federal Status under ESA	Distribution
Piping plover	*Charadrius melodus*	T/CH	Atlantic coast, Great Lakes, Northern Great Plains, Gulf of Mexico. Critical habitat for wintering populations entire Gulf Coast.
Mississippi sandhill crane	*Grus canadensis pulla*	E/CH	Mississippi
Whooping crane	*Grus Americana*	E/CH	Critical habitat is on Texas coast
Wood stork	*Mycteria americana*	E	Alabama (Mississippi Valley)

Source: USFWS 2019
Notes: CH – Critical habitat
E – Federally listed as endangered
T – Federally listed as threatened

Table 12. Protected Birds of the U.S. Pacific Coast

Common Name	Scientific Name	Federal Status under ESA	Distribution
California Condor	*Gymnogyps californianus*	E	Condors reintroduced into mountains of Los Angeles, vicinity of Big Sur, and Arizona
California clapper rail	*Rallus longirostris obsoletus*	E	San Francisco Bay area, California
California least tern	*Sterna antillarum browni*	E	Central and southern coast of California
Light-footed clapper rail	*Rallus longirostris levipes*	E	Southern California coast
Marbled murrelet	*Brachyrampus marmoratus marmoratus*	T/CH	Alaska coast south to California coast. Critical habitat in Alaska.
San Clemente loggerhead shrike	*Lanius ludovicianus mearnsi*	E	San Clemente Island, California
San Clemente sage sparrow	*Amphispiza belli clementeae*	T	San Clemente Island, California

Short-tailed albatross	*Phoebastria albatrus*	E	Open Pacific Ocean from Alaska to California
Spectacled eider	*Somateria fisheri*	T/CH	Coast of Alaska
Steller's eider	*Polysticta stelleri*	T/CH	Alaska Coast, accidental south to California. Critical habitat in Alaska.
Western snowy plover	*Charadrius alexandrinus nivosus*	T/CH	Washington to California. Critical habitat in California, Oregon, and Washington.

Source: USFWS 2019
Notes: CH – Critical habitat
E – Federally listed as endangered
T – Federally listed as threatened

Table 13. Protected Birds of the Pacific Islands

Common Name	Scientific Name	Federal Status under ESA	Distribution
Guam bridled white-eye	*Zosterops conspicillatus conspicillatus*	E	Guam
Hawaiian Coot	*Fulica americana alai*	E	Hawaii coasts
Hawaiian dark-rumped petrel	*Pterodroma phaeopygia sandwichensis*	E	Pacific Ocean around Hawaii
Hawaiian duck	*Anas wyvilliana*	E	Pearl Harbor, Hawaii
Hawaiian stilt	*Himantopus mexicanus knudseni*	E	Hawaii coasts
Laysan duck	*Anas laysanensis*	E	Laysan, Hawaii
Laysan finch	*Telespyza cantans*	E	Laysan, Pearl, and Hermes atolls, Hawaii
Mariana crow	*Corvus kubaryii*	E	Guam
Newell's Townsend's shearwater	*Puffinus auricularis newelli*	E	Pacific Ocean around Hawaii
Nihoa finch	*Telespyza ultima*	E	Nihoa Island, Hawaii
Short-tailed albatross	*Phoebastria albatrus*	E	Open Pacific Ocean from Alaska to California

Source: USFWS 2019
Notes: CH – Critical habitat in the Action Area
E – Federally listed as endangered
T – Federally listed as threatened

Table 14. Marine Mammals Common in the NMFS Greater Atlantic Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Phocids (true or earless seals)			
Bearded seal	*Erignathus barbatus*	*	Unusual
Gray seal	*Halichoens griseus*	*	Year-round resident
Harbor seal	*Phoca vitulina*	*	Year-round resident
Harp seal	*Phoca groenlandica*	*	More common in winter
Hooded seal	*Cystophora cristata*	*	More common in winter
Ringed seal	*Phoca hispida*	*	More common in winter
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Population highest in spring/summer due to northward migration from subtropics
Bryde's whale	*Balaenoptera edeni*	*	Located in southern part of ROI
Fin whale	*Balaenoptera physalus*	E	Year-round resident, peak from April to October, visits coastal waters in many areas
Minke whale	*Balaenoptera. acutorostrata*	*	Abundant from April to November; frequent coastal regions, bays, offshore banks
Humpback whale	*Megaptera novaeangliae*	*	Migratory population, with peak abundance mainly during summer but also in autumn; coastal distribution in the summer. Breeds in the Caribbean within 8–16 km of shore
North Atlantic right whale	*Eubalaena glacialis*	E/CH	Population highest in spring/summer
Sei whale	*Balaenoptera borealis*	E	Range from ME to VA
Odontocetes (toothed whales and dolphins)			
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	*	Common inshore spring through autumn, uncommon from DE to VA

Atlantic spotted dolphin	*Stenella frontalis*	*	Occur in southern part of ROI, generally pelagic
Beluga whale	*Delphinapterus leucas*	*	Occasional strays, seen in winter
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic habitat
Bottlenose dolphin	*Tursiops truncatus*	*	Seen in summer offshore, uncommon
Clymene dolphin	*Stenella clymene*	*	Occur in southern ROI, pelagic
Cuvier's beaked whale	*Ziphius cavirostris*	*	Common in summer
Dwarf sperm whale	*Kogia sima*	*	Occur from DE to VA
False killer whale	*Pseudorca crassidens*	*	Occur from DE to VA
Gervais' beaked whale	*Mesoplodon europaeus*	*	Oceanic habitat
Harbor porpoise	*Phocoena phocoena*	*	Common in inshore areas from April to October; strandings reported in Florida; sometimes enters bays and river mouths
Killer whale	*Orcinus orca*	*	Occasional visitor
Long-finned pilot whale	*Globicephala melas*	*	Pelagic, moves inshore late summer and fall
Northern bottlenose whale	*Hyperoodon ampullatus*	*	Occasional, seen in fall and winter
Pantropical spotted dolphin	*Stenella attenuata*	*	Uncommon
Pygmy sperm whale	*Kogia breviceps*	*	Rare north of Cape Cod, MA
Risso's dolphin	*Grampus griseus*	*	Uncommon north of Cape Cod, MA
Rough-toothed dolphin	*Steno bredanensis*	*	Pelagic habitat
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Generally pelagic, occurs in southern ACTION AREA(DE to VA) in the summer
Sowerby's beaked whale	*Mesoplodon bidens*	*	Pelagic habitat

Sperm whale	*Physeter macrocephalus*	E	Mainly in deep waters, migrates to shallower waters from ME to NC
Spinner dolphin	*Stenella longirostris*	*	Occurs in southern ACTION AREA(DE to VA)
Striped dolphin	*Stenella coeruleoalba*	*	Common, pelagic habitat
True's beaked whale	*Mesoplodon mirus*	*	Pelagic habitat
Short-beaked common dolphin	*Delphinus delphis*	*	Generally pelagic, common
White-beaked dolphin	*Lagenorhynchus albirostris*	*	Occur from November to June

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the Action Area
E – Federally listed as endangered
T –Federally listed as threatened
* – only protected under MMPA

Table 15. Marine Mammals Common in the NMFS Southeast Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Phocids (true or earless seals)			
Harbor seal	*Phoca vitulina*	*	Occasional
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Population highest in spring/summer due to northward migration from subtropics
Bryde's whale	*Balaenoptera edeni*	*/E	Common/Gulf of Mexico subspecies is listed as endangered
Fin whale	*Balaenoptera physalus*	E	Year-round resident, visits coastal waters in many areas
Minke whale	*Balaenoptera acutorostrata*	*	Uncommon in Gulf of Mexico, occur in other waters of the ROI; frequent coastal regions, bays, offshore banks
Humpback whale	*Megaptera novaeangliae*	*	Migratory population moves along the southeastern U.S. on the way to its wintering grounds, occur January through May
North Atlantic right whale	*Eubalaena glacialis*	E/CH	Wintering and calving grounds are along Georgia and Florida, occur December through March, nearshore
Sei whale	*Balaenoptera borealis*	E	Southern portion of range during spring/summer
Odontocetes (toothed whales and dolphins)			
Atlantic spotted dolphin	*Stenella frontalis*	*	Generally pelagic
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic
Bottlenose dolphin	*Tursiops truncatus*	*	Both coastal and offshore variety are common in this ROI, frequents bays and estuaries
Clymene dolphin	*Stenella clymene*	*	Pelagic
Cuvier's beaked whale	*Ziphius cavirostris*	*	Pelagic
Dwarf sperm whale	*Kogia sima*	*	Pelagic

Gervais' beaked whale	*Mesoplodon europaeus*	*	Oceanic
Harbor porpoise	*Phocoena phocoena*	*	Rare in southeast Atlantic, not in Gulf of Mexico/Caribbean
False killer whale	*Pseudorca crassidens*	*	Pelagic
Fraser's dolphin	*Lagenodelphis hosei*	*	Rare in southeast Atlantic and Gulf of Mexico, occurs in Caribbean, pelagic
Killer whale	*Orcinus orca*	*	Uncommon
Long-finned pilot whale	*Glodicephala melas*	*	Northern part of southeast Atlantic, rare, pelagic
Melon-headed whale	*Peponocephala electra*	*	Rare in southeast Atlantic, occur in Gulf of Mexico, pelagic
Pantropical spotted dolphin	*Stenella attenuata*	*	Offshore and coastal groups
Pygmy killer whale	*Feresa attenuata*	*	Pelagic
Pygmy sperm whale	*Kogia breviceps*	*	Pelagic
Risso's dolphin	*Grampus griseus*	*	Pelagic
Rough-toothed dolphin	*Steno bredanensis*	*	Pelagic
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Pelagic
Sperm whale	*Physeter macrocephalus*	E	Generally pelagic
Spinner dolphin	*Stenella longirostris*	*	Common, pelagic and coastal, daytime in shallow bays
Striped dolphin	*Stenella coeruleoalba*	*	Pelagic
True's beaked whale	*Mesoplodon mirus*	*	Pelagic
Short-beaked common dolphin	*Delphinus delphis*	*	Pelagic
Trichechids (manatees)			
West Indian manatee	*Trichechus manatus*	T/CH	Resident in rivers and coastal waters of peninsular Florida and southern Georgia; previous records in Carolinas and Texas

Source: Geraci and Lounsbury 2005
Notes: CH – Critical Habitat in the Action Area
E – Federally listed as endangered
* – only protected under MMPA

Table 16. Marine Mammals Common in the NMFS West Coast Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Otariids (eared seals or sea lions)			
California sea lion	*Zalophus californianus*	*	Year-round resident
Guadalupe fur seal	*Arctocephalus townsendi*	T	Breeds off Baja California
Northern elephant seal	*Mirounga angustirostris*	*	Year-round resident
Northern fur seal	*Callorhinus ursinus*	*	Year-round resident
Steller sea lion	*Eumetopias jubatas*	T/CH	Visitor to area from southern breeding grounds, coastal to pelagic
Phocids (true or earless seals)			
Harbor seal	*Phoca vitulina*	*	Year-round resident
Mysticetes			
Blue whale	*Balaenoptera musculus*	E	Population highest in spring due to northward migration from subtropics
Bryde's whale	*Balaenoptera edeni*	*	Rare in southern California
Fin whale	*Balaenoptera physalus*	E	Common in summer, visits coastal waters in many areas, migratory
Gray whale	*Eschrichtius robustus*	*	Migration population, with peak abundance in winter and spring
Humpback whale	*Megaptera novaeangliae*	*/E/T	Migratory population, with peak abundance mainly during summer but also in autumn
Minke whale	*Balaenoptera acutorostrata*	*	Year-round resident, frequent coastal regions, bays, offshore banks
North Pacific right whale	*Eubalaena japonica*	E	Uncommon
Sei whale	*Balaenoptera borealis*	E	Seen in summer/fall during migration, pelagic

Odontocetes (toothed whales and dolphins)			
Baird's beaked whale	*Berardius bairdii*	*	Pelagic
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic
Bottlenose dolphin	*Tursiops truncatus*	*	Year-round resident; frequents bays and estuaries in southern regions
Cuvier's beaked whale	*Ziphius cavirostris*	*	Pelagic
Dall's porpoise	*Phocoenoides dalli*	*	Year-round resident, nearshore in deep water, pelagic
Dwarf sperm whale	*Kogia sima*	*	Rare further north, pelagic
Ginkgo-toothed beaked whale	*Mesoplodon ginkgodens*	*	Rare, pelagic
False killer whale	*Pseudorca crassidens*	*	Occasional, pelagic
Harbor porpoise	*Phocoena phocoena*	*	Coastal in bays, estuaries, and rivers; frequent offshore banks
Hubb's beaked whale	*Mesoplodon carlhubbsi*	*	Pelagic
Killer whale	*Orcinus orca*	*/E	Incidental accounts of transients in area, most likely from northern latitudes; common inshore visitors. Southern Resident population listed as endangered. Inshore year-round.
Long-beaked common dolphin	*Delphinus capensis*	*	Occur in southern California, prefer shallow, warm waters
Northern right whale dolphin	*Lissodelphis borealis*	*	Inshore winter through spring, pelagic
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	*	Year-round resident, peak winter through spring, pelagic
Perrin's beaked whale	*Mesoplodon perrini*	*	Pelagic
Pygmy sperm whale	*Kogia breviceps*	*	Pelagic
Risso's dolphin	*Grampus griseus*	*	Year-round resident, pelagic
Rough-toothed dolphin	*Steno bredanensis*	*	Uncommon, pelagic

Short-beaked common dolphin	*Delphinus delphis*	*	Year-round resident, pelagic
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Uncommon
Sperm whale	*Physeter macrocephalus*	E	Generally pelagic
Stejneger's beaked whale	*Mesoplodon stejnegeri*	*	Pelagic
Striped dolphin	*Stenella coeruleoalba*	*	Pelagic
Mustelid (otters)			
Northern sea otter	*Enhydra lutris kenyoni*	T	Year-round resident in Washington/Oregon
Southern sea otter	*Enhydra lutris nereis*	T	Year-round resident in California

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the Action Area

E – Federally listed as endangered

T – Federally listed as threatened

* – only protected under MMPA

Table 17. Marine Mammals Common in the NMFS Alaska Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Otariids (eared seals or sea lions)			
Northern fur seal	*Callorhinus ursinus*	*	Found in Pribilof Islands and San Miguel Island, breeding areas, occur summer-fall
Steller sea lion	*Eumetopias jubatas*	T/CH	Distributed around North Pacific rim, northward to Bering Sea and along eastern shore of Kamchatka Peninsula, Gulf of Alaska, and Aleutian Islands
Phocids (true or earless seals)			
Bearded seal	*Erignathus barbatus*	*	Occur along continental shelf of Beaufort, Chukchi, and Bering Seas
Harbor seal	*Phoca vitulina*	*	Year-round resident throughout Alaskan waters
Northern elephant seal	*Mirounga angustirostris*	*	Males feed near eastern Aleutian Islands, and in Gulf of Alaska
Ribbon seal	*Histriophoca fasciata*	*	Found in Bering and Chukchi seas; winter-spring, offshore along ice front; summer range unknown; breeds along ice front
Ringed seal	*Phoca hispida*	T	Found in southern Bering Sea
Spotted seal	*Phoca largha*	*	Occur along continental shelf of Beaufort, Chukchi, and Bering Seas
Odobenids (walrus)			
Walrus	*Odobenus rosmarus divergens*	*	Found in shallow water areas, close to ice or land; geographic range encircles the Polar Basin
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Occur from the Gulf of Alaska to the Aleutian Islands, pelagic, may frequent coastal waters and shallow banks

Fin whale	*B. physalus*	E	Common in summer, generally pelagic, visits coastal waters in many areas, migratory
Minke whale	*B. acutorostrata*	*	Common in summer, frequent coastal regions, bays, and offshore banks
Humpback whale	*Megaptera novaeangliae*	*/E/T	Common in summer, coastal in many areas, migratory. Some stocks are listed as endangered or threatened
Gray whale	*Eschrichtius robustus*	*	Migrate along the Alaskan coast in winter and early spring; inhabit eastern Alaskan waters during summer
Bowhead whale	*Balaena mysticetus*	E	Occur in the coastal and offshore regions
North Pacific right whale	*Eubalaena japonica*	E	Rare, winter distribution and migration pattern unknown
Sei whale	*Balaenoptera borealis*	E	Occur in southern Alaska during summer and fall, pelagic
Odontocetes (toothed whales and dolphins)			
Baird's beaked whale	*Berardius bairdii*	*	Occur in southern part of Alaska during winter, pelagic
Beluga whale	*Delphinapterus leucas*	*/E	Coastal in bays, estuaries, and rivers; winter offshore in pack ice. Cook Inlet stock listed as endangered.
Cuvier's beaked whale	*Ziphius cavirostris*	*	Occur in the Aleutian islands, pelagic
Killer whale	*Orcinus orca*	*	North of Bering Strait in summer only
Dall's porpoise	*Phocoenoides dalii*	*	Occur south of the Bering Strait, pelagic, nearshore in deep water
Harbor porpoise	*Phocoena phocoena*	*	Occur in southern Alaska during winter; coastal in bays, estuaries, and rivers; frequent offshore banks
Narwhal	*Monodon monoceros*	*	Rare, usually associated with pack ice and deep water
Pacific White-sided dolphin	*Lagenorynchus obliquidens*	*	Common in Aleutian Islands in summer, pelagic, nearshore in deep water
Stejneger's beaked whale	*Mesoplodon stejnegeri*	*	Pelagic

Sperm whale	*Physeter macrocephalus*	E	Common in summer, mostly males, generally pelagic
Mustelids (otters)			
Northern sea otter	*Enhydra lutris keyoni*	T	Lives in shallow water areas along the shores of the North Pacific

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the Action Area
E – Federally listed as endangered
T – Federally listed as threatened
* – only protected under MMPA

Table 18. Marine Mammals Common in the NMFS Pacific Islands Region

Common Name	Scientific Name	Federal Status under ESA	Distribution
Phocids (true or earless seals)			
Hawaiian Monk seal	*Monachus schauinslandi*	E/CH	Most common northwest of the main seven-island chain
Mysticetes (baleen whales)			
Blue whale	*Balaenoptera musculus*	E	Population thought to occur in deeper offshore waters
Bryde's whale	*Balaenoptera edensi*	*	Occurs throughout the main seven island chain January through April
Fin whale	*Balaenoptera physalus*	E	Occurs in winter
Humpback whale	*Megaptera novaeangliae*	*	Occurs throughout the main seven island chain January through April
Minke whale	*Balaenoptera acutorostrata*	*	Occurs near Leeward Island
North Pacific right whale	*Eubalaena japonica*	E	Rare, most likely stray individuals from more northern populations
Sei whale	*Balaenoptera borealis*	E	In eastern North Pacific, population is migratory transient from coast of Mexico to Gulf of Alaska
Odontocetes (toothed whales and dolphins)			
Blainville's beaked whale	*Mesoplodon densirostris*	*	Pelagic
Bottlenose dolphin	*Tursiops truncatus*	*	Common along the coastlines

Cuvier's beaked whale	*Ziphius cavirostris*	*	Rare
Dwarf sperm whale	*Kogia sima*	*	Pelagic
False killer whale	*Pseudorca crassidens*	*/E	Occasionally seen between the main Hawaiian islands, pelagic. The Main Hawaiian Islands insular stock is a small discrete stock that lives exclusively in nearshore waters and is listed as endangered.
Fin whale	*Balaenoptera physalus*	E	Common in winter, visits coastal waters in many areas, migratory
Fraser's dolphin	*Lagenodelphis hosei*	*	Pelagic
Killer whale	*Orcinus orca*	*	Rare
Melon-headed whale	*Peponocephala electra*	*	Occasionally seen between the main Hawaiian islands, pelagic
Pantropical spotted dolphin	*Stenella attenuata*	*	Common along the coastlines
Pygmy killer whale	*Feresa attenuata*	*	Occasionally seen between the main Hawaiian islands, pelagic
Pygmy sperm whale	*Kogia breviceps*	*	Pelagic
Rough-toothed dolphin	*Steno bredanensis*	*	Pelagic
Short-finned pilot whale	*Globicephala macrorhynchus*	*	Occasionally between the main Hawaiian islands, pelagic
Sperm whale	*Physeter macrocephalus*	E	In deeper waters off Hawaii, year-round resident
Striped dolphin	*Stenella coeruleoalba*	*	Pelagic
Spinner dolphin	*Stenella longirostris*	*	Pelagic and coastal, daytime in shallow bays

Source: Geraci and Lounsbury 2005

Notes: CH – Critical Habitat in the Action Area

E – Federally listed as endangered

* – only protected under MMPA

Appendix VII

Economic Resources

Table 1: Summary of overall statewide information on veterinary services

State	Number of Establishments	Revenue and Receipts ($ 1,000)	Annual Payroll ($ 1,000)	Number of Employees
Atlantic Coast/Gulf of Mexico Coast				
Alabama	516	$ 385,349	$ 124,027	4,881
Connecticut	357	$ 426,627	$ 154,598	4,322
Delaware	66	$ 96,155	$ 37,807	1,069
Florida	2,110	$ 1,873,484	$ 625,441	20,443
Georgia	880	$ 812,327	$ 280,894	9,712
Louisiana	435	$ 370,541	$ 115,449	4,270
Maine	191	$ 164,517	$ 56,454	1,783
Maryland	547	$ 642,411	$ 232,156	6,953
Massachusetts	516	$ 700,791	$ 262,397	7,086
Mississippi	270	$ 202,360	$ 58,479	2,392
New Hampshire	191	$ 187,351	$ 70,565	2,130
New Jersey	619	$ 833,667	$ 300,846	8,396
New York	1,324	$ 1,575,778	$ 578,523	16,472
North Carolina	953	$ 946,282	$ 328,862	11,171
Puerto Rico+	384	$ 272,340	$ 68,870	2,657
Rhode Island	88	$ 88,558	$ 31,800	893
South Carolina	414	$ 391,796	$ 131,536	4,374
Texas	2,292	$ 2,361,474	$ 752,105	23,964
U. S. Virgin Islands+	10	$ 11,709	$ 3,964	87
Virginia	856	$ 966,810	$ 371,965	11,359
Pacific Coast				
Alaska	60	$ 70,630	$ 28,431	790
California	2,905	$ 3,392,352	$ 1,155,229	33,091
Oregon	521	$ 635,073	$ 238,816	5,921
Washington	750	$ 730,573	$ 255,380	7,999
Pacific Islands				
Hawaii	82	$ 98,620	$ 30,577	956
American Samoa+	2	*	*	<20
Guam+	18	$ 8,091	$ 4,039	136
Commonwealth of the Northern Mariana Islands+	14	$ 1,495	$ 541	48

2012 Economic Census
North American Industry Classification System (NAICS) code 541940
+ = NAICS code 5419 which includes veterinary services as well as other sub-industries
* = Information withheld by Census to avoid disclosing data for individual companies

Table 2: Summary of overall statewide information on zoos, aquariums, and botanical gardens

State	Number of Establishments	Revenue and Receipts ($1,000)	Annual Payroll ($1,000)	Number of Employees
Atlantic Coast/Gulf of Mexico Coast				
Alabama	13	$ 23,801	$ 9,260	342
Connecticut	5	$ 42,729	$ 13,082	459
Delaware	2	*	*	20 to 99
Florida	54	$ 209,289	$ 68,146	2,553
Georgia	16	$ 133,116	$ 36,167	1,178
Louisiana	8	*	*	500 to 999
Maine	8	$ 9,225	$ 3,031	74
Maryland	6	*	*	500 to 999
Massachusetts	18	$ 70,179	$ 25,085	699
Mississippi	2	*	*	20 to 99
New Hampshire	2	*	*	20 to 99
New Jersey	13	*	*	100 to 249
New York	43	$ 288,324	$ 104,214	2,610
North Carolina	16	$ 13,202	$ 4,250	176
Puerto Rico	No data	No data	No data	No data
Rhode Island	1	*	*	20 to 99
South Carolina	7	$ 38,433	$ 9,887	433
Texas	34	$ 219,729	$ 70,625	2,541
U. S. Virgin Islands	No data	No data	No data	No data
Virginia	15	$ 24,135	$ 8,334	359
Pacific Coast				
Alaska	6	*	*	20 to 99
California	53	$ 502,344	$ 164,375	4,612
Oregon	15	$ 21,276	$ 7,832	277
Washington	15	$ 56,883	$ 22,283	554
Pacific Islands				
Hawaii	18	$ 66,885	$ 17,272	615
American Samoa	No data	No data	No data	No data
Guam	No data	No data	No data	No data

Commonwealth of the Northern Mariana Islands	No data	No data	No data	No data

2012 Economic Census

NAICS code 712130

* = Information withheld by Census to avoid disclosing data for individual companies

Table 3: Summary of overall statewide information on zoos, aquariums, and botanical gardens with federal tax-exempt status

State	Number of Establishments	Revenue and Receipts ($1,000)	Annual Payroll ($1,000)	Number of Employees
Atlantic Coast/Gulf of Mexico Coast				
Alabama	10	*	*	250 to 499
Connecticut	5	$ 42,729	$ 13,082	459
Delaware	2	*	*	20 to 99
Florida	27	$ 127,439	$ 45,787	1,725
Georgia	11	*	*	1,000 to 2,499
Louisiana	4	*	*	500 to 999
Maine	6	*	*	20 to 99
Maryland	5	*	*	500 to 999
Massachusetts	11	*	*	500 to 999
Mississippi	1	*	*	20 to 99
New Hampshire	1	*	*	20 to 99
New Jersey	8	*	*	20 to 99
New York	36	$ 270,280	$ 98,339	2,287
North Carolina	10	*	*	100 to 249
Puerto Rico	No data	No data	No data	No data
Rhode Island	1	*	*	20 to 99
South Carolina	2	*	*	100 to 249
Texas	25	$ 197,227	$ 64,575	2,354
U. S. Virgin Islands	No data	No data	No data	No data
Virginia	6	*	*	250 to 499
Pacific Coast				
Alaska	4	*	*	20 to 99
California	36	$ 493,862	$ 161,808	4,520
Oregon	8	*	*	100 to 249
Washington	14	*	*	500 to 999
Pacific Islands				
Hawaii	9	*	*	100 to 249
American Samoa	No data	No data	No data	No data

Guam	No data	No data	No data	No data
Commonwealth of the Northern Mariana Islands	No data	No data	No data	No data

2012 Economic Census

NAICS code 712130

* = Information withheld by Census to avoid disclosing data for individual companies

Table 4: Summary of overall information on food and lodging services in coastal counties

State	Number of Establishments	Revenue and Receipts ($1,000) *	Annual Payroll ($1,000) *	Number of Employees *
Atlantic Coast/Gulf of Mexico Coast				
Alabama	1,133	$ 1,178,483	$ 329,004	24,410
Connecticut	5,354	$ 6,993,878	$ 1,863,962	90,697
Delaware	1,987	$ 2,148,437	$ 566,694	35,609
Florida	28,888	$ 36,124,087	$ 9,992,453	578,058
Georgia	1,465	$ 1,547,288	$ 434,077	27,868
Louisiana	3,696	$ 5,066,768	$ 1,415,555	78,631
Maine	2,612	$ 1,924,097	$ 567,211	30,279
Maryland	6,430	$ 6,435,771	$ 1,746,082	104,131
Massachusetts	9,533	$ 10,818,954	$ 3,112,938	160,254
Mississippi	789	$ 1,537,711	$ 377,985	18,209
New Hampshire	853	$ 810,246	$ 237,253	13,804
New Jersey	10,681	$ 11,784,477	$ 3,297,639	164,805
New York	31,073	$ 35,402,108	$ 9,949,463	421,359
North Carolina	2,502	$ 1,534,769	$ 410,646	31,102
Puerto Rico	4,084	$ 4,256,139	$ 1,135,032	74,741
Rhode Island	2,973	$ 2,481,314	$ 705,886	44,063
South Carolina	3,206	$ 4,263,153	$ 1,171,155	67,691
Texas	11,780	$ 13,844,035	$ 3,723,169	239,559
U. S. Virgin Islands	279	$ 539,442	$ 160,542	347,000
Virginia	6,431	$ 6,973,798	$ 1,856,711	117,423
Pacific Coast				
Alaska	1,844	$ 1,869,445	$ 534,572	23,267
California	58,773	$ 69,429,105	$ 19,515,145	1,044,284
Oregon	2,113	$ 1,579,525	$ 445,590	27,708
Washington	11,306	$ 10,341,974	3,012,417	161,583
Pacific Islands				
Hawaii	3,518	$ 9,536,706	$ 2,535,950	98,364
American Samoa	36	$ 28,924	$ 6,172	574

Guam	450	$ 789,844	$ 189,446	523,816
Commonwealth of the Northern Mariana Islands	142	$ 179,975	$ 37,761	3,195

2012 Economic Census
NAICS code 72 (combined food and lodging category)
* = The following counties had information withheld by Census to avoid disclosing data for individual companies: Aleutians East Borough, AK; Bethel Census Area, AK; Jefferson County, FL; Liberty County, GA; St. Bernard Parish, LA; Calvert County, MD; Charles County, MD; Dorchester County, MD; Kent County, MD; Hancock County, MS; Jackson County, MS; Craven County, NC; Currituck County, NC; Dare County, NC; Hyde County, NC; Pamlico County, NC; Tyrrell County, NC; Washington County, NC; Kenedy County, TX; Kleberg County, TX; Refugio County, TX; Westmoreland County, VA; Island County, WA; Mason County, WA; Wahkiakum County, WA

Appendix VIII

Marine Mammal Stranding Agreement
#SA-REG-YYYY-##

BETWEEN

[REGION]
NATIONAL MARINE FISHERIES SERVICE OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION DEPARTMENT OF COMMERCE

AND

[Stranding Network Organization]

Articles III- VII are reserved and issued at the discretion of the NMFS Regional Administrator.

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Article I: General Provisions

A. Authority

1. This Marine Mammal Stranding Agreement (hereinafter Agreement) is entered into between the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) [REGION], and the Stranding Network Participant [*insert* Stranding Network Organization] (Participant), under the authority of section 112(c) and section 403 of the Marine Mammal Protection Act of 1972 (MMPA), as amended. **This Agreement supersedes all pre-existing Stranding Agreements between these parties. An organizational representative with signatory authority (e.g. Executive Director, President, CEO) must sign this Agreement on behalf of the Stranding Network Organization.**

2. NMFS has been delegated authority by the Department of Commerce to administer the MMPA. To assist in the implementation and administration of the MMPA, the Stranding Network has been established to respond to stranded marine mammals within NMFS' [REGION] of the United States. The [REGION] consists of the following coastal states and territories: [STATES]

B. Scope

1. Under the MMPA, NMFS is responsible for mammals of the **Order Cetacea** and the **Order Pinnipedia** other than walruses (hereinafter marine mammals).

2. The geographic response area assigned to the Participant consists of the following: [(*list* response area including primary and secondary geographic response areas as necessary, and if different for different articles)]. The Participant may assist in stranding response within the Region outside of their assigned response area, if requested by NMFS or by another Participant. Outside the [REGION], the Participant may assist with stranding response upon request from the appropriate regional NMFS Regional Stranding Coordinator(s).

C. Limitations

1. This Agreement creates an authorization for the Participant to take marine mammals, which would be otherwise prohibited by the MMPA. This taking authorization only applies to the Participant and its authorized personnel (see Article VI) for activities that are consistent with this Agreement.

2. In particular, this Agreement does <u>not</u> authorize:
   a. The taking of any marine mammal species listed as endangered or threatened under the Endangered Species Act of 1973 (ESA), as amended. Authorization to take ESA listed species is provided under a MMPA/ESA

permit issued to the NMFS National Marine Mammal Health and Stranding Response Program Coordinator and **requires authorization and direction from the NMFS Regional Stranding Coordinator in the event of a stranding involving a threatened or endangered marine mammal.**

b. The sale or offer of sale of any marine mammal or marine mammal parts including cells, gametes, or cell cultures.

D. Definitions - All terms used in the Agreement shall be interpreted to have the meaning specified in the MMPA section 3 and section 410 and NMFS implementing regulations 50 CFR 216.3 unless the context or specific language requires otherwise.

Article II: Purpose and General Responsibilities

A. Purpose of Agreement. NMFS and the Participant enter into this Agreement for the following purposes:

1. To provide for rapid response and investigation of stranded marine mammals *[insert* taxa*]* within the [REGION] in accordance with the purposes and policies of the MMPA.

2. To implement Title IV (Marine Mammal Health and Stranding Response Program) of the MMPA
   a. To facilitate the collection and dissemination of reference data on the health of marine mammals and health trends of marine mammal populations in the wild
   b. To correlate the health of marine mammals and marine mammal populations in the wild with available data on physical, chemical, and biological environmental parameters; and
   c. To detect and coordinate effective responses to Marine Mammal Unusual Mortality Events (UMEs).

3. To specify the activities during which the Participant may take stranded marine mammals [*insert* taxa] or marine mammal parts for the primary purpose of ensuring the appropriate response, [rehabilitation], disposition, and utilization of stranded marine mammals or marine mammal parts under MMPA sections 109(h), 112(c), and 403 and the Agreement.

4. To define the nature and extent of services that the Participant will provide NMFS under this Agreement and NMFS' responsibilities to the Participant.

5. To specify the requirements for the preparation and maintenance and reporting of records containing scientific data obtained from dead and live stranded marine mammals or parts from dead stranded marine mammals.

6. To provide for the timely exchange of information for use by both parties and other network members in furthering the objectives of the MMPA under this Agreement.

B. Joint Responsibilities: NMFS and the Participant will work cooperatively to:

1. Implement Title IV of the MMPA;

2. Effectively respond to and investigate the causes and impacts of UMEs;

3. Collect the appropriate data for determination of serious injuries and mortalities due to human interactions;

4. Collect reference data on marine mammal health and diseases;

5. Collect data on the frequency and causes of strandings;

6. Interpret findings and identify health trends and diseases of concern to include national and state reportable and/or zoonotic diseases; and

7. Work collaboratively to communicate with Federal, state, tribal, and local officials and employees in preparation for, during, and after stranding events within their jurisdictions and area of operations.

C. NMFS Responsibilities – NMFS shall:

1. Provide the Participant with notice of any changes to laws, regulations, policies and/or guidelines applicable to or promulgated by NMFS that may apply to the Participant's activities. This includes criteria for issuance, renewal and termination of stranding agreements. Notwithstanding this provision, it is the responsibility of the Participant to comply with any and all federal, state, tribal or local laws, regulations, policies and/or guidelines that apply given the Participant's activities and area of operations.

2. Conduct periodic compliance reviews of Stranding Agreements as stated in Article IX.

3. Provide guidance and assistance regarding investigation of marine mammal unusual mortality events including physical resources (example: NOAA laboratory assistance) and financial resources when available and authorized (in accordance with section 405 of the MMPA – UME National Contingency Fund) and in coordination with the Working Group on Marine Mammal Unusual Mortality Events.

4. Alert the Participant when NMFS has been notified that there are diseases of concern that are national and state reportable and/or zoonotic within the [REGION].

5. Pursuant to criteria established under the MMPA section 407, provide access to the National Marine Mammal Health and Stranding Response Program Database, as developed, and access to marine mammal tissues in the National Marine Mammal Tissue Bank following NMFS data and tissue access procedures and policies.

6. As needed and as resources are available, provide specialized marine mammal stranding response and investigation training on a local, regional or national basis.

7. Pursuant to MMPA Section 402, collect and update periodically and make available to stranding network participants, and other qualified scientists, existing information on:
    a. Procedures and practices for rescuing and rehabilitating stranded marine mammals;
    b. Species by species criteria used by the stranding network participants, for determining at what point a marine mammal undergoing rescue and rehabilitation is returnable to the wild based on its ability to survive in the wild and risk to the wild population of marine mammals;
    c. Procedures and practices for collecting, preserving, labeling, and transporting marine mammal tissues for physical, chemical, and biological analyses;
    d. Relevant scientific literature on marine mammal health, disease, and rehabilitation;
    e. Compilation and analyses of strandings by region to monitor species, numbers, conditions, and causes of illness and death in stranded marine mammals; and
    f. Other life history and reference level data, including marine mammal tissue analyses that would allow comparison of the causes of illness and death in stranded marine mammals with physical, chemical, and biological environmental parameters.

8. Identify a [REGION] Marine Mammal Stranding Program Coordinator who will serve as the Participant's primary point of contact for notification, coordination, reporting, and response [and rehabilitation] activities as specified throughout this Agreement. The NMFS Regional Administrator will serve as the Participant's primary point of contact for administration of the Agreement, as well as dispositions and other management activities as specified throughout the Agreement. **The NMFS Regional Administrator's designated point of contact for this Agreement is the NMFS** [REGION] **Marine Mammal Stranding Program Administrator,** [REGION] **Regional Office, Protected Resources Division.** (see Attachment B for contact information).

9. In certain circumstances such as large scale events (e.g. mass stranding, unusual mortality events, live right whale stranding), NMFS may establish a formal Incident Command System (ICS) for response, including the identification of an Incident Commander. For multi-agency incidents, NMFS will follow direction from any Federal incident commanders, including the United States Coast Guard (USCG). Opportunities for ICS training can be accessed through the Federal Emergency Management Agency (see http://www.training.fema.gov/EMIWeb/IS/is100.asp), USCG, or NMFS. If necessary, guidance will be provided by NMFS on a case-by-case basis.

10. Relay reports of stranded marine mammals (live or dead) within the Participant's geographic range to the Participant and determine whether the Participant has the capability to respond. If the Participant cannot respond, the Stranding Coordinator

may make requests to other regional Stranding Participants to respond.

11. Coordinate regional activities to maximize geographic coverage while facilitating appropriate division of responsibilities among regional Participants according to institutional abilities and authorities, and assisting with coordination and communication between Participants and Federal, State, tribal, and local officials and employees as needed, before, during and after stranding events.

12. Facilitate communication and coordination between Participants

13. Respond to the Participant's completed requests for authorizations such as requests for parts authorizations, parts transfers, and release determinations.

14. Provide information regarding availability of Prescott Grants and any other relevant NMFS funding opportunities.

15. For emergency stranding events (live or dead), provide and maintain a [24-hour] stranding cellphone or pager number: [RESERVED].

D. Participant Responsibilities: The Participant shall:

1. Comply with laws, regulations, policies and/or guidelines applicable to or promulgated by NMFS that apply to activities under this Agreement; or any Federal, state, tribal or municipal laws that pertain to stranding network operations (e.g., National Park Service or U.S. Fish and Wildlife Service refuge regulations or policies, municipal water management laws).

2. Cooperate with other members of the [REGION] Stranding Network and the National Marine Mammal Stranding Program as well as Federal, state, tribal and local officials and employees, including NMFS communications staff, in matters supporting the purposes of this Agreement.

3. Be subject to the direction of a designated employee (e.g., NMFS Marine Mammal Stranding Coordinator or NMFS Special Agent) representing the NMFS [REGION] Regional Administrator or Office of Law Enforcement with respect to the taking of a stranded marine mammal.

4. Manage any and all expenses that the Participant incurs associated with the activities authorized by this Agreement, including close-out costs should the Stranding Agreement be modified or terminated. NMFS does not have funds to reimburse volunteers for expenses incurred in responding to stranding events. However under the marine mammal UME process, funding may be available for costs associated with specific analyses and additional requests in accordance with section 405 of the MMPA UME National Contingency Fund and in coordination with the Working Group on Marine Mammal Unusual Mortality Events. Additionally, competitive funding opportunities for Stranding Network

Participants may be available through the Prescott Stranding Assistance Grant Program (see https://www.fisheries.noaa.gov/grant/john-h-prescott-marine-mammal-rescue-assistance-grant-program).

5. Promote human and public safety by taking precautions against injury or disease to any network personnel, volunteers, and the general public when working with live or dead marine mammals. Immediately notify the NMFS Stranding Coordinator if an injury occurs that requires the injured party to seek medical attention.

6. Notify immediately the NMFS Stranding Coordinator upon learning of any diseases of concern (e.g., national and state reportable and/or zoonotic diseases; please see U.S. Department of Agriculture, Centers for Disease Control, or your state public health department list) that are detected and/or confirmed that could be a potential hazard for public health or animal health;

7. Follow requirements for the transfer of marine mammal parts (50 CFR 216.22 and 216.37):
    a. Non-diagnostic parts, including research specimens (see Attachment A), parts used for species enhancement, or education, shall be transferred only to persons or labs that are authorized under 50 CFR 216.22 or 216.37. A unique field number assigned by NMFS (e.g., NMFS Registration Number) or the Participant must be marked on or affixed to the marine mammal part or container. The Regional Administrator must be notified of the transfer within 30 days after the transfer occurs (50 CFR 216.22(5)(v)).
    b. Diagnostic specimens (see Attachment A) may be transferred to labs within the United States for diagnostic use without any additional authorizations or notifications.

8. Work cooperatively with the NMFS and the USCG in a hazardous waste spill (i.e., oil spills) ICS, if implemented. If you do not want to work cooperatively with NMFS and the USCG during a hazardous waste spill, you should notify the NMFS Regional Administrator as part of your application for a Stranding Agreement, or minimally in writing within 5 days of a request from the NMFS Regional Stranding Coordinator during an ongoing spill response.

9. Abide by all confidentiality requirements as required during active investigations (i.e. NMFS Office of Law enforcement) or litigation (i.e. Department of Justice). These confidentiality conditions may also require all data to be withheld from public release until the investigation or case concludes.

10. Notify the NMFS Regional Administrator in writing within 30 days of any changes in its key personnel (see Attachment A), capabilities, Designee organizations, and/or ability to respond within its geographic coverage area.

11. If requested, coordinate with NMFS and other relevant Agencies (e.g., Federal, state, tribal, and local governments) to develop and implement a cooperative media and communications plan relating to stranding events.

12. Notify the Regional Coordinator of any prospective media requests.

13. Conduct photo documentation (still or video) for other than diagnostic or identification purposes (such as dorsal fin identification, documentation of lesions, scars, etc.) that does not interfere with or influence the conduct of the stranding responders and response in any way or cause additional harassment to marine mammals.

14. If requested by the NMFS Regional Stranding Coordinator, provide copies of any photographs, films, and/or videotapes documenting any stranding, particularly for those strandings when human interactions are reported or suspected. Any photography, film and/or videotape of the stranding response used for educational or commercial purposes of stranding response by the Participant should include a credit, acknowledgment, or caption indicating that the stranding response was conducted under a Stranding Agreement [#SA – REG – YYYY– ##] between NMFS and the Participant under the authority of the MMPA or ESA. NMFS will not reproduce, modify, distribute, or publicly display the photograph, film, and/or videotape without consent of the owner, unless required to release a copy under Federal law or order (such as the Freedom of Information Act).

15. By its nature, the handling of stranded marine mammals (dead or alive) is potentially a dangerous activity. The Participant shall indemnify and hold harmless the United States Government from any and all losses, damages, or liability -or claims therefore -on account of personal injury, death, or property damage of any nature whatsoever, arising out of the activities of the Participant, his/her/its employees, his/her/its qualified representatives, designees, subcontractors, volunteers, or agents. Liability for person(s) acting under this agreement is addressed in sections 406(a) and (b) of the MMPA [16 U.S.C. 1421e).

    Reserve for state agencies/universities and replace above language with: [By its nature, the handling of stranded marine mammals (dead or alive) is potentially a dangerous activity. To the extent allowed by law and without waiving its sovereign immunity, [State Agency] shall indemnify and hold harmless the United States Government from any and all losses, damages, or liability or claims thereof on account of personal injury, death, or property damage of any nature whatsoever, arising out of the activities of [State Agency], his/her/its employees, his/her/its qualified representatives, designees, subcontractors, volunteers, or agents. Liability for person(s) acting under this agreement is addressed in Section 406(a) and (b) of the MMPA (16 U.S.C. 1421e)].

16. Provide accurate and honest information in all reports and communications to

NMFS.

17. Maintain records upon which required reports are based for at least 3 years on-site, except where a longer period is specified (e.g., 15 years for rehabilitation cases, see Attachment D *NMFS Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release – Standard for Rehabilitation Facilities).*

18. Upon request by the NMFS Regional Administrator, allow the Regional Stranding Coordinator, other appropriate NMFS employees, or any other appropriate person duly designated by the Regional Administrator, to inspect the facilities and inspect and/or request records that pertain to stranding network activities.

19. *Reserved for GARFO/SERO:* [Verbally report any right whale sightings that occur or are reported as part of their normal activities. See Attachment B for contact information.]

Article III: Dead Animal Response

[Reserved]
Or

A. The Participant may take species of marine mammals under the MMPA for the purpose of dead animal investigation and response.

Subject to the conditions contained in this Agreement, the MMPA, and the implementing regulations, the Participant may take dead stranded marine mammals or parts therefrom for the collection of data on the health and health trends of wild populations, for the detection of marine mammal UMEs, for the detection of signs of human interaction, for research or education on marine mammal biology and life history, for the determination of cause of death, for the detection of human caused and natural mortality, or for other research as deemed appropriate by the NMFS. These activities specifically include: obtaining measurements and biological samples from dead stranded marine mammals; disposing, or assisting in the disposal, of the carcass of dead stranded marine mammals at a suitable location (following the Marine Mammal Carcass Disposal Best Practices); and taking and transporting dead stranded or floating dead marine mammals, or parts therefrom, to facilities or individuals approved pursuant to 50 CFR. 216.22 or 216.27 for scientific research, maintenance in a properly curated, professionally accredited scientific collection, or for educational purposes. Note that stranding response activities may require additional authorization(s) from entities with land or water jurisdiction.

B. Terms and Conditions for Dead Animal Response

1. Response

a. The Participant shall respond as practicable to reports of dead stranded marine mammals within the geographic range or response specified under Article I, Number B.2. If the Participant is the closest and/or first responder, the Participant is considered the on-site coordinating organization and is in charge of all on-site activities. In certain circumstances such as a UME, mass stranding, or endangered marine mammal stranding, NMFS may implement the ICS structure and designate an on-site coordinator to be in charge of the event (see Article II C9). In all situations, the Participant will cooperate with Federal, state, tribal, and local government officials and employees and other stranding network participants when responding to these strandings, and follow all applicable Federal, state, tribal, or local laws, regulations, policies, and/or guidelines. If the Participant receives a verified report of a dead stranded marine mammal and does not have the capability to respond appropriately to the report, the Participant shall notify the NMFS Regional Stranding Coordinator and/or adjacent stranding network participants within 24 hours if feasible.

b. If the Participant leaves a dead animal at the stranding site, or if responding to multiple animals, such as the case of a UME or mass stranding response, the Participant shall, if feasible, mark each animal with a tag or mark, such as roto-tags or grease stick, to assist with data collection and to prevent multiple reports of the same animal(s).

c. If requested by the NMFS Regional Stranding Coordinator and if feasible and practicable, the Participant will assist with stranding response in neighboring areas outside the Participant geographic range (specified in Article I B2).

2. **Data Collection and Reporting** – The Participant shall collect and provide the following information for each stranded marine mammal they respond to:

   a. Complete the Marine Mammal Stranding Report – Level A form (NOAA Form 89-864, OMB #0648-0178) for each stranded marine mammal. Complete the Human Interaction form (also NOAA Form 89-864, OMB #0468-0178) for each applicable stranded marine mammal (see Examiner's Guide for when this form should be completed). Completed forms shall be sent to the NMFS Regional Stranding Coordinator via the NMFS National Marine Mammal Stranding Database or in writing (see Attachment B), no later than 30 days after responding to the stranding event. If requested by the NMFS Regional Stranding Coordinator and if feasible, the Participant shall provide preliminary data (verbal or written) from the Level A - Marine Mammal Stranding Report within 24 hours.

   b. Upon request and as resources are available, collect additional Level B and Level C data, including skin or other samples for genetic analysis at a NMFS lab, to assist NMFS with stock assessments (16 U.S.C. 1386) or other mandates of the MMPA.

   c. Notify the Regional Stranding Coordinator of the following cases within 24 hours or according to the specific reporting guidance provided by the Stranding Coordinator:
      1. Possible or confirmed human interactions (including military activity);
      2. Suspected UMEs;
      3. Extralimital or out-of-habitat situations;
      4. Mass stranding events and/or mass mortalities;
      5. Large whale strandings; and
      6. Any stranding involving endangered or threatened species or identified species of concern [list species]

   d. In certain circumstances (e.g., oil spill, listed or rare species stranding, UME, possible human interaction case, extralimital or out-of-habitat situation), the NMFS Regional Stranding Coordinator may request necropsies be conducted by a Necropsy Team Leader, a specific sampling protocol be followed, samples be stored in a certain manner or location, or that there be additional and expedited reporting (verbal or written) of Level B and C data, such as analytical results and necropsy reports, if available. NMFS will not reproduce, modify, distribute, or publish data submitted under this section without consent of the Participant unless required to release the data under Federal law or order (such as the Freedom of Information Act);

e. Collect and make available any samples, gear, debris, or other objects (e.g., tissues, bullets, arrows, net webbing, etc.) recovered from a stranded marine mammal that may provide evidence of human interaction or may otherwise be necessary for law enforcement or Federal litigation. The Participant must comply with chain of custody procedures or any other instructions as specified and supported by NMFS [REGION] and/or NMFS Office of Law Enforcement personnel.

3. **Parts Disposition** - Diagnostic parts, tissue samples, fluid specimens, hard, and soft parts may be transferred to labs within the United States for diagnostic use for the Participant without any additional authorizations. For non-diagnostic parts or samples:

   a. Retention: Marine mammal parts may be retained by the Participant for education and/or research purposes, provided they are properly indicated in the “Specimen Disposition” field of NOAA Form 89-864, OMB #0648-0178 (the Marine Mammal Stranding Report - “Level A" Form). Parts and/or containers must be marked with the field identification number assigned by the Participant or by NMFS (i.e., NMFS registration number).

   b. Retention of parts from ESA-listed species: Authorization to take and retain parts from ESA listed species in the [REGION] is provided under a MMPA/ESA permit issued to the NMFS Marine Mammal Health and Stranding Response Program Coordinator, and requires authorization and direction from the NMFS Regional Stranding Coordinator and Permit PI or CI.

   c. Transfers to and from Other Organizations within the Stranding Network: The Participant may transfer and receive marine mammal parts from other members of the [REGION] Stranding Network for education and/or research purposes with no additional authorization or notification, provided the transfer is properly indicated in the “Specimen Disposition” field of NOAA Form 89-864, OMB #0648-0178 (the Marine Mammal Stranding Report - “Level A" Form). Parts and/or containers must be marked with the field identification number assigned by the Participant or by NMFS (i.e., NMFS registration number).

d. Transfers to Other Organizations Outside the Stranding Network: Report to the NMFS Regional Administrator (See Attachment B) within 30 days of the stranding event, the transfer of any parts salvaged from the stranded marine mammal collected under this Agreement as required by 50 CFR 216.22 or 50 CFR 216.37. The Participant must ensure the receiving institution is authorized by the NMFS Regional Administrator to receive marine mammal parts. The Participant must provide the institution name where specimen materials have been deposited and ensure that the retained or transferred parts are marked with the field identification number or assigned NMFS Registration number in the "Specimen Disposition" field on the NOAA Form 89864, OMB #0648-0178 (the Marine Mammal Stranding Report – Level "A" Form) and ensure that retained or transferred parts are marked with the field identification number or the NMFS Registration Number.

e. Transfers upon Termination of Stranding Agreement: Upon suspension or termination of the Stranding Agreement, NMFS may authorize retention or may require that the Participant transfer marine mammal parts, samples, and data collected while the Stranding Agreement was active. These transfers may extend beyond the official termination date of this Stranding Agreement, per conditions set forth by NMFS when confirming the suspension or termination of this Stranding Agreement.

4. **Site cleanup** - The Participant shall make every reasonable effort to assist in the clean-up of beach areas where their activities (e.g., necropsy or specimen collection) occur under this Agreement that may contribute to soiling of the site.

Article IV: Live Animal Response: First Response

[Reserved]
Or

A. The Participant may take species of marine mammals covered under the MMPA for the purpose of live stranding first response (initial assessment and care at the site of stranding and assist in the appropriate disposition of the animal), [hazing/deterrence of out of habitat animals or to prevent strandings,] beach triage, beach release, temporary (not to exceed 24 hours unless extended by a Regional Coordinator) holding for assessment and triage, translocation and/or transportation to a NMFS authorized rehabilitation center within the [REGION].

1. The Participant must take live stranded marine mammals in a humane manner (as defined in 50 CFR 216.3, see Attachment A) for the protection or welfare of the marine mammal. [*Reserve for those w/ Article III authorization:* If the animal dies during the course of response and/or investigation, then the terms and responsibilities contained in Article III of this Agreement become operative.] In addition to the activities authorized in Articles I, II, (*reserved* Article III), the Participant is authorized to implement the following activities under this article:

    a. Take measurements [and customized list of authorized procedures – *e.g.,* collect blood or other diagnostic samples] from live stranded marine mammals.

    b. Return live stranded marine mammals, as directed by the NMFS Regional Stranding Coordinator, to their natural habitat, including tagging or marking such animals.

    c. Transport live stranded marine mammals for rescue and rehabilitation to a NMFS approved rehabilitation facility or NMFS approved (verbal or written) temporary (< 24 hours) holding facility. [Treatment may be given during transport, for animal welfare and optimal outcomes].

    d. [Perform humane euthanasia. Euthanasia shall only be performed by the attending veterinarian or by a person acting under the direction of the attending veterinarian and following approved guidelines such as those referenced in Attachment C (2007 Report of the American Veterinary Medical Association Panel on Euthanasia, 2nd Edition of the CRC Handbook of Marine Mammal Medicine, 2006 Journal of the American Association for Zoo Veterinarians) as well as the Marine Mammal Euthanasia Best Practices. When using controlled drugs, such person(s) shall comply with all applicable state and Federal laws and regulations (i.e., registered with the Drug Enforcement Administration). Authorization for euthanasia of ESA-listed species is provided under the current MMPA/ESA permit issued to the NMFS Marine Mammal Health and

Stranding Response Program, as amended, and requires prior approval and direction from the NMFS Regional Stranding Coordinator.]

2. This Agreement does not authorize any projects involving "intrusive research" (as defined in 50 CFR 216.3). Measurements or sampling for scientific research purposes (i.e., outside the scope of accepted diagnostic and treatment practices for the care of an animal) must be authorized under a NMFS MMPA/ESA scientific research permit.

B. Terms and Conditions for Live Stranding: First Response

1. Response

   a. The Participant shall respond to reports of live stranded marine mammals [R*eserved* for taxa and schedule]. If the Participant is the closest and/or first responder, the [Participant acronym] is considered to be the on-site coordinator and is in charge of all on-site activities. In certain circumstances such as a UME, mass stranding, or endangered marine mammal stranding, NMFS may implement the ICS structure and designate an on-site coordinator to be in charge of the event (see Article II C9). In all situations, the Participant will communicate and cooperate with Federal, state, tribal, and local government officials and employees and other stranding network participants when responding to these strandings. If the Participant receives a verified report of a live stranded marine mammal and does not have the capability to respond appropriately to the report, the Participant shall notify the NMFS Regional Stranding Coordinator without delay. Also, if the NMFS Regional Stranding Coordinator receives a report of a live stranded marine mammal, the Regional Stranding Coordinator may contact the Participant to determine whether the Participant has the capability to respond to the stranding. If the Participant cannot respond in a timely manner, the NMFS Regional Stranding Coordinator may request another Stranding Network participant to respond.

   b. The Participant shall take all steps reasonably practicable under the circumstances to prevent further injury to any live stranded marine mammal, injury to any network personnel, volunteers, government personnel and the general public.

   c. The Participant shall tag or mark any animals that are immediately released to their natural habitat using a NMFS approved tag, such as one-bolt roto tag (cattle ear tag), or mark such as freeze branding or paint stick. Application of other tagging methods must first be approved by the NMFS Regional Stranding Coordinator. Tagging and post-tagging activities are restricted to monitoring the success of marine mammals released to the wild. Any telemetry projects outside the scope of monitoring the success of a release must be authorized under a NMFS MMPA/ESA scientific research permit.

d. If the Participant determines that it is necessary to temporarily hold or triage a stranded marine mammal at a separate site from the NMFS approved rehabilitation facility, the animal(s) cannot be moved until the Participant obtains verbal approval from the NMFS Regional Stranding Coordinator. Written documentation of the need for an interim location and written concurrence from the NMFS Regional Stranding Coordinator with any associated conditions must be provided at the earliest time practicable within 24 hours.

e. If the Participant considers responding to an “out-of-habitat” or free-swimming marine mammal in distress (including injured or entangled), the Participant must first contact the NMFS Regional Stranding Coordinator for approval and discuss plans for live capture, any required authorizations (including determining whether the response will be conducted under the authority of this Stranding Agreement or needs to be covered under the MMPA/ESA Permit), and/or needs for assistance. The NMFS Regional Stranding Coordinator may require a NMFS employee to be present at the time of capture.

2. Data Collection and Reporting – The Participant shall collect and provide the following information for each stranded marine mammal they respond to:

   a. Complete the Marine Mammal Stranding Report – Level A form (NOAA Form 89-864, OMB #0648-0178) for each stranded marine mammal. Complete the Human Interaction form (also NOAA Form 89-864, OMB #0468-0178) for each applicable stranded marine mammal (see Examiner’s Guide for when this form should be completed). Completed forms shall be sent to the NMFS Regional Stranding Coordinator via the NMFS National Marine Mammal Stranding Database or in writing (see Attachment B), no later than 30 days after responding to the stranding event. If requested by the NMFS Regional Stranding Coordinator, and if feasible, the Participant shall provide preliminary data (verbal or written) from the Level A - Marine Mammal Stranding Report within 24 hours.

   b. If temporarily (<24 hours) holding a stranded animal under NMFS approval prior to transferring to a NMFS approved longer-term rehabilitation facility acting in accordance with this Article, the Participant should not complete the NOAA Form 89878, OMB # 0648-0178 (the Marine Mammal Rehabilitation Disposition Report), as this form will be completed by the long-term rehabilitation facility.

   c. Upon request and as resources are available, collect additional Level B and Level C data, including skin or other samples for genetic analysis at a

NMFS lab, to assist NMFS with stock assessments (16 U.S.C. 1386) or other mandates of the MMPA.

d. Notify the NMFS Regional Stranding Coordinator of the following cases within 24 hours or according to the specific reporting guidance provided by the Stranding Coordinator:

1. Possible or confirmed human interactions (including military activity);
2. Suspected UMEs;
3. Extralimital or out-of-habitat situations (see B.1.e. of this Article)
4. Mass stranding events and/or mass mortalities;
5. Large whale strandings; and
6. Any stranding involving endangered or threatened species or identified species of concern: [list species].

e. In certain circumstances (e.g., oil spill, listed or rare species stranding, UME, possible human interaction case, extralimital or out-of-habitat situation), the NMFS Regional Stranding Coordinator may request necropsies be conducted by a Necropsy Team Leader, a specific sampling protocol be followed, samples be stored in a certain manner or location, or that there be additional and expedited reporting (verbal or written) of Level B and C data, such as analytical results and necropsy reports, if available. NMFS will not reproduce, modify, distribute, or publish data submitted under this section without consent of the Participant unless required to release the data under Federal law or order (such as the Freedom of Information Act);

f. Collect and make available any samples, gear, debris, or other objects (e.g., tissues, bullets, arrows, net webbing, etc.) recovered from a stranded marine mammal that may provide evidence of human interaction or may otherwise be necessary for law enforcement or Federal litigation. The Participant must comply with chain of custody procedures or any other instructions as specified and supported by NMFS [REGION] and/or NMFS Office of Law Enforcement personnel.

3. [Reserved for those without Article III authorization: Parts Disposition – Diagnostic parts, tissue samples, fluid specimens, parts or cells may be transferred to labs within the United States for diagnostic use without any additional authorizations. For non-diagnostic parts or samples:

a. <u>Retention</u>: Marine mammal parts may be retained by the Participant for education and/or research purposes, provided they are properly indicated in the “Specimen Disposition” field of NOAA Form 89-864, OMB #0648-0178 (the Marine Mammal Stranding Report - “Level A" Form). Parts and/or containers must be marked with the field identification number assigned by the Participant or by NMFS (i.e., NMFS registration number).

b. Retention of parts from ESA-listed species: Authorization to take and retain parts from ESA listed species in the [REGION] is provided under a MMPA/ESA permit issued to the NMFS Marine Mammal Health and Stranding Response Program Coordinator, and requires authorization and direction from the NMFS Regional Stranding Coordinator and Permit PI or CI.

c. Transfers to and from Other Organizations within the Stranding Network: The Participant may transfer and receive marine mammal parts from other members of the [REGION] Stranding Network for education and/or research purposes with no additional authorization or notification, provided the transfer is properly indicated in the “Specimen Disposition” field of NOAA Form 89-864, OMB #0648-0178 (the Marine Mammal Stranding Report - “Level A" Form). Parts and/or containers must be marked with the field identification number assigned by the Participant or by NMFS (i.e., NMFS registration number).

d. Transfers to Other Organizations Outside the Stranding Network: Report to the NMFS Regional Administrator (See Attachment B) within 30 days of the stranding event, the transfer of any parts salvaged from the stranded marine mammal collected under this Agreement as required by 50 CFR 216.22 or 50 CFR 216.37. The Participant must ensure the receiving institution is authorized by the NMFS Regional Administrator to receive marine mammal parts. The Participant must provide the institution name where specimen materials have been deposited and ensure that the retained or transferred parts are marked with the field identification number or assigned NMFS Registration number in the “Specimen Disposition” field on the NOAA Form 89864, OMB #0648-0178 (the Marine Mammal Stranding Report – Level “A” Form) and ensure that retained or transferred parts are marked with the field identification number or the NMFS Registration Number.

e. Transfers upon Termination of Stranding Agreement: Upon suspension or termination of the Stranding Agreement, NMFS may authorize retention or may require that the Participant transfer marine mammal parts, samples, and data collected while the Stranding Agreement was active. These transfers may extend beyond the official termination date of this Stranding Agreement, per conditions set forth by NMFS when confirming the suspension or termination of this Stranding Agreement.]

4. **Site Cleanup** – The Participant shall make every reasonable effort to assist in the clean-up of beach areas where their activities (e.g., euthanasia, necropsy, or specimen collection) occur under this Agreement.

Article V: Live Animal Response: Rehabilitation and Final Disposition

Reserved
Or

A. **The Participant may take live stranded marine mammals in a humane manner with the goal of rehabilitation and release. If the animal dies during the course of rehabilitation, then the terms and responsibilities contained in Article III of this Agreement become operative. In addition to the activities authorized in Articles I, II, (*reserved* III, IV) of this Agreement and subject to the conditions contained in this Agreement, the MMPA, and the implementing regulations, the Participant is authorized to implement the following activities under this article:**

1. In accordance with applicable regulations and NMFS guidelines and best practices, transfer marine mammals to another NMFS approved rehabilitation facility within the [REGION] for:

    a. Release back to the wild;

    b. Temporary placement in a scientific research facility holding a current NMFS scientific research permit and a United States Department of Agriculture Animal and Plant Health Inspection Service (APHIS) Research License; or

    c. Permanent disposition at an authorized facility (i.e. holds an APHIS exhibitors license {7 U.S.C. 2131 et seq.}) after consultation with, and authorization by, the NMFS Office of Protected Resources Permits, Conservation and Education Division.

2. Conduct scientific research on stranded animals in a rehabilitation facility, only if the responsible individual has a NMFS scientific research permit and the facility holds an APHIS research license in accordance with the Animal Welfare Act (see 50 CFR 216.27 (c)(6)).

3. Return rehabilitated stranded marine mammals to their natural habitat. A decision regarding whether or not a marine mammal has the potential to be released must be made as early as possible during the rehabilitation period. Any marine mammal eligible for release must be released as early as possible and no later than six months after being taken for rehabilitation unless the attending veterinarian determines that: the marine mammal might adversely affect marine mammals in the wild; release is unlikely to be successful due to the physical condition and behavior of the marine mammal; or more time is needed to make a determination. Release plans must be submitted to the NMFS Regional Administrator at least 15 days prior to the release, unless advanced notice is waived by the NMFS Regional

Administrator. The NMFS Regional Administrator may require the participant to provide additional information, modify the release plan, or dispose of the marine mammal in another manner (see 50 CFR 216.27(a) and the *Standards for Release of Marine Mammal Following Rehabilitation.*

4. Tag rehabilitated stranded marine mammals, strictly for purposes of monitoring success of release to the wild using a NMFS approved tag, such as one-bolt roto-tag, cattle ear tags, or freeze branding. Application of other tagging methods must first be approved by the NMFS Regional Stranding Coordinator. Tagging and post-tagging activities are restricted to monitoring the success of marine mammals released to the wild. Any projects outside the scope of monitoring the success of a release must be authorized under a NMFS MMPA/ESA scientific research permit.

5. Perform humane euthanasia. Euthanasia shall only be performed by the attending veterinarian or by a person acting under the direction of the attending veterinarian and following approved guidelines such as those referenced in Attachment C (*2007 Report of the American Veterinary Medical Association Panel on Euthanasia, 2nd Edition of the CRC Handbook of Marine Mammal Medicine, 2006 Journal of the American Association for Zoo Veterinarians*). When using controlled drugs, such person(s) shall comply with all applicable state and Federal laws and regulations (i.e., registered with the Drug Enforcement Administration). Authorization for the euthanasia of ESA-listed species is provided under a MMPA/ESA permit issued to the NMFS Marine Mammal Health and Stranding Response Program, and requires prior approval and direction from the NMFS Regional Stranding Coordinator.

B. Terms and Conditions for Live Animal Response: Rehabilitation, release, or Final Disposition Determination.

1. Rehabilitation

   a. The Participant shall comply with laws, regulations, policies, and/or guidelines applicable to or promulgated by NMFS that apply to activities under this Agreement. The Participant must also have all applicable Federal, state, tribal, and local permits for rehabilitation facilities, and must comply with all Federal, state, and municipal laws related to operations of the facility.

   b. The Participant shall be responsible for the custody of any living marine mammal taken pursuant to this Article using standards for humane care and for practicing accepted medical evaluation and treatment as described in the *NMFS Final Standards for Rehabilitation Facilities– Standards for All Rehabilitation Facilities*.

   c. The Participant shall not exceed their maximum holding capacity for cetaceans and pinnipeds based on the minimum standard space requirements, the number of animals housed in each holding area, and the availability of qualified personnel as described in the *NMFS Final Standards for Rehabilitation Facilities– Standards for All Rehabilitation Facilities* unless a written waiver is first received from the NMFS Regional Administrator. The NMFS Regional Stranding Coordinator may offer assistance for relocating animals to another rehabilitation facility and in supporting decisions to euthanize when necessary. Other considerations for determining maximum holding capacity include:

1. On-site veterinary and husbandry care, volunteer support, and experienced staff;
2. Adequate food and medical supplies and medical test capabilities;
3. Isolation for marine mammals;
4. Adequate water quality;
5. Limited public access; and
6. Ability to maintain current, accurate, and thorough records.

d. The Participant shall follow contingency plans approved by NMFS for the care of marine mammals in rehabilitation during planned events (e.g., construction) or unexpected events such as mass strandings, UMEs, natural disasters (e.g., hurricanes, harmful algal blooms, El Niño), and/or hazardous waste spills.

e. The Participant shall separate rehabilitating marine mammals from other wild or domestic animals and from any animal in permanent captivity.

f. The Participant shall prohibit the public display and training for performance of stranded rehabilitating marine mammals as required by 50 CFR 216.27(c)(5). This includes any aspect of a program involving interaction with the public.

g. The Participant shall follow any additional requirements for rehabilitation (e.g., isolation) and release prescribed by NMFS in consultation with the Working Group for Marine Mammal Unusual Mortality Events during a marine mammal UME, as recommended in the *National Contingency Plan for Response to Unusual Marine Mammal Mortality Events;* D.W. Wilkinson, NOAA Technical Memorandum NMFS-OPR-9, September 1996.

h. The Participant must temporarily refuse admittance of new cases of stranded marine mammals due to the severity of a disease outbreak when instructed by the NMFS Regional Stranding Coordinator, in consultation with the UME Working Group or other experts, if diseases of concern have been reported (e.g. diseases associated with a UME, zoonotic diseases).

i. The Participant shall not transfer a marine mammal being rehabilitated under this Agreement to another facility without prior approval from the

NMFS Regional Stranding Coordinator.

j. [Reserved, or: If a marine mammal dies while in rehabilitation, Article III applies.]

2. Release

   a. Release Recommendation

      1. The Participant shall make a final written recommendation for each animal in rehabilitation as early as possible, and no more than six months after its date of rescue, for release or non-release determination to the NMFS Regional Administrator according to any applicable NMFS release guidelines and regulations including 50 CFR 216.27 (release, non-releasable, and disposition under special exception permits for rehabilitated marine mammal.
      2. The final recommendation shall include a release recommendation signed by the Participant's attending veterinarian, attesting that the marine mammal is either medically and behaviorally suitable for release in accordance with the NMFS Standards for Release, or not suitable for release for reasons listed in the letter.
      3. The final recommendation shall include a concurrence signature from the Participant's Authorized Representative or Signatory of the Stranding Agreement (see *Standards for Release of Marine Mammals Following Rehabilitation*).

   b. Release Plan

      1. If the Participant recommends release, a release plan is also required for review and approval by NMFS. A template release plan is available in the *Standards for Release of Marine Mammals Following Rehabilitation*.
      2. The Participant is responsible for communication and coordination with local land management agencies with jurisdiction over proposed release sites, including obtaining prior approval if necessary.
      3. The release plan must be submitted to and approved by the NMFS Regional Administrator (or their designee) at least 15 days prior to the release, unless advanced notice is waived by the NMFS Regional Administrator, as required by 50 CFR 216.27(a).

3. Data Collection and Reporting
   a. Diseases of concern reporting - The Participant shall immediately notify the NMFS Stranding Coordinator upon learning of any diseases of concern (e.g., national and state reportable and/or zoonotic diseases; please see U.S. Department of Agriculture, Centers for Disease Control, or your state

public health department list) that are detected and/or confirmed that could be a potential hazard for public health or animal health;

b. Disposition Reports- Upon release or other disposition of any marine mammal under this Article, the Participant shall complete the Marine Mammal Rehabilitation Disposition Report Form (NOAA Form 89878, OMB # 0648-0178). Completed forms shall be sent to the NMFS Regional Stranding Coordinator via the NMFS National Marine Mammal Stranding Database or in writing (see Attachment B), no later than 30 days after final disposition of the marine mammal. If requested by the NMFS Regional Stranding Coordinator and if feasible, the Participant shall provide preliminary data (verbal or written) from the Marine Mammal Rehabilitation Disposition Report within 24 hours.

c. In certain circumstances (e.g., oil spill, listed or rare species stranding, UME, possible human interaction case, extralimital or out-of-habitat situation), the NMFS Regional Stranding Coordinator may request a specific sampling protocol be followed, samples be stored in a certain manner or location, necropsies be conducted by a Necropsy Team Leader (if applicable), or that there be additional and expedited reporting (verbal or written) of Level B and C data, such as analytical results and necropsy reports, if available. NMFS will not reproduce, modify, distribute, or publish data submitted under this section without consent of the Participant unless required to release the data under Federal law or order (such as the Freedom of Information Act);

d. [Reserved for Regions that require an Annual Summary: Annual Summary Reports - The Participant shall submit an annual report (due January 31 each year) summarizing the Participant's rehabilitation activities for the past calendar year. NMFS will not reproduce, modify, distribute, or publish the data without consent of the Participant unless required to release the data under Federal law or order (such as the Freedom of Information Act). The reports shall include the following for each animal in rehabilitation:

    1. Field number
    2. Species
    3. If the animal was released:
        a. Date
        b. Location of release (latitude and longitude)
        c. Type and specifics of post-release monitoring (roto-tag, satellite tag, etc.) and any tag or brand numbers used
        d. Duration of post-release monitoring
        e. Status of post-release monitoring
        f. Indications from monitoring relative to the success of the rehabilitation effort

   g. Disposition of tracking data (if applicable)
   h. Photos if possible
4. If the animal was transferred to permanent captivity:
   a. Date of transport (or retention if applicable)
   b. Location of permanent care
5. If the animal was euthanized, provide the date of euthanasia
6. If the animal died, provide the date of death

4. [**Reserved for those without Article III Authorization**: Parts Disposition. Diagnostic parts, tissue samples, fluid specimens, parts or cells may be transferred to labs within the United States for diagnostic use without any additional authorizations. For non-diagnostic parts or samples:

   f. Retention: Marine mammal parts may be retained by the Participant for education and/or research purposes, provided they are properly indicated in the "Specimen Disposition" field of NOAA Form 89-864, OMB #0648-0178 (the Marine Mammal Stranding Report - "Level A" Form). Parts and/or containers must be marked with the field identification number assigned by the Participant or by NMFS (i.e., NMFS registration number).

   g. Retention of parts from ESA-listed species: Authorization to take and retain parts from ESA listed species in the [REGION] is provided under a MMPA/ESA permit issued to the NMFS Marine Mammal Health and Stranding Response Program Coordinator, and requires authorization and direction from the NMFS Regional Stranding Coordinator and Permit PI or CI.

   h. Transfers to and from Other Organizations within the Stranding Network: The Participant may transfer and receive marine mammal parts from other members of the [REGION] Stranding Network for education and/or research purposes with no additional authorization or notification, provided the transfer is properly indicated in the "Specimen Disposition" field of NOAA Form 89-864, OMB #0648-0178 (the Marine Mammal Stranding Report - "Level A" Form). Parts and/or containers must be marked with the field identification number assigned by the Participant or by NMFS (i.e., NMFS registration number).

   i. Transfers to Other Organizations Outside the Stranding Network: Report to the NMFS Regional Administrator (See Attachment B) within 30 days of the stranding event, the transfer of any parts salvaged from the stranded marine mammal collected under this Agreement as required by 50 CFR 216.22 or 50 CFR 216.37. The Participant must ensure the receiving institution is authorized by the NMFS Regional Administrator to receive marine mammal parts. The Participant must provide the institution name where specimen materials have been deposited and ensure that the retained or transferred parts are marked with the field identification number or assigned NMFS Registration number in the "Specimen Disposition" field on the NOAA Form 89864, OMB #0648-0178 (the Marine Mammal Stranding Report – Level "A" Form) and ensure that retained or transferred parts are marked with the field identification number or the NMFS Registration Number.

j. Transfers upon Termination of Stranding Agreement: Upon suspension or termination of the Stranding Agreement, NMFS may authorize retention or may require that the Participant transfer marine mammal parts, samples, and data collected while the Stranding Agreement was active. These transfers may extend beyond the official termination date of this Stranding Agreement, per conditions set forth by NMFS when confirming the suspension or termination of this Stranding Agreement.]

Article VI: Live Animal Response: Short-Term Holding

Reserved
Or

A. The Participant may take live stranded marine mammals in a humane manner with the goal of short-term holding (24 to 96 hours) for assessment and triage, translocation and/or transportation to a NMFS authorized rehabilitation center within the [REGION]. If the animal dies during the short-term holding period, then the terms and responsibilities contained in Article III of this Agreement become operative. In addition to the activities authorized in Articles I, II, (*reserved* III, IV) of this Agreement and subject to the conditions contained in this Agreement, the MMPA, and the implementing regulations, the Participant is authorized to implement the following activities under this Article:

1. In accordance with applicable regulations and NMFS guidelines and best practices, transfer marine mammals held for less than 96 hours to another NMFS approved rehabilitation facility within the [REGION or NETWORK] for long-term (i.e., greater than 96 hours) rehabilitation. [Treatment may be given during transport, for animal welfare and optimal outcomes].
   the [REGION] [Reserved: on a case-by-case basis OR in a blanket written approval]

2. The Participant must take marine mammals in short-term holding in a humane manner (as defined in 50 CFR 216.3, see Attachment A). [*Reserve for those w/ Article III authorization:* If the animal dies during the course of response and/or investigation, then the terms and responsibilities contained in Article III of this Agreement become operative.] [*Reserve for those without Article III authorization:* If the animal dies during the course of response and/or investigation, then the carcass must be transferred to another Stranding Agreement holder, at the direction of and in coordination with the NMFS [**REGION**] Stranding Coordinator.] In addition to the activities authorized in Articles I, II, [*reserved* Article III, Article IV], the Participant is authorized to implement the following activities under this Article:

   a. Take measurements [and customized list of authorized procedures – *e.g.*, collect blood or other diagnostic samples] from marine mammals in short-term holding for health assessment.
   b. Remove entanglements and hooks.
   c. Apply tags or marks for identification [may be further customized or specified]
   d. Give medical treatments or provide supportive therapy [may be further customized or specified]

3. Perform humane euthanasia. Euthanasia shall only be performed by the attending

veterinarian or by a person acting under the direction of the attending veterinarian and following approved guidelines such as those referenced in Attachment C (2007 Report of the American Veterinary Medical Association Panel on Euthanasia, 2nd Edition of the CRC Handbook of Marine Mammal Medicine, 2006 Journal of the American Association for Zoo Veterinarians). When using controlled drugs, such person(s) shall comply with all applicable state and Federal laws and regulations (i.e., registered with the Drug Enforcement Administration). Authorization for the euthanasia of ESA-listed species provided under MMPA/ESA Permit No. 18786, as amended, and requires prior approval and direction from the NMFS Regional Stranding Coordinator.

4. [Reserved or for organizations without Article III – Conduct necropsies of animals that die in care or during transport.]

B. Terms and Conditions for Short-Term Holding

1. The Participant shall comply with laws, regulations, policies, and/or guidelines applicable to or promulgated by NMFS that apply to activities under this Agreement. The Participant must also have all applicable Federal, state, tribal, and local permits for rehabilitation facilities, and must comply with all Federal, state, and municipal laws related to operations of the facility.

2. The Participant shall be responsible for the custody of any living marine mammal taken pursuant to this Article using standards for humane care and for practicing accepted medical evaluation and treatment for short-term holding as described in the *NMFS Final Standards for Rehabilitation Facilities– Standards for Short-Term Holding Facilities.*

3. The Participant shall not exceed their maximum short-term holding capacity for cetaceans and pinnipeds based on the minimum standard space requirements, the number of animals housed in each holding area, and the availability of qualified personnel as described in the *NMFS Final Standards for Rehabilitation Facilities– Standards for Short-Term Holding Facilities* unless a written waiver is first received from the NMFS Regional Administrator. The NMFS Regional Stranding Coordinator may offer assistance for relocating animals to another rehabilitation facility and in supporting decisions to euthanize when necessary. Other considerations for determining maximum holding capacity include:
    a. On-site veterinary care, volunteer support, and experienced staff;
    b. Adequate food and medical supplies and medical test capabilities;
    c. Isolation for marine mammals;
    d. Adequate water supply;
    e. Limited public access; and
    f. Ability to maintain current, accurate, and thorough records

4. The Participant shall follow contingency plans approved by NMFS for the care of marine mammals in rehabilitation during planned events (e.g., construction) or unexpected events such as mass strandings, UMEs, natural disasters (e.g., hurricanes, harmful algal blooms, El Niño), and/or hazardous waste spills.

5. The Participant shall separate rehabilitating marine mammals from other wild or domestic animals and from any animal in permanent captivity.

6. The Participant shall prohibit the public display and training for performance of stranded rehabilitating marine mammals as required by 50 CFR 216.27(c)(5). This includes any aspect of a program involving interaction with the public.

7. The Participant shall follow any additional requirements for short-term holding (e.g., isolation) prescribed by NMFS in consultation with the Working Group for Marine Mammal Unusual Mortality Events during a marine mammal UME, as recommended in the *National Contingency Plan for Response to Unusual Marine Mammal Mortality Events;* D.W. Wilkinson, NOAA Technical Memorandum NMFS-OPR-9, September 1996.

8. The Participant must temporarily refuse admittance of new cases of stranded marine mammals due to the severity of a disease outbreak when instructed by the NMFS Regional Stranding Coordinator, in consultation with the UME Working Group or other experts, if diseases of concern have been reported (e.g. diseases associated with a UME, zoonotic diseases).

9. The Participant shall not transfer a marine mammal being rehabilitated under this Agreement to another facility without prior approval from the NMFS Regional Stranding Coordinator, per A(1).

C. Data Collection and Reporting

1. Diseases of Concern Reporting - The Participant shall immediately notify the NMFS Stranding Coordinator upon learning of any diseases of concern (e.g., national and state reportable and/or zoonotic diseases; please see U.S. Department of Agriculture, Centers for Disease Control, or your state public health department list) that are detected and/or confirmed that could be a potential hazard for public health or animal

2. Disposition Reports – The Participant shall complete the NOAA Form 89878, OMB # 0648-0178 (the Marine Mammal Rehabilitation Disposition Report) for all animals held in short-term holding (24-96 hours). This report shall be sent to the NMFS Regional Stranding Coordinator via the NMFS National Marine Mammal Stranding Database or in writing (see Attachment B), no later than 30 days after responding to the stranding event. If requested by the NMFS Regional Stranding Coordinator and if feasible, the Participant shall provide preliminary

data (verbal or written) from the Marine Mammal Rehabilitation Disposition Form within 24 hours.

3. In certain circumstances (e.g., oil spill, listed or rare species stranding, UME, possible human interaction case, extralimital or out-of-habitat situation), the NMFS Regional Stranding Coordinator may request a specific sampling protocol be followed, samples be stored in a certain manner or location, necropsies be conducted by a Necropsy Team Leader (if applicable), or that there be additional and expedited reporting (verbal or written) of Level B and C data, such as analytical results and necropsy reports, if available. NMFS will not reproduce, modify, distribute, or publish data submitted under this section without consent of the Participant unless required to release the data under Federal law or order (such as the Freedom of Information Act).

4. Collect and make available any samples, gear, debris, or other objects (e.g., tissues, swabs, bullets, arrows, net, webbing, etc.) recovered from a stranded marine mammal that may provide evidence of human interaction or may otherwise be necessary for law enforcement or Federal litigation. The Participant must comply with chain of custody procedures or any other instructions as specified and supported by NMFS [*insert* Region] and/or NMFS Office of Law Enforcement personnel.

D. Parts Disposition

1. Diagnostic parts, tissue samples, fluid specimens, parts or cells may be transferred to labs within the United States for diagnostic use without any additional authorizations.

2. As a short-term holding facility, no parts may be retained by or transferred from this organization for purposes other than diagnostic use (*e.g.*, scientific research or archival) without authorization and direction from the NMFS Regional Stranding Coordinator.

Article VII: Temporary Participation in the Stranding Network

[Reserved]
OR

Introduction/Description:
This Article is intended to authorize a facility that does not intend to be a long-term, continuing participant in the marine mammal stranding network, but is instead participating in a short-term capacity. This may be for purposes of response to an anthropogenic event such as an oil spill, a marine mammal event such as an Unusual Mortality Event, or to fill a temporary "gap in coverage." The intent is for an Applicant to be able to apply for and receive this SA Article in an expedited manner, and for it to be authorized on a short-term basis until the emergency situation is resolved.Applicants must still demonstrate qualifications necessary to undertake the proposed role(s), which will be assessed and approved by NMFS prior to issuance of a SA.

A. The Participant my take species of marine mammals (cetaceans and pinnipeds, excluding walrus) under the MMPA for the purpose of emergency response to stranded and distressed marine mammals.

1. Subject to the conditions contained in this Agreement, the MMPA, and the implementing regulations, the Participant may take live and/or dead stranded marine mammals or parts therefrom. Participant must collect and make available any samples, gear, debris, or other objects (e.g., tissues, bullets, arrows, net webbing, etc.) recovered from a stranded marine mammal that may provide evidence of human interaction or may otherwise be necessary for law enforcement or Federal litigation. The Participant must comply with chain of custody procedures or any other instructions as specified and supported by NMFS [REGION] and/or NMFS Office of Law Enforcement personnel.
2. The full suite of response activities may include:
    a. Reconnaissance activities to identify impacted marine mammals;
    b. Hazing or deterrence activities to prevent stranding of or impacts to marine mammals;
    c. Recovery activities to collect live or dead stranded marine mammals;
    d. Processing activities to collect appropriate samples, including necropsy of dead animals;
    e. Care and rehabilitation activities; and
    f. Providing personnel to conduct these activities.

3. General considerations:
    a. Placement of individuals will be subject to availability, logistics, and needs of the temporary facility, but may be coordinated with other organizations including permanent members of the marine mammal stranding network.

    b. Personnel training (and maintenance of training) is the sole responsibility of the organization. NMFS will endeavor to periodically provide opportunities for applicable trainings (e.g., oil spill drills and exercises, necropsy training, webinars or other virtual trainings).

c. Participation as a Temporary Facility may be on a voluntary or paid basis, depending on the arrangements with the Responsible Party and/or Incident Command, Working Group on Marine Mammal Unusual Mortality Events, etc. Each incident may be different, and it is the responsibility of the Personnel Organization to determine the compensation structure.

d. Participants must manage any and all expenses that the Participant incurs associated with the activities authorized by this Agreement, including close-out costs should the Stranding Agreement be modified or terminated. NMFS does not have funds to reimburse volunteers for expenses incurred in responding to stranding events. However under the marine mammal UME process, funding may be available for costs associated with specific analyses and additional requests in accordance with section 405 of the MMPA UME National Contingency Fund and in coordination with the Working Group on Marine Mammal Unusual Mortality Events. Additionally, competitive funding opportunities for Stranding Network Participants may be available through the Prescott Stranding Assistance Grant Program (see: https://www.fisheries.noaa.gov/grant/john-h-prescott-marine-mammal-rescue-assistance-grant-program).

B. Participant Authorized Roles

1. [Reserved or] **Personnel:** This organization is authorized to provide trained and qualified individuals (as approved by NMFS) to other organizations for the purposes of emergency response.

2. [Reserved or] **Hazing/Deterrence:** This organization is authorized to conduct field activities to haze or deter marine mammals from areas of potential danger (e.g., oiled areas, near-mass strandings, etc.). [May be limited by species, taxa, etc. upon issuance].

3. [Reserved or] **Field Response to dead marine mammals:** This organization is authorized to conduct field recovery activities to closely approach, assess, and capture or recover dead animals [May be limited by species, taxa, etc. upon issuance].

4. [Reserved or] **Field Response to Live Marine mammals:** This organization is authorized to conduct field recovery activities to closely approach, assess, and capture or recover animals determined to be in need of medical attention. [May be limited by species, taxa, etc. upon issuance].

5. [Reserved or] **Processing Facility:** A processing facility has the capacity to fully process/necropsy dead mammals (following appropriate protocols and sample storage requirements needed for evidentiary purposes). [May be limited by species, taxa, etc. upon issuance].

6. [Reserved or] **Stabilization:** A stabilization facility has the ability to temporarily hold live stranded marine mammals and provide initial "first aid" before moving on to a Primary Care Center. [May be limited by species, taxa, etc. upon issuance].

7. [Reserved or] **Rehabilitation:** These facilities will not receive oiled animals (or wash/de-oil mammals) but can hold and treat clean mammals for extended periods of time to allow for them to return to normal function/health (e.g., zoos/aquaria can fill these roles if off-exhibit holding is available). This facility is also authorized for the release of animals deemed releaseable following rehabilitation in accordance with NMFS regulations (50 CFR 216.27) and the guidance in the *Standards for Release of Marine Mammals Following Rehabilitation.*
   a. Any marine mammal in rehabilitation shall be isolated from other wild, domestic, or permanently captive animals.
   b. No public display and training for performance of animals in rehabilitation is permitted. No interaction with any members of the public is permitted.

8. [Reserved or] **Primary Oiled Animal Care (oil spill only):** Primary Oiled Animal Care facilities can receive live oiled marine mammals, conduct processing and intake procedures, clean them appropriately (and dispose of the oily waste water in a safe and legal manner), and hold them post-wash until they are cleared for release (e.g., typically larger facilities with full indoor and outdoor holding areas, cleaning space to de-oil mammals, the ability to zone the facility into "hot" and "cold" zones, and the necessary infrastructure (HVAC, water systems) to support spill operations). This facility is also authorized for the release of animals deemed releaseable following rehabilitation in accordance with NMFS regulations (50 CFR 216.27) and the guidance in the *Standards for Release of Marine Mammals Following Rehabilitation.*
   a. Any marine mammal in rehabilitation shall be isolated from other wild, domestic, or permanently captive animals.
   b. No public display and training for performance of animals in rehabilitation is permitted. No interaction with any members of the public is permitted.

9. [Reserved or List any equipment or resources at the organization that will not be made available to support temporary response, *e.g.* particular pools, trucks, etc.]\

C. General Restrictions and Responsibilities as a Temporary Facility

1. This authorization is for response within the following geographic area: [*insert* geographic area] and for the following taxa: [*insert* taxa or species]

2. In all situations, the Participant will cooperate with Federal, state and local government officials and employees and other stranding network participants when responding to strandings. If the Participant receives a "confirmed by public" report of a stranded marine mammal and does not have the capability to respond appropriately to the report, the Participant shall notify the NMFS Regional Stranding Coordinator and/or adjacent stranding network participants within 24 hours if feasible.

3. The Participant will take all steps reasonably practicable under the circumstances to prevent further injury to any live stranded marine mammal, network responders, volunteers, government personnel, and the general public.

4. If the Participant leaves a dead animal at the stranding site, or if a live stranded animal is immediately released from the stranding site, the Participant shall, whenever feasible, mark each animal with a tag or mark, such as roto-tags or grease stick, to assist with data collection and to prevent multiple reports on the same animal(s).

D. Data Collection and Reporting – The Participant shall collect and provide the following information for each stranded marine mammal they respond to:

1. Complete the Marine Mammal Stranding Report - "Level A" Form (NOAA Form 89-864, OMB #0648-0178) for each stranded marine mammal. Completed forms shall be sent to the NMFS Regional Stranding Coordinator in writing (see Attachment B), no later than 30 days after responding to the stranding event. If requested by the NMFS Regional Stranding Coordinator and if feasible, the Participant shall provide preliminary data (verbal or written) from the Level A - Marine Mammal Stranding Report within 24 hours.

2. As resources are available and upon request, collect additional Level B and Level C data, including skin or other samples, to assist NMFS with stock assessments (16 U.S.C. 1386) or other mandates under the MMPA.

3. The Regional Stranding Coordinator may require:
   a. Necropsies be conducted by a Necropsy Team Leader or other identified personnel;
   b. A specific sampling protocol be followed;
   c. Samples are stored in a certain matter or location; or
   d. That there are additional and expedited reporting (verbal or written)) of Level A, B and C data such as analytical results and necropsy reports if available. NMFS will not reproduce, modify, distribute, or publish data collected under this section without consent of the Participant unless required to release the data under Federal law or order (such as the Freedom of Information Act),

4. Collect and make available any samples, gear, debris, or other objects (e.g., tissues, swabs, bullets, arrows, net, webbing, etc.) recovered from a stranded marine mammal that may provide evidence of human interaction or may otherwise be necessary for law enforcement or Federal litigation. The Participant must comply with chain of custody procedures or any other instructions as specified and supported by NMFS [*insert* Region] and/or NMFS Office of Law Enforcement personnel.

E. Parts disposition.

1. Diagnostic Diagnostic parts, tissue samples, fluid specimens, parts or cells may be transferred to labs within the United States for diagnostic use without any additional authorizations.

2. As a Temporary Facility, no parts may be retained by or transferred from this organization for purposes other than diagnostic use (*e.g.*, scientific research or archival) without authorization and direction from the NMFS Regional Stranding Coordinator. Disposition instructions will be provided by NMFS for any parts that are collected while your Temporary Facility is in operation.

F. Site cleanup. The Participant shall make every reasonable effort to assist in the cleanup of beach areas where their activities (e.g., necropsy, euthanasia, specimen collection) under this Agreement that may contribute to soiling of the site.

Article VIII: Participant's Authorized Personnel [and Designees]

A. Personnel and volunteers

1. Taking of marine mammals authorized in this Agreement may only be directed by the Participant's personnel and trained volunteers identified by the Participant in writing to the NMFS Regional Administrator. The Participant may use other (i.e., not previously identified to NMFS) volunteers to carry out activities in this Agreement only if they are under the close direction of previously identified trained personnel or volunteers. The Participant may not delegate authority to take marine mammals to another person except as provided in this article.

2. In the event of changes in key personnel, the prospective Participant shall notify the NMFS Regional Administrator in writing (see Attachment B) and provide a description of the experience of new key personnel for review and approval by NMFS within 30 days.

3. If changes in key personnel will result in the Participant's failure to meet the Evaluation Criteria, the Participant will notify the Regional Administrator immediately. New key personnel must meet the qualification terms identified in the *NMFS Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release - Evaluation Criteria for a Marine Mammal Stranding Agreement.*

B. Untrained citizens

1. If the Participant requests the assistance of untrained citizens (e.g., during a mass stranding), the Participant is responsible for the actions of those citizens during the response; must take precautions against injury or disease to those volunteer citizens; and must ensure that the citizens' actions do not cause unnecessary harassment of marine mammals.

2. The Participant and their volunteer citizens shall indemnify and hold harmless the United States Government from any and all losses, damages, or liability - or claims therefore - on account of personal injury, death, or property damage of any nature whatsoever, arising out of the activities of the Participant, his/her/its employees, his/her/its qualified representatives, designees, subcontractors, volunteers, or agents. Liability for person(s) acting under this agreement is addressed in sections 406(a) and (b) of the MMPA [16 U.S.C. 1421(e)].

C. [RESERVED or]Designee Organizations

1. Authorization for Designee Organization(s)

    a. The Participant may designate an organization or institution to act on behalf of the Participant as a Designee in accordance with this Agreement.

For purposes of this Agreement, the term "Designee" does not refer to individual personnel/volunteers of the Participant's organization, or to individual personnel/volunteers of the designee organization or institution.

b. Any designation requires prior written approval from the NMFS Regional Administrator (Appendix A).

c. Any organization or institution so designated shall be deemed an agent of the Participant and NMFS, and is subject to ALL applicable provisions of this Agreement as well as applicable laws, regulations, and guidelines.

d. The Participant must provide oversight of their Designee organization(s).

e. Any breach of the provisions of this Agreement by a Designee of the Participant shall be deemed a breach by the Participant.

2. Purpose of Designee Organization(s)
   a. The purpose of a designee organization(s) is to assist the Participant with improved sub-region coordination, response, and/or rehabilitation capability within the Participant's geographic area of responsibility. The ability to train and oversee Designees helps create new organizations and build the Stranding Network capacity.

   b. NMFS will evaluate designee organizations based on the Participant's justification for geographic need, enhancement of response capabilities, and level of experience provided by the designee organization.

3. Terms and Conditions for Adding Designee(s)
   a. To request the addition of a Designee organization to the Participant's Stranding Agreement, the Participant must submit a memorandum of understanding (MOU) between the Participant and the Designee (see below and Attachment D, *NMFS Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release - Evaluation Criteria for a Marine Mammal Stranding Agreement).*

   b. The signed MOU must be received at least 30 days prior to any prospective designation by the NMFS Regional Administrator for review.

   c. NMFS will respond within writing to the Participant's request to add a Designee within 30 days of the receipt of the request with an approval, rejection, or request for more information.

   d. The request to add a Designee organization must contain:
      1. Complete name and contact information for the Designee organization or institution;
      2. Resumes or CVs of all key personnel for the Designee

organization, including evidence of relevant training;
3. Justification statement for designation;
4. Geographic coverage area for response (or role of Designee);
5. For rehabilitation facilities, a facility operation plan including personnel, veterinary care, equipment list, and other requirement stated under any applicable NMFS laws, regulations, policies, and guidelines. The Designee must also have all applicable Federal, state, tribal, and local permits for rehabilitation facilities;
6. Oversight plan, including how the Participant will monitor the activities of the designee under the Agreement; and
7. A copy of the written and signed MOU between the Participant and the Designee that must state that the Designee has agreed to abide by all the terms and conditions in the Participant's Stranding Agreement, as well as any other policies or protocols that the two organizations are establishing.

4. A Designee organization may not be authorized for activities exceeding those contained in the Stranding Agreement of the Participant.

Article IX: Rights of States, Tribal, and Local Governments

Nothing in this Agreement shall be construed to affect the rights or responsibilities of other Federal, state, tribal, or local government officials or employees acting in the course of their official duties with respect to taking of marine mammals in a humane manner (including euthanasia) for protection or welfare of the marine mammal, protection of public health and welfare or non- lethal removal of nuisance animals (MMPA Section 109(h)).

Article X: Effective Date, Renewal, and Application Procedures

A. Effective Date – The terms of this Agreement shall become effective upon the signature of both [Participant acronym] and the NMFS [Region] Regional Administrator.

B. Period of Agreement

1. Duration – Unless terminated as provided in this Agreement, this Agreement shall expire at the end of the following applicable period [insert expiration date]:

    a. [As needed for response to a temporary situation (Article VII)
    b. Up to 1 year for new Provisional Stranding Network Participants (new participants)
    c. Up to 4 years for a live animal responder/rehabilitator (Articles IV, V, VI)
    d. Up to 6 years for a dead animal only responder (Article III only)]

2. Stranding Agreement Renewals

    a. No later than 90 days prior to the expiration date of this Agreement, NMFS will provide the Participant with a written notice of expiration, and prescribe information needed from the Participant for renewal (see NMFS *Evaluation Criteria for Marine Mammal Stranding Agreements*).

    b. No later than 60 days prior to the expiration date, the Participant shall indicate in writing to NMFS (see Contacts, Attachment B) that a renewal of this Agreement is requested and shall provide the prescribed information.

    c. Following NMFS review of the submitted information to determine if Participant meets applicable requirements, the Agreement may be renewed if agreed to in writing by both parties.

    d. **<u>If no written renewal request is received from the Participant, this Agreement becomes null and void upon the above expiration date</u>**.

3. Denial of Stranding Agreement Renewal

    a. The decision to renew or deny a Stranding Agreement is solely at the discretion of the NMFS Regional Administrator and is not compelled by the Participant's adherence to the Stranding Agreement criteria.

    b. If the NMFS Regional Administrator denies a renewal request, the denial will be issued in writing by certified mail from the NMFS Regional Administrator to the Participant within 30 days of the Participant's submission of a completed application.

c. Any denial will be based upon the Regional Administrator's judgement of:
    1. The past performance of the Participant;
    2. The existing capabilities of the Participant; or
    3. Geographic and programmatic needs of NMFS' stranding program.

d. **A Stranding Agreement renewal request which is denied by the NMFS Regional Administrator becomes null and void upon the above expiration date**.

Article XI: Review, Modification, and Termination

A. Review – The NMFS [Region] ARA for Protected Resources shall review this Agreement from time to time for performance adequacy and effectiveness.

B. Modification

1. A request for a modification to the Stranding Agreement can be initiated by the Participant or the [REGION] Regional Administrator. Modifications can include, but are not limited to, procedural or administrative changes, such as a change in contact information, and a request for expansion or reduction of activities (including if your organization would like to opt-out of response during hazardous waste spills or other disaster responses) authorized by this Agreement.

2. A request for authority for additional activities may require submission of information identified in NMFS Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release - Evaluation Criteria for a Marine Mammal Stranding Agreement.

3. NMFS will review and issue or deny proposed modifications and increases or reductions in authority within 30 days of receipt of a completed request. The Participant and the NMFS Regional Administrator may determine that a new Stranding Agreement is warranted, rather than amendment of a prior Agreement.

C. Suspension or Termination Request by Participant

1. The Participant may request suspension of all or part of this Stranding Agreement for a stated period of time (not to exceed 1 year).

2. The Participant may terminate this Agreement, upon 30 days written notice to the NMFS Regional Administrator.

3. NMFS will reply and confirm the suspension or termination of all or part of this Stranding Agreement within 30 days. NMFS may also include conditions by which this Agreement is to be terminated or how it may be reinstated.

4. Suspension of the authorization of activities at the request of the Participant may be given without prejudice to the reinstatement of authorization or renewal of a Stranding Agreement and will not prevent the Participant from being in “good standing”.

5. Upon suspension or termination of the Agreement, NMFS may request that the Participant transfer items to other network members. These can include, but are not limited to, equipment purchased with Federal funds, marine mammal parts, samples, and data. These transfers may extend beyond the official termination date of this Stranding Agreement, per conditions set forth by NMFS when

confirming the suspension or termination of this Stranding Agreement.

D. Non-Compliance with Stranding Agreement or Violations of Law by Participant

1. If the the Participant fails to satisfy the terms and condition of this Agreement or violates any laws, regulations, or guidelines applicable to this Agreement, or Federal, state, tribal, or municipal laws related to stranding network operations, NMFS shall provide the Participant, in writing, with notice and an opportunity to correct any deficiencies within a time period specified by NMFS.

2. NMFS may immediately suspend or terminate this Agreement in cases of willfulness, or those in which animal welfare, public health, interest, or safety requires immediate action.

3. NMFS may take the following actions based on the circumstances:

    a. Probation
        1. The Participant may be put on probation (not to exceed 1 year) if deficiencies are not corrected.
        2. The NMFS Regional Stranding Coordinator and the Participant will develop a timetable with reasonable and measurable milestones that must be achieved to correct deficiencies during the probation period.
        3. Probation requires annual reviews of the Participant's activities for up to three years.
        4. A participant on probation is <u>not</u> in "good standing" with the Stranding Network.

    b. Suspension
        1. The NMFS Regional Administrator may suspend the Participant's authority, or any portion of their authority, as appropriate (e.g., suspend rehabilitation authority, but not live or dead animal response), with 30 days written notice, for up to 1 year.
        2. If the Participant's Stranding Agreement is suspended while animals are in rehabilitation, NMFS reserves the right either to confiscate the animals or to arrange for another participant to take over rehabilitation or take custody of the animals.
        3. A notice of suspension listing deficiencies and a timetable with reasonable and measurable milestones required to correct those deficiencies will be issued in writing, delivered in person or by certified mail, from the NMFS Regional Administrator if, in the judgment of the Regional Administrator, the Participant has:
            a. Submitted false information or statements in applications or reports;
            b. Not satisfied the terms and conditions of the Agreement;
            c. Failed to correct deficiencies in a timely manner; or

    d. Violated applicable Federal, state, tribal, or municipal laws, regulations, guidelines, or other requirements.
4. A participant on NMFS-initiated suspension is not in “good standing” with the Stranding Network.

c. Immediate suspension
1. The NMFS Regional Administrator may require immediate suspension of authorization under a Stranding Agreement, or any part of the Agreement, without prior notice if, in the judgment of the Regional Administrator, suspension is needed:
    a. To protect marine resources;
    b. In cases of willfulness; or
    c. As otherwise required to protect animal welfare, public health, welfare, interest, or safety.
2. During the suspension period, the NMFS Regional Stranding Coordinator may ask other Stranding Network participants to respond in the Participant’s area of geographic coverage.
3. If the Participant’s Stranding Agreement is suspended while animals are in rehabilitation, NMFS reserves the right either to confiscate the animals or to arrange for another participant to take over rehabilitation or take custody of the animals.
4. A written notice of immediate suspension will be issued in person or by certified mail.
5. A participant on immediate suspension is not in “good standing” with the stranding network.

d. Termination
1. The NMFS Regional Administrator may terminate this Agreement, or any part thereof, upon at least 30 days written notice to the Participant, delivered in person or by certified mail.
2. The Agreement may be terminated for any reason, including the Participant’s:
    a. Submission of false information or statements in applications or reports;
    b. Failure to satisfy the terms and conditions of the Agreement;
    c. Failure to correct deficiencies in a timely manner; or
    d. Violation of applicable Federal, state, tribal, or municipal laws, regulations, guidelines, or other requirements.
3. The NMFS Regional Stranding Coordinator may ask another Stranding Network participant to respond in the Participant’s area of geographic coverage.
4. If the Participant’s Agreement is terminated while animals are in rehabilitation, NMFS reserves the right to either confiscate the animals or to arrange for another participant to take over rehabilitation of or to take custody of the animals.

5. Termination of the Agreement for any reason shall automatically terminate any designations by the Participant to any Designee organizations under this Agreement.

e. [Reserved for SAs with Designees: Violations by Designees
   1. Violations by the Participant's Designee organization are considered to be violations by the Participant.
   2. NMFS will address violations by Designees directly with the Participant according to this Article.
   3. NMFS may use the remedy of terminating the designation.]

Signature Page

Pursuant to the terms and conditions described above in this Stranding Agreement between NMFS [REGION] and [Participant], the Participant is authorized *[insert applicable authorizations:*

- **Under Article III to respond to strandings of dead marine mammals *{reserve for taxa}*;**
- **Under Article IV to provide first response to live stranded marine mammals;**
- **Under Article V to rehabilitate and release live stranded marine mammals**
- **Under Article VI for short-term holding of live stranded marine mammals**
- **Under Article VII as a temporary facility for the activities listed within]**

This Stranding Agreement is entered into and made effective this

Date:	Date:
Regional Administrator NMFS [REGION]	Authorized Representative [Stranding Network Organization]

This Stranding Agreement remains in effect until: [Expiration date]

Appendix A: Designee Signature Page

Designees: Statement of Agreement for designation of authority and responsibilities to any organization or institution to act as agents under this agreement.

AGREEMENT

I have read the conditions as stated above for participating in the Stranding Network as an agent of the____________________________ (Stranding Network Organization) under its Agreement with the National Marine Fisheries Service [REGION] and agree to abide by all applicable provisions of the Agreement between the National Marine Fisheries Service [REGION] and _______________________________ (Stranding Network Organization).

NMFS Region	Stranding Organization	Designee Organization
______________________	______________________	______________________
Signature	Signature	Signature
Regional Administrator	______________________	______________________
Title	Title	Title
NMFS [Region]	______________________	______________________
Affiliation	Affiliation	Affiliation
______________________	______________________	______________________
Date	Date	Date

Expiration Date:

Appendix IX

Evaluation Criteria for
Marine Mammal Stranding Agreements

New Applicants and Renewals

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Shaded text denotes reserved text at the discretion of the NMFS Regional Administrator.

[1] To renew an existing Stranding Agreement, the applicant must demonstrate past compliance with the terms and responsibilities of their Stranding Agreement, including reporting requirements and deadlines.

[2] Referenced evaluation criteria <u>may</u> be waived based on the discretion of the NMFS Regional Administrator for the purposes of:

- Network development or expansion of stranding response capabilities in geographically remote or low coverage areas [e.g., Alaska, Washington, Oregon, Hawaii, and American Territories (i.e., Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Marina Islands)];
- Network development or expansion of stranding response capabilities to fill an emergency gap in coverage (e.g., due to the loss of a pre-existing stranding agreement holder); or
- Due to an ongoing large-scale emergency [e.g., oil spill or natural disaster]

[3] If long-term care is not feasible, a plan for disposition of live marine mammals at alternate care facilities must be submitted.

Purpose and Application

These minimum evaluation criteria have been developed to assist the National Marine Fisheries Service [Region] Region (NMFS) in its evaluation of Stranding Agreement renewal requests and new Stranding Agreements proposals. Prior to issuing new Stranding Agreements, the NMFS [Region] Regional Administrator must determine there is a programmatic and/or geographic need for a Stranding Network Participant in the proposed area of response. Geographic or programmatic needs are based on, but not limited to, the following factors: the historic number of stranded marine mammals in an area, the amount of personnel and resources of stranding network participants with existing agreements in the proposed response area, the geographic extent of the proposed response area, and the proximity of the existing and prospective stranding network participants to the proposed response area.

The decision to enter into an Agreement under which an organization may take species under the Marine Mammal Protection Act for the purpose of stranding response is solely at the discretion of the NMFS [Region] Regional Administrator. NMFS [Region] Region is not compelled to enter into or to decline to enter into a Stranding Agreement based on an interested party's adherence with these criteria. NMFS weighs the geographical need, programmatic need, level of expertise, stranding related activities, cooperation, and criteria listed below when making its determination in determining whether to issue a new Stranding Agreement.

General Evaluation Criteria for Article III-VII Authorization [1, 2]

A. General Information - The existing or prospective Participant should provide the following information to NMFS as part of their request to obtain or renew an existing Stranding Agreement with NMFS, as well as upon any significant changes to the information:

1. Participant Contact Information. This should include:
   a. Mailing address, phone number, and e-mail for all official correspondence
   b. Physical address and location of the facility
   c. Name, title, and contact information for an authorized representative with signatory authority for the organization (e.g., Executive Director, Director, President, CEO, etc.)
   d. Contact numbers including office, home, and/or cell phone numbers of primary responders, key personnel/volunteers, and veterinarians
   e. Public hotline
2. Description of Organizational Goals, Capability, and Experience. This should include:
   a. Brief summary of the existing or proposed organization's mission, goals, and objectives and how these complement objectives for the [Region] Regional Stranding Network
   b. Brief summary on history and type of organization (*e.g.*, university, governmental agency, non-profit, aquarium, museum, etc.)
   c. Description of any past or current collaboration with NMFS, other Stranding Network participants, relevant government agencies (*e.g.,* Federal, state, tribal, or local conservation agency), scientific researchers, or the public
   d. Summary of relevant organizational experience with response to live/dead stranding events and /or rehabilitating marine mammals within the past four years
   e. An overview of general capabilities to conduct stranding response
3. Proposed Scope and Area of Geographic Response. This should include:
   a. Brief summary of the existing or proposed scope of the stranding program
      1. Species or taxa (*e.g.*, all species of cetaceans, pinnipeds or certain taxa/species only);
      2. Size/age class; and
      3. Type of response: dead animals only, live and dead animals, short-term holding, and/or rehabilitation
   b. Justification and description of the existing or proposed geographic area of coverage and why the area of response is appropriate for the organization (e.g., the amount of personnel/volunteers and resources available, relative to shoreline covered, historic number of stranding events, etc.). Latitude and longitude of proposed geographic area and maps are especially helpful
4. Decription of organizational structure. This should include:
   a. An overview of staffing, personnel, volunteers, veterinarians, the primary representative, and primary responders, including organizational charts, titles, and position descriptions as appropriate

b. Brief summary of relevant training, experience, and qualifications for key stranding response personnel, including primary responders, veterinarians and volunteers as appropriate
c. Description of how personnel/volunteers will collect, report, and maintain Level A stranding data and conduct basic (Level B) tissue sample collection. This should also address requirements for accurate and timely reporting
d. Description of how volunteers are trained and monitored to ensure quality data collection
e. Description of how the organization will keep NMFS informed about any changes in key personnel, geographic area of coverage, or capabilities

5. Equipment and resources. This should include:
    a. Description of resources, supplies and equipment currently available to conduct stranding response (live and/or dead)
    b. Types and availability of specialized equipment as applicable (*e.g.* necropsy equipment, freezers, trucks, tagging equipment, stretchers, vessels, triage equipment, transport equipment, temporary and/or permanent pools, etc.)
6. Rapid response and investigation procedures. This should include (as applicable, based on the type of authorization requested):
    a. Procedures for stranding response for dead/live stranded marine mammals
    b. Human health and safety precautions implemented
    c. How calls are handled, availability (e.g., 24-hour or a different schedule, staffed hotline vs. voicemail, etc.), and which personnel will respond
    d. How necropsies will be coordinated and conducted
    e. Capabilities and general rescue plan, and plans for animal care (e.g., on-site veterinary care) for live animal response including triage, transport, and euthanasia
    f. Protocols for decision-making when responding to a live animal
    g. Description of how the organization will communicate and coordinate with other Stranding Network members, NMFS, and other agencies for responses within their jurisdiction (*e.g.*, National or state parks)
7. Any other relevant documentation (permits, authorizations, agreements, etc.) for review prior to entering into any Stranding Agreement and at any subsequent time as requested by the [Region] Regional Administrator, or when additional documentation is obtained that may become relevant to performance under the Agreement
8. Documentation of experience, ability, and knowledge (e.g., CV, resume, certificates, letters of recommendation, etc.) of key personnel (e.g., primary representative, primary responder). Experience can be obtained through paid employment, internships, volunteering, course work, and/or NMFS approved training
9. For prospective Participants, demonstrate experience working under the direct supervision of an existing Stranding Network Participant in good standing or NMFS for at least three years or equivalent case load.[(2)] The prospective Participant may apprentice as a "designee" organization under a Stranding Agreement holder to obtain this experience
10. Letter(s) of support from peers such as other stranding network organizations (Stranding Agreement/Designee organizations), universities/researchers, government agencies, non-governmental organizations, professional organizations, etc. For new Stranding Agreement applicants, such letters of support could also be provided from the current

Stranding Agreement holder under which the Participant received experience and include assurances that the prospective Participant can support programmatic and geographic needs in the area

B. General Evaluation Qualifications for Articles III, IV, V, VI, and VII – NMFS will evaluate existing and prospective participants based on their demonstrated track record and their capabilities in the following areas as described in their request

1. Ability to provide description of on-call coverage for the proposed geographic area of response (e.g., established "hot-line" number, voicemail box, app, text messages, staffed pager, etc.)
2. Demonstrated ability to comply with standard instructions and collect Level A and human interaction data from stranded marine mammals according to established protocols
3. Ability to conduct full post-mortem exams, including obtaining histopathology samples and other biological samples (if feasible and requested by NMFS).
4. Willingness and ability to communicate in a professional manner, and demonstrated ongoing cooperation with NMFS (including communications staff), other network members, the general public, local, tribal, federal, and state agencies.
5. Willingness and ability to cooperate with authorized marine mammal researchers.
6. Ability to address health and safety when responding to dead or live stranded marine mammals, or marine mammals in rehabilitation or short-term holding (e.g., a description of the organization's operational safety plan or protocols).
7. Demonstrated experience specific to the marine mammal species that are most likely encountered in the proposed area of geographic response.

Evaluation Criteria for Article III Authorization: Response to Dead Stranded Marine Mammals – First Response [1, 2]

In addition to the General Criteria in Section A, Participants proposing to respond to dead stranded marine mammals should provide information that shows the Participant's plan for implementing Article III of the Stranding Agreement, and present evidence that the Participant has the skills, resources, and organizational capabilities to be successful.

A. Information for Article III Authorization
1. Key Personnel
    a. The prospective Participant should have and maintain one **Authorized Representative** and at least two **Primary Responders**, at least one of whom will be on-site or supervising when dead animals are being examined or handled and is responsible for the day to day operations (Primary Responders may be staff, or experienced lead volunteers, interns, etc.).[2]
    b. The **Authorized Representative** has signatory authority for the stranding organization and may be the signatory of the stranding agreement (e.g., Executive Director, President, CEO, etc.)
    c. Additional personnel may be necessary, commensurate with the proposed geographic area of response and frequency of stranding events
2. Equipment list
    a. The prospective Participant should demonstrate they have and maintain equipment appropriate to dead animal stranding response
    b. Minimally, this should include items necessary for Level A and human interaction data collection

B. Qualifications for Article III Authorization
1. Key Personnel (Primary Responders and any other necessary personnel to provide coverage) should have experience or comparable training to collect Level A and human interaction data and if possible to collect Level B data (i.e., complete necropsy)
2. Minimal key personnel qualifications are:
    a. Experience conducting or observing complete necropsies on a minimum of [six] marine mammals with at least [three] of those necropsies on Code 2 animals.[2]
    b. Ability to identify species of marine mammals in the field (Code 2).
    c. Ability to accurately identify code condition of marine mammals in the field (Code 1-5).
    d. Ability to obtain accurate Level A and human interaction stranding data and if possible, to conduct basic tissue sample (Level B) collection.
    e. Knowledge and experience complying with Level A and human interaction data reporting requirements.
    f. Knowledge and experience complying with sampling protocols, sample processing, and shipping procedures.
    g. Knowledge of marine mammal anatomy and physiology.

h. Knowledge of human health and safety precautions including potential zoonotic marine mammal disease.
i. Knowledge of federal, tribal, state, and local disposal policies and rules

Evaluation Criteria for Article IV Authorization: First Response, Triage, and Transport of Live Stranded Marine Mammals [1, 2]

In addition to criteria in sections I and II, prospective Participants proposing to conduct response to live stranded marine mammals should provide information that shows the Participant's plan for implementing Article IV of the Stranding Agreement, and present evidence that the Participant has the skills, resources, and organizational capabilities to be successful. Applications should be specific to the types and extent of activities being proposed for live animal response and care (e.g., extent of veterinary treatment).

A. Information for Article IV Authorization

1. Key Personnel
    a. The prospective Participant should have and maintain one Authorized Representative and at least two Primary Responders, at least one of whom will be on-site or supervising when animals are being examined or handled and is responsible for the day to day operations (Primary Responders may be staff, or experienced lead volunteers, interns, etc.).(2)
    b. The Authorized Representative has signatory authority for the stranding organization and may be the signatory of the stranding agreement (e.g., Executive Director, President, CEO, etc.)
    c. Additional personnel may be necessary, commensurate with the proposed geographic area of response
2. Veterinary Support
    a. The prospective Participant should identify an attending veterinarian and identify at least one backup veterinarian or have a contingency plan for when the attending veterinarian is not available.
    b. In some cases, identifying a remote veterinarian may be acceptable, provided that the veterinarians can provide telemedicine and are willing to consult with Participant's responders in the field. [2]

B. Qualifications for Article IV Authorization

1. Key personnel should have experience or comparable training in all aspects of live animal response:
    a. Experience responding to a minimum of [five] live marine mammal stranding events (note: a mass stranding is considered to be one event).[2]
    b. Experience providing triage and/or transport for a minimum of [three] live stranded marine mammals during separate stranding events.[2]
    c. Knowledge and experience monitoring marine mammal vital signs.
    d. Ability to assess the condition of stranded marine mammals and make recommendations concerning immediate release, rehabilitation, or euthanasia.
    e. Ability to accurately identify species of marine mammals in field conditions.
    f. Ability to [draw blood and] make basic measurements (e.g., length).
    g. Ability to tag a marine mammal (e.g., for situations that involve immediate release following assessment).
    h. Ability to communicate professionally with other members of the Stranding Network, federal, state, tribal or other local authorities that have jurisdiction

within the Participant's area of operations and take direction from NMFS and other on-site coordinators or local authorities.
    i. Preferred but not required - Experience responding to at least one cetacean mass stranding event
2. Attending veterinarians should meet the following criteria:
    a. Be on-call 24-hours [or during the operational hours of the Participant].
    b. Have experience in monitoring marine mammal vital signs.
    c. Ability to assess the condition of stranded marine mammals and make recommendations concerning immediate release, rehabilitation, or euthanasia.
    d. Ability to draw blood from a marine mammal.
    e. Have the appropriate registrations and licenses (e.g., registered with the Drug Enforcement Administration for handling controlled substances) to obtain the necessary medications and euthanasia drugs.
    f. Ability to perform humane euthanasia on marine mammals.
    g. Demonstrated familiarity with marine mammal triage and transport.
    h. Access to a list of veterinarians with marine mammal expertise to consult with if needed.
    i. Compliance with any applicable state requirements for veterinary practice on stranded marine mammals.
3. The prospective Participant should demonstrate knowledge of Federal, state, tribal, and local/municipal laws relating to live animal response.
4. The prospective Participant should have provisions for, and willingness to conduct, euthanasia when appropriate, if euthanasia is included in the proposed activities of the Participant.
5. Equipment List.
    a. The prospective Participant should have and maintain equipment appropriate to the proposed extent of live stranding response, i.e., those items necessary for triage, transport, and/or euthanasia.
    b. A complete list of equipment available shall be provided by the prospective Participant

Evaluation Criteria for Article V Authorization: Rehabilitation and Release of Live Marine Mammals [1, 2]

In addition to the criteria in sections II, III, and IV (if applicable), Participants requesting authorization to conduct rehabilitation of marine mammals should provide information that shows the Participant's plan for implementing Article V of the Stranding Agreement, and present evidence that the Participant has the skills, resources, and organizational capabilities to be successful. The NMFS document, "Policies and Best Practices: Standards for Rehabilitation Facilities," provides additional detailed guidance for preparing Stranding Agreement requests. This document can be found at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations. Facility operations should be consistent with applicable NMFS policies, guidelines, directives, regulations, and other applicable State and Federal policies, guidelines, directives, regulations, and laws.

A. Information for Article V Authorization: The prospective Participant should provide information on the following:

1. Facility Capabilities and Procedures. This should include, but not be limited to:
    a. Information on facilities
        1. Pool type (or housing/pool for pinnipeds) design, description, and dimensions.
        2. Type of available shelter and/or shading.
        3. Maximum holding capacity. Description of facility's maximum holding capacity based on minimum standard space requirements and number of animals housed in each holding area and the availability of qualified personnel as provided in the NMFS document, "Policies and Best Practices: Standards for Rehabilitation Facilities".
            a. Water Quality. Description of water, source, quality, and how it is maintained, including how water is tested and frequency of tests.
            b. How the facility/rehabilitation area is secured from public access.
            c. How other wild and/or domestic animals will be kept isolated from marine mammals.
            d. How animals will be isolated or quarantined if necessary.
    b. Information on procedures for:
        1. Food handling and sanitation.
        2. Human health and safety throughout the rehabilitation facility.
        3. Maintenance of medical, husbandry, and other relevant records for each animal. Samples of record forms are helpful.
        4. Efforts to reduce disease transmission.
        5. Humane animal care, routine medical procedures, and euthanasia.
2. Key Personnel

a. The prospective Participant should have and maintain one **Authorized Representative**, an **Attending Veterinarian**, an **Animal Care Supervisor**, and at least one additional primary animal care specialist, all with experience in marine mammal care and rehabilitation.
b. The Attending Veterinarian:
    1. The prospective Participant should identify an attending veterinarian with experience with marine mammal rehabilitation
    2. Identify at least one backup veterinarian or have a contingency plan for when the attending veterinarian is not available.
c. The Animal Care Supervisor:
    1. Is responsible for overseeing prescribed treatments, maintaining hospital equipment, and controlling drug supplies
    2. Should be adequately trained to deal with emergencies until the veterinarian arrives,
    3. Be able to direct the restraint of the animals,
    4. Be responsible for administration of post-surgical care
    5. Be skilled in maintaining appropriate medical records
    6. communicates frequently and directly with the attending veterinarian to ensure that there is a timely transfer of accurate information about medical issues
    7. Preferred but not required – be a licensed veterinary technician or animal health technician who reports to, or is responsible to, the attending veterinarian
d. Additional personnel may be necessary, commensurate with the maximum holding capacity.
e. Information regarding Key Personnel should include:
    1. Overview of staffing plan and capabilities for the rehabilitation facility (e.g., veterinary technicians, food preparation, record keeping, volunteer/shift coordination, facility maintenance, etc.), including the back-up veterinary coverage
    2. Description of on-site experienced personnel who are caring for the animals, including resumes or CVs of all key personnel (at minimum: Authorized Representative, Attending Veterinarian, Animal Care Supervisor(s), any other primary animal care specialists) and documentation of relevant training, experience, and licensing (if applicable)
    3. Description of how new personnel and volunteers are trained and monitored

3. Contingency Plans
    a. Provide a copy of contingency plans for protection of or relocation of rehabilitating marine mammals in case of
        1. Emergency events (hurricanes, fires, other natural disasters)
        2. Unusual mortality events
        3. Planned events such as construction
    b. Provide any other facility contingency plans
4. Copies of all applicable Federal, state, tribal, and local permits for rehabilitation facilities.

5. General protocols and procedures for release and post-release monitoring of marine mammals in rehabilitation, including:
    a. How animals will be assessed for release determinations and who makes the assessment and final recommendation.
    b. How the prospective Participant will follow the NMFS Standards for Release of Rehabilitated Marine Mammals (available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations).
    c. How the prospective Participant will conduct tagging, release, and post-release monitoring
6. Resources – demonstrate sufficient physical and financial resources:
    a. To maintain appropriate animal care for the duration of rehabilitation
    b. To cover costs associated with release (e.g., long term rehabilitation, transport to release site, post release monitoring) or transport to another facility

B. Qualifications for Article V Authorization – requests should be evaluated based on the following:
1. Key personnel should have experience or comparable training in all aspects of marine mammal rehabilitation. Requests should address key personnel qualifications for each evaluation criteria below:
    a. Experience or education leading to an understanding of the life history, behavior, biology, physiology, and animal husbandry of applicable marine mammals.
    b. Familiarity with *NMFS Final Standards for Rehabilitation Facilities*, *Standards for Release of Marine Mammals*, and applicable regulations.
    c. Experience in a supervisory role rehabilitating a minimum of [three] separate rehabilitation cases (Note: Multiple animals in rehabilitation from a mass stranding are considered to be one case).
    d. Ability to humanely restrain a marine mammal to conduct basic medical procedures such as: drawing blood from at least two sites, taking fecal, gastric, blowhole/nasal samples, morphometrics, weighing, injections, and tubing.
    e. Experience maintaining and operating a facility/pool for marine mammal care, including familiarity with maintaining proper water quality.
    f. Ability to supervise and coordinate on-site personnel and volunteers.
    g. Ability to conduct necropsies.
    h. Experience with record keeping, such as food intake records, daily behavioral records, medical records, and water quality records (e.g., water temperature, salinity, etc.).
    i. Preferred but not required - Knowledge of how to design and conduct a behavior ethogram
2. Attending veterinarian should meet the following criteria:
    a. Have an active veterinary license in the United States (means a person who has graduated from a veterinary school accredited by the American Veterinary Medical Association Council on Education, or has a certificate issued by the American Veterinary Graduates Association's Education Commission for Foreign Veterinary Graduates), or has received equivalent formal education as determined by NMFS Administrator (adapted from the Animal Welfare Act Regulations 9 CFR Ch. 1).

b. Assume responsibility for diagnosis, treatment, and medical clearance for release or transport of marine mammals in rehabilitation (50 CFR 216.27).
c. Ability to provide a schedule of veterinary care that includes a review of husbandry records, visual and physical examinations of all the marine mammals in rehabilitation, and a periodic visual inspection of the facilities and records.
d. Be available on a 24-hour basis to answer veterinary-related questions, and be available in case of an emergency.
e. Ability to perform routine diagnostic and medical procedures on the type(s) of marine mammal(s) most often admitted to the rehabilitation facility (e.g., draw blood, give injections, etc.).
f. Have marine mammal experience or be in regular consultation with a veterinarian who has marine mammal experience and have access to a list of expert veterinarians to contact for assistance.
g. [Reserved. - Have documented one-year clinical experience working with marine mammals, or have a written consulting agreement with an experienced marine mammal veterinarian, which assures availability of consultation when needed.]
h. Ability to conduct full necropsy on marine mammals.
i. Have access to the most recent edition of the CRC "Handbook of Marine Mammal Medicine."
j. Be familiar with and comply with the standards of veterinary care in the NMFS Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release - Standards for Rehabilitation Facilities.
k. Have the appropriate registrations and licenses (e.g., registered with the Drug Enforcement Administration for handling controlled substances) to obtain the necessary medications for the animals housed at that rehabilitation facility.
l. Be knowledgeable of species-specific pharmacology.
m. Have provisions for performance of humane euthanasia.
n. Ability to write and submit timely disposition recommendations for marine mammals in rehabilitation.
o. Be knowledgeable of marine mammal zoonotic diseases and appropriate safety precautions.

3. A trained staff or volunteer base sufficient to initiate and maintain adequate and appropriate marine mammal care and husbandry and implementation of veterinary direction.
4. Knowledge of national, state, tribal, and local laws relating to live animal rehabilitation.
5. Familiarity with, and a copy of, the most current version of the NMFS Rehabilitation Facility Standards and Standards for Release of Marine Mammals.

Evaluation Criteria for Article VI Authorization: Live Animal Response: Short-Term Holding (1, 2, 3)

In addition to the criteria in sections II, III, and IV (if applicable), Participants requesting authorization to conduct short-term holding of marine mammals should provide information that shows the Participant's plan for implementing Article VI of the Stranding Agreement, and present evidence that the Participant has the skills, resources, and organizational capabilities to be successful. The NMFS document, "*NMFS Final Standards for Rehabilitation Facilities*," provides additional detailed guidance for preparing Stranding Agreement requests. This document can be found at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations. Facility operations should be consistent with applicable NMFS policies, guidelines, directives, regulations, and other applicable State and Federal policies, guidelines, directives, regulations, and laws.

A. Information for Article VI Authorization – The prospective Participant should provide information on the following:

1. Facility Capabilities. This should include, but may not be limited to:
    a. Pool type (or housing/pool for pinnipeds) design, description, and dimensions.
    b. Type of available shelter and/or shading.
    c. Maximum holding capacity. Description of facility's maximum holding capacity based on minimum standard space requirements and number of animals housed in each holding area and the availability of qualified personnel as provided in the NMFS document, "Policies and Best Practices: Standards for Rehabilitation Facilities". The number of animals housed in each pool/pen for short-term holding can exceed the standard for long-term rehabilitation, particularly in extraordinary circumstances. However, the facility must have a written plan for maximum capacity, outlining the following:
        1. Number of animals per pen by species, age class
        2. How to determine cohorts when facility is at maximum capacity
        3. How to handle need for increased transports
        4. How staffing will be provided when facility is at maximum capacity
    d. Water Quality. Description of water (fresh or salt), source, quality, and how it is maintained, including how water is tested and frequency of tests.
    e. How the facility/rehabilitation area is secured from public access.
    f. How other wild and/or domestic animals will be kept isolated from marine mammals.
    g. How animals will be isolated or quarantined if necessary.
2. Information on procedures/protocols for:
    a. Food handling and sanitation
    b. Human health and safety throughout operations
    c. Maintenance of medical, husbandry, and other relevant records for each animal. Samples of record forms are helpful
    d. Efforts to reduce disease transmission
    e. Humane animal care,

   f. Routine medical procedures
   g. Euthanasia
6. Key Personnel The prospective Participant should have and maintain one **Authorized Representative**, an **Attending Veterinarian**, an **Animal Care Supervisor**, and at least one additional primary animal care specialist, all with experience in marine mammal care and rehabilitation.
   a. The Attending Veterinarian:
      1. The prospective Participant should identify an attending veterinarian with experience with marine mammal rehabilitation
      2. Identify at least one backup veterinarian or have a contingency plan for when the attending veterinarian is not available.
   b. The Animal Care Supervisor:
      1. Is responsible for overseeing prescribed treatments, maintaining hospital equipment, and controlling drug supplies
      2. Should be adequately trained to deal with emergencies until the veterinarian arrives,
      3. Be able to direct the restraint of the animals,
      4. Be responsible for administration of post-surgical care
      5. Be skilled in maintaining appropriate medical records
      6. communicates frequently and directly with the attending veterinarian to ensure that there is a timely transfer of accurate information about medical issues
      7. Preferred but not required – be a licensed veterinary technician or animal health technician who reports to, or is responsible to, the attending veterinarian
   c. Additional personnel may be necessary, commensurate with the maximum holding capacity.
   d. Information regarding Key Personnel should include:
      1. Overview of staffing plan and capabilities for the rehabilitation facility (e.g., veterinary technicians, food preparation, record keeping, volunteer/shift coordination, facility maintenance, etc.), including the back-up veterinary coverage
      2. Description of on-site experienced personnel who are caring for the animals, including resumes or CVs of all key personnel (at minimum: Authorized Representative, Attending Veterinarian, Animal Care Supervisor, any other primary animal care specialists) and documentation of relevant training, experience, and licensing (if applicable)
      3. Description of how new personnel and volunteers are trained and monitored
3. Contingency Plans
   a. Provide a copy of contingency plans for protection of or relocation of rehabilitating marine mammals in case of
      1. Emergency events (hurricanes, fires, other natural disasters)
      2. Unusual mortality events
      3. Planned events such as construction
   b. Provide any other facility contingency plans

4. Copies of all applicable Federal, state, tribal, and local permits for short-term holding facilities
5. General protocols and plans for transfer to long-term marine mammal rehabilitation center
    a. How it will be determined when animals are ready for transport to a long-term rehabilitation facility.
    b. How the prospective Participant will follow the NMFS *Cetacean and Pinniped Transport Best Practices* during transport.
    c. How prospective Participant will conduct transports
6. Resources demonstrate sufficient physical and financial resources:
    a. To maintain appropriate animal care for the duration of short-term rehabilitation
    b. To cover costs associated with transport to another facility

B. Qualifications for Article VI Authorization – requests should be evaluated based on the following

1. Key personnel should have experience or comparable training in all aspects of short-term holding for marine mammal rehabilitation. Requests should address key personnel qualifications for each evaluation criteria below:
    a. Experience or education leading to an understanding of the life history, behavior, biology, physiology, and animal husbandry of applicable marine mammals.
    b. Familiarity with NMFS Rehabilitation Standards, NMFS Standards for Release of Rehabilitated Marine Mammals, and applicable regulations.
    c. Experience in a supervisory role short-term holding a minimum of three separate cases (Note: Multiple animals in rehabilitation from a mass stranding are considered to be one case).
    d. Experience maintaining and operating a facility/pool for marine mammal care, including familiarity with maintaining proper water quality.
    e. Ability to supervise and coordinate on-site personnel and volunteers.
    f. Ability to conduct necropsies.
    g. Experience with record keeping, such as food intake records, daily behavioral records, medical records, and water quality records (e.g., water temperature, salinity, etc.).
    h. Ability to humanely restrain a marine mammal and perform routine diagnostic and medical procedures on the type(s) of marine mammal(s) most often admitted to the short-term holding facility (e.g., draw blood, give injections, etc).
    i. Have marine mammal experience or be in regular consultation with a veterinarian who has marine mammal experience and have access to a list of expert veterinarians to contact for assistance.
2. Attending veterinarians should meet the following criteria:
    a. Have an active veterinary license in the United States (means a person who has graduated from a veterinary school accredited by the American Veterinary Medical Association Council on Education, or has a certificate issued by the American Veterinary Graduates Association's Education Commission for Foreign Veterinary Graduates), or has received equivalent formal education as determined by NMFS Administrator (adapted from the Animal Welfare Act Regulations 9 CFR Ch. 1).
    b. Assume responsibility for diagnosis, treatment, and medical clearance for release or transport of marine mammals in short-term holding (50 CFR 216.27).

c. Ability to provide a schedule of veterinary care that includes a review of husbandry records and a periodic visual inspection of the facilities and records.
d. Be available on a 24-hour basis to answer veterinary-related questions, and be available in case of an emergency.
e. Ability to perform routine diagnostic and medical procedures on the type(s) of marine mammal(s) most often admitted to the short-term holding facility (e.g., draw blood, give injections, etc).
f. Have marine mammal experience or be in regular consultation with a veterinarian who has marine mammal experience and have access to a list of expert veterinarians to contact for assistance.
g. [Reserved. Have documented one-year clinical experience working with marine mammals, or have a written consulting agreement with an experienced marine mammal veterinarian, which assures availability of consultation when needed.]
h. Ability to conduct full necropsy on marine mammals.
i. Have access to the most recent edition of the CRC "Handbook of Marine Mammal Medicine."
j. Be familiar with and comply with the standards of veterinary care in the NMFS Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release - Standards for Rehabilitation Facilities.
k. Have the appropriate registrations and licenses (e.g., registered with the Drug Enforcement Administration for handling controlled substances) to obtain the necessary medications for the animals housed at that rehabilitation facility.
l. Be knowledgeable of species-specific pharmacology.
m. Have provisions for performance of humane euthanasia.
n. Ability to write and submit timely disposition recommendations for marine mammals in rehabilitation.
o. Be knowledgeable of marine mammal zoonotic diseases and appropriate safety precautions.

3. A trained volunteer base sufficient to initiate and maintain adequate and appropriate marine mammal care and husbandry and implementation of veterinary direction.
4. Knowledge of national, state, tribal, and local laws relating to live animal rehabilitation.
5. Familiarity with, and a copy of, the most current version of the *NMFS Final Standards for Rehabilitation Facilities* and *Standards for Release of Marine Mammals Following Rehabilitation*.

Evaluation Criteria for Article VII: Temporary Participation in the Stranding Network [2]

This Article is intended to authorize a facility that does not intend to be a long-term, continuing participant in the marine mammal stranding network, but is instead participating in a short-term capacity. This may be for purposes of response to an anthropogenic event such as an oil spill, a marine mammal event such as an Unusual Mortality Event, or to fill a temporary "gap in coverage." The intent is to be able to apply for and receive this SA Article in an expedited manner, and for it only to be authorized until the emergency situation is resolved.

Therefore, the Participant may be applying for a range of stranding response roles, typically covered in Articles III, IV, V, and/or VI. Therefore, the Participants should be assessed against the criteria in sections 2, 3, 4, 5, and/or 7, depending upon the specific role they intend to fill in the Stranding Network. The NMFS Regional Administrator may waive specific criteria requirements in those sections for temporary facilities, depending upon the nature of the Participant's role in the Stranding Network, as long as waiving those criteria will not compromise animal and human health and welfare.

Evaluation Criteria for Designee Organizations

The purpose of a Designee organization is to assist the Participant with sub-region coordination, response, and/or rehabilitation capability within the Participant's geographic area of responsibility and under the Participant's oversight. If a Participant is proposing oversight of a Designee organization(s), the Participant [must] should provide evidence that the Designee organization has the skills, resources, and organizational capability to respond to dead/live stranded marine mammals [or rehabilitate marine mammals]. In some cases, it may not be possible for each proposed Designee organization to meet all of the evaluation criteria listed below. If this is the case, NMFS needs written assurance and details specifying how the prospective Participant will take responsibility for fulfilling specific qualifications lacking for the Designee organization.

A. Information for Designee Organizations for Articles III, IV, V, and VI
   1. For each proposed Designee organization, the Participant should provide the same information required in sections II through VI.
   2. Justification for Designee. The Participant should submit a justification for the geographic need, and enhancement of response capabilities provided by the Designee organization to the Participant.
   3. Copy of a written and signed memorandum of understanding (MOU) between the Participant and the Designee that includes a statement that the Designee organization has read and agreed to the terms of the Participants current Stranding Agreement

B. Qualifications for Designee Organizations for Articles III, IV, and V
   1. Each proposed Designee organization will be evaluated according to the same required qualifications listed in Sections II through VI.
   2. The MOU provided will be reviewed for completeness.

Appendix X
Cetacean and Pinniped Transport Best Practices

Table of Contents

1. Introduction

1.1 Background

In 1992, the Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the Marine Mammal Protection Act (MMPA). The MMHSRP serves to coordinate marine mammal stranding response efforts in the United States by working to standardize regional network operations and define national stranding response policy. NMFS published the guidance document "Standards for Release" in 2009 as part of the broader Policies and Best Practices: Marine Mammal Stranding Response, Rehabilitation, and Release. The Standards for Release give detailed protocols for rehabilitation and release, but there are no detailed guidelines for transport of animals to or from rehabilitation. The MMHSRP also holds a MMPA/Endangered Species Act (ESA) research and enhancement permit that allows the program to authorize qualified individuals to transport ESA-listed cetaceans and pinnipeds.

1.2 Legislation Pertinent to Marine Mammals

There are two key pieces of legislation that govern interactions with marine mammals in the United States.

Marine Mammal Protection Act (MMPA): The MMPA, signed into law in 1972, prohibits the "take" of sea otters, seals, sea lions, walruses, whales, dolphins, and porpoises, which includes harassing or disturbing these animals, as well as harming or killing, unless such take is specifically exempted in the statute or authorized. The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS has jurisdiction over cetacean and pinniped species (with the exception of walrus), and USFWS has jurisdiction over walrus, polar bear, sea otters, and manatees. The 1992 amendments to the MMPA included Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health of marine mammals and health trends of marine mammal populations through the collection of stranding data.

Endangered Species Act (ESA): The ESA, enacted in 1973, provides for the conservation of species that are listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on "take" including harassment and disturbance as well as injuring and killing.

Specifically for live animal transportation, there are regulations that apply to marine mammals. Per the Animal Welfare Act, US Code, Title 7: Chapter 54: Section 2131, there are three objectives, listed below, that pertain to activities, such as transportation, by carriers or organizations using marine mammals for research, exhibition purposes, or holding them for rehabilitation purposes (2012, gpo.gov):

1) To ensure that animals intended for use in research facilities or for exhibition purposes or for use as pets are provided humane care and treatment;

2) To assure the humane treatment of animals during transportation in commerce; and

3) To protect the owners of animals from the theft of their animals by preventing the sale or use of animals which have been stolen.

The International Air Transport Association's (IATA) Live Animals Regulations (LAR) is the worldwide standard for transporting live animals by commercial airlines to ensure safety and animal welfare are addressed (https://www.iata.org/en/programs/cargo/live-animals/). These regulations apply to all parties involved in the transportation of the live animals to ensure the animal's welfare is the top concern.

CITES guidelines address the transport of live marine animals and prevent illegal trafficking of endangered species. For more detailed information on the CITES guidelines refer to https://www.cites.org/eng/resources/transport/index.php.

1.3 Intended Uses of Best Practices

NMFS and the Marine Mammal Stranding Network (the Network) have developed protocols and procedures for transportation of live marine mammals to rehabilitation facilities or other locations while ensuring the health, welfare, and safety of both the human responders and animals. These protocols balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, the reader should consult references such as *Marine Mammals Ashore* (Geraci *et al.* 2005) and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018). Human and animal safety is the top priority for NMFS and the Network, and it is pertinent to prepare, if possible, a detailed transportation plan. Each event is unique and requires the consideration of multiple aspects, which are addressed below.

These Cetacean and Pinniped Transportation Best Practices highlight general procedures specific to cetacean and pinniped transportation requirements and handling of various scenarios. These Best

Practices do not specifically address mass strandings although some aspects in these Best Practices may be applicable in a mass stranding event. For more specific details on mass strandings, refer to the Mass Stranding Best Practices. Additionally, these Best Practices are designed to be paired with more specific regional guidelines to address significant issues that may exist including species-specific issues that are more appropriate to address at regional or state levels.

1.4 Funding

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for eligible members of the Network through an annual competitive grant process. These grants support the rescue and rehabilitation of stranded marine mammals (including small cetacean interventions), data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are competitive and many members do not receive these funds, individual Network members often also support many of the costs for normal operations. Determining whether funding is available for an intervention is an important first consideration, as lack of funds or available in-kind donations (*e.g.*, boat use) may limit available options for response.

2. Planning for Transportation

Transportation refers to the transfer or transport of a marine mammal from one location to another utilizing a carrier or conveyance system. Transporting marine mammals poses many challenges. Typically, during transportation, an animal will not have access to its normal aquatic environment that provides physical support, temperature control, and freedom of movement. It is recommended that anyone planning to transport marine mammals should consult experts prior to shipping for up-to-date expertise and methodologies to ensure the health of the animals (CCAC, 2014).

2.1 Crew/Escorts

Each transport should have a designated transport coordinator responsible for all aspects of the transport in addition to experienced escorts/crew. An escort or crew member is defined as a qualified NOAA or stranding network facility staff person/volunteer or designee that has been trained in monitoring pinnipeds and/or cetaceans and is able to identify emerging health concerns and administer treatment, medications and/or fluids if needed under the instruction of a veterinarian. It is also preferred to have veterinary staff attend the transport, if not available, one will be available at all times during transport for a phone consultation. However, there may be specific situations where a veterinarian is required to be present.

Recommendations for all attendants who accompany marine mammals during transportation include:

- Ability to recognize signs of stress in the animal and their causes, and how to reduce these causes;
- Ability to recognize an animal which is ill or becomes unfit for transport; and
- Skill in the treatment of injuries, when and how to administer veterinary drugs (when and where permitted), and when and how to immobilize an animal, if necessary.

Additionally, attendants accompanying marine mammals for AIR TRANSPORT recommend the following (CCAC, 2014):

- knowledge of the appropriate handling and care of animals during loading, takeoff, flight, landing, and unloading, and any restrictions on animal care staff; and
- working knowledge of aircraft and airport operations and procedures

Because inherent risks can be encountered during transportation, methods used to transport and restrain an animal should minimize risk, stress, and pain to the animal while also ensuring the safety of both the animal and transport crew.

- Create a written safety protocol with emergency numbers to be kept with first aid kits.
- Transport staff will only conduct procedures for which they meet minimum qualifications and training.
- Personnel will wear appropriate personal protective equipment (PPE) such as strong, non-slip footwear, gloves, and coveralls as necessary and all persons handling delivery devices or drugs will be wearing proper PPE (*e.g.*, latex gloves, safety glasses, and masks when loading syringes).
- If drugs are to be used they should be recorded on an emergency response sheet in case of accidental human exposure, so EMS can quickly evaluate human exposure.
- A veterinarian will be present if sedation is used.
- Transport staff are trained in basic first aid and first aid kits are readily available.

A sufficient number of crew/escorts are assigned as necessary to provide for physical and medical needs of the animals. There may be different minimums depending upon transportation method (*e.g.*, vehicle, vessel or aircraft). For cetaceans, the transportation of four animals or less requires at least one attendant per animal, with a minimum of two attendants per transport. On transports of five or more cetaceans, additional attendants may be added at the discretion of the veterinarian and/or transport coordinator. For pinnipeds, the number of accompanying staff is dependent on the number of animals and ideally a minimum of two staff per transport will be used when feasible for driver safety.

Transport drivers should take safety breaks every four to six hours to avoid driving fatigue. It is also suggested that when driving more than 48 hours, the driver increases the frequency of breaks for their own safety.

2.2 Logistics

A well-defined plan, as well as good record keeping and reporting, is essential for the continued well-being of the animal during transportation.

The transport plan should ensure that best practices are followed. Dependent on the transportation needs and location, a transport plan can include any or all of the following: details of pre-trip treatment and care (if any), transport, and contingency plans in case of possible emergencies (refer to Appendix C for example transport plans). Different transport scenarios can have more simplified or complex plans, such as, describing the itinerary, contact list and numbers, pre-transport needs, during transportation monitoring, post-transport and follow-up monitoring of the animal, and contingency plan.

Consideration of weather forecasts and location are essential for the transport plan, and should be consulted prior to transport. Escorts/Crew (especially vessel crews) should consider: wind, precipitation, fog, sea state, and incoming storm systems or any other changes in weather. For vessel crews, environmental conditions that should be assessed include: tides, currents, substrate (*e.g.*, rocky, slippery kelp, coral, cultural resources at risk), and incoming surf. The temperature should also be considered for all crews.

Communication is important when managing transport logistics. Emphasizing the need for the crew to be informed of the presence of the marine mammal on board the vehicle/vessel/aircraft, the specific temperature and ventilation requirements, and the necessity of informing the individual accompanying the animal of any unexpected delays as soon as they are known. Transport crews should have cell or satellite phones or radios to communicate.

In general, primary transport containers should (CCAC, 2014):

- be constructed from materials sufficiently strong to contain the animal and withstand the normal rigors of transportation;
- be constructed from non-toxic, durable materials that cannot be chewed or swallowed;
- be constructed of materials designed to minimize potential abrasions to the marine mammal's skin;
- have interiors which are free from any openings or protrusions that could injure the animals;
- be easy to sanitize;
- be constructed so that no parts of the contained marine mammals are exposed to the outside of the containers;
- have openings with locking devices that make the animals easily accessible at all times for emergency removal or treatment;
- have air inlets on each side of the containers at heights suitable for cross ventilation; and
- have adequate handholds or other devices on the exterior to facilitate lifting without unnecessary tilting, and to ensure that the persons handling the containers do not come into contact with the animals.

2.3 Decision Making and Contingency

In the process of decision making, the safest and most expedient method of transportation should be used. It must be safe and should minimize stress, with the greatest emphasis on the well-being of the animals. Time in transit for transporting marine mammals should be kept to a minimum and best transport practices must be used with consultation with appropriate experts, if needed. Decision making should also take in the following considerations:

- Human safety
- Logistics
- Environmental conditions
- Social needs
- Injuries

- Stress and shock
- Available resources
- Rehabilitation space

When the decision is made to transport the animal, options for contingency should always be noted in the plan. Pre-transport protocols allow for outlining possible emergencies or unusual situations that may occur and possible contingency plans for dealing with situations. These situations include, but are not limited to, the following:

1. Repositioning of animal; keeping the animal cooled or warmed sufficiently; ensuring pectoral flippers are allowed freedom of motion at all times for cetaceans;

2. Calming the animal – contingency plans for calming animals include positioning according to compatibility and repositioning if necessary, and administering appropriate sedative if needed;

3. Medical assistance – veterinary administration of medications or first aid as required;

4. Loss of power (*i.e.*, availability of flashlights and batteries);

5. Animal health emergencies – Continual availability of veterinarian for consultation;

6. Inability of any transport crew member(s) to perform their assigned duties;

7. Equipment failure/malfunctions (*e.g.*, truck or forklift breakdowns, etc.);

8. Airport diversions, road construction and delays in transport (contingency plans for delays must include ability to maintain animal temperature);

9. Hazardous weather for boat travel; and

10. Escape of pinnipeds from primary containers.

3. Pinnipeds

3.1 Overview

Pinniped transport is less complex than that of cetaceans because pinnipeds are able to tolerate long periods out of water if kept cool and/or moist (Gulland *et al.* 2018). All transport crates should have ventilation on the sides and front and be made of heavy-duty material (*e.g.*, plastic, metal, etc.). Cage dimensions must be large enough to allow the animal to turn around and exhibit normal posturing during transport (Gulland *et al.* 2018). Containers must be properly secured at all times. Specifically for fur seals, it is recommended the cages have a double base to allow separation between the animal and fluid and excrement that may soil the fur.

In general, animals shall be transported in carriers based on their weight (see examples below).

10-15 kg	#300 carriers
15-30 kg	#400 carriers
30- 40 kg	#500 carriers
40-75 kg	#700 carriers
75-150 kg	small metal carrier
>150 kg	large metal carrier

3.2 Observations/Monitoring

Pinnipeds must be evaluated before transporting. An example general physical examination form is provided in Appendix B. Initially, the animals will be closely observed for signs of acute stress (*e.g.*, continued high respiration and heart rate, agitated behavior, shaking) prior to loading on a transport vehicle.

Monitoring should be conducted throughout transportation and animals evaluated for changes in health and behavior. When transporting, escorts/crew will look for a variety of threats, indications of stress or disease, and ways to mitigate these while observing the animal, such as:

a) Entrapment/entanglement in cage;

b) Abnormal discharge from body orifices;

c) Abnormal respiration;

d) Abnormal behavior;

e) Change in body temperature

Pinnipeds tend to overheat in warm temperatures (*e.g.*, summer months); provide access to ice or cool water or keep on an elevated rack with ice or ice packs underneath to ensure that the animal does not overheat when transporting during warmer months. It is suggested to wet the animal every 2-3 hours if transporting in an open vehicle in warm temperatures. Notify a veterinarian and animal care manager immediately if any abnormal changes in the animal's health occur during transport. If transporting a pinniped by vehicle, the driver should take breaks every two to four hours to monitor the pinnipeds, especially if the animal is not transported in a climate-controlled vehicle. Additionally, transport duration by vehicle should not exceed 12 hours of transit on the road. If transport duration will be longer than 12 hours please consult with your Regional Stranding Coordinator (RSC).

3.3 Handling

All loading and unloading of animals should ensure the safety of the animal(s) and the handlers. Handling of pinnipeds should be conducted with care to avoid trauma, overheating, excessive cooling, distress, physical harm and unnecessary discomfort. Those handling animals should have demonstrated expertise in currently accepted professional standards and techniques for handling the species involved. They should be able to recognize abnormal behavior and signs of distress for the species (CCAC, 2014).

When handling pinnipeds, it is important to move slowly and avoid startling gestures while limiting noise. Pinnipeds are capable of being aggressive and can bite, so gloves and closed-toed shoes must always be worn when handling these animals. Be sure to thoroughly clean hands and equipment with soap and water after handling.

Pinnipeds can be handled with manual restraint, squeeze cages, or an array of equipment such as nets, baffles, etc. Herding boards should be used, not only for protection, but to help direct the pinniped into the cage/carrier. Young pinnipeds are best restrained on land by holding their neck just behind the skull and covering their eyes with a towel; for larger or stronger pinnipeds, a second handler is needed to firmly hold the animal's front flippers against its sides (Gage, 2003). For very large or potentially aggressive species (*e.g.*, gray seals, Steller sea lions, etc.), a net, squeeze cage, wooden boards for herding, restraining beds, and pole nets may help a handler to better control the animal (CCAC, 2014).

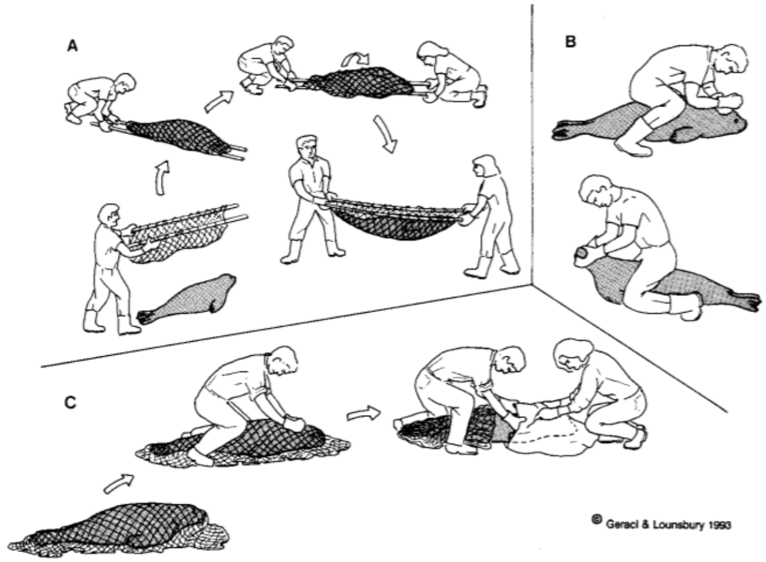

Figure 1: a) Use of net stretcher in capture, b) Physical restraint suitable for small phocids, c) Capture and restraint involving through net, physical restraint, and covering head (Geraci *et al.* 2005).

3.4 Methods of Transportation

A variety of transportation options may be used, including large vessels (*e.g.*, NOAA ships, other chartered vessels), small vessels, airplanes, helicopters, trucks or automobiles, and other modes of transportation as appropriate depending on location and available resources. Another factor to consider when transporting pinnipeds is the number and size of animals. Below are three common transport methods and protocols.

Vessel: The vessel's specific capacity will determine the number of pinnipeds that may be transported at any one time. Generally pinnipeds will be held separately, unless shared housing is determined to be beneficial for transport, and no physical contact will be made, unless a problem arises in which an examination or treatment needs to be performed. Each cage should be strapped to the deck to prevent sliding if rough seas occur. Each cage should have an opening to allow access to the animal if medical care or treatment is needed in transit. If the vessel transfer is a short transfer to shore, it is possible to net the pinniped in the water and haul it to shore before placing in a carrier. Be sure to protect animals from exhaust fumes, direct sun, heat, and wind.

Aircraft: All pinnipeds must be transported in cages. Animal coordinators are responsible for ensuring all airline requirements are satisfied (*e.g.*, IATA regulations, health certificates, etc.). IATA provides information and minimum requirements on how to ship live animals safely. The IATA Live Animal Regulations manual (https://www.iata.org/en/programs/cargo/live-animals/) includes a list of the precautions all crew should take on the ground and during transport (CCAC, 2014).

The cabin should be climate-controlled, with the temperature set within that species thermal range, depending upon the season during transport (Gulland *et al.* 2018). The animal may be cooled with water before and after loading onto the aircraft, if the animal does not already have access to water in its cage and overheating is a concern. If a layover is necessary, the pinniped should be unloaded from the plane (if the layover is less than one hour) and an experienced team member must be with the pinniped.

Vehicle: When transporting by vehicle, protect animals from exhaust fumes, direct sun, heat, wind, and freezing temperatures. Animals should be transported in temperatures that are within the species thermal range, to reduce the risk of hyper-or hypothermia (Gulland *et al.* 2018). If pinnipeds are transported in the back of an open bed truck, animals should be cooled with water prior to transporting in warm months. Generally, pinnipeds must be transported in cages secured in the vehicle. Additionally, the following should be considered:

- Timing of transport should be evaluated so animals won't be moved be transported during peak traffic times
- Animals must be escorted by an experienced team member(s) to monitor the animals' health and welfare during transport
- Ice and water sprays must be available to cool pinnipeds during transport during warmer temperature/months

4. Cetaceans

4.1 Overview

Stranded cetaceans are generally transported using dry transport which places the dolphin on open or closed cell foam pads or similar padding, and if the weather is mild to warm, includes continuous application of water via bucket, sprayer, etc. during transport to keep the skin moist. In some non-emergencies, including transport for releases, "wet transport" (*e.g.*, water-filled boxes) may be used for cetacean transport. Transportation of small cetaceans held in fabric stretchers and suspended in large freshwater-filled boxes provides a good approximation of the near weightlessness these animals experience in water. Animals should be kept calm to avoid struggling, thrashing or other unnecessary activity which may cause overheating, stress, or physical trauma. All necessary equipment and supplies for maintaining the animal's appropriate body temperature should be available.

4.2 Observations/Monitoring

Observations should be documented before, during, and after transport. Initially, the animals should be closely observed for signs of acute stress (*e.g.*, continued high respiration and heart rate, agitated behavior, shaking, arching) prior to being loaded on a transport vehicle. If after the initial health assessment the cetacean shows physical signs of stress/shock, the veterinarian or biologist after consultation with a veterinarian may determine to sedate the animal for transportation, or postpone the transport to attempt to stabilize the cetacean, if logistics permit.

Descriptive and medical observations will be collected for each individual cetacean.

Cetaceans should always be monitored during transport and never left unattended. The tail flukes, dorsal fin, and flippers can be palpated for signs of hyper- or hypothermia, and the animal should be treated accordingly (wetting with spongers, scoops, sprayers and clean cool water if hot; or covering warm dry blankets if cold) with the goal of maintaining normothermia during transport (Sharp *et al.* 2016). Monitoring the skin condition is more of a concern on longer dry transports. Escort/crew should monitor respiration rates (breaths per minute) because it can help evaluate stress level. The typical respiration rate for a stranded bottlenose dolphin is 4-8 breaths per minute but this can vary with age, medical condition, and/or other cetacean species. Healthy pre-release dolphins should breathe 1-4 times per minute. Other indicators of stress are thrashing or arching, shivering/shaking, arching, and vomiting/retching/gagging. Heart rate should also be monitored, if possible. A typical heart rate is approximately 60-120 bpm (beats per minute) depending upon age, species, and medical condition. The animal should be continually monitored for signs of progression into a state of shock, including foamy feces, flatulence, belching, pale mucous membranes, lack of palpebral reflex, sustained elevated heart/respiration rate, and loss of responsiveness; and treated accordingly.

4.3 Handling

Animals should be handled with care to avoid trauma, overheating, excessive cooling, distress, physical harm, and unnecessary discomfort. Personnel handling animals should have demonstrated expertise in currently accepted professional standards and techniques for the species involved. They should be able to recognize abnormal behavior and signs of distress for the species (CCAC, 2014). Noise should be reduced near the animal.

The well-being of the animals during restraint is paramount. Improper restraint may lead to major and potentially fatal physiologic disturbances, stress, or injury. Physical restraint techniques should be tailored to the species, and size of the animal. Always approach the animal so they can see you.

If physical restraint is required, the following should be assessed (CCAC, 2014):

- the need for any chemical restraint or analgesia;
- the safety of the animal and the staff;
- the availability of skilled and appropriately trained people to perform the restraint procedure; and
- unexpected events that might occur, and contingency plans.

When cetaceans are removed from the water, care should be taken to prevent skin abrasions and hyperthermia; a smooth work surface and frequent spraying with water help to prevent these problems. When dolphins are held on foam for dry transport make sure to tuck the pectoral flippers to avoid dislocating the shoulders.

The methods used to place a cetacean in a stretcher vary depending upon the size of the animal. For small or very young animals, you may be able to place them in the stretcher by picking them up with one or two people. For larger animals, it is recommended to remove the poles from the stretcher (if present) and roll the animal to place the stretcher under the animal (Figure 2). To roll the animal onto the stretcher, roll to one side while keeping the downside flipper tucked close to its body and pointed to the rear of the animal. Place the stretcher under the animal's body, bunching it up slightly against its belly (*i.e.*, accordion style). Next, roll the animal to the other side, and bring the bunched-up stretcher out from under the animal. Be careful not to scrape the animal or strain any rescue personnel. It is extremely important to make sure that the animal is centered in the stretcher. Cetaceans can quickly lose circulation to the flippers, resulting in serious injury. Therefore, it is imperative that if the stretcher has holes for pectoral flippers, the flippers are centered in the holes to minimize rubbing and allow for proper circulation. Foam placed under the flippers (or whole animal) can help to prevent chafing and loss of circulation. Also keep in mind where the animal's tail fluke is at all times. Rostrum, flippers, and flukes can easily be scraped on rocks or even in the transport vehicle if you are not careful. Make sure that there are enough people to safely lift the animal. Custom designed dolphin carts with foam padding and beach wheels can markedly improve rapid beach response and facilitate transport of animals across rugged beach terrain to a vehicle access point (Sharp *et al.* 2016).

Wet transport containers for cetaceans should allow for adequate freedom of movement of the flippers at all times, and permit the animal to change position without leading to injury. Stretchers should have extra openings at the level of the animals' genital opening and at the level of the eyes, and have appropriate cushioning at sites of possible friction. The stretcher used should be based on the measurements (*e.g.*, length and girth) of each individual animal. Adjustments in the position of the cetaceans during transport should be made when necessary to prevent necrosis of the skin at pressure points. The water in which the animal is held during transport should be maintained at a temperature near that of the environment from which the animal came, cooled with ice if necessary (Antrim and McBain, 2001).

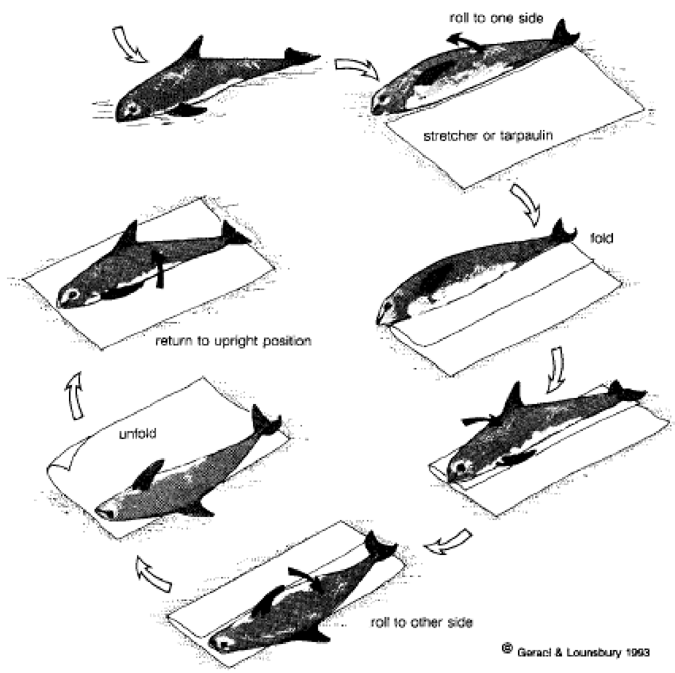

Figure 2: Technique for positioning a cetacean onto a tarpaulin or stretcher without lifting (Geraci *et al.* 2005).

4.4 Methods of Transportation

A variety of transportation options may be used, including large vessels (*e.g.*, NOAA ships, other chartered vessels), airplanes, helicopters, vehicles, and other modes of transportation as appropriate, depending on location and available resources. Another factor to consider when transporting cetaceans is the number and size of animals. Below are three common transport methods and protocols.

Vessel: A vessel may be used to transport a cetacean to shore or for release offshore, outside a harbor, or around a point of land. The animal may be in a stretcher alongside the vessel, if short distance, or in a stretcher on the vessel, depending on the size of the boat. For smaller cetaceans, a net compass can be pulled into nearby shallow water, or the dolphins are handled from the side of response vessels and moved onto specially designed floating mats that are either towed to shallow water or directly onto a vessel (Barratclough *et al.* 2019).

Aircraft: Cetaceans can be transported in water-filled transport containers. When transporting via aircraft, the cetacean needs to be properly secured. Before takeoff and landing, raise and close the poles at the head and flukes of the dolphin to avoid splashing water in the blowhole, and to restrict movement. After takeoff and landing, recheck the dolphin as soon as possible, and return the poles to their in-flight position. Make sure the dolphin's flukes, flippers, etc. are not rubbing against the transport container or stretcher bed due to weight shifting during takeoff/landing.

The transport coordinator or attending veterinarian should monitor cabin pressure throughout the flight. The initial aircraft request should include cabin pressure, altitude, and temperature requirements, and will be communicated to the flight operations personnel well in advance of the transport to avoid any confusion. A shallow angled ascent and descent is necessary to prevent water from spilling over the head of the cetacean and out of the transporter. If the cabin loses pressure, attend to your own safety first, and then be ready to assist the veterinarian with the cetacean. At the veterinarian's discretion, emergency oxygen will be utilized; the oxygen can be vented above the blowhole as the dolphin breathes. Oxygen masks can be used and a constant flow can be bled over the animal's blowhole (per comms with Navy).

Vehicle: Before placing the animal in the stretcher and moving the animal to the vehicle, make sure to plan out the route and carefully organize how to get around or over any obstacles on the way. Verify that all personnel are aware of where they are going. Bring the vehicle as close to the animal as possible. When transporting by vehicle, protect animals from exhaust fumes, direct sun, heat, wind and freezing temperatures.

There are several ways to transport animals in the truck, or ideally, in an enclosed truck or van. These range from several layers of foam pads for smaller animals to stretcher support frames for larger animals. Some foam pads can even hold water to help support the animal's weight. For truck transport, however, only a couple of inches of water, and wet foam, should be placed in the bottom of the support frame. Too much water can slosh back and forth, cause the animal to become disoriented, and even get in the animal's blowhole. Prior to transport, verify the following:

a. The animal is centered in the stretcher;

b. The pectoral flippers are not bearing any weight and are at a natural angle;

c. The stretcher is not digging into the axilla or any other part of the flipper;

d. The blowhole is not obstructed;

e. The rostrum, flipper, and flukes will not rub on anything during transport; and

f. The animal's skin has been kept moist.

During transport, drive carefully and check the animal repeatedly. Keep the animal's skin moist, monitor respirations, and remain in contact with the Stranding Coordinator and Veterinary Staff.

5. Different Transportation Scenarios

5.1 Immediate Release

Immediate release is when an animal is rescued and can be released back into the wild during the same event. Candidates for immediate release include healthy animals that may have strayed too far inland or have come ashore entangled in debris but are minimally injured (Geraci *et al.* 2005). Before releasing, make sure a health assessment is performed, the stranding is documented, and determine if post-release monitoring and/or marking is needed.

Transport could be used if the team decides to release the animal offshore. For example, an organization could prefer to release cetaceans offshore or from a beach location with better access to deep water to reduce the likelihood that the animal will restrand. Pinniped releases are not as involved; typically, the cage door is simply opened at a suitable shoreline site (Geraci *et al.* 2005).

5.2 Translocation

Translocation is the capture, transport, and release or introduction of a species to a similar habitat. Currently, this practice is primarily used for ESA-listed pinnipeds.

The transportation of pinnipeds between subpopulations could be accomplished using any reasonable mode of transportation. During the transport to a destination site, the animal will be escorted by veterinary staff and an experienced escort that is able to respond if there is an emergency.

Once an animal is identified for translocation, it must not show signs of disease, injury, or any other factors that may compromise survival, before it can be selected. In older seals, the steps involved in translocation may include some, but not necessarily all, of the following:

1) Selection and capture of seals for health screening and attachment of tracking instruments;
2) Quarantine;
3) Transport;
4) Release of seals at a new location; and
5) Post-release monitoring.

5.3 Rehabilitation

Rehabilitation is when an animal is rescued and transported to a facility to receive care and/or can be transferred between facilities. Transporting an animal from a stranding site to a rehabilitation facility is typically accomplished via vehicle, as this method is the easiest when time is limited and the health status of the individual is unknown.

5.4 Release after Short-term Holding or Rehabilitation

Transport is generally necessary for release of animals post short-term holding or long-term rehabilitation. Animals may be transported using any transport type discussed above (*e.g.*, vehicle, vessel, or aircraft). Previous descriptions of monitoring should be followed depending upon transport type used. Some animals may be tagged or marked in some way to facilitate post-release monitoring; care should be taken to ensure that the transport cage or method does not impact the tag during transport.

6. Conclusion

Prior to transporting a marine mammal for any reason, a plan should be made to identify the most appropriate transport method and container, to maximize the safety and health of both the marine mammal and human escorts. Although each transport will be different, following the considerations (*e.g.*, size, species, and condition, etc.) outlined in this best practice document will promote the successful transport of marine mammals.

7. Literature Cited

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8. Appendix A: Example Transport Checklist

Logistics

Airlines / Airport

- ❑ Airline
    - ❑ Have measurements and weights (with water, equipment, and animal) for all equipment
    - ❑ Ensure all transport equipment will fit through doors of airplane and be able to maneuver into position
    - ❑ Establish route and determine if fuel stops will be needed
    - ❑ Get load plans and load order from airline
    - ❑ Coordinate truck layouts and loading plan
    - ❑ Determine proper cabin temperature and flight altitude
    - ❑ Determine number of seats available for attendants
    - ❑ Establish contingency landing sites
    - ❑ Communicate with cockpit crew regarding flight angles on take off and landing.
- ❑ Ground Crew
    - ❑ Set up logistics at the Airport through ground personnel
    - ❑ Make visit to the Airport
    - ❑ Ensure proper loading/unloading equipment is available
        - ❑ Loaders
        - ❑ Large forklift(s)

        - ❑ Back up equipment
    - ❑ Discuss contingency plans
    - ❑ Are there security restrictions or concerns?
    - ❑ What is the access to the tarmac?
    - ❑ Is there suitable shelter to protect animals from inclement weather or direct sun?
- ❑ Have all needed hazardous materials paperwork been done (*e.g.*, batteries, oxygen, etc.)?
- ❑ Order needed straps and pallets and have them delivered ASAP
- ❑ Find out if there is a way to track the flight while it is en route

Cranes / Forklifts or other equipment

- ❑ Set up a facility crane if needed. Ensure it will handle the load and distance, and has any needed rigging (35 ton for whales)
- ❑ Set up a crane for the Airport. Ensure it will handle the load and distance, and has any needed rigging (140 ton for whales)
- ❑ Is an additional, or larger, forklift needed in the facility?
- ❑ Have contingency if crane is needed en route (*i.e.*, truck breakdown)

Trucks

- ❑ Set up trucks through a company or rental agency. Ensure they understand all needs and requirements.
    - ❑ Number and type of trucks

    - ❑ Extra tractor
    - ❑ Rollers or not
    - ❑ Height of truck bed
    - ❑ Length
    - ❑ Weight
    - ❑ Side rails
    - ❑ Arrival schedule
    - ❑ Loading schedule

- ❑ Inspect all trucks/trailers for any potential problems
- ❑ Determine overall height of trucks with equipment on them (include any windbreaks)
- ❑ Discuss placement of trucks in the facility with Security and others as needed.
- ❑ Check and measure pathways in the park to determine route. Do a dry run if needed to ensure the truck can maneuver where it needs to.
- ❑ Make detailed truck layouts
    - ❑ Date
    - ❑ Animals and equipment on trucks
    - ❑ Staff on trucks

Other

- ❑ Are rental vans needed to transport staff to and from the airport?
    - ❑ List of staff going in vehicles other than transport truck

- ❑ Ensure that sources of freshwater are available to fill boxes if needed
- ❑ Have several logistical plans to heat or cool water as needed
- ❑ Do we need portable light trees during any part of the move?
- ❑ All needed maps are available for all that need them.
- ❑ Set up logistical contacts for the day of the transport. Ensure all parties have relevant phone numbers.
- ❑ Ensure proper personnel have access to cellular phones during phases of transport.
- ❑ Set up communication plan with vehicle drivers

Travel

- ❑ Check on travel arrangements
    - ❑ Hotels
    - ❑ Plane reservations
    - ❑ Expense money
    - ❑ Rental Car
    - ❑ Do staff coming to the facility need any of these or are they handling it on their own?
- ❑ Do people need rides to or from the airport?

Equipment

- ❑ Have detailed equipment lists for all phases and parts of the transport
    - ❑ Truck

  - ❑ Plane
  - ❑ Animal loading or unloading
- ❑ Have a plan for what equipment will be where and when if it needs to move from truck to plane etc.
- ❑ Have plan for getting water in units at needed temperature
  - ❑ Preset hoses
  - ❑ Have a hot water source or way to heat it
- ❑ Ensure there is a place to store incoming equipment

Lifting equipment

- ❑ If using choker cables on a whale cradle: 30 foot long, load tested to pick up 20,000 pounds in a basket configuration. (10,000 pounds per choker) Minimum three to one breaking strength, five to one is better
- ❑ Check sling pick-ups so they work with the stretchers and poles being used
- ❑ Check all slings for rust, working clips, etc. If older then get load tested.
- ❑ Check turnbuckles on slings for easy movement and then if they are secured at needed length

Cetacean Transport Units

- ❑ Check animal measurements versus all equipment being used: stretchers, poles, boxes, etc. to insure proper size and fit
- ❑ Ensure all units are in good condition –
  - ❑ Water test boxes without liners

- ❑ Check all bolts and nuts for crossbars
- ❑ Check all lifting hoists so they work properly
- ❑ Check condition of bolts on stretcher poles or welds of lift points
- ❑ Check the condition of stretchers for tears or potential weak points
- ❑ Check and remedy all potential problems
- ❑ Check overall appearance – does it need painted, etc.

❑ Check liners for boxes

- ❑ Do a detailed check for small holes or tears before and after it is installed in the box. Repair any that are found
- ❑ Check the rails (or other attachment system) to be sure there are no loose rails or screws
- ❑ When installed the liner should be as smooth as possible. There should be no large folds near the animal's mouth, or around the pecs and flukes

❑ Ensure all boxes, pole ends, cross bars, etc. are foamed properly

- ❑ Cetacean boxes should have foam at the pecs and flukes
- ❑ Pole ends should be capped with drain holes drilled. The caps should then be foamed
- ❑ Cross bars should have foam where they are directly over the animal. Usually this is between the hanging points

❑ Assemble all equipment to be sure all fits and works properly

❑ Establish water temperature and height parameters.

❑ Place thin foam on contact points of cross bars on boxes to reduce movement

❑ Be sure all cage doors can be properly secured. (Have back up hardware in equipment packs)

- ❑ Have weights of all transport units for airlines
- ❑ Will units need additions – seats, covers, sides, etc. – to make it safe and easier to move around on the plane?

Pinniped Transport Units

- ❑ Check animal measurements versus cage size to ensure animal has room to turn around and have normal posture
- ❑ Ensure cage is structurally sound and has no weak or rotten areas
- ❑ Check for any sharp edges, splinters, etc. on inner surface
- ❑ Ensure all wire mesh is secured and cannot be pulled loose by the animal
- ❑ Ensure doors open and close easily
- ❑ Ensure doors can be secured with bolts or nails
- ❑ Support equipment should contain some wood to do quick cage repair if needed

Support Equipment (equipment box and packs)

- ❑ Have sprayers or ladles for water
- ❑ Extra jugs of water
- ❑ Ensure all equipment from appropriate lists is in packs or the equipment box. These lists will vary with the nature of the transport
- ❑ Put a laminated equipment list in the equipment box.
- ❑ Ensure all staff are familiar with contents of the packs and box (especially those going with the animals on trucks or planes)

- ❑ Make sure all equipment is in good and working condition
- ❑ Store equipment appropriately in weather. Put things that will freeze inside.

Shipping Equipment

- ❑ Check all airline pallets for bends, gouges, popped rivets, tears in the lining
- ❑ Ensure all pallets are on three –6 by 8 inch timbers (8 inch height)
- ❑ Place planking between transport units and airline pallets. Configurations will vary with the situation and the units involved (80 inches across width, approximately 120 inches across length)
- ❑ Do we need forklift rollers to assist in loading the plane?

Other Equipment Related

- ❑ Have all needed equipment at unloading or loading points (*e.g.*, nets, SCUBA, etc.)
- ❑ Check watertight gates (if needed)
- ❑ Ensure all gates in areas are in good working order
    - ❑ Latches all functioning
    - ❑ Net gates have no loose areas
- ❑ Check water quality and pool cleanliness

Purchasing Department

- ❑ Order ice if needed
- ❑ Set up rental van to transport staff

- ❑ Pick up van
- ❑ Order any support equipment needed
    - ❑ Foam
    - ❑ Timbers (6 by 6 inches)
    - ❑ Planking (2 by 6 inches, 2 by 10 inches)
    - ❑ Equipment box and pack equipment
- ❑ File all necessary purchase requests for cranes and trucks with Purchasing Department

Other Departments

Food Service

- ❑ Have food available for meeting if needed
- ❑ Have coffee and drinks available throughout if needed

Health Services

- ❑ Have Health Services personnel on duty and along with transport
- ❑ Provide first aid kit for transport equipment box
- ❑ Provide hot packs/warming blankets in cold weather

Horticulture

- ❑ Have pathways clear of ice and snow

Lab

- ❑ Copy all needed medical records
- ❑ Establish if Lab staff needs to be in the facility for the transport
- ❑ Ensure that all oxygen bottles are filled
- ❑ Check water test results on exhibit
- ❑ Check on proper inventory of vitamins and medication for incoming animals

Maintenance

- ❑ Provide additional lighting as needed.
- ❑ Ensure any light timers for facility are set to be on during transport times
- ❑ Have an electrician and mechanic on duty during transport
- ❑ Maintenance crew to help with unload/load at facility and airport. Also, to help unload equipment after move
- ❑ Have equipment van loaded and ready
- ❑ Remove any obstacles in the area, such as fencing
- ❑ Check on proper crane placement
- ❑ Have forklifts operational and available

Merchandise

- ❑ Reserve use of box van for support equipment

Operations

- ❑ Clean work areas around transport areas
- ❑ Ensure pathways are clear for truck movement
- ❑ Set up barricades as needed around transport area
- ❑ Supply drivers as needed for vans

Public Relations

- ❑ Provide staff to accompany transport
- ❑ Be prepared with statement and Q&A sheets for staff
- ❑ Coordinate any media coverage
- ❑ Take pictures or video as requested

Security

- ❑ Arrange Police escort for the convoy
- ❑ Check on number of radios that are needed
- ❑ Check on route with attention to bridges, construction, road conditions
- ❑ Ensure all entrance gates to park function properly
- ❑ Coordinate with airport security as needed

Water Quality

- ❑ Have pools at proper height for release of animal or to place in stretcher

<u>Schedules</u>

- ❑ Establish night watch schedules (if needed)
- ❑ Change normal work schedule to accommodate transport
- ❑ Ensure all areas are covered outside of transport. Shift feeding times for the facility as needed
- ❑ Develop timeline for general facility staff
  - ❑ Date and Times
  - ❑ Animals
  - ❑ Route
  - ❑ Times of major occurrences (*e.g.*, loading, unloading, departing for airport, plane arrivals, etc.)
  - ❑ Where trucks are entering and staging in the facility
  - ❑ Staff going to and from various destinations, and how they are getting there (*e.g.*, van, truck, plane, etc.)
  - ❑ Include truck layouts
- ❑ Develop detailed timeline for staff
  - ❑ Truck staff (loaders)
  - ❑ Animal observers on trucks
  - ❑ Specific equipment assignments (*e.g.*, guide ropes, nets, stretcher, doors on cage, etc.)

  - ❑ Release or restraint teams with specific assignments
  - ❑ Designate if in wetsuits or not
  - ❑ Staff to load/unload equipment at airport and in facility,

Animals

- ❑ Compliance with applicable laws and regulations (15-day notice, etc.)
- ❑ Pre-transport physicals
- ❑ Have all needed medical and behavioral records ready to transport with the animal
- ❑ Have plan on when and where animals will be staged for transport – move ahead of time if needed (*i.e.*, exhibit to back area)
- ❑ Schedule set for diet on pre-transport days
- ❑ Establish diet for incoming animals
- ❑ Ensure proper amount of food is ordered and on hand for incoming animals
- ❑ Determine time that will be needed for animal/keeper-trainer introduction and acclimation

Permits and Forms

- ❑ Federal
  - ❑ 15-day notice with NMFS
  - ❑ Hazardous Materials for any applicable support equipment
  - ❑ Customs forms
- ❑ State

    - ❑ Permit for attendants on back of truck

- ❑ Local/Park

    - ❑ Health Certificates signed

    - ❑ Acquisition/Distribution forms

Week of the Transport

- ❑ Go through entire checklist again

- ❑ Confirm all times and schedules with Truckers and Crane operators

- ❑ Confirm and drive route (Security)

- ❑ Go to the airport and check with the ground crew. Cover all equipment and scenarios. Discuss contingency plans.

- ❑ Go over all equipment in detail. Be sure all is in working order

- ❑ Ensure staff knows how to work all of the equipment properly

- ❑ Set up meeting with all departments involved several days before the transport

- ❑ Ensure animal staff understands schedule and job assignments

- ❑ Ensure all diving of pools is complete

<u>Meetings</u>

- ❑ **Initial Meeting**

    - ❑ Hold as soon as possible after decision is made to transport animals

    - ❑ Representatives from Maintenance, Operations, Public Relations, and appropriate animal management

- ❑ Discuss basic timeline
- ❑ Discuss logistics
  - ❑ Air or land
  - ❑ What outside contractors may be involved
- ❑ Discuss equipment
  - ❑ Will things need to be built (by when)
  - ❑ What will need to be purchased
  - ❑ Can things be borrowed from another facility
  - ❑ When should equipment be in place
- ❑ Are there any major concerns that need to be addressed

❑ **Approximately two weeks before transport**

- ❑ Representatives from all departments that are involved and individuals who have a major role in planning and/or performing the transport
- ❑ Go over detailed timeline
- ❑ Discuss outside contractors duties and needs (*e.g.*, airlines, truckers, cranes, etc.)
- ❑ Go over each departments duties and when they need to be completed
- ❑ Assign duties as they arise from discussions
- ❑ Answer questions

❑ **Week of the transport (park meeting)**

- ❑ Representatives from all departments that are involved and individuals who have a major role in planning and/or performing the transport

- ❑ Go over detailed timeline – highlighting any changes
- ❑ Confirm outside contractors duties and needs (*e.g.*, airlines, truckers, cranes, etc.)
- ❑ Ensure that each department has completed or is ready to perform needed tasks. Establish who will be the contact person for each department during the transport
- ❑ Discuss any last-minute details

❑ **Week of the transport (Staff meeting)**

- ❑ Staff involved in the transport be present at the meeting
- ❑ Discuss detailed timeline
- ❑ Discuss detailed task assignments
- ❑ Ensure all are familiar with equipment

❑ **Other Meetings (as needed)**

- ❑ Additional planning meetings as deemed necessary
- ❑ Educational seminar about the transport for any staff that have not been involved in one (*i.e.*, show video, pictures, etc.)

9. Appendix B: Example of Physical Examination Forms

EXAMPLE **Physical Examination Form**
Circle as appropriate

Body outline: Swelling, Wound, Change from previous day
If yes, describe: ____

Flippers: Normal use of all 4 flippers with full-range of motion, Favoring one flipper (describe), Lacerations, Swelling, Ulcers/sores, Signs of pain or discomfort

Discharges: Ears, Nares, Eyes, Umbilicus, Rectum, Vagina, Other
If yes, describe amount:______ mL, Color:___________,
Consistency:______________

Feces: Describe amount:______ mL, Color:___________,
Consistency:______________

Urine: Color:___________

Eyes:

Right: Discharge: Clear tears, Crustiness around eyes, Purulent discharge
Redness or congestion of conjunctiva, Swelling of conjunctiva, Prominence of third eyelid, Corneal opacity/ cloudiness, Corneal ulcer, Lacerations, Swelling of eyelids, Squinting or photosensitivity, Any obvious loss of vision

Left: Discharge: Clear tears, Crustiness around eyes, Purulent discharge
Redness or congestion of conjunctiva, Swelling of conjunctiva, Prominence of third eyelid, Corneal opacity/ cloudiness, Corneal ulcer, Lacerations, Swelling of eyelids, Squinting or photosensitivity, Any obvious loss of vision

Mouth: Color of mucous membranes: Pink, Red, Pale pink/White
Teeth: Broken, Erupting. List
site:____________________________________

Behavior: Alert, Bright, Lethargic, Depressed, Active, Inactive, Stereotypic behavior, Disorientation, Vocalizations, Other abnormal behavior for each individual seal, Any marked change from previous days
Describe:____

Other comments (environmental conditions, respiration rate, heart rate, etc.):

____
____
____
____
____
____

Animal ID: __________ **Date:**____________ **Name of Observer:**__________________
Time:____________

Date: ________ **Stranding Location:**________________________ **Lat/Long:** ___________________ GPS GE Cell

Time Init Rpt: _______ **Init Rpt'd:** □ swimming □ stranded (□ dry □ in some wtr) **Est. Time Stranded:** ______

On-scene @: ________ **Admit @:** _______ **Loc in Veh:** ___________ **# Animals:** _______ □ Susp Mom/calf

Str. Length: _______cm **Max Width:**_____cm	**Photos:** □ pre-tagging □ post-tagging □ lesions
Sex: M F CBD NE **Weight:** _________kg	**Species:** ___________ **HI:** N Y CBD □ HI form

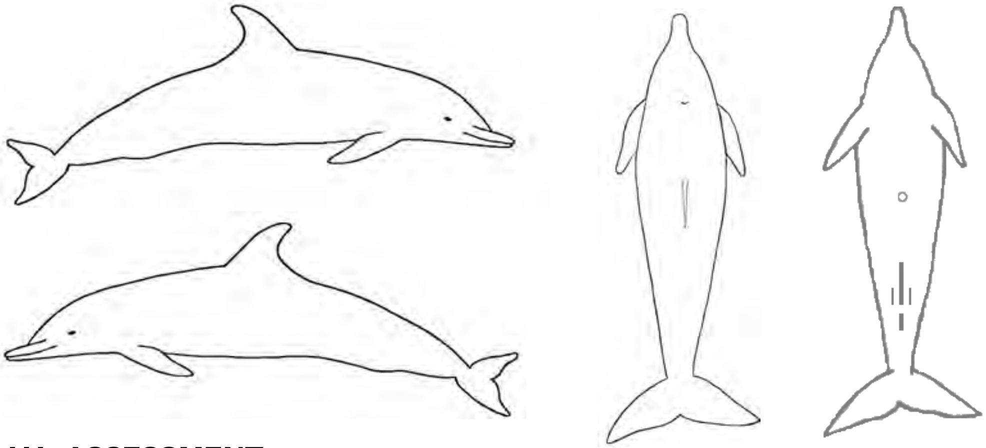
I. SUBJECTIVE:

Abnormal/Normal

Attitude	BAR QAR lethargic non-responsive	A / N
Disposition	calm but responsive arching thrashing hyperesthetic tail fluttering vocalizing	A / N
Body condition	emaciated (1) thin (2) slightly thin (3) mesomorphic (4) robust (5)	A / N
MM Color	pink pale pink white gray cyanotic (purple) injected (bright red) N/E	A / N

II. OBJECTIVE: **Rectal Temp:** ______°F **HR** (bpm): _____ /_____ @ ___:____ **RR** (bpm): ____ @ ____:_____

Post Nuchal Fat Pad	Concave (1) Spongy (2) Firm (3) Convex (4)	A / N
Neurologic	Alert Dull Stuporous **Nystagmus** (repetitive eye motion)**:** N Y (vert OR horiz / bilat OR unilat) **Strabismus** (abnormal eye position): N Y (dorsally ventrally cranially caudally) **Other Abnorm**:	A / N
Ophthalmic OD (right eye)	**Palpebral:** NE, 0, 1, 2 **PLR:** NE, 0, 1, 2 **Blepharospasm** (squinting): + / - **Visual Tracking**: + / - **Globe Intact**: N Y **Discharge:** N Y (describe): If corneal lesion, stain uptake: NE NA N Y (describe/draw):	A / N
Ophthalmic OS (left eye)	**Palpebral:** NE, 0, 1, 2 **PLR:** NE, 0, 1, 2 **Blepharospasm** (squinting): + / - **Visual Tracking**: + / - **Globe Intact**: N Y **Discharge**: N Y (describe): If corneal lesion, stain uptake: NE NA N Y (describe/draw):	A / N
Oral (mouth, tongue, teeth)	**Dentition** (broken, worn, missing, partially erupted teeth): **Lesions/Masses/Other**:	A / N
Cardiovascular	**Heart Rate** (bpm): _______(Brad) _______ (Tach) @ ____:____ **ECG Tracing:** N Y **Rhythm:** Sinus arrhythmia ("split") OR Normal sinus rhythm (steady = "no split") Tachycardia (fast, sustained) Bradycardia (slow, sustained) Other Abnorm: ___________ **Murmur**: NMA Murmur (note systole vs diastole, Grade 1-6):	A / N
Respiratory	**Respiratory Rate** (bpm): _________ @ ____:____ **Malodorous Blow:** N Y **Blowhole Seal Intact:** N Y **Blowhole Discharge**: N Y (describe): **Character:** WNL Full Shallow Apneustic Uniform Rapid Double breathing (freq occ) Exhale only (freq occ) Chuffing (freq occ) Blowhole Leaking (freq occ) **Lung sounds** (note affected lung field and % lung for abnormalities): R: Clear (NBVS) Harsh (crackles, wheezes, increased BVS) Absent L: Clear (NBVS) Harsh (crackles, wheezes, increased BVS) Absent	A / N
Gastrointestinal	**Feces:** N Y (describe color, amt, blood present, consistency (FOAMY?), parasites): **Flatulence:** N Y **GI Sounds Auscultated:** N Y NE **Vomiting:** N Y	A / N
Urogenital	**Sex:** M F NE **Urine:** N Y (Describe color, amt, USG): **Lactating:** NE NA N Y (describe): **Lesions/Discharge:**	A / N
Musculoskeletal:	**Scoliosis:** N Y ("C" shape open to: L R / mild moderate marked) **Other Abnorm:** N Y	A / N
Integument (skin)	**Rake Marks:** N Y (fresh healed) **Skin sloughing:** N Y (mild, mod, marked) **Lesions:** N Y (describe and draw on reverse):	A / N



***Example Conditions** (not all-inclusive):*
- *Shock (foamy feces, unresponsive, pale mm, rapid HR)*
- *↑ HR/no split*
- *↑RR, harsh lung sounds*
- *Anemia*
- *Elevated liver values (ALT, GGT, TBili)*
- *Elevated muscle enzymes (CK, AST)*
- *Dehydration (mild ↑BUN, creatinine, hemoconcentrated)*
- *Scoliosis*
- *Ruptured globe (eye)*
- *Significant wounds/scav dam*
- *Single strander/release*
- *Pregnant*

III. ASSESSMENT:

MASTER PROBLEM LIST:

1. ______________________ 4. ______________________
2. ______________________ 5. ______________________
3. ______________________ 6. ______________________

CONDITION DURING TRANSPORT: □ Stable □ Improving □ Declining

RELEASE CRITERIA: *good=0, fair=1, poor=2, grave=3* ***Dependent calves should be scored '6' on the social component***

PE____+ Behavior____+ Blood____+ Social____ = ______ *(0-2 = good release candidate, 3-5 = borderline, 6-12 DNR)*

IV. PLAN:

DIAGNOSTICS:

Bloodwork: Draw Time: _______ Site: DFL VCP DFN IC Method: Syr / Vac / Pico

In-House: □ CG4+ □ HM5 □ Vetscan / □ CHEM 8+ IDEXX: □ Dolphin Profile □ CBC/Chem

Ultrasound: □ L side □ R side □ Brief □ Full □ Thoracic □ Abdominal □ Blubber Thickness

Results: □ WNL □ Renal Gas □ Pulmonary Lesions □ Pregnant (1st, 2nd, 3rd trimester, CBD) Initials:________

Other DX: □ ECG □ capnography □ AEP □ blowhole swab □ rectal swab □ skin □ other:________________

TREATMENTS: (*E/Se (2.5mg/mL Se): 0.06mg/kg Se IM)*

E/Se: _______mL Time:________ Inj Site:____________ / Other: _______________ Time:______ Inj Site:____________

Fluids: ____________mL Type: □LRS □0.9% NaCl Site(s): VCP / DFL / DFN *(22.5 mL/kg IV bolus in 30 min, can repeat once)*

1st bag: Start Time: ______________ End Time: _______________

2nd bag (only if indicated): Start Time: ______________ End Time: _______________

DISPOSITION: **Tag:** Roto / Caisley Tag #: _______ Sat. Tag #: ___________ Pin length: _____mm □ Not tagged

□ **Reloc/ Rel** Site:______________________ □ **Released at site** □ **LAS** Time: __________ Total # dolphins: ________

Release Conditions (great=0, 3=bad):____

Animal Release Score (How well did the animal swim off? well=0, 3=badly)_____________________________________

□ **Euthanized** Staff Init: _____ Vet Init: ______ Bottle #: ______ Volume: _____mL Inj time: ________ TOD: _________

□ **Died** TOD: ___________ Notes:____

Tagging & Disposition Justification:____

OVERALL PROGNOSIS: → Tally scores from above: Release Criteria + Release Conditions + Animal Release Score = ________

→ *(0-3 = good, 4-8 = borderline/fair, 9+ = poor)*

Primary examiner: ________ **Signature:** ______________________________ □ **vet consult** ________

10. Appendix C: Example Transport Plan

<u>Example of a blank transport plan:</u>

Proposed Release, Research, Monitoring and Contingency Plan for (Species, Animal ID, "Name")

Contact:

Proposed Release Date:

I. Release Logistics

Upon medical and permit clearance of Animal X:

- Transport logistics to release site
- Personnel for transport
- Immediate post-release and short-term monitoring

II. Release Site selection rationale:

- Suitability of release site
- Animal X's home range (if known)

III. Research and Monitoring Plan

- Tagging, etc.
- Long-term monitoring (if possible)

IV. Contingency Plan

- Re-capture/relocation? (if possible)
- Placement?

Example of a Seal Transport Plan:

Alaska SeaLife Center
SEAL TRANSPORT PLAN

Species: Harbor Seal (*Phoca vitulina*)

Animal: PV1904 – Tag #

Transport: Harbor Seal from Seward to Whittier

Date: Release on Monday, August 12, 2019

Transport Coordinator: Jane Belovarac, LVT

ASLC Attendees: Savannah Costner (Lead), Jessica McCord (intern), Lisa Hartman (Husbandry Director)
Other: Nat Geo film crew: Zack Vincent, Chris Sondreal, and Patrick Greene; Captain and Crew of Lazy Otter charters

Care Responsibility:
Responsibility for animals care will be under the ASLC from the time of departure in Seward until the animal is released. Although it is unlikely that there will be a need to return to Seward, it is always prudent to have the ability to return should an emergency present itself. Per USDA Animal Welfare Specifications Marine Mammal Transport Standards (CFR part 3 subpart E section 3.116), a licensed veterinarian or an employee of the shipper or receiver, knowledgeable and experienced in the area of marine mammal care and transport, must accompany all marine mammals during periods of transportation to provide for their good health and well-being, observe the animals to determine whether they need veterinary care, and to obtain veterinary care, if required, as soon as possible.

Trip Itinerary:
On August 12, the seal will be loaded into a transport crate at 12:15pm at the Alaska SeaLife Center with a departure from the Alaska SeaLife Center at 12:30pm. Anticipating to catch the Whitter tunnel at the 2:30 opening. Arrival at Whittier Harbor will be approximately 2:40pm. Animal will be moved to a Lazy Otter charter vessel, the Kyak Chief, for estimated departure time at 3pm. The seal will be released in the waters outside of Whittier, likely near Blackstone Glacier.

Mode of Transportation:
Transport Crate – The seal will have a transport kennel with ventilation on the sides and front, measures 36" X 27" X 25", and weighs approximately 100 pounds with the animal. The kennel is constructed of heavy duty plastic. Attendants will have easy access to the seal through the front door. The floor of the cage will be fitted with mesh grating that will allow feces and urine to pool below the floor and prevent the seal from lying in waste. If ambient temperatures require, ice and/or frozen towels will be placed into the kennel prior to the transport to keep the animal cool. Towels will be used to soak up any feces or urine.

Transport - The animal will be placed into the transport kennel 15 min prior to departure from the Alaska Sea Life Center. The seal will be transported along with the care giver and assistants in a truck to Whittier. In Whitter, the seal will be transferred to the vessel, the Kayak Chief, run by the Lazy Otter. The seal will be checked periodically for the duration of the transport (approximately hourly).

Release – The animal will be released in the waters outside of Whittier off a boat. First choice is in the waters near Blackstone Glacier, but if more seal friendly waters are determined, release will be at the best location.

Contingency option – If weather is hazardous for boat travel, seal may be released on beach in Whittier likely near the Whittier campground or airstrip.

Pre-Transport Items:
Health Inspection - Regular routine blood samples have been drawn from the seal by the veterinary staff at the Alaska Sea Life Center. Final samples were collected on August 11, 2019. The attending veterinarians at Alaska Sea Life Center have determined the seal is healthy and deemed releasable for transport and release.

Transport Supplies - Please see the attached list of supplies necessary for transport. (Attachment 1)

Emergency and Veterinary Care - Please see the attached list of veterinary kit supplies necessary for transport. (Attachment 2)

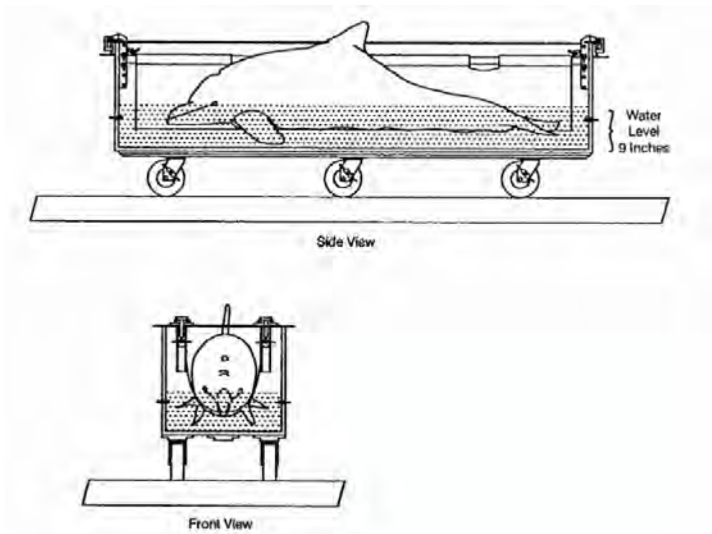
Emergency Contacts - In addition to the veterinarian and ASLC staff, government agencies will be on standby to assist or make special arrangements if needed. Please see the attached list of emergency contact names and numbers. (Attachment 3)

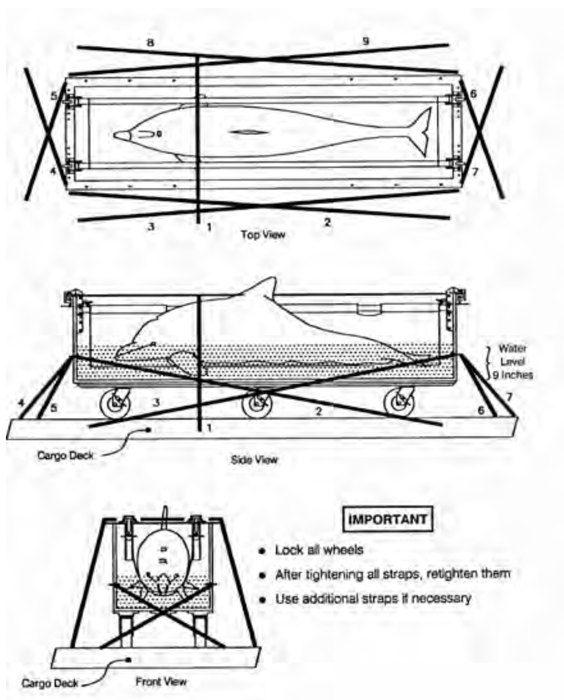
Return Information:
ASLC staff and attendants will return to Seward that evening. They will report to Jane Belovarac to close out their travel plan.

Paperwork to accompany Animal on the transport:
- Transport Plan
- Transport Logs
- Letter of Authorization for release
- Permit

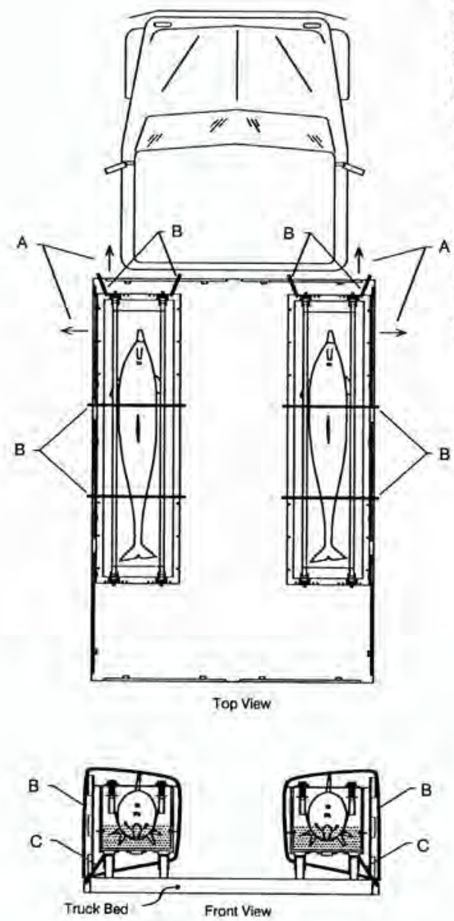
11. Appendix D: Photos

Cetacean transportation carriers (Navy SOP #21-10):



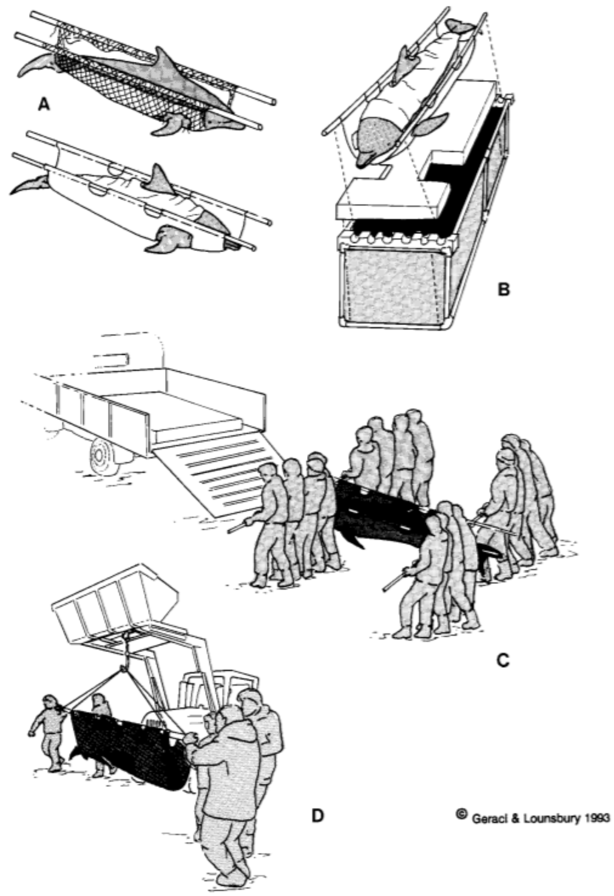


Note: Animal Transporters are no longer equipped with wheel locks due to high maintenance and unreliable performance. Use wood blocks or similar material to secure the wheels and prevent the possibility of any rolling to occur during transport.



Note: Due to the variability of trucks used to transport dolphins, it is impossible to standardize a single strap-down diagram. If the following guidelines are used with every truck bed design, a secure strap-down is possible.

- Make sure the transporters are as far forward and to one side as possible (see A).
- Secure each front and side to the truck bed (see B).
- Strap the outside casters to the truck bed (see C).
- Use additional straps wherever possible.
- The transport coordinator will check and approve the strap-down before transit.



Cetacean transport methods (Geraci *et al.* 2005). A) Stretchers with holes for flippers. B) Specially constructed transport box with foam pad and waterproof liner. C) Manual method of moving a small cetacean onto a foam-padded transport vehicle, using poles positioned cross-wise through stretcher handles to allow necessary support. D) Use of heavy equipment to move larger cetaceans.

Photo Credit: IFAW

Photo Credit: IFAW


Photo Credit: IFAW

Photo Credit: IFAW


Photo Credit: IFAW

Cages: Cages are used to contain and transport animals. Doors lift completely out and can be used as crowding boards. The cage can be lifted by a team or by forklift and has bridle attachment points to be lifted by crane or helicopter. Placing a cage in shallow (less than two feet) water may aid a compromised animal with entry/exit in conjunction with other tools such as crowding boards. Three different cage sizes pictured below.


Hawaiian monk seal research program, NOAA Fisheries


Hawaiian monk seal research program, NOAA Fisheries

Appendix XI

MMHSRP Research Methodologies

1. Current Endangered Species Act (ESA)/ Marine Mammal Protection Act (MMPA) Permit Activities

The activities described in this appendix are those that may be conducted under the current ESA/MMPA permit issued to the Marine Mammal Health and Stranding Response Program (MMHSRP). Many of the activities are only applicable to the scientific research conducted by Co-Investigators (CIs) under the permit. Some activities are also applicable to the emergency response of ESA-listed species, which is covered under the ESA/MMPA permit, and the differences between research and emergency response use are outlined below. However, this appendix does not include information on basic stranding and entanglement response activities.

1.1 Close Approach

Animals may be taken through close approaches by aircraft (including unmanned aerial systems (UASs)) for observations, assessments, monitoring, photo-identification, photogrammetry, behavioral observation, hazing, sampling, and unintentional harassment. Animals may be taken through close approaches by ground or vessel (including unmanned underwater vehicles including gliders or remotely operated vehicles (ROVs)) for disentanglement, assessments, monitoring, photo-identification, photogrammetry, behavioral observation, capture, tagging, marking, biopsy sampling, skin scrapes, swabs, collection of sloughed skin and feces, breath sampling, blood sampling, administration of drugs, video recording, hazing, and unintentional harassment. More than one aircraft and vessel may be involved in close approaches and aircraft and vessels may approach an animal more than once. Unitentional harassment of non-target animals may occur during close approaches by aircraft or vessel. During emergency response and research activities, close approaches may occur for any age class, sex, and species (including ESA-listed species). Methods and protocols for close approach and associated activities are described below. The specific parameters of a close approach is determined by the Principal Investigator (PI) or CIs prior to beginning the effort. This discussion will take into account the need for the close approach, the species involved, and any specifics of the situation, and the CIs and other key personnel will formulate an operating plan (which may be a verbal agreement).

1.2 Aerial Surveys

Aerial surveys are generally used to: collect information on animal abundance; resight branded, tagged, and entangled pinnipeds; locate imperiled or dead marine mammals (ESA-listed and non-listed species) including tagged individuals; monitor behavior or disease in a given population or individual; monitor body condition and extent of entanglement or injury; monitor behavior; survey the extent of disease outbreaks or die-offs; evaluate potential exposure to an oil spill or chemical spill, locate out of habitat animals after an extreme weather event or mass stranding, and locate carcasses. During emergency response and research activities, aerial surveys may occur for any age class, sex, and species (including ESA-listed species).

The aircraft type used during emergency response activities depends upon the aircraft available at the time of the response, the requirements of the mission, and the logistics of the activity. Crewed platforms (*i.e.*, helicopters and fixed-wing aircraft) may be used, as well as UASs or drones that may be either remotely-operated or autonomous. Common types of UASs currently in use include fixed wing aircraft and Vertical Take Off and Landing (VTOL) multi-rotor craft (*e.g.*, quad and hexa-copters), but the field is rapidly advancing and additional types are likely to be available during the project period. The frequency of surveys is dependent on the circumstances of the involved event or study such as stranded or entangled animals, disease, or the occurrence of an Unusual Mortality Event (UME), mass stranding, weather emergency, or hazardous waste spill. Aerial surveys using crewed aircraft are typically flown along predetermined transect lines at a set altitude and air speed while observers scan the water for signs of marine mammals.

The speed and altitude of the aircraft depend on the aircraft and the response or research situation and may vary depending upon the research or response mission need. For large cetaceans, crewed surveys typically are flown at an altitude of 230-300 m (750-1,000 feet) at approximately 110 knots (203 kilometers/hour) or 100 knots (185 kilometers/hour) for right whales. For smaller cetaceans, crewed surveys typically are flown at an altitude of approximately 230 m (750 feet). Large survey aircraft are generally flown at 110 knots (203 kilometers/hour) and small aircraft are generally flown at 97 knots (179 kilometers/hour). When an animal or group of animals is sighted, the survey aircraft may descend and circle over the animal or animals to obtain photographs and assess the animal(s), as needed. Total circling time is situation specific, and could be on the scale of seconds at lower altitudes (e.g., to take photographs) to hours at higher altitudes (e.g., to remain with an entangled animal until a response vessel arrives on scene).

For crewed aircraft, a minimum altitude of 153 m (500 feet) is used for pinniped research surveys. The typical altitude is between 182-244 m (600-800 feet) at 80 to 100 knots (148-185 kilometers/hour). For Steller sea lion (*Eumetopias jubatus*) surveys during the breeding season, an altitude of at least 214 m (700 feet) is used to collect photographs. In the non-breeding season, surveys are flown between 150-200 m (492-655 feet) at a speed of 100-150 knots (185-278 kilometers/hour). All aerial surveys are flown according to the National Oceanic and Atmospheric Administration (NOAA) Aviation Safety Policy (NOAA Administrative Order 209-124), with trained observers and pilots.

Unmanned aircraft may be flown at lower altitudes than those listed above, but no lower than necessary to collect the data sought or for the mission purpose. The most frequent use of UASs are to carry a small camera to relay images to researchers/responders in real time or record video and still images of animals in distress or are the subject of a study that may be reviewed later. UASs may instead/also carry another digital sensor such as thermal imaging. Most currently available VTOL UASs typically weigh no more than five pounds and have an average battery life of 20-30 minutes, while the currently available fixed wing UASs are heavier and have battery lives of several hours. However, UAS technology is rapidly evolving and we anticipate that UASs with different parameters are likely to be developed over the life of this PEIS, and the MMHSRP may utilize newer UASs as they are available. The altitude in emergency response cases is determined by the operational conditions, but is usually 10-50 feet to appropriately visualize wounds, lesions, entanglements, or other body condition parameters. For research studies, the altitude used is more variable and will depend on the specific goals of the study.

UASs may also be used to collect biological samples; for example, an exhalate sample may be collected on an apparatus mounted beneath the UAS; the minimum altitude for this activity is just above the cetacean's blowhole (approximately 6 feet). If the UAS is equipped to take skin scrapes (*e.g.*, with dish scrubbies), collect a biopsy sample, or apply a tag, then the minimum altitude is 0 feet as the UAS will make contact with the mammal for a brief period of time. Given the continuing need to monitor response to UAS approaches and data/sample collection activities, all attempts continue to report the effect of altitude, payload, and other factors on the subject(s) in specific scenarios. Additionally, whenever possible, trials of new techniques or UAS tools are conducted on carcasses prior to use in the field. All UAS operations under the permit conducted by NOAA employees or contractors are conducted pursuant to NOAA UAS Policy 220-1-5, including aircraft airworthiness certification, pilot and crewmember training, aircraft authorization through the FAA, preflight and operational checklists, and appropriate agency notifications. All non-NOAA operators under the permit are required to comply with FAA regulations and other applicable laws. All operators are required to have obtained appropriate training on any given airframe and meet all FAA requirements for licensing prior to being authorized under the permit.

1.3 Vessel Surveys

Vessel surveys of both ESA-listed and non-listed marine mammals may be conducted to: collect data on animal abundance; assess animal condition; locate animals for research and response activities; track radio tagged individuals; and collect research samples. The vessels themselves may be used as a platform for conducting animal sampling. Vessel surveys using manned and unmanned surface and underwater vessels are used to conduct a variety of assessment activities, post-release monitoring of rehabilitated or disentangled animals, photo-identification, photogrammetry, and monitoring/tracking. Vessel surveys may also be used to track extralimital/out-of-habitat animals, animals in an oil or chemical spill or extreme weather event, entangled animals, and to conduct carcass surveys during UMEs. During emergency response and research activities, vessel surveys may occur for single or groups of animals of any age class, sex, and species (including ESA-listed species).

For small cetaceans and pinnipeds, inshore monitoring surveys are typically conducted using small (5-7 m) outboard motor powered boats. Animals are located by having crew members visually search waters as the boat proceeds at slow speeds (8-16 kilometers/hour). Animals outfitted with Very High Frequency (VHF) radio tags or satellite tags may be located or tracked by listening for the appropriate frequency of the tag and, after detecting a signal, maneuvering the boat towards the animal using a combination of signal strength and directional bearings. Frequencies and remote sensors are also monitored. In addition, using remote sensing or satellite tag data, a preferred range or habitat may be established for an individual or group which is then used to narrow a search range. Once an animal or group of animals is located, the boat approaches them so that crew members can assess their physical, behavioral, and medical condition. Photographs of individual animals may be taken for later identification and matching to existing photo-identification catalogs, (*e.g.*, humpback whale fluke, right whale callosities, and dolphin dorsal fins). For post-release monitoring of a rescued and released cetacean, or when a small cetacean is located that has been recently caught for a health evaluation, an attempt is made to photograph the dorsal fin and body to confirm identification, health, and behavior. A photograph of the dorsal fin, body, wound, tag site (if applicable) and visible would also be used to assess wound healing from tag attachment and tag position, to look at tag migration, to evaluate wound healing, injury alterations over time, and overall health of the animal. The area behind and below the posterior aspect of the dorsal fin may also be photographed to assess biopsy wound healing. For pinnipeds, photographs of tag and mark sites or other naturally identifying markings are used to identify the animal and assess health and tag attachment. A telephoto lens is used for photographs, so vessels are generally at least 10 meters from animals.

Multiple approaches may be required to obtain appropriate quality photographs, particularly if there are multiple individuals within a group. Close approach is terminated and the boat moves away from the group if animals begin to display behavior that indicates undue stress that could possibly be related to the approach (*e.g.*, significant avoidance behavior such as chuffing [forced exhalation], tail slapping, or erratic surfacing for cetaceans, or movement toward the water for pinnipeds on land).

1.4 Hazing and Attractants

Hazing in the context of wildlife response is defined as a process to disturb an animal's sense of security to the extent where it moves out of an area or discourages an undesirable (and potentially dangerous) activity. Hazing of ESA-listed marine mammals may occur if an animal is in the vicinity of an oil or hazardous material spill, harmful algal bloom, out-of-habitat, or in another situation determined to be harmful to the animal. Cetaceans may also be hazed to deter a potential mass stranding. Hazing activities are not included in all Stranding Agreements (SAs), and is often accomplished under the MMHSRP MMPA/ESA permit. Hazing is considered to fall under the SA if it is for an individual or small number of non-listed pinnipeds or small cetaceans and the techniques used will not harass non-target animals. For the majority of instances where hazing would be considered as a technique, hazing would not fall under a SA primarily due to unintentional harassment of non-target individuals or ESA species. Additionally, in the context of a large oil spill, hazing activities may be conducted by non-governmental personnel (*e.g.*, NGO or contractor staff) and therefore these activities are not always covered under Section 109(h) of the MMPA. Given the need for flexibility and to provide coverage for all situations, hazing is authorized under the MMHSRP's MMPA/ESA permit for all marine mammals, including non-listed, threatened and endangered species. Unintentional harassment of non-target animals is authorized for all marine mammal species under NMFS jurisdiction. The goal of a deterrent is to create aversive stimulus that excludes the animal from certain resources or habitats and capitalizes on the mechanisms of threat detection and avoidance (Schakner and Blumstein 2013). Non-lethal hazing deterrence methods include, but are not limited to: visual deterrents, physical barriers, chemo-sensory, tactile (*e.g.*, electrical, projectiles, manual instruments, water), and acoustic deterrents, including impulsive (*e.g.*, seal bombs, firecrackers, banging pipes, bird bangers) or non-impulsive (*e.g.*, pingers, predator sounds, air horns) methods (Proposed Rule: Guidelines for Safely Deterring Marine Mammals; 85 FR 53763). The correct use of deterrents incorporates the element of surprise, while minimizing the potential for habituation and injury. Attractants (*e.g.*, species specific vocalizations) are also used to attempt to encourage animals to move to a different area. The Pinniped and Cetacean Oil Spill Response Guidelines contains a section on hazing that outlines common hazing techniques (Ziccardi *et al.* 2015).

As there are few established protocols or documented results of different hazing methodologies, research studies may be implemented to evaluate various methods. For research purposes, the use of hazing and attractants would be for method development and testing, to determine if a particular method was effective or how it could be refined to be effective. All research on deterrents and attractants would be conducted on surrogate non-ESA listed species whenever possible, and is not expected to exceed Level B harassment.

Acoustic deterrents that may be used to deter cetaceans include, but are not limited to: pingers, bubble curtains, acoustic deterrent devices (*e.g.,* Airmar devices), seal control devices (seal bombs), airguns, mid-frequency and low-frequency sonar, predator calls, aircraft, vessels, and fire hoses (85 FR 53763). Pinniped-specific acoustic deterrents may include impulsive explosive (*e.g.*, fireworks, cracker shells, and bird whistlers, etc.) and non-impulsive (*e.g.,* passive acoustic in-air deterrents), and non-impulsive (*e.g.*, acoustic alarms, in-air noisemakers, and predator sounds, etc.) devices (85 FR 53763).

Visual deterrents for pinnipeds and cetaceans include flags, streamers, and flashing lights (85 FR 53763). Exclusion devices for pinnipeds and cetaceans may include nets or fencing. The specific parameters of a hazing/attractant effort will be determined by the CIs prior to beginning the effort, in consultation with the PI (*i.e.*, the MMHSRP coordinator) if circumstances permit. This discussion would take into account the need for the close approach, the species involved, resources available including types of deterrent devices on hand or easily acquired, and any specifics of the situation, and an operating plan will be formulated (which may be a verbal agreement).

Pingers, which are typically used in the commercial fishing industry, produce high-frequency pulses of sound to deter animals. The standard pinger emits a signal of 10 kHz (with harmonics to at least 60 kHz) with a source level of 132 dB re μPa at 1 m, which is within the hearing range of most cetaceans (Reeves *et al.* 1996), but other pingers with different frequencies may also be used depending on specific circumstances. Bubble curtains may be used as a barrier from other acoustics. Oikomi pipes are banged together by personnel on boats.

Airmar devices, which also produce pulses of sound, have a source level of 195 dB re µPa at 1m and their peak energy is at 10 kHz with higher harmonics. These devices are moved at low speeds on small boats or are hull mounted on boats to allow faster movement. They may be able to deter animals 3 km away. A line of directional Airmar devices could be deployed at the site of a spill near cetaceans to cause them to move them away from the oiled area. The received levels needed to cause deterrence without acoustic trauma would vary with species, and can be calculated (NMFS 2018), however, temporary injury to an animal (*e.g.,* Temporary Threshold Shift) is better than the alternative (*i.e.,* death).

“Seal bombs” are underwater explosives that are launched by hand (i.e., thrown manually). The explosive charge is contained in a sealed cardboard tube, fitted with a waterproof fuse, and weighted to sink below the surface of the water before detonating. Seal bombs are considered “explosive pest control devices,” which are regulated explosives under the Bureau of Alcohol, Tobacco and Firearms (ATF) jurisdiction and subject to requirements of the Federal explosives laws and regulations. If used properly (*e.g.*, minimum distances from a marine mammal, silent intervals, etc.), the noise and light would potentially startle marine mammals, but not cause any injuries (Petras 2003). Airguns are generally a towed array that is deployed behind a ship. Their peak energy is dependent on size, and may range from 10 Hz to 1 kHz. Airguns produce broadband pulses with energy at frequencies ranging over 100 kHz. The higher frequencies are less intense and attenuate faster.

Mid-frequency sonar may be used to deter cetaceans. It has caused deterrence in killer whales in Haro Strait during the 2003 *USS Shoup* transit episode. The sonar had a source level of approximately 235 dB (exact level is classified) and the frequency ranged from 2.6-3.3 kHz over 1-2 second signals emitted every 28 seconds (USN 2004). Mid-frequency sonar could be effective over 25 km, which would be important for deterring animals during a large oil spill. Low-frequency sonar may also be used, especially for mysticete deterrence, but is too low for some cetaceans to hear.

Predator calls (typically killer whale calls) are played to deter potential prey. However, in most situations, predator calls have proven ineffective in changing prey behavior. Aircraft, such as helicopters, generate a fair amount of noise and wave movement at close range and could produce a startle or avoidance response. This may be effective initially, but animals would likely habituate quickly. Aircraft could also be used to deploy seal bombs, if necessary. Vessels may be used to herd animals back out to open water or away from a hazardous situation. Booms or line on the water may be used to displace small odontocetes from stranding. Fire hoses may be used at close range as a physical deterrent. Fire hose spray on the surface of the water proved successful at causing two out-of-habitat humpback whales to change course, although responders were unable to use them with lasting herding effect (Gulland *et al.* 2008).

Attractants that are used include playbacks of acoustic calls of conspecifics or prey and release of chemosensory stimuli that could lure marine mammals from one harmful area to another that would be safer. Dimethyl sulphide (DMS) is a naturally occurring scented compound that is produced by phytoplankton in response to zooplankton grazing. DMS has been experimentally proven to be an attractant to seabirds (Nevitt *et al*. 1995); extreme olfactory sensitivity to DMS has been shown in harbor seals (Kowalewsky *et al*. 2006).

To appropriately deploy and use many of these hazing methodologies, field responders need to be trained and experienced. The best way to ensure trained responders and to provide the necessary experience is to use the tools in a non-emergency preparatory training scenario (*e.g.*, during an exercise or drill). Drills can be designed to minimize impacts on marine mammals (taking into account geography, season, etc.), but there is still the potential for unintentional harassment. For instance, when using oikami pipes as part of a drill, the sound produced may result in harassment of cetaceans that are within the acoustic range of the activity. Unintentional harassment resulting from preparatory exercises and trainings is authorized under the permit.

1.5 Capture, Restraint, and Handling

Capture of any species of ESA-listed marine mammals (small cetaceans and pinnipeds) may be necessary during research and enhancement activities to perform a veterinary examination; evaluate a wound, disease, entanglement, or injury; attach tags and/or scientific instruments; and collect specimens. As the SA is issued under the MMPA (as a MMPA 112(c) agreement), it provides coverage for "take" under the MMPA only. When responding to ESA-listed stranded or entangled animals, the authorization for "take" under the ESA does not come from the SA and must come from the MMHSRP MMPA/ESA permit. Capture of non-ESA listed marine mammals is sometimes necessary during research activities under the MMHSRP MMPA/ESA permit.

To the extent possible, the MMHSRP collaborates with other permitted researchers during their scheduled capture programs, especially for those on ESA-listed pinnipeds (*e.g.*, Hawaiian monk seals

(*Monachus schauinslandi*)), to collect different or additional samples for evaluation, diagnostics, or surveillance purposes. Therefore, the capture of these animals often occurs under the permits of the other researchers, while the samples collected for the MMHSRP are takes under the permit (termed "piggy-backing").

In some instances there may be a need to capture additional animals (beyond those permitted elsewhere), or to conduct a sampling trip outside of the scheduled programs of the researchers – *e.g.*, to a different geographic area or in a different season. In these instances, the capture of the animals (as well as subsequent sampling) occurs under the permit. This could apply to ESA-listed pinnipeds (excluding Hawaiian monk seals), and some ESA-listed small cetaceans.

For research activities, capture, restraint, and handling may occur for any age class, sex, and species of marine mammal, including ESA-listed species. Additionally, capture, restraint, and handling may occur for pregnant and lactating females and pups/calves except for small cetaceans estimated to be less than one year of age. Prior to beginning a field capture response or research program, the specific needs of the situation are assessed by the PI and CIs to determine which activities will be performed (including the determination of the appropriate capture method) and which samples need to be collected and prioritized.

During capture activities, non-target animals may be unintentionally harassed. For instance, "healthy" pinnipeds on a haul-out near a target animal may be flushed from the haul-out during the capture operation. In very rare instances, capture operations for a stranded or entangled animal may result in the accidental mortality of a non-target animal. For example, when capturing a free-swimming entangled bottlenose dolphin, an associated animal may also be netted and may drown. All precautions are taken to minimize the likelihood that non-target animals are caught in the net, and if caught, will be released as quickly as possible. However, in the unlikely event that one of these associated animals perishes, accidental mortality is authorized under the permit. If a non-target animal is accidentally killed during emergency response activities, the circumstances surrounding the death are immediately reviewed and future similar responses will be modified as appropriate, which may include cessation (in the example given, ceasing all capture operations for free-swimming entangled dolphins) if appropriate modifications or mitigation cannot be identified. If the target (entangled, debilitated, injured) animal is accidentally killed (*i.e.* not euthanized) during an emergency response, the circumstances are likewise reviewed, but these deaths are more likely given the compromised nature of the animals.

Capture methods include, but are not limited to, hand, nets, traps, behavioral conditioning, and anesthesia/chemical immobilization.

Capture and restraint of cetaceans (listed and non-listed) occurs during investigations such as health assessment studies, prospective research, emergency response, and entanglement response activities. Typical methods currently used during health assessment studies and for emergency response are described below. However, these methods may vary depending on the species and location and may change, depending upon advances in technology. For research health assessment studies of non-listed small cetaceans, primarily bottlenose dolphins, but which could include other species, small groups of animals are approached for identification (see description under vessel surveys). Every effort is made to capture no more than five dolphins at a time during a net set. Additionally, in the rare event that more than five dolphins are captured at one time, the additional animals would be immediately released, unless the attending veterinarian determines that doing so could have a negative impact on individual dolphins. If working in water greater than two meters, every effort is made to capture no more than two animals at a time during a set. Ideal circumstances include shallow water (less than 1.5 meters) where personnel can stand on hard bottom to support the dolphins as necessary, with minimal current and no obstacles that will catch the net. The animals are encircled with a 400-600 m long by 4-8 meter deep seine net, deployed at high speed from an 8 meter long commercial fishing motor boat. Small (typically 5-7 meter) outboard-powered vessels are used to help contain the animals until the net circle is complete (Barratclough *et al.* 2019). These boats make small, high-speed circles, creating acoustic barriers.

Once the net corral is completed, about 15-25 handlers are deployed around the outside of the corral to correct net overlays and aid any animals that may become entangled in the net. The remaining 10-20 or more team members prepare for sampling and data collection and begin the process of isolating the first individual. Isolation may be accomplished by pinching the net corral into several smaller corrals. Handlers are sometimes able to hand catch the selected animal as it swims slowly around the restricted enclosure. However, a few animals may strike the net, become entangled, and need to be quickly disentangled. After animals are restrained by handlers, an initial evaluation is performed by a trained veterinarian. Once cleared by the veterinarian, the animal is transported to the processing boat via a Navy mat or in the water by a team of handlers, accompanied by a veterinarian. A specially-designed sling is used to bring the animal aboard the examination vessel, and at the end of the exam, to place an animal back in the water for release.

In some cases, cetaceans may be captured in deep waters (*e.g.*, greater than six meters). A break-away hoop-net is used to capture individuals as they ride at the bow of the boat. When they surface to breathe, the hoop is placed over their head and they move through the hoop, releasing the net. The additional drag of the net slows the animals substantially, but the design allows the animal to still use its flukes to reach the surface to breathe. The net is attached to a tether and large float, and the animal is retrieved, maneuvered into a sling and brought onboard the capture boat.

Small cetaceans (including emergency response situations involving Hawaii insular false killer whales (*Pseudorca crassidens*), Cook Inlet beluga whales (*Delphinapterus leucas*), and Southern resident killer whales (*Orcinus orca*)) in shallow water may be caught using a net deployed from a boat with methods similar to those described above. In shallow rivers and canals, responders may use their bodies, boats, sounds, or nets (*e.g*. seine, hoop, etc.) to herd an animal and then capture it by hand. In deep water (*e.g.*, greater than six meters), a hoop net or tail lasso may be used to capture animals.

For land captures of pinnipeds (including both those species listed under the ESA and non-listed), net types may include, but are not limited to, circle, hoop, dip, stretcher, and throw nets. Net guns and pole nooses may be used for capture of pinnipeds. An injectable immobilizing agent administered remotely by a dart or pole syringe or by hand, may also be used to subdue animals if warranted by the circumstances (*e.g.*, older or larger animals). Herding boards are used to maneuver animals into cages. For water captures of pinnipeds the use of the following devices include (but are not limited to): dip nets, large nets, modified gill nets, floating or water nets (nets with a floating frame that may be brought adjacent to a haulout which the animals jump in to), and platform traps. Purse seine or tangle nets are used offshore of haul-out sites to capture animals when they stampede into the water. Animals become entangled by the net as it is pulled ashore (seine) or in the water (tangle). Once removed from the net, animals are placed head first into individual hoop nets. Pups may be restrained by hand, in a hoop net, with injectable sedatives or anesthetics, or with the inhalation of a gas anesthesia (administered through a mask over their nose). Older animals may be restrained by hand, a fabric restraining wrap, a restraining net, a restraint board, using gas anesthesia (administered through a mask or endotracheal tube), or through injectable sedation or anesthesia, as determined by an attending veterinarian, veterinary technician, or experienced biologist (see 1.27 Administration of Medications, below).

1.6 Transport

Vehicles, boats, or aircraft may be used to transport marine mammals, regardless of reason for transport. Transport times may vary from a few minutes to several days, depending upon the stranding and rehabilitation locations. For example, transport of a stranded pinniped in a remote part of Alaska may take 48 hours to be transported to rehabilitation, and transport would likely occur via a combination of plane (or helicopter) and vehicle (including snowmobile, truck, or van). Transports of Hawaiian monk seals from the Northwest Hawaiian Islands to the rehabilitation center on the Big Island may take several days via boat or many hours via plane. Transports of stranded cetaceans in the Pacific Northwest from temporary holding facilities to rehabilitation centers capable of long-term rehabilitation located in California may take several hours via vehicle and plane.

Cetaceans may be transported on stretchers, foam pads, or air mattresses. For short-term transport, closed-cell foam pads are preferred because they are rigid and do not absorb water. Open cell foam pads are typically used for long-term transport of cetaceans because it can contour to the animal's form. Boxes may be constructed to transport the animal upright in a stretcher in water. Cetaceans must be protected from exhaust fumes, sun, heat, cold, and wind, as transport often occurs on the flatbed of a truck. Animals are kept moist and cool, to avoid overheating (Geraci and Lounsbury 2005).

Small pinnipeds are typically transported in plastic kennel cages or metal cages. Cages are large enough for animals to turn around, stretch out, and raise their heads, and allow proper air circulation. As with cetaceans, pinnipeds traveling by vehicle must be protected from the sun, heat, cold, wind, and exhaust fumes. Pinnipeds may overheat during transit and wetting the animal helps to prevent hyperthermia (Geraci and Lounsbury 2005). Fur seals should be transported in a cage with a double base to allow separation between the animal and fluids and excrement that may soil the fur. Large pinnipeds are transported in appropriately sized crates or containers, which may need to be custom made. If animals cannot be appropriately contained, or to reduce the stress experienced, some animals are sedated during transport.

Transport procedures for marine mammals used in scientific research under U.S. jurisdiction follow the Animal and Plant Health Inspection Service's (APHIS) "Specifications for the Humane Handling, Care, Treatment, and Transportation of Marine Mammals" (9 CFR Ch 1, 3.112). The "Live Animal Regulations" published by the International Air Transport Association (IATA), and accepted by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, are followed for the air transport of animals under foreign jurisdiction (IATA 2006). Both sets of standards have specifications for containers, food and water requirements, methods of handling, and care during transit.

1.7 Attachment of Scientific Instruments

Instrumentation of marine mammals is used to monitor the animal's location and assess an animal's movements after immediate release (from a stranding site), release after rehabilitation, after disentanglement, or release after research activities. Tagging of non-listed marine mammals may occur under the permit as part of a research project or experimental scientific instrument development (*e.g.*, remotely deployed single-pin dorsal fin tags). Other tags or scientific instruments deployed on animals as part of a scientific research project are used to obtain physiological data (*e.g.,* dive depth, dive duration, heart rate, ECG, EEG, stomach temperature, etc.), oceanographic data (water temperature, light levels, chlorophyll levels, etc.) and/or acoustic data (animal and other underwater sounds). The method of tagging will be chosen based upon the criteria of the situation including, but not limited to, the subject species, the data needs from the tag, the required tag duration, the number of animals to be tagged, and the supplies on hand for the tagging (including available funding). The least invasive tagging method possible that meets the requirements of the situation will be chosen. Based upon the size, age class, and species being tagged, as well as the other procedures being conducted while the animal is in hand, individuals may be sedated or anesthetized for marking and tagging, as described in the sections on administration of medications.

During research activities, tags are not attached to large cetacean calves less than six months of age or females accompanying such calves (note that this does not apply to emergency response enhancement activities, when tags may be attached to large cetacean calves or females with accompanying calves in distress). For small cetaceans, no tagging occurs on calves less than one year of age (except roto-tagging, if necessary). Tags may be attached to pinnipeds of all age classes, sex, and species for research and response activities, including pups (nursing and weaned), lactating females, and pregnant females.

Types of tags that are used include, but are not limited to: roto tags (cattle tags), button tags, very high frequency (VHF) radio tags, satellite-linked tags, Passive Integrated Transponder (PIT) tags, deep-implant tags, radio frequency identification (RFID) tags, digital archival (D-tags), Low Impact Minimally Percutaneous Electronic Transmitter (LIMPET) tags, dart/barb tags, dorsal ridge (*i.e.,* spider tags), code division multiple access (CDMA) tags, pill (*e.g.*, stomach temperature telemeters), time-depth recorders (TDRs), life history transmitters (LHX tags), and Crittercams (video cameras). Tag attachment methods vary with tag type, species, and circumstances. Attachment methods for cetaceans include, but are not limited to: bolt, tethered-buoy, tethered, punch, harness, suction cup, implant, or ingestion. Pinniped attachment methods include, but are not limited to: glue, bolt, punch, harness, suction cup, surgical implant, or ingestion. Tags may be affixed to an animal in hand (stranded, rehabilitating, or during health assessment) or deployed remotely on a free-swimming animal (entangled or out-of-habitat; see below). Specific tags and methods of attachment will be evaluated for each situation in consultation with biologists, veterinarians, and other personnel with recent experience with a particular tag or type of tag to determine optimal protocols. As new technologies are developed, and the best available science improves, the standard techniques will likely change. For baseline health research, implantable tags are generally not deployed on obviously health-compromised animals, but may be deployed on animals with known health concerns for emergency response-related research.

Tags are generally attached to free-swimming cetaceans by crossbow, compound bow, rifles, spear guns, slingshot (or throwing device), pole or jab spears. Tags are only applied by experienced marine mammal biologists, trained in the relevant techniques for the chosen tag type. Prior to deployment, new tag types and attachment methods will be tested first on carcasses to ensure appropriate function of the new method prior to being used on live animals, and will then be approved by the NMFS Office of Protected Resources' Permits and Conservation Division. The tag attachments typically occur via a suction cup, bolt/pin, dart/barb, or deep-implant device, and tag attachment duration is variable from hours to months or even years.

Scientific instruments attached via suction cups are generally used only in cetaceans and include, but are not limited to D-tags, TDRs, VHF tags, satellite-linked tags, acoustic tags, physiologic tags, and Crittercams. Large, slow moving whales may be tagged via suction cups using a pole delivery system, handheld or cantilevered on the bow of a boat. Bow-riding small cetaceans may be tagged using a hand held pole. Crossbows are the preferred method for tagging fast-moving toothed whales. Suction cup tags are attached on the dorsal surface of the animal behind the blowhole, closer to the dorsal fin. Tag placement ensures that the tag will not cover or obstruct the whale's blowhole, even if the cup migrates after placement (as any movement would be toward the tail).

Implantable tags (*i.e.,* dart/barb and deep-implant) are attached on free-swimming cetaceans by mounting the instrument on an arrow tip or other device designed to penetrate the skin of the animal. Any part that will be implanted in an animal is thoroughly cleaned and sterilized using the best techniques available in the given location (*e.g.*, capabilities of laboratories) and appropriate to the material (*e.g.*, gas or cold-sterilization) prior to being brought into the field and are maintained as sterile as possible in the field (*e.g.*, wrapped in foil, stored in sterile sample bags, etc.) prior to use. These techniques follow IACUC approved protocols. Handling or manipulation of the sterile tag anchors or implantable tags before deployment is performed with sterile surgical gloves or other sterilized equipment. If the tag anchors or deep-implant tag becomes contaminated and is no longer sterile (*e.g.*, missed attempt, contacts seawater, physical contact) prior to use, a new sterile tag anchors or deep-implant tag would be used. Currently many tags are typically deployed by crossbow and may include, but are not limited to LIMPET tags, satellite-linked tags, VHF tags, D-tags, and TDRs. After an implantable tag (*i.e.*, dart/barb and deep-implant) is deployed, the animal is opportunistically monitored to ensure that the tag does not migrate or cause health concerns over time, such as loss of fecundity (IWC 2020). There continues to be significant research and development on tag technology and deployment including development of remotely deployed single pin tags for placement on dorsal fins. As new information on efficacy and risks become available, testing followed by use may occur. For entangled whales, tethered buoys are used to attach VHF, GPS, and/or satellite-linked tags to entangling gear. Buoys may also be attached to increase drag and buoyancy in an attempt to slow a whale's swim speed and maintain it at the surface for disentanglement. Animal monitoring systems such as digital still or video cameras, passive acoustic recorders, drag load cells, time-depth recorders, etc., may also be attached to gear trailing from an entangled whale.

For cetaceans in hand, tags may be attached for longer deployments. Roto tags may be attached to cetaceans with a plastic pin to the trailing edge of the dorsal fin (Balmer *et al*. 2011). Single pin satellite-linked and VHF tags are applied along the trailing edge of the dorsal fin. Remote deployment of satellite-linked single pin tags are currently under development. The attachment pin is a 5/16" delrin pin, machine-bored to accept a zinc-plated flathead screw in each end. A stainless steel washer will be inserted between the screw head and the tag attachment wings. The tag attachment site is cleaned with chlorhexiderm scrub followed by a methanol swab, rinsed with methanol and injected with lidocaine. A sterilized or disinfected biopsy punch is used to make a 5/16" diameter hole in the desired region of the fin (where the fin is sufficiently thin that tag will swing freely and not apply pressure to the fin). Visible space (about the thickness of a playing card) is left between the tag and the fin to ensure the tag is not too tight. Photographs of the fin are taken both before and after the tags are attached. The pin on each type of tag is held in place by screws that will corrode in seawater and allow the tag to be released. Roto tags are applied using similar techniques and in a similar location as described for the electronic tags, with the exception that anesthetic injection is optional based upon veterinary discretion, no delrin pin is needed, and there is no corrodible release mechanism.

Dorsal ridge “spider tags" may be used on beluga whales, excluding Cook Inlet beluga whales (Litzky *et al.* 2001, Hobbs *et al.* 2005). Up to four holes are bored in the region of the anterior terminus of the dorsal ridge using a coring device (trochar) with a diameter of no more than 1 centimeter, where the trochar is of an equal diameter to the pins to be used. Rods of nylon or other non-reactive material, not greater than 1 centimeter in diameter and 50 centimeter in length, are then pushed through the holes and attached to the wire cables or other straps of the satellite-linked tags or through bolt holes in the tag. The wire cables are tightened to hold the tag against the back of the animal to minimize tag movement and drag, but would not be put under significant tension to avoid pressure necrosis around the pin insertion points. The other attachment systems are manipulated to achieve the best possible fit depending on their design. Excess rod is then cut off. All equipment is sterilized in cold sterile solution, alcohol, or equivalent, and kept in air- and water-tight containers prior to use. Trochars and rods are coated with antiseptic gel prior to insertion and each trochar would only be used for one hole before it is cleaned, sharpened, and re-sterilized. Where more than one instrument is to be attached, the number of pins would be limited to four. Additional instruments for use in cetaceans in hand may include but are not limited to LIMPET tags and suction cup tags.

Tagging of pinnipeds with scientific instruments generally involves using a glue or fast drying adhesive, generally but not exclusively epoxy. Instruments are attached to the dorsal surface or head and release when the animal molts. Roto tags are attached to flippers using a single plastic or metal pin. Satellite tags are attached to flippers using one or two stainless steel screws, similar to flipper tag attachments. Tags can also be injected or surgically implanted subcutaneously, intramuscularly or into the body cavity of pinnipeds. Implanted tags include but are not limited to PIT, radio, satellite-linked, and LHX tags.

A PIT tag is a glass-encapsulated microchip, which is programmed with a unique identification code. When scanned at close range with an appropriate device, the microchip transmits the code to the scanner, enabling the user to determine the exact identity of the tagged animal. PIT tags are biologically inert and are designed for subcutaneous (SQ) injection using a needle and syringe or similar injecting device. The technology is well established for use in fish and is being used successfully on sea otters (Thomas *et al.* 1987), manatees (Wright *et al.* 1998), sea turtles, southern elephant seals (Galimberti *et al.* 2000) and Hawaiian monk seals. PIT tags are also commonly used to identify domestic animals (*e.g.*, dogs and cats). PIT tags are injected just below the blubber in the lumbar area, approximately 5 inches lateral to the dorsal midline and approximately 5 inches anterior to the base of the tail. Tags may also be injected at alternative sites on a pinniped's posterior, but only after veterinary consultation. The injection area is cleansed with Betadine (or equivalent) and alcohol prior to PIT tag injection. PIT tags are currently being used in Hawaiian monk seals and harbor seals and have been used without known complications for over 10 years.

Surgically implanted tags other than PIT tags require sedation and local or general anesthesia for surgical implantation and may include VHF or other type tags. LHX tags are implantable, satellite-linked life history transmitters used to measure mortality events in pinnipeds (Horning *et al*. 2017). The tag allows continuous monitoring from up to five built-in sensors, including pressure, motion, light levels, temperature, and conductivity. Specifically for LHX tags, the tag is surgically implanted by a veterinarian into the abdominal cavity while the animal is anesthetized. An incision of typically 7-8 centimeters long through the abdominal wall, including abdominal muscles and peritoneal layers, is required to insert the tag (note that this measurement may change if the specifications of the tags change, but is likely to be reduced in size as technology improves). The incision is closed using absorbable sutures and may be further secured with surgical glue or dissolvable staples. When the animal dies, the tag is released from the body and floats to the surface or falls out onshore. Data from the tag are transmitted to a NOAA satellite and then processed via the ARGOS system. The battery life of a LHX tag is approximately 15 years. These tags may be used for long-term monitoring of rehabilitated animals as well as research animals, on listed and non-listed species. A second generation of LHX tags, known as LHX2, were developed by Wildlife Computers and Dr. Markus Horning. These tags are only 3.8 inches long and require a smaller incision than the previous model, and can be used on smaller marine mammals such as fur seals and sea otters.

1.8 Marking

All marine mammals, regardless of age, sex, or species may be marked during emergency response and research activities. Marking methods include, but are not limited to: hair dye, grease pencils/crayon, zinc oxide, paint (including paint balls), notching, hot branding, and freeze branding. The method of marking is chosen based upon the criteria of the situation including, but not limited to, the subject species, the distance from which the mark must be distinguishable (*e.g.*, how approachable is the animal, will it be recaptured and in hand or must the mark be viewed from farther away), the intent for the marking (*e.g.*, identify previously handled individuals for researchers or rehabilitators, NRDA purposes, identification for subsistence hunters, mark/recapture population assessment), whether a tag could be used instead of or in addition to the mark, the potential user groups that would be reading the mark (*e.g.*, subsistence hunters, biologists, oil spill responders, general public), the needed duration of the mark (days, weeks/months during a given field season, multiple years, lifetime of the animal), the number of animals to be marked, and the supplies on hand for the marking. The least invasive marking method possible that meets the requirements of the situation is chosen. Based upon the size, age class, and species being marked, as well as the other procedures being conducted while the animal is in hand, individuals may be sedated or anesthetized for marking, as described in the sections on administration of medications.

Grease pencils/crayons, zinc oxide, and paint are used on cetaceans and pinnipeds for temporary, short-term marking. Hair dye markings can be used on pinnipeds. The marks are temporary, non-invasive, with the length of time dependent on molting.

Notching can be used to permanently mark cetaceans by cutting a piece from the trailing edge of the dorsal fin. Notching is slightly invasive as it does involve removal of tissue but it can generally be accomplished quickly.

Cetaceans can be marked using freeze branding, typically on both sides of the dorsal fin and/or just below the dorsal fin. Protocols developed as part of other cetacean health assessment projects will be used (Irvine and Wells 1972; Irvine *et al*. 1982, Odell and Asper 1990, Scott *et al*. 1990, Wells 2009). Freeze branding uses liquid nitrogen to destroy the pigment producing cells in skin. Each brand (typically letters and/or numbers approximately 2 in high) is supercooled in liquid nitrogen and applied to the dorsal fin for 15-20 seconds. After the brand is removed, the area is wetted to return the skin temperature to normal. Branded areas may eventually re-pigment, but may remain readable for more than 10 years. Freeze brands provide long-term markings that may be important during subsequent observations for distinguishing between two animals with similar fin shapes and natural markings.

Hot branding is used in several existing longitudinal studies of certain populations of pinnipeds to assess long-term survival and reproduction. In remote locations, or when the response needs to occur very quickly, a propane forge may be much simpler to acquire, maintain, transport, and handle in a field situation than a supply of liquid nitrogen. Hot branding uses heat to kill both hair follicles and pigment-producing cells to leave a bald brand, similar to the longer contact freeze-branding method. Generally most pinnipeds will be sedated or anesthetized prior to hot-branding. Each brand (typically letters and/or numbers approximately 8 centimeter high) is heated in a propane forge until red-hot. Brands are applied with less than 5 lbs of pressure for a maximum of 4 seconds per digit. Details of hot branding techniques on pinnipeds are documented in Merrick *et al.* (1996). Hot brands have been documented to be long-lasting, with Steller sea lions resighted with readable marks at least 18 years after having been branded (Merrick *et al*. 1996, Hastings et al. 2020). Potential mortality from hot branding was investigated in Steller sea lions by Hastings *et al*. (2009), and New Zealand sea lions (*Phocarctos hookeri*) (Wilkinson *et al.* 2011) and data did not suggest mortality within 12 weeks following branding, or resulting from the capture or other disturbance associated with branding. All species of pinnipeds, excluding Hawaiian monk seals, may be hot branded.

Only highly experienced and well-trained personnel are involved in branding operations. Typically, branding is the last procedure to occur when handling the animal. Therefore, immediately after branding and recovery from anesthesia (if used), the animal is returned to the water (or near the water, for pinnipeds). Animals are observed for deleterious effects during recovery (aberrant respiration rate, sluggishness, lack of response, signs of injury). Once returned to the ocean, the sea water acts as the best analgesic to alleviate any pain associated with branding and begins the healing process.

1.9 Diagnostic Imaging

Diagnostic imaging, including but not limited to, thermal imaging, ultrasound, x-ray, magnetic resonance imaging (MRI), and computed tomography (CT) scans, may be conducted on ESA-listed species of marine mammals during response activities and all marine mammals during research. This includes free ranging animals, animals captured during emergency response (ESA-listed species), animals undergoing rehabilitation (ESA-listed species), as part of post-mortem examination (ESA-listed species); or, during research activities on any species in the wild, in rehabilitation, or in captivity. Diagnostic imaging could be conducted on animals of any age/sex including pregnant females.

Ultrasound may be used to evaluate a variety of anatomic structures including but not limited to blubber thickness, bone density, wounds, lesions, reproductive organs (including pregnancy status assessment), and blood vessels. Ultrasound may also be used to evaluate cardiac function, lung condition, other internal organs, and the presence of fat or gas emboli. B-mode, 2-D, 3-D and doppler imaging may be used on all marine mammals. Any diagnostic ultrasound unit with a “scroll” or “zoom” capability (to visualize deeper structures) would be used to examine marine mammals (Gulland *et al*. 2018). Transducer type will depend on the area of interest and the size of the patient. External and internal (transvaginal, transrectal, and transesophageal) ultrasound procedures may be conducted. During transvaginal, transrectal, and transesophageal ultrasounds, a transducer probe is inserted into the appropriate orifice to the minimum depth required to visualize the structures being observed. The probe is well lubricated, if necessary. The length and diameter of the probe is determined by the species and individual anatomy. Sedation may be necessary for the comfort of the animal. The level of sedation/restraint is at the discretion of the attending veterinarian. Following use, and between animals, transducer probes are rinsed off, disinfected (e.g., chlorhexidine or equivalent), and dried. Cetacean ultrasounds are conducted, as often as possible, while the animal is in water.

For example, during health assessment studies of bottlenose dolphins, a diagnostic ultrasound is used to examine the condition of the internal organs and to measure testis length and diameter to assess male maturity. Females are also examined by a veterinarian or trained ultrasound technician during the initial evaluation for pregnancy and the presence of developing follicles. The ultrasound operates at a frequency of about 2.5-5.0 MHz, well above the dolphin's hearing. The length of an examination varies depending on the level of examination required, and is not likely to exceed one hour. Examinations are recorded on video and audio tape, and thermal prints are made of features of interest. In addition, digital video thermography may be used to measure skin temperature.

Radiographic methods may include radiographs, dual-energy X-ray absorptiometry (DXA), CT, and MRI. Radiographs, DXA, CT and MRI are used for a variety of diagnostic reasons including, but not limited to, detection and assessment of: entanglements, ingested foreign objects (*e.g.*, hooks), wounds, lesions, parasites, infection, pregnancy, bone density, and dental health including age estimation. Additionally, radiographs, CT and MRI are also used to evaluate cardiac function, other internal organs, and the presence of fat or gas emboli.

Any diagnostic radiograph unit including digital, portable field, and dental units may be used to examine marine mammals. Plate and film type will depend on the area of interest and the size of the marine mammal. Any CT or MRI could be used to examine marine mammals which would typically involve transport of the marine mammal to a veterinary or human facility (*e.g.*, for brain scans, bone scans, specialized cardiac scans, etc.). The *CRC Handbook of Marine Mammal Medicine* is used as a reference for equipment and methods of radiography for marine mammals (Gulland *et al*. 2018). For some species, sedation and/or anesthesia may be necessary for the comfort of the animal and to limit movement for radiography; or, imaging may be conducted concurrently with other scheduled medical procedures requiring sedation or anesthesia. The level of sedation/restraint is at the discretion of the attending veterinarian.

1.10 Sample Collection and Analysis

Specimen samples are taken from ESA-listed marine mammal species during research, enhancement (*i.e.*, stranding/entanglement response) and necropsy activities and from non-listed species during research activities. Specimen materials may include, but are not necessarily limited to: earplugs, teeth, bone, tympanic bullae, ear ossicles, baleen, eyes, muscle, skin, blubber, internal organs and tissues, reproductive organs, mammary glands, milk or colostrum, serum or plasma, urine, tears, blood or blood cells, cells for culture, bile, fetuses, internal and external parasites, stomach and/ or intestines and their contents, feces, air exhalate, flippers, fins, flukes, head and skull, and whole carcasses. During necropsy of dead animals, any specimens of interest may be collected. Specimens are often acquired opportunistically with ongoing studies or prospective design plans. Because most specimens are acquired opportunistically, the MMHSRP has minimal control over the age, size, sex, or reproductive condition of any animals that are sampled. During research activities, samples are not collected from young-of-the-year small cetaceans. During research activities, samples may be collected from pinnipeds of all ages, including pups, and lactating and pregnant females, as called for in the research protocols. Specific methods for biopsies, blood, breath, and other sampling are described below under the corresponding sections.

Marine mammal specimens collected for analysis or archiving are legally obtained from the following sources:

1. ESA-listed marine mammals stranded (alive or dead) or in rehabilitation in the U.S. [for live animals, sample collection will be at the discretion of the attending veterinarian and the PI and combined with necessary medical sampling whenever possible];

2. Any marine mammal stranded (alive or dead) or in rehabilitation abroad (*i.e.*, outside the U.S.);

3. Soft parts sloughed, excreted, or discharged by live animals (including blowhole exudate) as well as excrement (feces and urine);

4. Permitted marine mammal research programs conducted in the U.S. and abroad, including research programs, collections, or museums authorized under the permit;

5. Any captive marine mammal (public display, research, military, or rehabilitation) sampled during husbandry, including samples beyond the scope of normal husbandry or normal rehabilitation practices;

6. Marine mammals taken in legal fisheries targeting marine mammals abroad;

7. Marine mammals killed during legal subsistence harvests by native communities in the U.S. and abroad;

8. Marine mammals killed incidental to legal recreational and commercial fishing operations or other human activities in the U.S. or abroad; or

9. Marine mammals or their parts confiscated by law enforcement officials.

Specimen and data collection from marine mammal carcasses may follow the necropsy protocols for pinnipeds (Dierauf 1994), right whales (and other large cetaceans) (McLellan *et al.* 2004), killer whales (Raverty and Gaydos 2004), small cetaceans (HSWRI 2005), and all marine mammals (Pugliares *et al.* 2007). These protocols provide details on how samples should be stored, transported, and analyzed. During live animal response or research, specimen and data collection protocols depend on the samples being collected and the intended analyses. Sample analyses occur at various diagnostic and research laboratories in the U.S. and abroad.

1.10.1 Biopsy Sampling

Biopsy sampling is conducted to collect samples of skin, blubber, muscle, or other tissue (see below for details). Sampling may occur on free ranging animals (live and dead, including healthy, compromised, and entangled animals), animals in rehabilitation, animals in managed care, and captured animals during research activities. For emergency response enhancement activities, biopsy samples may be collected from any species, age, and sex animals. For research animals, limits may be placed on which animals may be sampled (see below).

Skin and blubber samples can be analyzed to investigate genetic relationships (species ID, stock structure, relatedness), foraging ecology (stable isotopes, fatty acid signatures), contaminants (including PAH, heavy metals, POPs, etc.), disease exposure or state (*e.g.*, skin lesions), reproductive status, stress, wound healing processes (Noren and Mocklin 2012), and transcriptomics (Ellis *et al*. 2009). Skin has also been investigated as a way of constructing a health index for marine mammals by investigating skin-associated bacterial communities (Apprill *et al.* 2014). Skin and blubber biopsy sampling from a vessel is conducted using, but not limited to, a modified .22 caliber rifle, crossbows, compound crossbows, dart guns, or pole spears. The dimensions and type of the biopsy tip will vary depending on the species being sampled, the need, and the depth of their blubber layer. For small cetaceans, such as bottlenose dolphins, the biopsy tip used to collect blubber for contaminant analysis typically penetrates to a depth of approximately 1.0-2.5 cm. Shorter tips are used when only epidermal sampling is required. Samples are collected from free-swimming marine mammals within approximately 3 to 30 m of the bow of the vessel. For pinnipeds, such as Steller sea lions, dart tips will be approximately 1.0 cm in diameter and not exceed 3.5 cm in depth to limit pentration into muscular tissue (Hoberecht *et al.* 2006). For large whales, biopsy tips will be approximately 1.0 cm diameter by 4.0 cm deep.

The tip of the biopsy dart (*i.e.*, the cutting head), regardless of delivery device, is thoroughly cleaned and sterilized using the best techniques available in the given location (*e.g.,* capabilities of laboratories) and appropriate to the material (*e.g.,* gas or cold-sterilization) prior to being brought into the field and is maintained as sterile as possible in the field (*e.g.,* wrapped in foil, stored in sterile sample bags, etc.) prior to use. If the biopsy dart tip becomes contaminated and is no longer sterile (*e.g.,* missed attempt, contacts seawater, physical contact) prior to use, a new sterile biopsy dart tip would be used, or the contaminated tip would be disinfected using a high-level disinfectant protocol.

Remote biopsy darts are used to collect skin and blubber biopsy samples from free-swimming cetaceans (Kellar *et al.* 2014). Standard techniques of firing the biopsy dart involve using a blank charge in a modified .22 caliber rifle (for large whales) or a crossbow (for small cetaceans) to propel a dart with a small cutting head. For small cetaceans, the ideal target area is in the side of the animal, below the dorsal fin and behind the pectoral flippers. For large whales, biopsy samples are also taken from the side, well behind the blowhole. A stopper prevents the dart from penetrating to a depth greater than the thickness of the blubber and aids in the removal of the sample from the animal. The floating dart is retrieved, and the approximately 1 cm diameter by 1.5 – 2 cm long blubber sample is processed for archiving and analysis. As new technologies are developed, the standard techniques may change. All new technologies would be tested first on carcasses to ensure appropriate function of the dart prior to being used on live animals.

Pole spears are used to collect skin and blubber biopsy samples from small, bow-riding cetaceans. The biopsy tip is attached to the pole spear (approximately 5.5 m in length), which is tethered to a vessel. The pole spear is lowered to within 0.5 m of the target prior to sampling, which allows a specific area of the animal to be targeted with a high degree of accuracy.

Blubber biopsies may be taken during health assessment studies. Protocols developed as part of other cetacean health assessment projects will be followed (*e.g.*, Hansen and Wells 1996, Hansen *et al*. 2004, Schwacke *et al*. 2002, Wells *et al*. 2004, 2005). An elliptical wedge biopsy is obtained from each cetacean. The sampling site is located on the left or right side of the dolphin, below and just behind the posterior insertion of the dorsal fin. Local anesthetic (typically Lidocaine) is injected in an L-block at the biopsy site. A veterinarian then uses a clean scalpel to obtain a sample that is up to approximately 5 centimeter long and 3 centimeter wide, through nearly the full depth of blubber (approximately 1.5-2.0 centimeter). A cotton plug soaked with ferric subsulfate is inserted into the site once the sample is removed in order to stop bleeding. The sample is then partitioned into separate containers to allow different analyses. Skin obtained with the blubber biopsy is used for genetic analyses. Additionally, during health assessments skin scrapings, biopsy samples including blubber punch biopsies (see pinniped section below), muscle samples, or needle aspirates may be collected for clinical diagnoses from sites of suspected lesions. These samples are processed by various diagnostic laboratories and a subsample may be sent to the National Marine Mammal Tissue Bank when appropriate.

Biopsy sampling also occurs on cetaceans and pinnipeds in rehabilitation or in hand during health assessment studies for diagnostic purposes. Skin and blubber are collected as described above for captured animals. Biopsy sampling for diagnostic purposes may also include surgical procedures. Samples may be taken from muscle, lymph nodes, masses, abscesses, other lesions, gingiva, liver, kidneys, and other organs, including the oral cavity and genital region. The number of biopsies per animal will vary depending on the number of lesions. The lesion biopsy site is wiped with an appropriate antiseptic (*e.g.*, chlorhexiderm) scrub followed by an alcohol swab, rinsed with alcohol, and injected with and appropriate anesthetic (*e.g.*, 2% lidocaine with epinephrine). For gingival biopsies, an appropriate anesthetic (*e.g.*, 2% lidocaine with epinephrine or carbocaine) is used to anesthetize the biopsy site. Using pre-cleaned instruments and a sterile scalpel blade or sterile punch biopsy the lesion or gingival tissue will be collected in its entirety if less than 10 mm or subsampled if larger. The biopsy is often subsampled into different storage media for viral culture, PCR, and histological evaluation as appropriate. Surgical procedures are performed by experienced marine mammal veterinarians.

Skin, blubber, and/or muscle biopsies are also collected from pinnipeds. The procedure has been performed on a number of different pinniped species without adverse effects or complications (Kanatous *et al*. 1999; Ponganis *et al*. 1993). Prior to sampling, a local anesthetic is injected subcutaneously and intramuscularly at the sampling site to minimize pain. The sampling site is cleaned with an antiseptic scrub and a small incision may be made with a scalpel blade or biopsy punch. All biopsies are taken using appropriately sized sterile biopsy punches (*e.g.*, 6mm, 8mm or larger). The punch is pushed through the blubber and into the muscle layer (if a muscle biopsy is being taken) and the biopsy is then withdrawn and pressure is applied to the wound. The biopsy site may be irrigated with an antiseptic (*e.g.*, Betadine). Sutures are not needed for the wound.

Remote biopsy darts are also used to collect skin and blubber biopsy samples from pinnipeds (Hoberecht *et al.* 2006) darted from land or water. Samples are collected from juvenile and adult male and females using a retrievable dart fired from a crossbow. All penetrative parts of the biopsy head are sterilized prior to use. Samples are taken from the center of mass – preferably the shoulder of flank- and care is taken to avoid striking near the head. A stopper limits penetration depth and aids in the removal of the sample from the animal. Additionally, a small hole in the dart allows attachment of a tether line for dart retrieval. At rookeries animals will be approached to within 20 m from downwind if possible. No attempt will be made to dart an animal if the wind is estimated to be greater than 13 knots (Hoberecht *et al.* 2006) or, if darting from a vessel, if sea conditions are greater than 1ft. As new technologies are developed, the standard techniques may change. All new technologies would be tested first on carcasses to ensure appropriate function of the dart prior to being used on live animals.

Lung, kidney, and liver biopsies may be taken from cetaceans or pinnipeds that are found to have moderate to severe lung, kidney, and liver disease on ultrasound examination during health assessments or rehabilitation, when deemed appropriate by the PI (or CI) and the lead veterinarian. Lung, kidney, and liver biopsies are taken via fine needle or core biopsy and are used to determine the etiology of the disease (bacterial, viral, fungal, neoplastic, etc.), as described in Lutmerding *et al*. (2010) and Smith *et al*. (2012) and previously performed by Van Bonn and Jensen (2001).

1.10.2 Blood Sampling

Blood samples in cetaceans are collected from the dorsal fin, caudal peduncle, pectoral flipper, or, typically, the flukes. Sampling at any of these sites is generally done using an 18-20 gauge 4-cm needle, with a scaled down needle bore for calves, Dall’s porpoises (*Phocoenoides dalli*), and harbor porpoises (*Phocoena phocoena*). Blood sampling of cetaceans during health assessments may occur in the water prior to coming aboard the vessel, or once aboard the vessel. Typically, the blood sample is drawn from a blood vessel on the ventral side of the fluke, using an 18-20 gauge ¾" butterfly catheter.

Blood samples in phocids are typically collected through the bilaterally divided extradural vein, which overlies the spinal cord. Otariids are typically sampled using the caudal gluteal vein. Additionally, both phocids and otariids can be sampled using the plantar interdigital vein on the hind flippers, or the subclavian or jugular veins if sedated (Geraci and Lounsbury 2005). Sampling will generally be done with an 18-20-gauge, 4-cm needle or butterfly needle, although larger spinal needles may be needed for larger animals or those with thick blubber layers. For pinnipeds undergoing anesthesia indwelling catheters may be placed in the jugular or another accessible vein per veterinary discretion.

The volume of blood taken from individual animals at one time would not exceed more than 0.5-1.0 percent of its body weight, depending on taxa (Dein *et al*. 2005). Only qualified researchers will collect blood samples, and should not need to exceed three attempts (needle insertions) per person per sampling site. If an awake animal cannot be adequately immobilized for blood sampling, efforts to collect blood would be discontinued to avoid the possibility of serious injury or mortality from stress. Sterile, disposable needles are used to minimize the risk of infection and cross-contamination.

From animals that are being euthanized, blood may be collected from the heart after heavy sedation and prior to administration of euthanasia solution into the heart. From dead animals, blood may be collected wherever and however is feasible during the necropsy. Blood may also be collected by an entanglement or stranding response team during the response enhancement activities.

Blood samples may be used for: standard chemistry, hematology, and hormonal analysis; contaminant analyses; biotoxins; immune function studies; serology; PCR; aliquots for culturing for assessment of pathogens; genetics; a variety of “omics”; and other preparations as necessary (*e.g.*, Venn-Watson *et al*. 2007, Bryan *et al.* 2007, Romano *et al*. 1992, Mancia *et al.* 2014) .

1.10.3 Breath Sampling

Breath sampling is conducted on both ESA-listed and non-listed cetaceans and pinnipeds to assess their nutritional status and health. Exhaled breath is collected as an ambient gas or liquid (exhaled breath condensate), and exhaled particulates (in cetaceans, “blow”) may also be collected. Broadly speaking, the field of marine mammal breath and blow analysis is in the early stages, although some studies have been conducted (and are summarized below) to show that it is a possible technique for health assessment in marine mammals. However, there have been many recent advancements in human breath research that have accelerated interest in developing this methodology for marine mammals (Hunt *et al*. 2013), and we anticipate that it will continue to grow during the project period of the permit. Some studies have looked at the stress hormone cortisol (Thompson *et al.* 2014) and metabolite content profiling (Aksenov *et al.* 2014) in cetacean breath. New tools and technologies may be developed and field tested by the MMHSRP and our Co-Investigators.

Different methodologies have been used to collect breath samples from animals in the wild. For non-restrained animals (*e.g.*, free-swimming whales, hauled out pinnipeds), breath may be collected with a variety of sampling devices positioned as close as possible to the blowholes or nares; positioning may be done with long poles or with remote-controlled vehicles (UAS) such as helicopters or hexacopters. Previous sampling devices have included nylon fabric in a plastic framework, inverted funnels connected to a vacuum cylinder, and Petri dishes (a review of previous marine mammal breath-sampling collection is available in Hunt *et al*. 2013). A plastic gasket may also be used around the blowhole in order to minimize water contamination (Thompson *et al*. 2014).

To collect a gas sample, a funnel which is attached to a vacuum cylinder via plastic tubing is used; the cylinder valve is manually opened during exhalation to collect the gas sample. Cooling this gas sample can provide the exhaled breath condensate for analysis (Cumeras 2014). An algal culture plate or mesh web may be used in combination (inside a funnel) or independently of the funnel to collect particulates. Exudate collected off of the algal plate or web is used for cultures of potential pathogens in the breath as well as for other potential tests such as those currently being used in human medicine (Schivo *et al*. 2013). The equipment typically does not touch the animal, although in some instances there may be brief (less than 10 seconds) contact. For research projects, a free-swimming or non-restrained individual animal may be approached up to three times to obtain a sample; if an animal exhibits rapid evasion during approaches, the animal will not be pursued.

A second methodology is used during health assessment captures (Aksenov *et al.* 2014). While the cetacean is being held on the deck or in the water, a mask is held above the blowhole to allow the collection of exhaled air and gas along a glass tube surrounded by dry ice inside a hard plastic sleeve. The animal is allowed to breathe normally for approximately five minutes, or six to ten breaths; the one-way valve opens during inhalation and closes during exhalation thus routing expired breath inside the collection tube. The breath condensate is collected and evaluated to determine the types and levels of biomarker compounds associated with petroleum product exposures in breath of marine mammals. The apparatus is cleaned between animals using ethanol.

UASs have been shown to be an effective tool to collect breath/exudate samples from cetaceans (Acevedo-Whitehouse *et al*. 2010; Pirotta *et al.* 2017). To collect breath samples, the UAS is flown through the cetacean's exhalant cloud.

Breath samples and exhalations may also be collected during health assessments, emergency response activities, during rehabilitation, and during captive research or on any live captured animal including both cetaceans and pinnipeds. Samples may be taken from targeted populations at specific times to compare with visual assessments and/or biopsies. The samples are then examined using gas chromatography-mass spectrometry for volatile compounds to evaluate respiratory disease, nutritional status, and physical condition. Cortisol can also be detected and monitored through breath samples (Thompson *et al.* 2014).

Tidal volume and end expiratory CO_2 and O_2 may also be measured to assess lung function and calculate metabolic rate in concert with respiratory rate, as part of a health assessment in small cetaceans. To measure these parameters, a pneumotachometer flow cell is placed non-obstructively over the blowhole for a series of 5 breaths. The pneumotachometer records data which are subsequently analyzed.

For animals in a captive setting (including in rehabilitation), or in certain field settings (*e.g.*, a pinniped foraging under ice with access to only an isolated air hole) a metabolic chamber, hood, or dome is placed over the water's surface such that all respirations occur within the hood (*e.g.*, Williams *et al*. 2001). Flow rate, oxygen consumption, other respiratory gases, and other samples of interest are measured on the exhaust air coming out of the metabolic chambers.

1.10.4 Tooth Extraction

The age determination of animals is conducted using the deposition of growth layer groups in teeth. A tooth is extracted from an animal in hand by a veterinarian or biologist trained in this procedure.

Tooth extraction typically occurs during cetacean and pinniped health assessment studies. Tooth extraction in cetaceans requires capture and manual restraint, and in pinnipeds requires capture, restraint, and sedation. For cetaceans the tooth removed is usually #15 in the lower left jaw but any tooth can be extracted and in pinnipeds the post-canine or incisor teeth are generally extracted.

For cetaceans, protocols developed as part of other cetacean health assessment projects are used (Hansen and Wells 1996, Hansen *et al*. 2004, Schwacke *et al*. 2002, Wells *et al*. 2004, 2005, Norman *et al*. 2012). In both cetaceans and pinnipeds the tissue surrounding the tooth is infiltrated with Lidocaine or Carbocaine (3%) without epinephrine (or equivalent local anesthetic), applied through a standard, high-pressure, 30 gauge needle dental injection system or regular syringe through a small gauge needle (25 gauge). Once the area is anesthetized, the tooth is elevated and extracted using dental extraction tools. For cetaceans, a cotton plug soaked in gel foam is inserted into the alveolus (pit where the tooth was) to stop bleeding. All dental tools are sterilized before each use. If necessary, after extraction, pressure is applied to the cavity until bleeding has stopped, and antibiotics are used at the discretion of the veterinarian to prevent infection. For pinnipeds, due to the need to sedate the animal, an attending veterinarian, or other qualified personnel, monitors the respiration and temperature of the animal. This procedure is modified from that described by Sweeney and Ridgway (1975) for cetaceans and is similar to that described by Arnbom *et al*. (1992) for pinnipeds. The revised procedure has been used for cetaceans in captivity and in live capture and release sampling for many years. Extracted teeth are sent to a laboratory for age determination.

1.10.5 Orifice Sampling (Blowhole/Nasal/Oral/Uro-Genital/Vaginal/Preputial/ Lesions)

Samples are collected from any orifice (blowhole, nasal, oral, uro-genital, vaginal, preputial) or wounds/lesions as described below. A sterile unbreakable swab is inserted into the blowhole/nares of a restrained individual during a breath, gently swabbed along the wall, and removed during the next breath. A sterile unbreakable swab is inserted into the oral cavity of a restrained individual, gently swabbed along the gumline and removed. A sterile unbreakable swab is inserted into the uro-genital slit/vaginal/preputial opening of a restrained individual, gently swabbed and removed. The number of swabs that are taken will vary greatly depending upon a number of factors, including the type of pathogen(s) being investigated (in a disease outbreak of unknown etiology, separate swabs could be taken for virus, bacteria, and fungi, with multiple swabs taken for each depending upon the testing to be performed or the need to archive and the parameters around archival techniques), the preferred transport medium for those pathogens (could be multiple kinds), the logistics of sampling (*e.g.*, whether cold storage is available), and the animal (which would be different for different species, and also whether the animal was under sedation or anesthesia vs. manually restrained). As a general guideline, 8 or fewer swabs are taken per site, but this number could be exceeded given the factors listed above. Samples are sent to a laboratory for culturing, PCR for species identification, or further analyses as necessary.

1.10.6 Ocular Sampling and Examination

Samples may be collected from the eye of a cetacean or pinniped. A sterile swab is inserted at the medial or lateral canthus of the eye, gently swabbed along the conjunctiva or cornea and removed. A complete ocular examination may be performed via visual examination and through use of an ophthalmoscope and tonometer (an example standard methodology for ophthalmic evaluation is presented in Wright *et al.* 2015). Additionally, if a corneal ulcer is suspected, fluorescein stain may be administered into the eye via a strip or drops and the cornea examined visually or with an ophthalmoscope to determine if a corneal ulcer is present. Samples collected are sent to a laboratory for culturing, PCR identification, or further analyses as necessary. Additional types of tests may be performed at the discretion of a veterinary ophthalmologist (*e.g.*, infrared photography, ultrasound, or pachymetry). Pachymetry is the process of measuring the thickness of the cornea using a device called a pachymeter, which may be either ultrasonic (using ultrasonic transducers) or optical (using specialized cameras). General sedation or anesthesia, with or without local anesthesia, may be needed to facilitate safe animal handling and reduce discomfort associated with certain evaluation procedures.

1.10.7 Urine Sampling

Urine samples may be collected using urinary catheterization and aseptic cystocentesis (in pinnipeds under general anesthesia). A veterinarian experienced with cetaceans or pinnipeds and/or a qualified veterinary technician performs the catheterization or aseptic cystocentesis procedure.

For small cetaceans, the animal is sampled lying on its side on the foam-covered deck of the boat serving as the veterinary laboratory during health assessment studies. Wearing sterile surgical gloves, the assistant gently retracts the folds of the genital slit to allow visualization of the urethral orifice. The veterinarian/veterinary technician (wearing sterile gloves) carefully inserts a sterile urinary catheter, lubricated with sterile lubricating gel, into the bladder via the urethra. A 50 ml collection tube without additive is used to aseptically collect the urine as it flows from the catheter. The catheter is removed after the urine is collected.

Pinnipeds are restrained and sedated or anesthetized before the catheter is inserted as described above. The respiration, heart rate, and temperature of the animal are monitored during the procedure. The animal is monitored after the procedure until it is released. Urine may also be collected opportunistically, by holding an open sterile container in the urine stream.

Cystocentesis is an effective and safe means of collecting an uncontaminated urine sample (Fry and Holloway 2004; Jodal 2002; van Duijkeren *et al*. 2004). By definition, a cystocentesis is a procedure during which the bladder is punctured for the purpose of obtaining an uncontaminated urine sample (Ettinger and Feldman, 2004). For example, in California sea lions (*Zalophus californianus*), this procedure is performed through the abdominal wall in a suprapubic position using a sterile 20 gauge 1.5 inch needle attached to a 10 cc syringe. The animal is placed in dorsal recumbency while under general anesthesia. The pubis is then palpated, and the needle inserted through cleansed skin while maintaining negative pressure on the syringe. The syringe is then used to aspirate 3-5 cc of urine, and withdrawn from the animal while negative pressure is maintained at all times. This procedure is used routinely in small animal practice (generally 22-25 gauge needles are used in these smaller animals) in awake and alert domestic dogs and cats for the sterile collection of urine (Fry and Holloway 2004; van Duijkeren *et al*. 2004) as well as in human infants (Jodal 2002).

Urine analyses are diagnostically useful to evaluate the urinary system (kidneys, ureters, bladder, and urethra). Important diagnoses can be made by determining the color, pH, turbidity, chemical constituents, presence or absence of blood, and by identifying any bacteria or yeast present in the urine. These diagnoses would likely be missed without such an examination. Urine is also useful for the detection of pathogens that are spread through urine (for example, *Leptospira spp.*).

1.10.8 Fecal Sampling

In both cetaceans and pinnipeds, fecal samples are obtained either from a small catheter, or fecal loop, inserted about 10 centimeter into the colon, from a sterile swab of the rectum, or enema. Additionally, cetacean feces may also be collected in the water column either from a vessel or a diver in the water. Pinniped feces may be collected from land from haul-out or rookery sites. Samples are sent to a laboratory for culturing, pathogen species identification, parasitology, or further analyses as necessary.

1.10.9 Milk Sampling

In both cetaceans and pinnipeds, adult females in hand may be checked for lactation and milk samples are collected from lactating females when feasible. A breast-pump apparatus or finger milking is used to obtain the milk sample. Milk is expressed with gentle manual pressure exerted on the mammary gland while suction is provided by a 60 cc syringe attached by tubing to another 12 cc syringe placed over the nipple. Samples of up to 30-50 ml may be collected. Among other testing, milk samples can be measured for the levels of lipophilic organic contaminants and to determine composition (% fat, etc.).

Oxytocin may be used to enhance collection of milk samples in pinnipeds and cetaceans. Oxytocin would generally be administered via intramuscular injection of 10 to 60 IU of commercially available, synthetic hormone, with dosage dependent upon animal size, species and situation (*e.g.*, field vs. rehabilitation).

1.10.10 Sperm Sampling

In both cetaceans and pinnipeds, for adult males in hand, ejaculate samples may be collected through manual manipulation of the penis when feasible. Additionally, semen may be obtained in males during urinary catheterization. Samples are examined for sperm count, motility, and condition, providing a direct measurement of male reproductive function. These data can inform the study of the potential reduction of reproductive capabilities from environmental contaminants.

1.10.11 Gastric Sampling

In both cetaceans and pinnipeds, gastric samples are obtained using a standard small or large animal stomach tube to evaluate health and evidence of toxin exposure. Generally, animals do not need to be sedated for this procedure, but this is dependent on taxa and age and should be left to veterinary discretion. The stomach tube is inserted through the mouth and down the esophagus into the stomach, taking care to avoid the trachea. Slight suction enables the collection of gastric fluid; with slight flushing with water, gastric particles and some foreign bodies can be flushed from the stomach and collected (Sweeney and Ridgeway 1975). In a rehabilitation and in the field setting, the animal can be tube fed or delivered drugs such as double-labeled water or stomach temperature probes using this same procedure.

1.10.12 Gas Sampling

In both cetaceans and pinnipeds, gases may be collected from carcasses during necropsies for diagnostic analysis such as assessment of decompression or decomposition (*e.g.*, Bernaldo de Quiros *et al*. 2013), or further analyses as necessary. Gas is sampled by inserting the needle of a syringe into the bubble, using the suction of the syringe to collect the gas present in the bubble, and depositing the gas into a glass vacutainer (if not collected directly into the vacutainer).

1.10.13 Sloughed Skin Sampling

Skin that sloughs off a cetacean or fur off a pinniped (*e.g.*, during molt) may be collected. Pieces of skin are collected floating on the surface of the water, from land (haul-out/rookery), off of equipment used to capture or disentangle animals, off of entangling gear, or by hand as the animal is being handled. Skin is used in the same analyses as identified previously for skin biopsy samples (genetics, pathogen/disease, contaminants, etc.).

1.10.14 Hair, Nails, and Vibrissae Sampling

In pinnipeds depending upon restraint used, a vibrissa may be pulled or clipped from animals with or without sedation. Vibrissae are pulled by gripping with forceps or fingers and pulling forcefully and rapidly in one smooth motion. Vibrissae are clipped close to the insertion of the vibrissae. Nails are clipped close to the base of the nail bed without causing bleeding. Hair samples are collected with scissors at the base of the hair without removing the follicle or by shaving with electric clippers. Hair, nails, and vibrissae provide a minimally invasive sample that may be analyzed for toxicology (McHuron *et al*. 2014, Wenzel *et al*. 1993), a time series for stable isotopes (Greaves *et al*. 2006, McHuron *et al*. 2014), and may be used for other tests (some to be developed).

1.11 Colonic Temperature

In both cetaceans and pinnipeds, colonic temperature is collected to understand core body temperature, vascular cooling, and reproductive status (Rommel *et al.* 1994). This information can be collected while the animal is in the water, on land, or on a vessel. Temperature measurements are obtained with a linear array of thermal probes interfaced to a laptop computer or a handheld device. The probes are typically housed in a 3 mm OD flexible plastic tube. The probe is disinfected, lubricated, and then inserted into the colon through the anus to a depth of 0.25-0.40 m, depending on the size of the animal. Temperature is continuously monitored.

1.12 Administration of Medications

In both cetaceans and pinnipeds, drugs are administered for sedation/chemical restraint and/or veterinary treatment during stranding response, disentanglement, rehabilitation, and release activities of ESA-listed species, and during research on non-listed and listed marine mammals. Anesthetics, analgesics, and antibiotics are used during research before or after performing biopsies, tooth extractions, and other procedures. Antibiotics, antifungals, anesthetics, analgesics, dewormers, vaccinations, and other medicines are administered during response and rehabilitation of ESA-listed species as well as during research procedures. Medications are given to induce abortion, when determined to be the appropriate veterinary medical treatment for a pregnant female in rehabilitation. The *CRC Handbook of Marine Mammal Medicine* will be used as a reference for potential drugs and doses for marine mammal species (Gulland *et al.* 2018). Medications are administered at the discretion of the attending veterinarian or the PI.

Marine mammals in captivity may be used for drug therapy (including vaccine efficacy, see section 1.26.1) or diagnostic test validation. The name and location of the facility and the specific animals (identified by their facility or NOAA ID number, where applicable) are provided to the NMFS Office of Protected Resources' Permits and Conservation Division prior to the start of any research activity. The research activity only proceeds after review and approval by the facility's Institutional Animal Care and Use Committee (IACUC). When testing new techniques, medications, or vaccinations, the preference would be to conduct the study in a controlled setting, such as a captive facility where the animals are well known and can be closely monitored, and are of the same species as the target wild population. If this is not possible, the next preference would be to use a closely-related surrogate species. If a suitable captive population cannot be found, a cohort in a rehabilitation center would be the next choice, particularly animals of the same species or a closely-related surrogate. Once validated vaccinations and other medications such as dewormers may be administered prospectively to wild, captive, or rehabilitating marine mammals.

Drugs may be administered orally, topically or through injection, intubation, or inhalation. Orally administered medications are typically hidden in fish but may also be given via stomach tube. Topical medications can be applied directly to wounds and lesions and ophthalmic topical medications can be applied to the eyes. Drugs administered through inhalation may include nebulization. Nebulization can occur through a specially designed crate/cage, via mask (which generally requires sedation), or under anesthesia via an endotracheal tube (Gulland *et al.* 2018). Subcutaneous (SQ), intramuscular (IM), intravenous (IV), and intraperitoneal (IP) injections are used to deliver drugs. All of these methods require some level of animal restraint. SQ injections are made in the interface between the blubber layer and the skeletal muscle layer. The most common site for SQ injections in pinnipeds is the craniodorsal thorax between the scapulae but other sites may be used. SQ injections would not be used in cetaceans.

IM drug injections require longer needles because of the thickness of skin and blubber. Caution is taken to avoid accidental injection into the blubber, which may cause sterile abscess formation or poor absorption (Gulland *et al.* 2018). Injection sites for phocids are the muscles surrounding the pelvis, femur, and tibia. These sites, as well as the large muscles overlying the scapulae, are appropriate for otariids (Gulland *et al.* 2018). IM injections in cetaceans may be made off the midline, slightly anterior to, parallel to, or just posterior to the dorsal fin. Caution is taken to avoid the thoracic cavity if the injection is anterior to the dorsal fin (McBain 2001). Multiple injection sites may be used and the volume per site should be reasonable depending on the animal.

In marine mammals, IV injections are generally used under restraint, sedation/anesthesia or during emergency procedures. IV injections sites for pinnipeds include the jugular or subclavian vein if sedated and if awake for phocids the extradural vein and for otariids the caudal gluteal vein. In cetaceans, medications are injected in the fluke vessel, dorsal fin vessel, or peduncle if the volume is low and the medicine is not harmful if delivered perivascularly. An indwelling catheter may be used for both pinnipeds and cetaceans if repeated administration or slow infusion occurs (McBain 2001).

IP injections deliver medications into the abdominal cavity. Only non-irritating drugs should be delivered by this method including sterile isotonic fluids and dextrose. During injection, caution must be taken to avoid damaging major organs, and for that reason this route is often suboptimal to others. A contaminated needle or puncturing the gastrointestinal tract could introduce bacteria into the abdominal cavity causing a septic peritonitis. Additionally, some euthanasia solutions can be administered IP (Gulland *et al.* 2018). Occasionally, medications could be delivered intraosseously (i.e. into the bone), this would mostly be done in emergency response procedures such as injecting dextrose into the flipper bone of a seizuring pinniped. The bone most often used would be the tibia.

Additionally, administration of medications includes directed research to collect data on body condition and metabolism (*e.g.* deuterium oxide), blood volume (*e.g.* Evan's blue), hormone function including adrenal and thyroid function (*e.g.* ACTH, TSH), and stable isotopes. These medications are administered via IM, IV or oral routes. For all procedures serial blood samples are taken prior to and after administration of medication (up to 3 hours post-administration) as needed based upon the equilibration of the medication in each taxa. Serial blood sampling is conducted within the overall holding time of the animal to accomplish other research objectives, and the holding time does not exceed the maximum time previously listed in the permit application for pinnipeds and small cetaceans.

1.26.1 Vaccinations

Vaccines currently used for prevention of infectious diseases (viral, bacterial, fungal or parasitic) in domestic animals can be divided into three types: those based on dead inactivated pathogens; those using live attenuated pathogens; and vaccines consisting of recombinant pathogens. Recombinant pathogen vaccines can use a vector virus that does not typically infect the target host but expresses antigen from the pathogen of interest, stimulating an immune response against it (Griffin and Oldstone 2009). Vaccines using a dead pathogen are considered the safest as the pathogen cannot replicate in the host or cause disease; however, this lack of replication often means that the immune response generated following vaccination is short lived and may not be protective. Live vaccines typically generate the most effective immune response, but present the risk (when used in species other than the one for which the vaccine was developed) of the pathogen replicating in the host and either causing disease in the vaccinated animal, or being shed in secretions and becoming infective to other contacted animals. Numerous carnivores, especially mustelids (weasel family) and procyonids (*e.g.*, raccoons), have died in zoological collections following vaccination with live canine distemper virus (CDV) vaccine (Deem *et al.* 2000). To overcome this risk of live vaccine use, recombinant vaccines to CDV are now used extensively in zoological collections (Bronson *et al.* 2007).

Vaccines currently already safely used in pinnipeds include a recombinant canary pox (Purevax, Merial) vaccine against CDV and an inactivated West Nile Virus (WNV) (Innovator, Fort Dodge). The recombinant CDV vaccine has been safely used on a wide range of non-domestic carnivores including pinnipeds. It has not been associated with live virus shedding and is likely to stimulate higher immunity than a dead vaccine. The recombinant CDV vaccine is also commercially available in the U.S. and is recommended by the American Association of Zoo Veterinarians for use in non-domestic carnivores. The recombinant CDV vaccine has been used on wild Hawaiian monk seal populations (Robinson *et al*. 2018), and on gray (*Halichoerus grypus*), harbor (*Phoca vitulina*), and harp seals (*Pagophilus groenlandicus*) in rehabilitation. The Fort Dodge WNV vaccine has been used on Hawaiian monk seals in captivity in San Antonio, Texas, with no adverse reactions observed (Braun and Yochem 2006), this vaccine has also been used in other marine mammal species including cetaceans. Taxa-specific vaccination justification, objectives, and methods can be found in Appendix A (pinnipeds) and Appendix B (cetaceans).

1.13 Auditory Brainstem Response/Auditory Evoked Potential

Auditory Brainstem Response (ABR) and Auditory Evoked Potential (AEP) procedures may be conducted as a method to evaluate the hearing abilities of individual animals or species (Nachtigall *et al.* 2007, Mulsow *et al.* 2012). Procedures are conducted on stranded animals, animals in rehabilitation, or on animals captured during research studies. The ABR technique involves repeatedly playing a test sound stimulus while simultaneously recording the neural evoked potential from non-invasive surface electrodes contained within suction cups for use on small cetaceans.

Procedures on odontocetes are non-invasive and can be conducted in short time frames. An animal may be resting at the surface or on the beach or may be physically restrained (held by researchers) during the procedure. ABR signals are collected through suction cup electrodes. Standard EEG gel is used on the electrodes to establish an electrical connection between the electrode and the skin. Sounds may be presented through a jawphone attached to the lower jaw via suction cup. Sounds may also be presented in the water and the animals hear naturally through their lower jaws and other sound paths to the ear. A reference electrode is attached near the dorsal fin and a recording electrode is attached about 5 cm behind the blowhole. The electrodes are on the surface of the skin and are connected to an amplifier via wires. The suction cups can easily be removed if there is any difficulty with the procedure. Evoked potentials are recorded from the electrodes. Frequencies used for testing range from 1 to 160 kHz (the range of frequencies that many odontocetes hear) and the maximum sound pressure level is less than 160 decibels re µPa at 1 m. AEP procedures may also be conducted on mysticetes using a 3-sensor configuration. Suction cup electrodes are attempted first; if unsuccessful, subcutaneous pin electrodes may be placed into the blubber layer of pinnipeds or large whales (if use of surface electrodes is unsuccessful). Prior to placing the pin electrodes, the surface of the skin will be treated with standard prophylactic procedures (betadine and alcohol scrubs).

Pinniped audiometric testing may be conducted while individuals undergo scheduled sedation and/or anesthesia for necessary medical procedures during rehabilitation. SQ electrodes are used for obtaining electrophysiological recordings from pinnipeds and are harmless to the animals. The SQ electrodes are sterile 27 gauge x 10 mm needles that are placed subcutaneously beneath the skin on the animals' head. One or two electrodes record AEPs and the other is a reference or ground electrode, which subtracts the biological noise produced by the animal to enhance the recorded evoked potential responses. Testing is conducted under the supervision of the rehabilitation facility's attending veterinarian. Individuals are not tested more than once and testing sessions do not last longer than 60 minutes, except in cases where the individual will be euthanized upon completion of the anesthetic procedure. Testing time has no impact on animal health or recovery from anesthesia in these individuals. Therefore, in situations where animals require euthanasia upon completion of anesthesia, testing may be allowed to continue for longer intervals at the discretion of the attending veterinarian. This protocol maximizes the amount of information that can be obtained from each subject, improves the quality of the data, and precludes any potential residual impact on anesthetic recovery on the individuals tested.

Hearing testing would not delay treatment, movement, or release of a stranded animal nor would it interfere with rehabilitation activities. It is considered best practice to conduct AEP on cetacean release candidates to assess suitability for release, so this would be considered part of the diagnostic testing of the animal and not for scientific research purposes. Testing would be stopped if an animal exhibited any adverse reaction, including abnormal respiration and locomotion, vocalization, vomiting, or other signs of distress.

1.14 Active Acoustic Playbacks

Active acoustic playbacks are used to expose cetaceans and pinnipeds to playbacks of pre-recorded songs, social sounds, and feeding calls. Playbacks may be used during capture and release activities and during rehabilitation. Sounds and songs are projected from an underwater speaker hung over the side of a small vessel, dock/pier, or in a pool. Sounds or songs are projected from the speaker at a volume and quality as close to a real sound/song as possible. The playback system is calibrated so precise levels of sound can be projected. The physiological and/or physical response of the animals to the sounds and songs are measured, often through behavioral observation and photographs/video recording of the subject animal(s). Playbacks are used to determine if an animal can hear and assess how they are responding to sounds. Sounds may be of conspecifics, closely related species (*e.g.,* other delphinids), or predators to assess the response to the sound. This information is used to determine the releasability of a rehabilitated animal. Additional uses of active acoustic playbacks as a hazing or attractant technique are discussed in section 1.4.

1.15 Documentation

Documentation would occur through a variety of means, including but not limited to, taking photographs (*e.g.*, photo identification), videos (including remote video), thermal imaging, and audio recordings, both above and below the surface of the water. This documentation would be used to assess the impacts of activities on the animals as well as better understand the health situation of the animal (*e.g.*, better visualize the extent of an entanglement). All documentation will be in support of or incidental to other requested activities and in the context of close approaches/handling requested above, and no additional takes are requested solely for the purpose of photography, videography, or acoustic recordings. Documentation obtained under the permit may be shared for education and outreach purposes after review by the PI. Review of documentation contributes information to the after action review and may result in future modification of activities.

1.16 Effects on non-target species

While emergency response activities are directed at a target individual, it is possible that other animals will be harassed, either when trying to identify the target (*e.g.*, aerial survey over several whales to find the entangled animal), or as part of the response. This is especially true for marine mammals, but also includes sea turtles and fish species. The MMHSRP tries to avoid unintentional takes of other species to the best of our ability by surveying the area prior to conducting research, by choosing appropriate equipment (*e.g.*, net mesh size) and by avoiding non-target animals if possible. If sea turtles, fish, or other marine mammals are unintentionally captured during research activities, the animal is immediately released. If the animal is injured, it is evaluated by the project veterinarian and treated, if necessary.

The MMHSRP also takes all practicable steps including the use of charts, GIS, sonar, fish finders, or other electronic devices to determine characteristics and suitability of bottom habitat prior to using gear to identify and avoid conducting net sets on protected and sensitive habitats, such as seagrass and corals. Research gear is not set, anchored on, or pulled across corals. Researchers also take great care to avoid damaging seagrass species including minimizing anchor or net drag and treading or trampling during in-water captures. To reduce the potential for seagrass damage, anchors may be set by hand when water visibility is acceptable. Anchors are placed in unvegetated areas within seagrass meadows or areas having relatively sparse vegetation coverage, whenever possible. Anchor removal is conducted in a manner that avoids the dragging of anchors and anchor chains. If research gear is lost, diligent efforts are made to recover the lost gear to avoid further damage to benthic habitats.

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APPENDIX A – PINNIPED VACCINATION RESEARCH AND RESPONSE PLAN

1. Vaccination – Background and Justification

Vaccination of animals including wildlife has been used as a management technique for years to eradicate or manage infectious diseases that impact public, domestic animal, and wildlife health (Cross et al 2007, Lombard et al 2007, Meeusen et al 2007). In recent years large national and international wildlife vaccination programs have focused on the control of rabies in a variety of wildlife vectors (Rosatte et al 2009, Mahl et al 2014). Additionally, for some endangered species several vaccination programs have been instituted to protect these small and vulnerable populations including Florida panthers (*Puma concolor coryi*) from disease outbreaks (Cunningham et al 2008), and black-footed ferrets (*Mustela nigripes*), prairie dogs (*Cynomys ludovicianus*), and Hawaiian monk seals (*Neomonachus schauinslandi*) from emerging threats to specific populations (Rocke et al 2008a-b, Duignan et al 2014).

Disease outbreaks are the occurrence of disease at a time or place (or population) that they do not usually occur, or with a greater frequency than expected in a certain period. Epidemics occur when the disease spreads easily in susceptible populations often causing morbidity and mortality. Severe epidemics may reduce host population density to such an extent that stochastic events or previously unimportant ecological factors may further reduce the host population size (Harwood and Hall 1990). For example, canine distemper dramatically reduced black-footed ferret populations in Wyoming, bringing them to extinction in the wild (Thorne and Williams 1988); and, avian malaria reduced native Hawaiian honeycreeper (*Hemignathus parvus*) populations to such small numbers that many were finally eliminated by predation or habitat loss (Warner 1968). Additionally, phocine distemper virus (PDV) outbreaks in northern Europe were responsible for a combined loss of 50% of the harbor seal (*Phoca vitulina*) populations in 1988 and 2002 (Harkonen et al 2006). Currently several wildlife vaccination programs exist for endangered species to enhance recovery including black-footed ferret and prairie dog vaccination for plague (*Yersinia pestis*); Florida panthers for feline leukemia virus or implementation being planned for enhancement of recovery in Hawaiian monk seals for morbillivirus and West Nile virus (USFWS 2008, USGS-NWHC 2012, NOAA-NMFS 2014).

Infectious diseases, especially those that are newly introduced to naïve populations of animals, can cause mass illness and death or affect reproductive success over multiple years. For rare species or small isolated discrete population segments with low genetic diversity, the risk of a newly introduced pathogen must be evaluated to determine whether the new disease might result in a significant disease outbreak with significant population impacts. After risk evaluation and modeling, it may be determined that the best means of protecting a population or preventing further spread of the infectious disease among animals may be either vaccination in the face of an epidemic or even prophylactic vaccination if the risk of disease at population levels is unacceptable.

The proposed pinniped vaccination program is designed to address potential infectious disease threats to pinniped species under NMFS' jurisdiction and outline a process to address these threats with vaccination. Although infectious disease does not currently appear to be significantly affecting the survival of any pinniped species, there is the potential for some infectious diseases such as morbillivirus, West Nile Virus (WNV) or avian influenza to have devastating effects on several endangered, threatened, or highly susceptible pinniped species including but not limited to Guadalupe fur seals (*Arctocephalus townsendi),* Hawaiian monk seals, ice seals-ringed (*Phoca hispida*), ribbon (*Histriophoca fasciata*), bearded (*Erignathus barbatus*) and hooded seals(*Cystophora cristata*), and Pacific and Atlantic harbor seals. Because of these concerns regarding the impact of infectious disease on pinniped species, NMFS is committed to being prepared to evaluate the risks of new or re-emerging pathogens, to be able to rapidly respond to, if not prevent, outbreaks of these perceived viral, bacterial, fungal or parasitic disease threats.

2. Objective, Potential Pathogens, and Vaccines

Objective

The overall objective of this pinniped vaccination plan is to outline the process that would be followed prior to implementation of a pinniped vaccination program in response to an existing or emerging infectious disease threat. The main components of the plan are vaccine selection, captive animal testing for safety and efficacy, pathogen surveillance, and vaccination of free-ranging pinnipeds.

In general, vaccination studies to determine the safety and efficacy of vaccines against specific pathogens considered most likely to spread to pinnipeds (e.g., morbillivirus, WNV, avian influenza, etc.) would be conducted to determine the effectiveness of the vaccine in mitigating or preventing the impacts of the infectious disease and to evaluate any negative effects of the vaccine. If previous safety and efficacy research have not been conducted, captive studies would likely be conducted in collaboration with the managed care veterinarian to determine that the existing or newly developed vaccines are safe and effective for use in pinniped species by initially using surrogate species for ESA or at risk species that are held in captive or rehabilitation facilities. If captive or rehabilitated target species were available these animals would be used as well in the study once initial safety testing is completed or as an initial trial. Once the research indicated that the vaccines were safe and effective, these vaccines might be administered in response to an outbreak or preventatively to wild or rehabilitating pinnipeds. When feasible vaccination risk assessment and modeling studies would have previously determined the effectiveness of the proposed response and prophylactic vaccination protocols for the species in question.

Currently vaccines that have been used or could be used in wildlife have been developed for three viruses that have been identified as potential high risk to pinnipeds: morbillivirus (specific for canine distemper virus and used in monk seals and harbor seals), WNV (used in managed care phocids) and avian influenza (specific to certain types of avian influenza viruses). These viruses and their vaccines will be used as examples for the pinniped vaccination planning procedures as outlined in the

Vaccination Plan Procedures section below. However, as new disease threats emerge the same procedures outlined in this plan will be practical to use for any emerging pathogens (other viral, bacterial, fungal or parasitic infectious diseases) that would require vaccination as part of a response or enhancement activity including the development of new vaccines.

Potential Pathogens

Morbilliviruses—Morbilliviruses, specifically phocine distemper virus (PDV) and canine distemper virus (CDV), have caused mass die offs of phocids; however there have been no mass mortality events identified in otariids. Pinnipeds are at risk for both CDV (often from wild or domestic terrestrial carnivores) and PDV. During 1988, approximately 18,000 (70% of the population) harbor seals in Europe died from PDV infection (Heide-Jørgensen et al 1992). A second outbreak of PDV occurred in the North Sea in 2002, which killed over 20,000 harbor seals (Jensen et al 2002). Outbreaks of CDV killed 5-10,000 Baikal seals (*Pusa sibirica*) in 1987-1988 (Grachev et al 1989), 10,000 Caspian seals (*Phoca caspica*) in 2000 (Kennedy et al 2000) and may have been responsible for the deaths of 2,500 crabeater seals (*Lobodon carcinophagus*) in the Antarctic in 1955 (Laws and Taylor 1957). While a morbillivirus was isolated from Mediterranean monk seals (*Monachus monachus*) that died during an epidemic, its importance relative to biotoxins in causing mortality remains controversial (Hernandez et al 1998). Although PDV outbreaks have occurred along the Atlantic coast in the past, to date no PDV outbreak in pinnipeds has occurred in the Pacific. A recent Alaska sea otter (*Enhyrda lutris*) mortality event was associated with PDV (Goldstein et al 2009). Additionally, based upon current data Pacific harbor seals are naïve to PDV (Ham-Lamme et al 1999, Greig et al 2014) and a PDV outbreak might have a large impact on coastal harbor seals along the Pacific coast from Alaska to Southern California. Additionally, sero-surveys conducted on Hawaiian monk seals show no exposure to PDV or CDV in the population (Aguirre et al 2007), thereby making this population exceedingly vulnerable to an outbreak.

West Nile Virus—WNV was introduced into North America in New York and has subsequently spread throughout all contiguous states causing human and avian illnesses and deaths. It has caused the death of a captive monk seal at SeaWorld San Antonio, Texas, and has caused mortality in captive harbor seals on the mainland U.S. (Del Peiro et al 2006, Root 2013). To date this virus has not been identified in wild marine mammals, although it is now present seasonally in humans and mosquitoes along the eastern seaboard, Gulf of Mexico and Pacific coast (USGS 2014). This mosquito-borne virus is currently not present within Hawaii and Alaska, and although these two states ramped up surveillance for several years, the effort was not sustained. Although neither single cases of disease nor epidemics of WNV have been reported in wild marine mammals to date, the deaths of Hawaiian monk and harbor seals in captivity indicate phocids are susceptible. Thus, the possibility of mortality in Hawaiian monk seals or Alaska seals exists if the virus were to be introduced to Hawaii or Alaska, warranting a response plan for such a scenario. WNV vaccination is routinely used in managed care pinnipeds in the continental United States.

Avian Influenza – Influenza refers to a group of viruses that infect human and animal species around the world. There are three types of influenza viruses: A, B, and C. The most common viruses are influenza A which has caused disease in birds, domestic mammals (e.g., dogs, horses, swine), wild mammals (seals) and humans, and influenza B viruses which cause illness principally in humans. Influenza viruses cause seasonal epidemics of disease in people almost every year globally with periodic outbreaks in swine, dogs, horses, and marine mammals. Influenza A viruses are divided into subtypes based on two proteins on the surface of the virus: hemagglutinin (H) and the neuraminidase (N). There are at least 16 different hemagglutinin subtypes and 9 different neuraminidase subtypes. Subtypes can be species specific and significant evolution of the virus occurs over time and space; not all subtypes are found in all species. Historically marine mammals have been infected with Influenza A viruses that originated in avian species (Geraci et al 1982, Hinshaw et al 1984, Callan et al 1995, Anthony et al 2012), although infection can may also occur from contact with infected humans or terrestrial mammals, and other marine mammals (Osterhaus et al 2000). There have been four identified mortality events in the U.S. that involved seals (and only harbor seals) and Influenza A viruses:

- 1979-1980 harbor seal mortality event in the NE USA: H7N7 (Geraci et al. 1982)
- 1982-1983 harbor seal mortality event in the NE USA: H4N5 (Hinshaw et al. 1984)
- 1991- 1992: harbor seal mortality event in NE USA: H4N6 and H3N3 (Callan et al. 1995)
- 2011: 2011-2012 harbor seal mortality event in NE USA: H3N8 (Anthony et al. 2012)

Although the H3N8 subtype encompasses the virus responsible for canine and equine influenza, the most recent U.S. seal virus associated with an epidemic is molecularly different from those viruses and appears more similar to the wild bird H3N8 subtype. Therefore the virus is thought to be a direct avian to seal transmission, similar to the other outbreaks in the US. The H3N8 influenza virus isolated from the most recent harbor seal mortality event has exhibited several genetic mutations that may make it more likely for this virus to further infect mammals increasing the potential risk for seal to seal transmission in rehabilitation centers (Anthony et al 2012) or in the wild on haul-outs or rookeries. Recently in 2014 there was a H10N7 influenza outbreak in harbor seals in Denmark and Sweden causing mortality of >1500 seals (CWSS 2014, Zohari et al 2014). Again this involved harbor seals and not as in the cases in the U.S. gray seals. Additionally, sero-surveys during the 1990s and 2000s in U.S. waters in the Pacific and Atlantic have found low prevalence of Influenza A antibodies in harbor seals, harp seals (*Pagophilus groenlandicus*), ringed seals, grey seals (*Halichoerus grypus*), northern elephant seals (*Mirounga angustirostris*), California sea lions (*Zalophus californianus*), and Pacific walrus (*Odobenus rosmarus divergens*). However sero-surveys conducted on Hawaiian monk seals show no exposure to influenza in the population (Aguirre et al 2007), thereby making this population exceedingly vulnerable to an outbreak.

New techniques for serological identification of subtype of antibodies (animal exposures) are currently being validated and will become important in the assessment of actual virus subtype exposure (addressing risks and vaccine identification). In addition there has been recent interest in development of universal influenza vaccines which would be greatly beneficial for wildlife programs. Current studies are underway to evaluate the recent highly pathogenic avian influenzas in wild birds in the Pacific flyway and the potential or actual transmission to pinnipeds from Alaska to California. Studies in lung receptors for influenza viruses have indicated that harbor seals have both mammalian and avian influenza receptors identifying this species as a high probability of co-infections or host for evolution of viruses to a more pathogenic one for mammals. Studies are underway to better characterize the risks to other pinniped species.

Types of Vaccines
Vaccines currently used for prevention of viral, bacterial, fungal or parasitic diseases in domestic animals can be divided into three types:

- Vaccines using a dead inactivated pathogen;
- Vaccines using live attenuated pathogen; and
- Vaccines using recombinant pathogen.

Vaccines using a dead pathogen are considered the safest because the pathogen cannot replicate in the host or cause the clinical disease; however, this lack of replication often means that the immune response generated following vaccination is short-lived and may not be protective unless boosters are given. Live vaccines typically generate the most effective immune response. When used in species other than the one for which the vaccine was developed, live vaccines may present the risk of the pathogen replicating in the host and either causing disease in the vaccinated animal or being shed in secretions thereby becoming infective to contact animals. Recombinant virus vaccines use a vector virus that does not typically infect or cause disease in the target host but expresses antigens from the pathogen of interest to stimulate an immune response against those targeted pathogen antigens.

Pathogen Specific Vaccines
For WNV an inactivated WNV vaccine (Innovator, Fort Dodge) has been routinely used for vaccinating pinnipeds in managed care facilities. This vaccine has already been used regularly on Hawaiian monk seals in captivity in San Antonio, Texas, with no adverse reactions observed (Braun and Yochem 2006).

For morbillivirus, a recombinant vaccine to CDV (monovalent recombinant canary pox vector expressing CDV antigens, Purevax, Merial) licensed for use in ferrets in the U.S. and used in zoological collections (Bronson et al 2007). Additionally, Merial has recently made a new canary pox vaccine available for use with a different CDV virion level. The original canary pox CDV vaccine is the only currently recommended CDV vaccine by the American Association of Zoological Veterinarians (http://www.aazv.org) for use in wild carnivores. Safety and efficacy trials conducted on captive harbor and Hawaiian monk seals demonstrated no adverse reactions and no shedding of canary pox (Quinley et al 2013, Yochem et al *in prep*) with that original product. All subjects developed positive CDV (though not PDV) titers after receiving a booster approximately one month following initial vaccination. The vaccine has also proven to be a safe and effective prophylactic treatment for captive southern sea otters (Jessup et al 2009). Currently availability of the Purevax CDV vaccine is a limitation to its use, as the product has been on manufacturer backorder for two years. Without greater certainty regarding the vaccine's future availability, development and testing of a new vaccine may be required and the new vaccine offered by Merial with a different CDV virion level appears to be available for further efficacy and safety testing in the near future.

For avian influenza, a recombinant vaccine to equine influenza (bivalent recombinant canary pox vector expressing H3N8 antigens, Recombitek® Influenza Vaccine, Merial) licensed for use in horses in the U.S. (Toulemonde et al 2005, Soboll et al 2010) and also used in dogs (Karac et al 2007) might be tested for safety and efficacy on a surrogate species (e.g. captive harbor seals) if the decision is made to vaccinate against H3N8. This vaccine expresses antigens to the H3N8 equine influenza virus and may provide cross-protection to the H3N8 avian influenza virus that caused the recent mortality event in harbor seals along the Atlantic coast (Anthony et al 2012) however it is not likely to be protective to the new Asian influenza viruses circulating in the Pacific. When a universal influenza A vaccine is developed for humans or domestic animals, it would be the most versatile vaccine to use.

3. Vaccination Plan Procedures

The vaccination plan incorporates four elements: vaccine selection, captive animal testing for safety and efficacy, pathogen surveillance and vaccination of free-ranging pinnipeds and assumes that risk evaluation based on susceptibility or infectivity testing and modeling has indicated a risk to the population. To prepare for and respond to an epidemic caused by morbillivirus, WNV, and avian influenza or to develop prophylactic preventative actions, the following plan is proposed as an example of MMHSRP procedures. As mentioned earlier these procedures might be applied to any new emerging threats which pose significant risks in the future where vaccination is identified as an appropriate tool.

a. Vaccine Selection
The vaccine to be selected would have been tested previously for safety and efficacy in pinnipeds, or a new vaccine would be tested for safety and efficacy. In general we will use inactivated and recombinant vaccines for the vaccination program.

For the three pathogens of interest the following vaccines would be used or tested:

- Inactivated WNV vaccine (Innovator, Fort Dodge) already used safely in harbor seals, Hawaiian monk seals and other pinnipeds.
- Recombinant CDV vaccine (Purevax, Merial) already used safely in harbor seals and Hawaiian monk seals.
    - Either of these two vaccines above could be deployed safely in the face of an outbreak of either disease in pinnipeds.
- Recombinant Equine Influenza vaccine *(*Recombitek® Influenza Vaccine, Merial) to be tested in captive harbor seals.

b. Safety and Efficacy Testing on Captive Animals
-Example Influenza Vaccine
Currently, influenza vaccines have not been tested in pinnipeds. Therefore vaccination of a surrogate species (e.g. captive harbor seals) would be needed to test the proposed recombinant equine influenza vaccine (Recombitek® Influenza Vaccine, Merial) for safety and efficacy.
Testing would evaluate the presence of a proper immune response; the number of vaccines (including boosters) needed to generate this response; the duration of immunity against influenza and would follow the methods outlined in Quinley et al (2013). In brief, 5 harbor seals would be vaccinated, and blood samples will be collected prior to vaccination and on days 0, 30, 180 and 365 after vaccination. Additionally, two seals would also receive one booster injection 30 days after the initially vaccination and have a blood sample taken 1 month following the second vaccination. Vaccination of captive harbor seals would be pursued with our partners, including several aquariums such as Sea World.

-Post-Vaccination Antibody Response Methods for Captive Seals
Captive seals can serve as a model to establish vaccine antibody response for certain vaccines. A study is already underway assessing the post-vaccination antibody response (PVAR) to both the CDV recombinant vaccine (Purevax, Merial) and WNV inactivated vaccine (Fort Dodge) in captive seals.

For new vaccines the following procedures would be followed to test for PVAR:
To assess the effectiveness of the vaccines, serum antibody samples must be taken throughout the year. It is proposed to collect serum on days 0, 28, 42, 182, 365, and annually thereafter to monitor antibody formation from either surrogate or target species in captivity or rehabilitation. Day 0 serum collection will occur prior to vaccination to provide baseline values for each animal. Vaccination will occur after the serum is collected. Along with serum samples, duplicate nasal swabs will be obtained. If determined by the safety and efficacy trials that a booster is needed a second vaccine will be given on the appropriate day depending upon the vaccine type (i.e. day 14, 28, etc.)

c. Surveillance for Pathogens of Concern: To enable detection of novel pathogens in pinniped populations, there is a need to routinely and actively monitor for infectious diseases. Monitoring wild seals for these pathogens may include tests for antibodies against the pathogen in blood (e.g., enzyme linked immunosorbent assays-ELISA), tests for actual pathogens in blood, feces, or nasal swabs (e.g., polymerase chain reaction assays-PCR), and clinical syndrome-based surveillance. Sample and data collection for these tests would be covered by health assessment studies conducted by various NMFS Science Centers (NEFSC, AFSC, PIFSC, etc.), MMHSRP, and other stranding network and research partners.

d. Outbreak and Prophylactic Vaccination Response for Free-Ranging Pinnipeds
A series of different disease parameters in pinnipeds, other marine mammals, and domestic animals have been identified that could trigger a vaccination response (see General Vaccination Response Triggers section). Vaccination of pinnipeds may occur either in response to an outbreak or prophylactically prior to a disease outbreak anywhere within US coastal waters. Depending up the population size impacted or threatened by an outbreak up to 80-95% of the population, or the most vulnerable population segment could be vaccinated if the need were to arise and safe, effective vaccines were available to meet that need. This threshold is based upon the need in general to have an 80-95% immunity rate to achieve herd immunity in a population depending upon the pathogen (Anderson and May 1990, Fine 1993). If this herd immunity threshold is reached then a disease outbreak can be limited and the impact on the population minimized.

MMHSRP proposes to vaccinate in response to disease outbreaks as determined by a series of triggers described below. If the infection risk of morbillivirus, WNV and avian influenza, or a new emerging pathogen in pinnipeds changes from the current situation outlined below, this approach may be modified.

4. General Vaccination Response Triggers

Vaccination response will vary dependent upon the pinniped population at risk and the target pathogen. Vaccination response can be triggered by detection of exposure to the target pathogen or presence of clinical disease in pinnipeds, other marine mammals, or in wildlife and domestic animals. Detection of pathogen exposure, pathogen transmission, and clinical disease will vary with the target pathogen and will influence the triggers used for vaccination.

Below are examples of trigger procedures for a generic pathogen that is spread by direct contact or inhalation (such as morbillivirus or avian influenza), and a vector-borne pathogen (such as WNV) in target pinniped species, non-target marine mammals, and other animals. For our purposes target pinniped species could include but are not limited to: Guadalupe fur seals, Hawaiian monk seals, ice seals including ringed, ribbon, bearded and hooded seals, and Pacific and Atlantic harbor seals. Non-target marine mammals are species that could have contact with target species thereby spreading disease and could include: California sea lions, Steller sea lions (*Eumetopias jubatus*), northern fur seals (*Callorhinus ursinus*), northern elephant seals, grey and harp seals and some small odontocete species especially for morbillivirus. Lastly, wildlife and domestic animals include terrestrial or avian species that are capable of interacting with and spreading the disease to target or non-target marine mammals or their environment. Again as mentioned earlier these procedures or a modified version will be applied to any new emerging pathogens in the future where vaccination is needed for response.

Each vaccination response is made by weighing the advantages and disadvantages, and recognizing that a second trigger occurring during a response may increase the level of response. Detection of antibody to a pathogen implies that exposure is occurring, but lack of clinical disease would imply that the pathogen is not causing illness in the population. Thus vaccination response for pathogen exposure without disease would be at a lower level than that to a confirmed case of disease.

All vaccination responses would be maintained as needed to respond to an outbreak. All vaccinated animals would be marked with flipper tags as well as other markings (dye marks, brands, satellite tags, etc.) as determined by the response team based upon the distance at which seals would need to be re-sighted. As feasible, re-sight surveys will be conducted to monitor vaccinated animals. Additionally, during the response phase, surveillance for the target pathogen through necropsy of dead animals and blood and body fluid testing of handled (wild caught and rehabilitated) live animals will be prioritized by MMHSRP. Lastly, 6-12 months post-response phase targeted capture-release health assessments of a sub-set of vaccinated animals will be conducted to test animals for antibody titers.

Below are general case definitions for generic pathogens outlining the differences between confirmed and suspect cases of disease and cases of only pathogen exposure.

General Pathogen Case Definitions

Confirmed Case: A dead or live animal with CONFIRMED histopathological lesions or clinical signs compatible with the pathogen AND presence of the pathogen in tissues via PCR with confirmed nucleic acid sequencing, culture, OR immunohistochemistry testing.

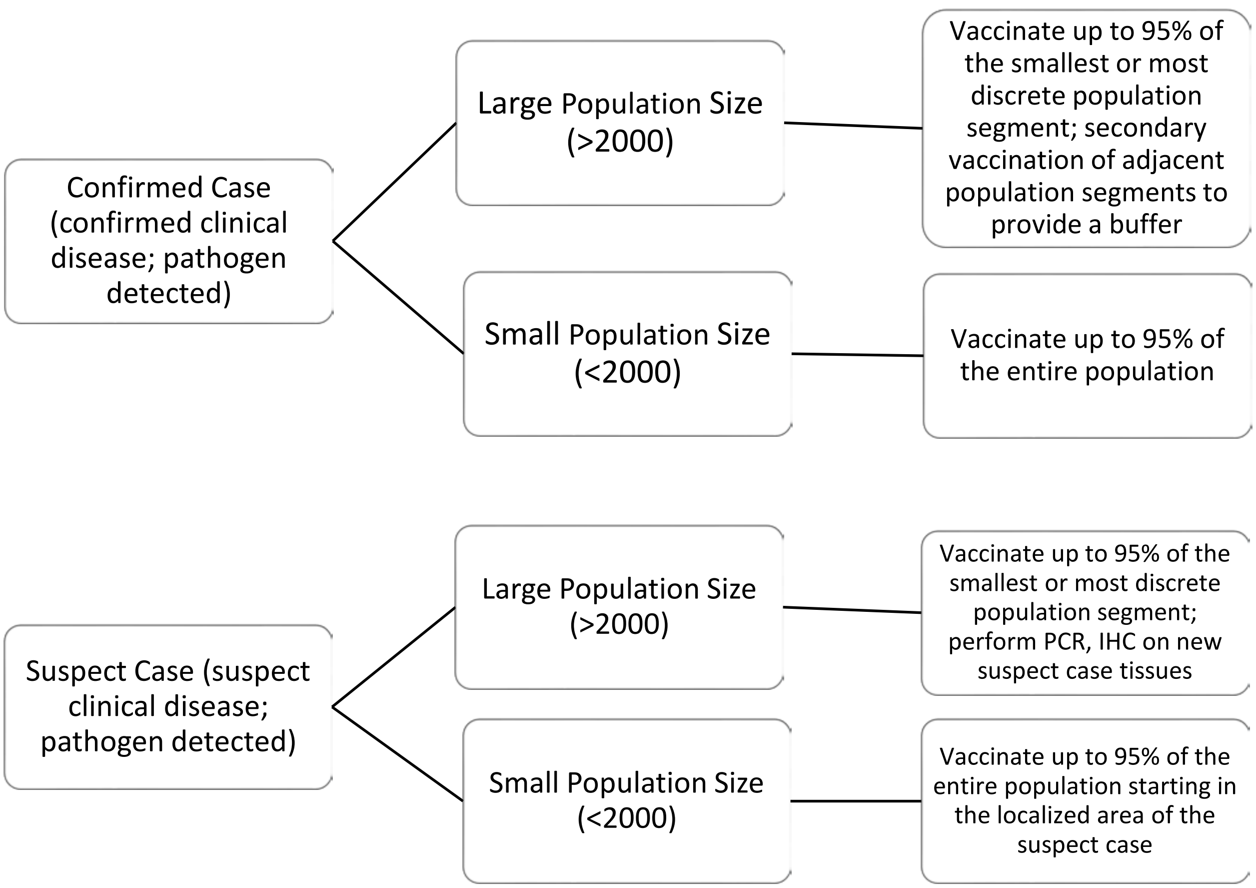
Suspect Case: A dead or live animal with SUSPECT histopathological lesions or clinical signs compatible with the pathogen AND presence of the pathogen in tissues via PCR with confirmed nucleic acid sequencing, culture, OR immunohistochemistry testing.

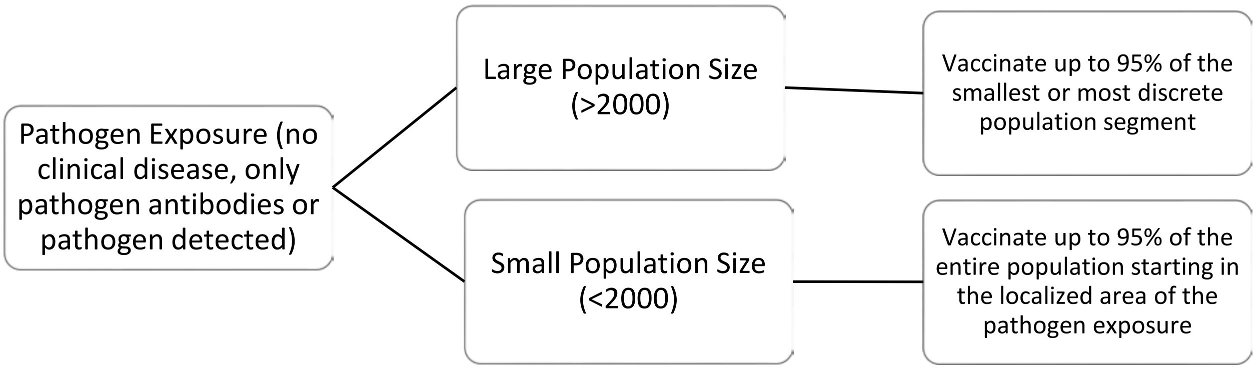
Pathogen Exposure: A dead or live animal with NO histopathological lesions or clinical signs compatible with the pathogen BUT presence of the pathogen in tissues via PCR with confirmed nucleic acid sequencing, culture, OR immunohistochemistry testing OR presence of antibody titers in blood indicating pathogen exposure.

General Prophylactic Vaccination

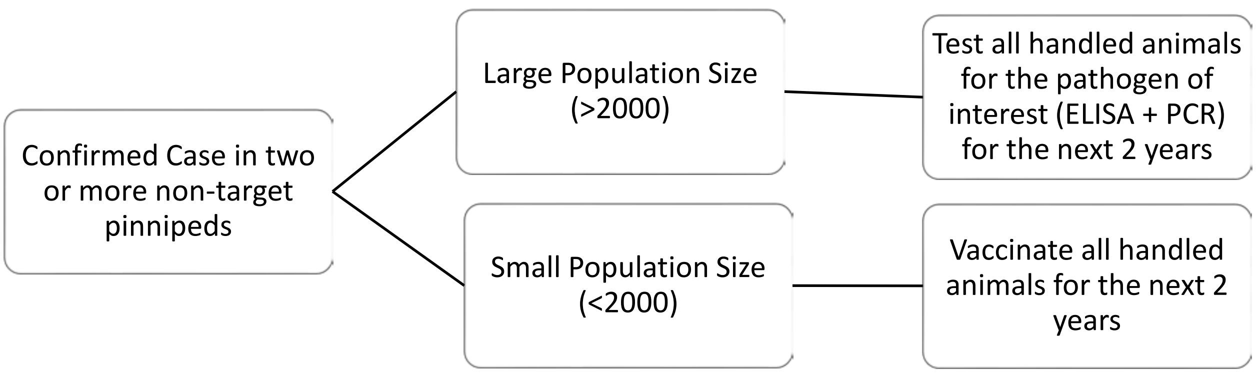
The best way to protect target pinnipeds against these infectious pathogens is to vaccinate prior to population-wide exposures. This is especially true if multiple doses of vaccines are required to gain immunity against infections, or if immunity responses take weeks to months to develop. Conversely, vaccines that mount short-term responses against infections or have higher risks of side effects may best be delivered only in the face of population-wide exposures. Based upon the information gained from research and any outbreak response, it will be determined whether prophylactic or solely response-driven vaccinations against target pathogens will be needed to protect pinniped populations at risk. Prophylactic vaccination would initially be implemented by vaccinating any live pinnipeds handled in rehabilitation or during live capture-release projects to begin to build herd immunity within the populations at risk.

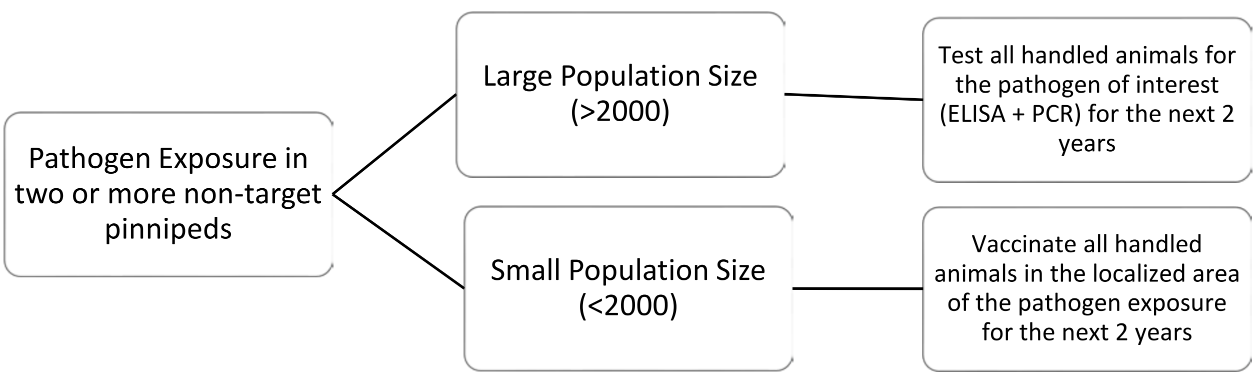
Triggers for a Direct Contact or Inhalation Pathogen Detected in a Target Pinniped

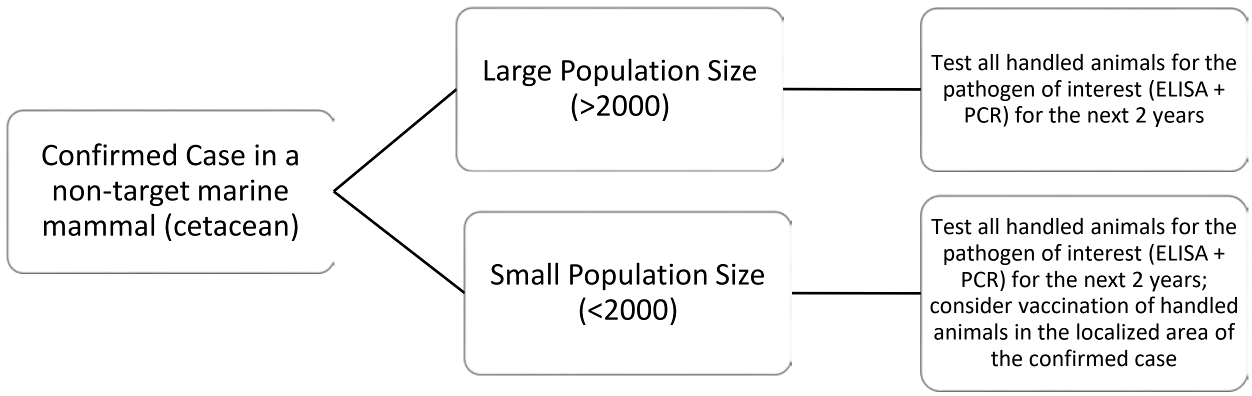


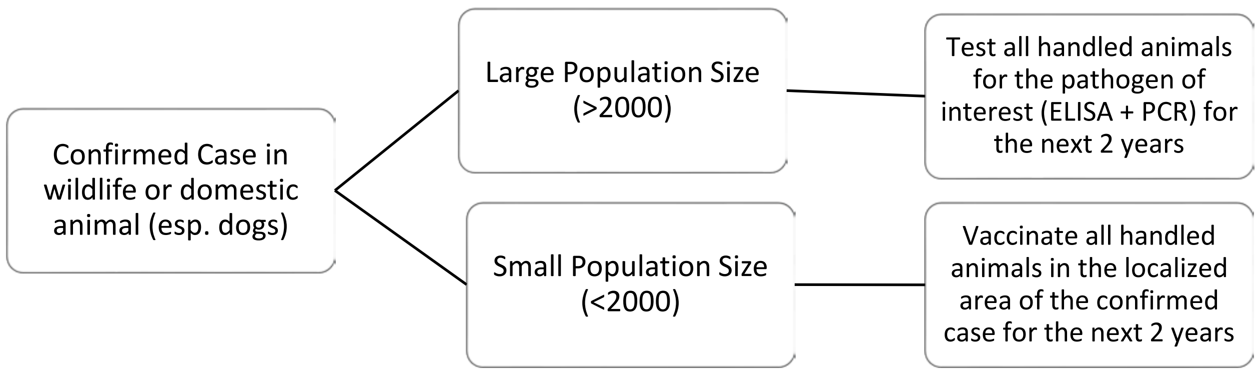


Triggers for a Direct Contact or Inhalation Pathogen Detected in a Non-Target Species









Results of the response to the first trigger event will be used to refine responses to subsequent trigger events. In particular, records will be taken on:

- Time between trigger and administration of vaccine;
- Number of pinnipeds vaccinated;
- Time required to vaccinate all or most animals of interest;
- Age distribution of vaccinated animals; and
- Re-sightings of vaccinated animals
- Any indication of adverse reaction to vaccination.

Triggers for a Vector-Borne Pathogen Detected in a Target or Non-Target Species

Example: WNV in Hawaii
The epidemiology of WNV differs significantly from that of avian influenza or morbilliviruses, as it is a vector borne zoonotic virus rather than a pathogen spread by inhalation or direct contact. To date this virus has not been identified in wild marine mammals, although it is present in humans and mosquitoes along the Atlantic coast, Gulf of Mexico and Pacific coast. This mosquito-borne virus is currently not present within Hawaii; the State has rigorous surveillance and response plans for controlling this virus due to its public health importance. Although neither single cases of disease nor epidemics of WNV have been reported in wild marine mammals to date, the death of a monk seal in

Texas and harbor seals from this infection indicates phocids are susceptible. Thus, the possibility of extensive mortality in monk seals exists if the virus were to be introduced to Hawaii, warranting a response plan to such a scenario

Trigger
A case of WNV in the Hawaiian Archipelago in humans, domestic animals, or wildlife, with activation of the State emergency response for WNV control, could trigger implementation of WNV vaccinations in wild Hawaiian monk seals.

Response
As vaccination of Hawaiian monk seals to WNV has occurred with proven safety for over 5 years in 8 captive monk seals in Texas, the risk of vaccination against WNV is minimal, apart from risks associated with approach and injection.

In response to a detected case of WNV in any species in Hawaii, all accessible seals on the main Hawaiian Islands would be vaccinated with WNV vaccine (Innovator, Fort Dodge), starting with the island on which the case was identified. Vaccine would be transported to each Northwestern Hawaiian Island as soon as feasible and used if the expert panel consulted determined it was appropriate.

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APPENDIX B – CETACEAN VACCINATION RESEARCH AND RESPONSE PLAN

1. Vaccination – Background and Justification

Vaccination of animals including wildlife has been used as a management technique for years to eradicate or manage infectious diseases that impact public, domestic animal, and wildlife health (Cross et al. 2007, Lombard et al. 2007, Meeusen et al. 2007). In recent years large national and international wildlife vaccination programs have focused on the control of rabies in a variety of wildlife vectors (Rosatte et al. 2009, Mahl et al. 2014). Additionally, for some endangered species several vaccination programs have been instituted to protect these small and vulnerable populations including Florida panthers (*Puma concolor coryi*) from disease outbreaks (Cunningham et al. 2008), and black-footed ferrets (*Mustela nigripes*), prairie dogs (*Cynomys ludovicianus*), and Hawaiian monk seals (*Neomonachus schauinslandi*) from emerging threats to specific populations (Rocke et al. 2008a-b, Duignan et al. 2014).

Disease outbreaks are the occurrence of disease at a time or place (or population) that they do not usually occur, or with a greater frequency than expected in a certain period. Epidemics occur when the disease spreads easily in susceptible populations often causing morbidity and mortality. Severe epidemics may reduce host population density to such an extent that stochastic events or previously unimportant ecological factors may further reduce the host population size (Harwood and Hall 1990). For example, canine distemper dramatically reduced black-footed ferret populations in Wyoming, bringing them to extinction in the wild (Thorne and Williams 1988); and avian malaria reduced native Hawaiian honeycreeper (*Hemignathus parvus*) populations to such small numbers that many were finally eliminated by predation or habitat loss (Warner 1968). Additionally, phocine distemper virus (PDV) outbreaks in northern Europe were responsible for a combined loss of 50% of the harbor seal (*Phoca vitulina*) populations in 1988 and 2002 (Harkonen et al. 2006) and a cetacean morbillivirus outbreak along the Atlantic coast in 1987-88 was responsible for a 50% loss of the coastal migratory stock of bottlenose dolphins (*Tursiops truncatus*; Scott et al. 1988). The current cetacean morbillivirus outbreak along the Atlantic coast in 2013-2015 has been responsible for the death of >1500 bottlenose dolphins from New York to Florida (NOAA-NMFS 2015). Currently several wildlife vaccination programs exist for endangered species to enhance recovery including black-footed ferret and prairie dog vaccination for plague (*Yersinia pestis*); Florida panthers for feline leukemia virus or implementation being planned for enhancement of recovery in Hawaiian monk seals for morbillivirus and West Nile virus (USFWS 2008, USGS-NWHC 2012, NOAA-NMFS 2014).

Infectious diseases, especially those that are newly introduced to naïve populations of animals, can cause mass illness and death or affect reproductive success over multiple years. For rare species or small isolated discrete population segments with low genetic diversity, the risk of a newly introduced pathogen must be evaluated to determine whether the new disease might result in a significant disease outbreak with significant population impacts. After risk evaluation and modeling, it may be determined that the best means of protecting a population or preventing further spread of the infectious disease among animals may be either vaccination in the face of an epidemic or even prophylactic vaccination if the risk of disease at population levels is unacceptable.

The proposed vaccination program is designed to address potential infectious disease threats to species under NMFS' jurisdiction and outline a process to address these threats with vaccination. Although infectious disease does not currently appear to be significantly affecting the survival of any cetacean species, there is the potential for infectious diseases such as morbillivirus to have devastating effects on several endangered, threatened, or highly susceptible species including Cook Inlet Beluga whales (*Delphinapterus leucas*), Hawaiian insular false killer whales (*Pseudorca crassidens*), North Atlantic right whales (*Eugalaena glacialis*), southern resident killer whales (*Orcinus orca*), and small Bay, Sound and Estuary (BSE) stocks of bottlenose dolphins, especially populations with low potential biological removals (PBR). Because of these concerns regarding the impact of infectious disease on species, NMFS is committed to being prepared to evaluate the risks of new or re-emerging pathogens, to be able to rapidly respond to, if not prevent, outbreaks of these perceived viral, bacterial, fungal or parasitic disease threats.

2. Objective, Potential Pathogens, and Vaccines

Objective

The overall objective of this cetacean vaccination plan is to outline the process that would be followed prior to implementation of a cetacean vaccination program in response to an existing or emerging infectious disease threat. The main components of the plan are vaccine selection, captive animal testing for safety and efficacy, pathogen surveillance, and vaccination of free-ranging cetaceans.

In general, vaccination studies to determine the safety and efficacy of vaccines against specific pathogens considered most likely to spread to cetaceans (e.g., morbillivirus, etc.) would be conducted to determine the effectiveness of the vaccine in mitigating or preventing the impacts of the infectious disease and to evaluate any negative effects of the vaccine. If previous safety and efficacy research have not been conducted, captive studies would likely be conducted in collaboration with the managed care veterinarian to determine that the existing or newly developed vaccines are safe and effective for use in cetacean species by initially using surrogate species for ESA or at risk species that are held in captive or rehabilitation facilities. If captive or rehabilitated target species were available, these animals would be used as well in the study once initial safety testing is completed or as an initial trial. Once the research indicated that the vaccines were safe and effective, these vaccines might be administered in response to an outbreak or preventatively to wild or rehabilitating cetaceans. When feasible, vaccination risk assessment and modeling studies would have previously determined the effectiveness of the proposed response and prophylactic vaccination protocols for the species in question.

Currently, vaccines that have been used or could be used in wildlife have been developed for one virus that has been identified as potential high risk to cetaceans: cetacean morbillivirus. Morbillivirus and its vaccines will be used as examples for the cetacean vaccination planning procedures as outlined in the Vaccination Plan Procedures section below. However, as new disease threats emerge, the same procedures outlined in this plan will be practical to use for any emerging pathogens (other viral, bacterial, fungal or parasitic infectious diseases) that would require vaccination as part of a response or enhancement activity including the development of new vaccines.

Potential Pathogen: Morbilliviruses—Five types of morbillivirus have been detected in marine mammals in the United States: canine distemper virus (CDV) in seals, phocine distemper virus (PDV) in sea otters and seals, and dolphin morbillivirus (DMV), pilot whale morbillivirus (PWMV), and Longman's beaked whale morbillivirus (LBWMV), which are collectively referred to as cetacean morbillivirus (CMV), that have been found in porpoises, dolphins and whales (Kennedy 1998, DiGuardo et al. 2005, Duignan et al. 2014, Van Bressem et al. 2014). In the United States, there have been morbillivirus mortality events caused by PDV in harbor seals in the northeast (2006) and DMV or PMV in bottlenose dolphins in the northeast in 1987-88 and currently in 2013-2015 (Lipscomb et al. 1994, NOAA-NMFS 2015) and Gulf of Mexico (1992 and 1994; Kraftt et al. 1995, Lipscomb et al. 1996). Internationally, there have been outbreaks of morbillivirus in harbor seals in the North Atlantic (1988, 2002; Harkonen et al 2006), in striped dolphins (*Stenella coeruleoalba*) in the Mediterranean (1990-92, 2007-8; Duignan et al 1992, Raga et al 2008) and most recently in bottlenose dolphins in Australia (2009; Stone et al 2011). As mentioned previously the ongoing dolphin morbillivirus outbreak along the Atlantic coast has caused the death of >1500 coastal migratory bottlenose dolphins as well as BSE populations within the Indian River Lagoon and St John's River systems. Besides bottlenose dolphins, other cetacean species testing positive for morbillivirus during this outbreak include striped dolphins, pygmy sperm whales (*Kogia breviceps*), fin whales (*Balaenoptera physalus*), and humpback whales (*Megaptera novaeangliae*; Fauquier et al. 2014).

Types of Vaccines

Vaccines currently used for prevention of viral, bacterial, fungal or parasitic diseases in domestic animals can be divided into three types:

- Vaccines using a dead inactivated pathogen;
- Vaccines using live attenuated pathogen; and
- Vaccines using recombinant pathogen.

Vaccines using a dead pathogen are considered the safest because the pathogen cannot replicate in the host or cause the clinical disease; however, this lack of replication often means that the immune response generated following vaccination is short-lived and may not be protective unless boosters are given. Live vaccines typically generate the most effective immune response. When used in species other than the one for which the vaccine was developed, live vaccines may present the risk of the pathogen replicating in the host and either causing disease in the vaccinated animal or being shed in secretions thereby becoming infective to contact animals. Recombinant virus vaccines use a vector virus that does not typically infect or cause disease in the target host but expresses antigens from the pathogen of interest to stimulate an immune response against those targeted pathogen antigens.

Pathogen Specific Vaccines
Previous studies on vaccination in cetaceans are few (Colgrove 1975) but a recent DNA vaccine against DMV was used in bottlenose dolphins with no adverse effects (Vaughan et al 2007). However, the immune response was not very strong and the investigative group has moved in another direction to find a more effective vaccine such as the recombinant vaccine to CDV described below (C. Smith, pers comm).

For morbillivirus, a recombinant vaccine to CDV (monovalent recombinant canary pox vector expressing CDV antigens, Purevax, Merial) is licensed for use in ferrets in the U.S. and is used in zoological collections (Bronson et al 2007). Additionally, Merial has recently made a new canary pox vaccine available for use with a different CDV virion level. The original canary pox CDV vaccine is the only currently recommended CDV vaccine by the American Association of Zoological Veterinarians (http://www.aazv.org) for use in wild carnivores. In general, morbillivirus vaccines offer cross-protection, so a CDV vaccine would provide some protection from a PDV or DMV infection. Safety and efficacy trials conducted on captive harbor and Hawaiian monk seals demonstrated no adverse reactions and no shedding of canary pox (Quinley et al. 2013, Yochem et al *in prep*) with that original product. All subjects developed positive CDV (though not PDV) titers after receiving a booster approximately one month following initial vaccination. The vaccine has also proven to be a safe and effective prophylactic treatment for captive southern sea otters (Jessup et al, 2009). Currently, availability of the Purevax CDV vaccine is a limitation to its use, as the product has been on manufacturer backorder for two years. Without greater certainty regarding the vaccine's future availability, development and testing of a new vaccine may be required and the new vaccine offered by Merial with a different CDV virion level appears to be available for further efficacy and safety testing in the near future.

3. Vaccination Plan Procedures

The vaccination plan incorporates four elements: vaccine selection, captive animal testing for safety and efficacy, pathogen surveillance and vaccination of free-ranging cetaceans and assumes that risk evaluation based on susceptibility or infectivity testing and modeling has indicated a risk to the population. To prepare for and respond to an epidemic caused by morbillivirus or to develop prophylactic preventative actions, the following plan is proposed as an example of MMHSRP procedures. As mentioned earlier these procedures might be applied to any new emerging threats which pose significant risks in the future where vaccination is identified as an appropriate tool.

a. Vaccine Selection

The vaccine to be selected would have been tested previously for safety and efficacy in cetaceans, or a new vaccine would be tested for safety and efficacy. In general we will use inactivated and recombinant vaccines for the vaccination program.

For the pathogen of interest the following vaccine would be used or tested:

- Recombinant CDV vaccine (Purevax, Merial) to be tested in captive bottlenose dolphins.

b. Safety and Efficacy Testing on Captive Animals
-Example Morbillivirus vaccine
Currently, the Recombinant CDV vaccine has not been tested in cetaceans although vaccine trials are underway with one of our partners. Therefore vaccination of a target/surrogate species (e.g. captive bottlenose dolphins) would be needed to test the proposed recombinant CDV vaccine (Purevax, Merial) for safety and efficacy. Testing would evaluate the presence of a proper immune response; the number of vaccines (including boosters) needed to generate this response; the duration of immunity against influenza and would follow the methods outlined in Quinley et al, (2013). In brief, 5 bottlenose dolphins would be vaccinated, and blood samples will be collected prior to vaccination and on days 0, 30, 180 and 365 after vaccination. Additionally, two bottlenose dolphins would also receive one booster injection 30 days after the initially vaccination and have a blood sample taken 1 month following the second vaccination. Vaccination of captive bottlenose would be pursued with our partners, including several aquariums such as SeaWorld.

-Post-Vaccination Antibody Response Methods for Captive Cetaceans
Captive cetaceans can serve as a model to establish vaccine antibody response for certain vaccines.

For new vaccines the following procedures would be followed to test for PVAR:
To assess the effectiveness of the vaccines, serum antibody samples must be taken throughout the year. It is proposed to collect serum on days 0, 28, 42, 182, 365, and annually thereafter to monitor antibody formation from either surrogate or target species in captivity or rehabilitation. Day 0 serum collection will occur prior to vaccination to provide baseline values for each animal. Vaccination will occur after the serum is collected. Along with serum samples, duplicate blowhole swabs will be obtained. If determined by the safety and efficacy trials that a booster is needed a second vaccine will be given on the appropriate day depending upon the vaccine type (i.e. day 14, 28, etc.)

c. Surveillance for Pathogens of Concern: To enable detection of novel pathogens in cetacean populations, there is a need to routinely and actively monitor for infectious diseases. Monitoring wild cetaceans for these pathogens may include tests for antibodies against the pathogen in blood (e.g., enzyme linked immunosorbent assays-ELISA), tests for actual pathogens in blood, feces, or blowhole swabs (e.g., polymerase chain reaction assays-PCR), and clinical syndrome-based surveillance. Sample and data collection for these tests would be covered by health assessment studies conducted by NMFS Science Centers (SEFSC), NOS, MMHSRP, and other stranding network and research partners.

d. Outbreak and Prophylactic Vaccination Response for Free-Ranging Cetaceans
A series of different disease parameters in cetaceans, other marine mammals, and domestic animals have been identified that could trigger a vaccination response (see General Vaccination Response

Triggers section). Vaccination of cetaceans may occur either in response to an outbreak or prophylactically prior to a disease outbreak anywhere within US coastal waters. Depending up the population size impacted or threatened by an outbreak up to 80-95% of the population, or the most vulnerable population segment could be vaccinated if the need were to arise and safe, effective vaccines were available to meet that need. This threshold is based upon the need in general to have an 80-95% immunity rate to achieve herd immunity in a population depending upon the pathogen (Anderson and May 1990, Fine 1993). If this herd immunity threshold is reached then a disease outbreak can be limited and the impact on the population minimized.

MMHSRP proposes to vaccinate in response to disease outbreaks as determined by a series of triggers described below. If the infection risk of morbillivirus or a new emerging pathogen in cetaceans changes from the current situation outlined below, this approach may be modified.

4. General Vaccination Response Triggers

Vaccination response will vary dependent upon the cetacean population at risk and the target pathogen. Vaccination response can be triggered by detection of exposure to the target pathogen or presence of clinical disease in cetaceans, other marine mammals, or in wildlife and domestic animals when applicable (e.g., wild birds for avian influenza). Detection of pathogen exposure, pathogen transmission, and clinical disease will vary with the target pathogen and will influence the triggers used for vaccination.

Below are examples of trigger procedures for a generic pathogen that is spread by direct contact or inhalation (such as morbillivirus) in target cetacean species, non-target marine mammals, and other animals. For our purposes target cetacean species could include but are not limited to: Cook Inlet Beluga whales, Hawaiian insular killer whales, North Atlantic right whales, southern resident killer whales, and other small BSE stocks of bottlenose dolphins especially populations with low PBR. Non-target marine mammals are species that could have contact with target species thereby spreading disease and could include: other small odontocetes such as striped dolphins, spotted dolphins, harbor porpoises, pygmy sperm whales, dwarf sperm whales, pilot whales, melon-headed whales; other large whales such as fin whales and humpback whales; and pinnipeds such as California sea lions, Steller sea lions, northern fur seals, northern elephant seals, and grey and harp seals. Lastly, wildlife including avian species that are capable of interacting with and spreading the disease to target or non-target marine mammals or their environment are included. Again as mentioned earlier these procedures or a modified version will be applied to any new emerging pathogens in the future where vaccination is needed for response.

Each vaccination response is made by weighing the advantages and disadvantages, and recognizing that a second trigger occurring during a response may increase the level of response. Detection of antibody to a pathogen implies that exposure is occurring, but lack of clinical disease would imply that the pathogen is not causing illness in the population. Thus vaccination response for pathogen exposure without disease would be at a lower level than that to a confirmed case of disease.

All vaccination responses would be maintained as needed to respond to an outbreak. All vaccinated animals would be marked with dorsal fin tags as well as other markings (dye marks, brands, satellite tags, etc.) as determined by the response team based upon the distance at which the animal would need to be re-sighted. As feasible, re-sight surveys will be conducted to monitor vaccinated animals.

Additionally, during the response phase, surveillance for the target pathogen through necropsy of dead animals and blood and body fluid testing of handled (wild caught and rehabilitated) live animals will be prioritized by MMHSRP. Lastly, 6-12 months post-response phase, targeted capture-release health assessments of a sub-set of vaccinated animals will be conducted to test animals for antibody titers.

General Prophylactic Vaccination

The best way to protect target cetaceans against these infectious pathogens is to vaccinate prior to population-wide exposures since in-water remote deployment of vaccines or capture-release projects during an outbreak may be difficult depending upon time of year and season. This is especially true if multiple doses of vaccines are required to gain immunity against infections, or if immunity responses take weeks to months to develop. Conversely, vaccines that mount short-term responses against infections or have higher risks of side effects may best be delivered only in the face of population-wide exposures. Based upon the information gained from research and any outbreak response, it will be determined whether prophylactic or solely response-driven vaccinations against target pathogens will be needed to protect cetacean populations at risk. Prophylactic vaccination would initially be implemented by vaccinating any live cetaceans handled in rehabilitation or during live capture-release projects to begin to build herd immunity within the populations at risk. This could be expanded to targeted surveys for the population at risk and the remote application of vaccines via pole syringes, darts, etc. for those species that congregate in areas at certain times of the year.

Below are general case definitions for generic pathogens outlining the differences between confirmed and suspect cases of disease and cases of only pathogen exposure.

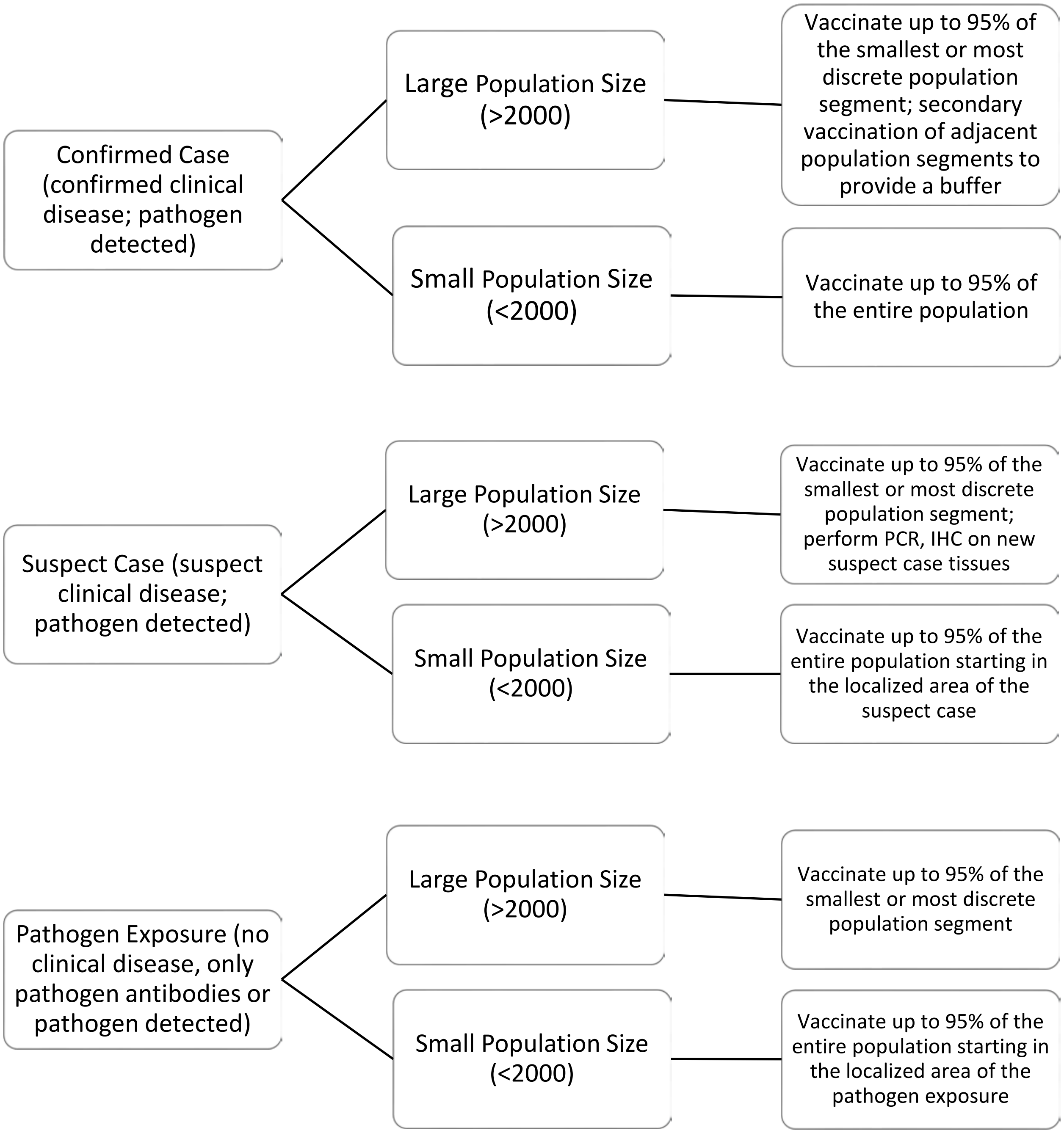
General Pathogen Case Definitions

Confirmed Case: A dead or live animal with CONFIRMED histopathological lesions or clinical signs compatible with the pathogen AND presence of the pathogen in tissues via PCR with confirmed nucleic acid sequencing, culture, OR immunohistochemistry testing.

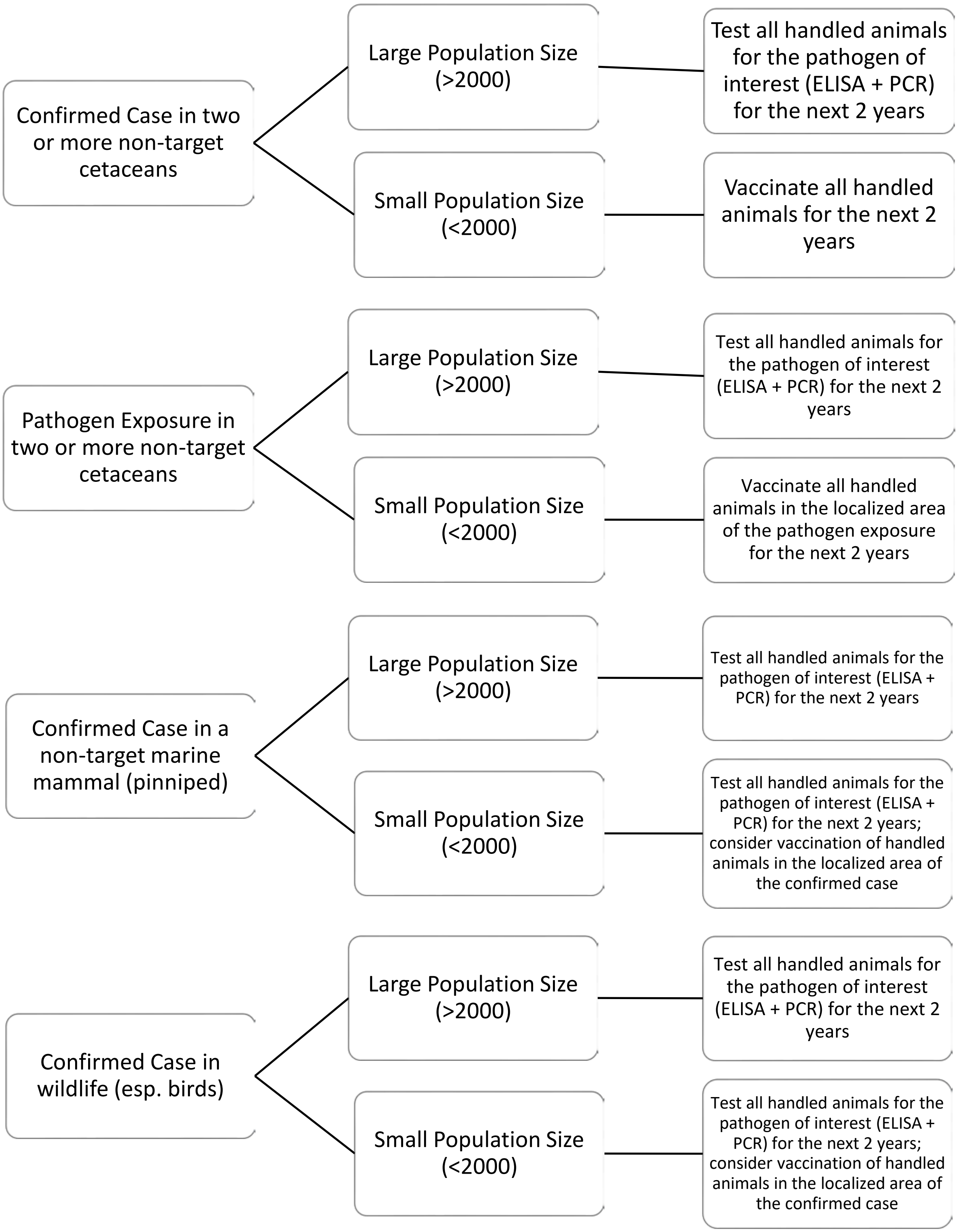
Suspect Case: A dead or live animal with SUSPECT histopathological lesions or clinical signs compatible with the pathogen AND presence of the pathogen in tissues via PCR with confirmed nucleic acid sequencing, culture, OR immunohistochemistry testing.

Pathogen Exposure: A dead or live animal with NO histopathological lesions or clinical signs compatible with the pathogen BUT presence of the pathogen in tissues via PCR with confirmed nucleic acid sequencing, culture, OR immunohistochemistry testing OR presence of antibody titers in blood indicating pathogen exposure.

Triggers for a Direct Contact or Inhalation Pathogen Detected in a Target Cetacean



Triggers for a Direct Contact or Inhalation Pathogen Detected in a Non-Target Species


Confirmed Case in two or more non-target cetaceans
Large Population Size (>2000)
Test all handled animals for the pathogen of interest (ELISA + PCR) for the next 2 years
Small Population Size (<2000)
Vaccinate all handled animals for the next 2 years
Pathogen Exposure in two or more non-target cetaceans
Large Population Size (>2000)
Test all handled animals for the pathogen of interest (ELISA + PCR) for the next 2 years
Small Population Size (<2000)
Vaccinate all handled animals in the localized area of the pathogen exposure for the next 2 years
Confirmed Case in a non-target marine mammal (pinniped)
Large Population Size (>2000)
Test all handled animals for the pathogen of interest (ELISA + PCR) for the next 2 years
Small Population Size (<2000)
Test all handled animals for the pathogen of interest (ELISA + PCR) for the next 2 years; consider vaccination of handled animals in the localized area of the confirmed case
Confirmed Case in wildlife (esp. birds)
Large Population Size (>2000)
Test all handled animals for the pathogen of interest (ELISA + PCR) for the next 2 years
Small Population Size (<2000)
Test all handled animals for the pathogen of interest (ELISA + PCR) for the next 2 years; consider vaccination of handled animals in the localized area of the confirmed case

Results of the response to the first trigger event will be used to refine responses to subsequent trigger events. In particular, records will be taken on:

- Time between trigger and administration of vaccine;
- Number of cetaceans vaccinated;
- Time required to vaccinate all or most animals of interest;
- Age distribution of vaccinated animals; and
- Re-sightings of vaccinated animals
- Any indication of adverse reaction to vaccination.

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Appendix XII

Small Cetacean Intervention Best Practices

Table of Contents

1. Introduction

1.1 Background

In 1992, the Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the Marine Mammal Protection Act (MMPA). The MMHSRP serves to coordinate marine mammal stranding response efforts in the United States by working to standardize regional network operations and define national stranding response policy. NMFS published the guidance document "Standards for Release" in 2009 as part of the broader Policies and Best Practices: Marine Mammal Stranding Response, Rehabilitation, and Release. The Standards for Release give detailed protocols for making determinations about when a rehabilitated marine mammal can be released back to the wild, but there are no detailed guidelines for free-swimming distressed small cetacean interventions prior to onsite release, translocation, or admission to rehabilitation. The MMHSRP also holds a MMPA/Endangered Species Act (ESA) research and enhancement permit that allows the program to authorize qualified individuals to conduct interventions on small cetaceans for which there are health concerns.

1.2 Legislation Pertinent to Small Cetaceans

There are two key pieces of legislation that govern interactions with marine mammals in the United States.

> Marine Mammal Protection Act (MMPA): The MMPA, signed into law in 1972, prohibits the "take" of sea otters, seals, sea lions, walruses, whales, dolphins, and porpoises, which includes harassing or disturbing these animals, as well as harming or killing, unless such take is specifically exempted in the statute or authorized. The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS has jurisdiction over cetacean and pinniped species (with the exception of walrus), and USFWS has jurisdiction over walrus, polar bear, sea otters, and manatees. The 1992 amendments to the MMPA included Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health trends in marine mammal populations through the collection of data from strandings, by catch, subsistence harvest, and research. These Best Practices focus on data collection from small cetacean interventions using the Stranding Network personnel.

Endangered Species Act (ESA): The ESA, enacted in 1973, provides for the conservation of species listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on "take" including harassment and disturbance as well as injuring and killing.

1.3 Intended Uses of Best Practices

These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations. These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a "living document," and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

NMFS and the Marine Mammal Stranding Network (the Stranding Network) have developed protocols and procedures for responding to live marine mammals stranded or otherwise in distress to ensure the health, welfare, and safety of the human responders, animals, and the public. These protocols balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, the reader should consult references such as *Marine Mammals Ashore* (Geraci *et al.* 2005) and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018). Human and animal safety are the top priorities for NMFS and the Stranding Network, and these two entities evaluate many factors before making a decision to intervene. Each event is unique and requires the consideration of multiple aspects, which are addressed below.

These Small Cetacean Intervention Best Practices (Best Practices) highlight general procedures specific to small cetacean intervention for free-swimming but distressed animals. As pinnipeds and large whale species are significantly different in their anatomy and biology from small cetacean species, these protocols and procedures should only be used for small cetacean species, which are defined for the purposes of this document as all Odontocetes excluding sperm whales (*Physeter macrocephalus*). These Best Practices also do not specifically address mass strandings of small cetaceans although some aspects in these Best Practices may be applicable in a mass stranding event. Protocols and procedures for use with large whales (all Mysticetes and sperm whales) and mass stranding can be found in the NMFS Best Practice Guide for Large Whale Emergency Response and for Cetacean Mass Strandings. Additionally, these Best Practices are designed to be paired with more specific Regional Annexes to address significant issues that may exist including species-specific considerations (*i.e.*, Southern Resident killer whales (*Orcinus orca*), etc.) that are more appropriate to address at regional or state levels.

1.4 Funding

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for a subset of Stranding Network members through an annual competitive grant process. These grants support the rescue and rehabilitation of stranded marine mammals (including small cetacean interventions), data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are competitive and many members do not receive these funds, individual Stranding Network members often also support many of the costs for normal operations. Determining whether funding is available for an intervention is an important first consideration, as lack of funds or available in-kind donations (*e.g.*, boat use) may limit available response options.

2. Planning for Small Cetacean Interventions

Under the MMPA a cetacean is considered stranded when it is on the beach (dead or alive) or free-swimming in U.S. waters, and unable to return to its natural habitat on its own volition. Free swimming cetaceans that are ill, out-of-habitat, entangled, or injured may also warrant intervention but those decisions are made on a case by case basis. All decisions regarding the health status and disposition of free-swimming small cetaceans of concern are made in consultation with a Stranding Network veterinarian and the NMFS Regional Stranding Coordinator (RSC). Every small cetacean of concern is evaluated on a case by case basis weighing all of the factors of the situation. Note that certain species (*e.g.*, Cook Inlet belugas, southern resident killer whales) may have specific criteria used to determine if an animal is of concern and in need of medical attention. If a free-swimming small cetacean is determined to be either in need of medical attention or unable to return to its natural habitat on its own, it can be considered “stranded” and falls under the MMHSRP’s MMPA/ESA authorization.

2.1 Authorization and Training

Most free-swimming small cetacean interventions are conducted under the MMHSRP's MMPA/ESA permit. In certain circumstances, an intervention may be conducted under a Stranding Agreement (by the Stranding Agreement holder) or by a government employee acting under MMPA Section 109(h) which authorizes federal, state, local, tribal government employees working as part of their duties to take a non-listed small cetacean. **As most of the intervention activities discussed in this document can only be conducted under the MMHSRP's MMPA/ESA permit, ALL small cetacean interventions should be discussed with the RSC and MMHSRP headquarters (HQ) staff prior to conducting any activities.** Additionally, only responders who have been authorized by NMFS to conduct that specific intervention and who have the training, experience, equipment, and necessary support should attempt small cetacean interventions. Authorized response efforts may also rely on partners such as tribal, local, state, and federal agencies (including law enforcement agencies and the U.S. Coast Guard), non-governmental organizations, fishermen, and other groups to assist with some interventions.

Stranding Network members who are trained or have experience in proper techniques for safe capture, restraint, and removal of gear from various marine mammal species must be authorized to respond. Periodic training workshops have been offered to members of the Stranding Network. Additionally, opportunities for apprenticeships or assistant roles to gain the necessary hands-on expertise may be available. Specific training issues or requirements may exist for certain activities (*e.g.*, in-water captures) and are more appropriate to address at local, regional, or state levels by working with the RSC in your response region.

2.2 Logistics

When planning for a potential intervention, in addition to assembling the appropriate team members with the correct expertise, several other logistical considerations need to be addressed. Below are some typical questions to consider when planning logistics.

- Personnel: How many people are available? Who is experienced?
- Vessels: How many (at least two for safety after the initial observations), what type of vessel (motor, kayak, paddleboard), do vessels have running lights if the return trip is after dark? Is the vessel operator experienced with approaching cetaceans?
- Equipment: This should include having communication equipment (marine radios, cell phones, satellite phones, etc.), stretchers, transport vehicles, and triage and treatment options,

including sedation and analgesic drugs for treatment and/or euthanasia capabilities. In some cases such as immediate post-hurricane or other disaster, some equipment may be impossible to obtain. Also, while a particular course of action may be deemed the most likely based upon the assessment and planning, it is important to be as prepared as possible for any eventuality, to ensure maximum flexibility.

- Environmental conditions: Consider conditions that increase likelihood of success and decrease risk to responders and the animal. What is the tide cycle for the response day and the intervening day? What are the depths in the area? What is the forecasted weather and sea state? Is the animal in immediate risk or is there time to stage response with improved environmental conditions? If the free-swimming animal stays at that location is it likely to strand at low tide? Is it a gently sloping beach or is there a steep drop-off? Are the substrate and weather (*e.g.*, thunderstorms, etc.) in the area conducive to safely capturing the animal? What time of day will the response occur (*i.e.*, close to sunset)?
- Accessibility: Are there boat launches or other access available for the vessels that will be used? How far away?

2.3 Decision Making to Intervene

Small cetaceans are observed in distress in myriad ways and due to various causes. Animals in distress due to human activities are prime candidates for rescue or intervention, including small cetaceans entangled in fishing gear or marine debris (refer to the Small Cetacean Entanglement Best Practices), injured from a vessel collision, trapped in an area resulting from human activities (*e.g.*, physical or perceived barriers, reconstruction of breached levees, construction noise, etc.), or impacted by an oil spill. However, interventions can occur for non-anthropogenic causes as well. Hurricanes, floods, wildfires, or atypical weather, as well as prey distribution, disease, and other causes not directly attributed to humans, may also result in a distressed condition for a small cetacean, and intervention may also be considered for these cases.

For marine mammals that are live, free-swimming and entangled, out of habitat, or trapped due to natural disasters or human activities, the Stranding Network should only intervene (*e.g.*, catch and disentangle, relocate, and/or rehabilitate) under the following conditions:

1) The animal is suffering from a life-threatening physical condition; or
2) Evidence suggests the animal is unlikely to survive in its immediate surroundings and is prevented from returning to its natural habitat by a physical or perceived barrier (*e.g.*, unable

to feed or forage appropriately, a completely freshwater habitat, animals displaced to inland waters due to hurricanes, trapped behind a lock, etc.).

These conditions are not mutually exclusive. The cost and benefits of responding in specific situations and scenarios are outlined below. (Note: animals exposed to an oil spill have separate considerations outlined in the NMFS Marine Mammal Oil Spill Guidelines (Ziccardi *et al.* 2015)).

The decision of whether (or not) to intervene is made by NMFS, after discussions between multiple parties – the local Stranding Network organizations that have "boots on the ground" responsibility for response, the NMFS RSC, and the MMHSRP at OPR Headquarters. Consultations will include marine mammal veterinarian(s), experts in the biology and life history of the affected species, and personnel familiar with the local area. The decision to intervene is made by NMFS after taking into consideration the following questions that can help determine whether the intervention is warranted and feasible, while also potentially including others that may be developed based upon the specific situation:

- What field observations have been made and how recently have they been reported?
- What is the health status of the individual?
- Is there a medical prognosis?
- What are the potential causes of the animals' observed condition?
- What is the estimated or known life history (*e.g.*, sex, age, size)? Is it a known individual?
- What is the conservation status/reproductive potential?
- What are the specific safety and logistical concerns for intervention (for the responders and for the animal(s))?
- What resources are available and is an intervention logistically feasible?
- What potential risks are there for conspecifics or other species?
- Is there a contingency plan in place if intervention is not successful (*i.e.*, if the animal dies in the course of intervention, if the intervention is unsuccessful, or if the animal requires rehabilitation)?

3. Pre-Intervention Monitoring

Before performing an intervention, it is best practice to assess and monitor the animal/s of concern. In some cases such as storm surge translocations during hurricanes, pre-intervention monitoring may not be possible and the response may depend on local input or authorized responders prior to the arrival of responders from the Stranding Network. If pre-intervention is possible, additional photos and/or video can be taken or gathered to increase our understanding of the physical and biological aspects of the situation, including assessing the surrounding environment. The responder can also perform additional targeted evaluation of the health, behavior, movements, and the environmental surroundings of the animal. For these visual assessments data to be collected would include: respiration rates, swim speed and capacity, diving ability, social parameters (*i.e.*, with a calf or a social group), habitat use (*i.e.*, preferred depth of water), prey availability, and physical animal observations (skin lesions, lacerations, etc.). To help with evaluating the environmental surroundings a responder may want to test water salinity, water depth, assess best access points in case of intervention, and address other environmental concerns. These concerns include sensitive/protected habitats that should be avoided (i.e., coral and oyster reefs, seagrass beds, etc.), subsurface obstacles, substrate consistency, predators in the area, lack of cell phone reception.

4. Methods of Intervention

4.1 Overview

As already described, there are many considerations that go into the decision of when and how to respond to free-swimming small cetaceans in distress. Based upon past interventions, following are a general progression of possible intervention actions – listed from least to most intensive.

4.2 Behavioral Observations (Remote)

In each case/event, every animal should be assessed through physical, behavioral, and environmental observations. Observations will enable better decision-making for the appropriate course of action for that particular individual (refer to the Mass Stranding Best Practices for information on groups of animals), but will also provide important information that can be used as a reference for future cases.

A standardized health form *may* be available, depending on region and taxa. If so, it should capture as much pertinent information as possible. If no form is available then when assessing an animal, the questions below should be determined (Cape Cod Stranding Network 2008). These are examples of a few main questions but not a complete list. In the future, regional health assessment forms for small cetaceans may be developed.

- Determine the species and specific individual by noting the size, coloration, rostrum, and dorsal fin. Is this a known individual?
- Estimate the total length, estimate the age class.

- Note body condition, is there a peanut head, are ribs visible, are scapula visible? Are there any visible wounds?
- If possible, count respirations (number of respirations per minute), note respiratory effort, is there any respiratory exudate or odor?
- Are there any other animals in the area? How many? Is the animal frequently in close association with any of them (*e.g.*, mom/calf, male pair, etc.)?
- Take photos and/or video to document injuries, disease or behavioral changes

Following remote observations, it is beneficial to share the information and elicit expert opinion (*e.g.*, marine mammal veterinarians, biologists with experience with a given species, etc.). This is possible when the case is not immediately life threatening (*e.g.*, animal in a golf course pond or drainage ditch) and the animal's behavior/sighting history is predictable to the extent that the animal can likely be relocated for future observation and potential intervention. In an emergency case (*e.g.*, an animal is in imminent danger of death, such as an anchored animal), immediate intervention (following approval from NMFS) may be necessary.

4.3 Sample Collection (Remote)

Depending upon the species and situation, several remote samples may be collected to provide more data about the health of an individual, to aid in the decision of whether or not to intervene. All remote sampling needs/plans should be discussed with the RSC and/or MMHSRP headquarters HQ staff, to ensure that sample collection is properly authorized under the MMPA/ESA permit. Samples that may be remotely collected can include but are not limited to:

- Remote collection of floating feces for parasite identification, hormones, etc.
- Remote collection of breath via pole or UAS for microbiology, etc.
- Remote collection of skin and blubber via biopsy dart for genetics, sex, hormones, pathogen screening, etc.

4.4 Herding/hazing/deterrence

While more commonly used to prevent mass strandings of small cetaceans, herding or deterrence actions may be appropriate for single or small groups of out-of-habitat animals. Various methods of deterrence or hazing can be used by experienced individuals, including:

- Vessel action, close approaches, percussive slaps on the water – can be attempted from non-motorized watercraft such as stand up paddleboards and kayaks, as well as motorized vessels (*e.g.*, boats, jet ski)
- Pingers or other acoustic devices (*e.g.*, diver recall sirens)
- Hukilau, Oikomi pipes, streamers, non-entangling nets, bubble curtains

For a more in-depth discussion of various non-lethal deterrence options, see NMFS Marine Mammal Non-Lethal Deterrence Guidance.

4.5 Remote Intervention Options

Some interventions may allow for a remote option, such as remote disentanglements. Remote disentanglement is defined as using cutting tools on poles or grapples while the animal remains free-swimming. Some situations where this might be a preferred option is if the entanglement is relatively loose (such that a knife can fit between the line and the skin) and where the cetacean is minimally responsive to the presence of vessels or actively seeks out vessels, such that a close approach is possible. Additionally, if a small cetacean is anchored by a crab trap or other type of anchor, remote tools or close approach by a vessel by bringing the anchored dolphin along-side the vessel may also be possible using remote disentanglement tools to cut the line. Again, only authorized trained personnel should attempt remote disentanglement activities and only after consultation with the RSC. More details on remote disentanglement procedures can be found in the Small Cetacean Entanglement Response Best Practices.

4.6 In-Water Capture

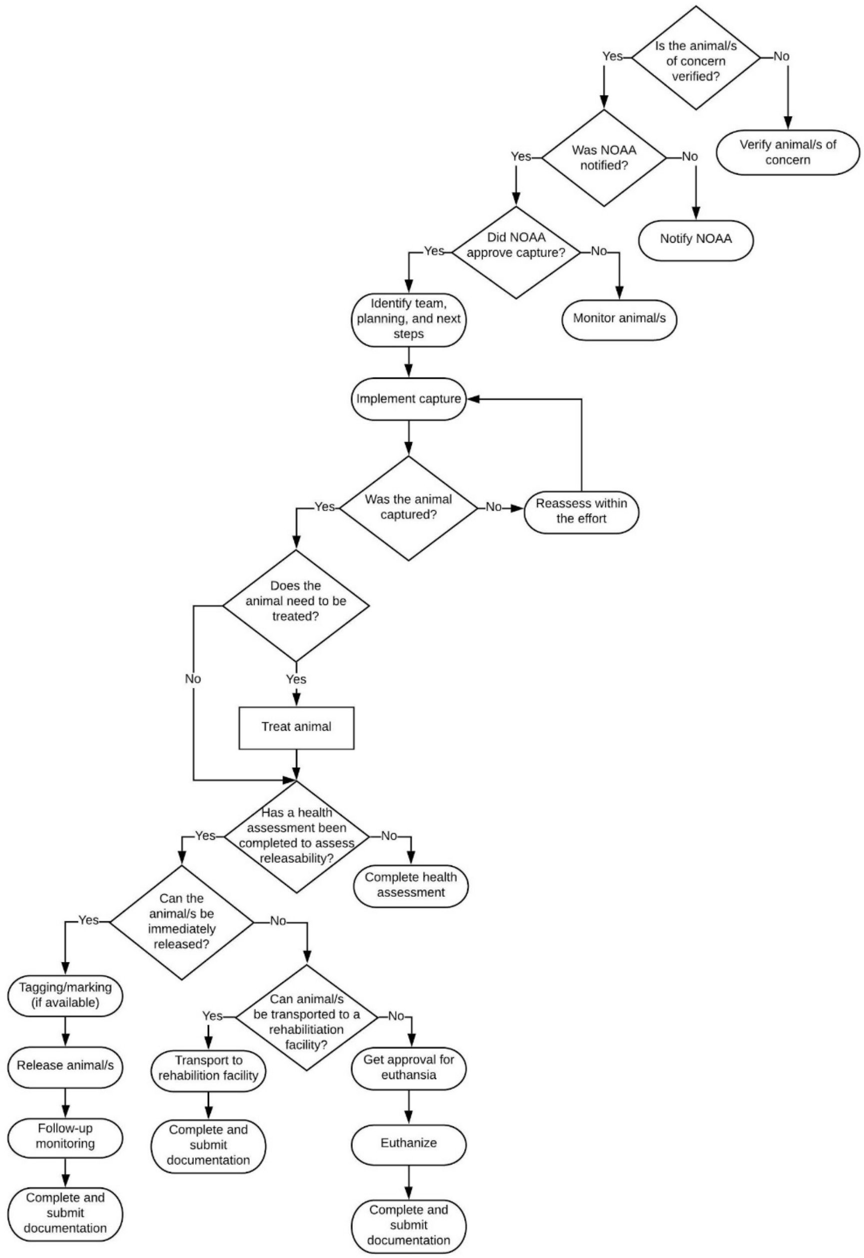
If the distressed cetacean is determined to have a life-threatening condition, or the animal cannot return to its own habitat without human intervention, the next decision is whether to attempt a capture (refer Section 4.7). Again, this decision needs to take into account the availability of trained personnel, necessary resources, and safety considerations for both responders and the animal. The decision on when, where, how to intervene needs to be approved by the RSC and/or MMHSRP HQ staff, to ensure that all intervention activities are properly authorized under the MMPA/ESA permit, or another authority. There are four potential methods for capture of small cetaceans: soft tail line, hoop net, encircling net, or hand set nets.

- Soft tail line: potential to use for slow-moving individuals (logging at surface) that allow close approaches from vessels. This method was successfully used to capture A73, a northern resident killer whale calf, as described in the case example below (NMFS Fisheries West Coast).

- Hoop net: good for bow-riding individuals or species.
- Encircling net: The most commonly used capture method in the U.S. is the encircling net, which is also used for small cetacean research captures. This method requires very specialized authorization (Permit, or, conducted under MMPA Section 109(h)), equipment, and highly trained/experienced personnel, particularly the capture lead, net boat operator, and lead veterinarian. This method employs a long, large mesh net used to encircle the target animal. The distressed animal may quickly become entangled in the net, or the responders may need to shrink the diameter of the net 'compass' to cause the animal to become wrapped in the net.
- Hand set nets (*e.g.*, to block canals): good for narrow, shallow locations or where the net can touch the bottom, use with small-sized cetaceans, or to block off an area, such as to block canals.

After the animal is captured, a thorough examination should be performed by an experienced marine mammal veterinarian or authorized responder. Appropriate samples should be collected as time and the condition of the animal allow, including measurements, photographs, a skin biopsy, blood samples (see Appendix C) and other priority samples identified for that specific case. The authority under which the intervention is conducted will also determine the type of samples taken, as activities conducted under a research/enhancement permit may allow for sampling beyond routine diagnostics samples. The animal may also receive appropriate treatment, such as removal of entangling gear, administration of medications and marking/tagging if release is imminent. Following the examination, the appropriate course of action should be determined by the attending veterinarian and capture lead, in consultation with other experienced personnel and NMFS as appropriate.

4.7 Decision/Process Matrix for In-Water Capture



5. Animal Disposition Options

5.1 Immediate In Situ Release or Translocation and Release

Intervening to assist small cetaceans involves many different factors. Generally, the capture process involves initial observations, decisions from NMFS whether to intervene, identifying the most appropriate capture methods along with the necessary sample collection needed. Once the animal is in hand, there are three options for the animal disposition: 1) immediate release (in situ or after translocation), 2) rehabilitation, and 3) euthanasia.

Immediate release is an option if the following factors are met:

- The animal is healthy or medically stable, and able to function normally as determined by the NMFS, capture lead, and the Stranding Network veterinarian (on-site or via phone consultation). Certain situations (*e.g.*, hurricanes) may have time constraints which may not allow for consultation with veterinarians and the only option may be transport/immediate release;
- Social requirements can be met (*e.g.*, maternal care for young)
- It is highly recommended the animal be marked or tagged in some manner prior to release, using NMFS-approved methods such as:
    - Marking – paint stick/crayon marking;
    - Notching or freeze-branding of the dorsal fin; or
    - Tagging - a roto tag or cattle ear tag or a single-pin radio or satellite tag (if available).

Marking and tagging should only be conducted by trained individuals.

The animal may be released in situ if:

- Environmental conditions are favorable;
- The animal is unlikely to strand/re-strand; and
- The capture location is near the animal's natural habitat.

The animal may be translocated to a different site and released immediately if:

- A different beach site is a more suitable site for release;
- The animal is manageable and adequate logistical support is available, including transport vehicles; and

- The new site is believed to improve the chances of a successful release for the captured cetacean, and reduce the likelihood of re-stranding.

5.2 Rehabilitation

Rehabilitation, per 50 CFR 216.3, is defined as treatment of beached and stranded marine mammals taken under section 109(h)(1) or 112 (c) or imported under section 109(h)(2) of the MMPA, with the intent of restoring the marine mammal's health and, if necessary, behavioral patterns. An authorized animal care facility is to provide treatment with a goal of releasing the animal back to the wild. Rehabilitation is an appropriate option when:

- The onsite examination by the veterinarian determines that the animal needs more medical treatment than can be provided in a short handling session;
- NMFS-approved facilities are available and equipped for the species and number of animals involved;
- Arrangements can be made for a safe and expeditious transport;
- There are sufficient funds and staff to provide care for a reasonable amount of time; and
- There is a good chance the animal can be restored to health and released back to the wild.

5.3 Euthanasia

Euthanasia is an option when:

- The veterinarian determines that euthanasia is the most humane course of action to take given the animal’s prognosis:
    - The animal is deemed to be critically injured or ill with little chance of recovery;
    - The animal is suffering or unlikely to survive if released; and
    - It is necessary to end the suffering of an animal.
- No rehabilitation facilities are available and immediate release is deemed inhumane or unlikely to succeed.
- Appropriate disposal options are available based on the chosen method.
- The procedure won’t jeopardize human safety.

The decision to euthanize the small cetacean is made in consultation with the RSC and the procedure must be conducted by:

- a Stranding Network veterinarian;
- an experienced, trained, and authorized Stranding Network member;
- an appropriately trained local, state, tribal, or federal law enforcement, wildlife or animal control agent; or
- a non-marine mammal veterinarian in consultation with an experienced Stranding Network veterinarian.

6. Intervention Scenarios (Evidence, levels of severity, and capture method)

6.1 Entanglements

For entangled small cetaceans, NMFS, in consultation with experts and veterinarians, determines if the entanglement is a serious injury and/or considered to be life-threatening. NMFS Serious Injury Guidance may be consulted (https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations#distinguishing-serious-from-non-serious-injury-of-marine-mammals). This assessment or prognosis is achieved through field observations by biologists/researchers/veterinarians, analysis of photos and/or videos, the animal's behavior, and prior experience with similar entanglements.

Once an entanglement is determined to be life threatening or the animal's prognosis is poor the next step is to determine the appropriate type of intervention. For small cetacean entanglements, it is most common to use in-water capture of the animal to ensure that the entanglement is completely removed and the animal is closely assessed, however remote disentanglement can also be used in certain cases. See the Small Cetacean Entanglement Response Best Practices for specific guidelines.

If a capture approach is selected (*e.g.*, soft tail line, hoop net, encircling net), the responders must next ensure that the logistical and resource requirements can be met for a safe and effective intervention. These requirements include the availability of trained personnel, equipment, and the animal's behavior, sighting history, and location, including whether it is an appropriate location (avoids protected/sensitive habitats, water depth, sea state, weather, etc.) for a safe capture effort. Due to the high risk to both humans and the animal, capturing small cetaceans for disentanglement is usually considered a measure of last resort, and conducted only when the risk for people is low and the risk for the animal of not intervening is greater than the risk involved with a capture.

If intervention is not an option, the animal may be monitored, usually by local researchers or NMFS biologists, to determine whether an intervention may be possible at a later date (*e.g.*, the animal moves to a more suitable area for rescue, the animal live strands, the animal becomes lethargic and more approachable).

Evidence	Visible entangling material present; encircling lesions with likelihood of embedded gear around mouth, body, flippers, tail flukes; animal anchored by gear. May also include lesions and abrasions from contact with trailing gear. Entangling material may include fishing gear (*e.g.*, monofilament, net, rope) or marine debris.
Level of Severity	**Conditions**
Serious Outcome (Life threatening)	Entanglement gear interfering with breathing and/or feeding; circumferential wraps around head, mouth, flippers, tail fluke, body; gear severely limiting mobility or animal is anchored; hooks in eyes or head; ingested fishing gear protruding from the mouth (https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations#distinguishing-serious-from-non-serious-injury-of-marine-mammals)
Unlikely Serious Outcome	No restrictions of breathing and/or eating; fishing gear not embedded; gear only impacting the dorsal fin; minor superficial lesions; strength of animal exceeds that of the gear (Moore *et al*. 2013); hooks externally except for eyes or head
Intervention Method	Remote disentanglement; In-water capture for free swimming animals
Disposition Options	Released at site; translocated and released; rehabilitation; euthanasia

Case Example: C2SEAB (Blair Mase)

On November 8, 2017 near New Smyrna, FL, during a survey in Mosquito Lagoon by Hubbs SeaWorld Research Institute (Hubbs), researchers observed a known mom and calf pair of bottlenose dolphins with gear present on the calf. The calf had gear tightly wrapped behind the head. The Southeast Regional (SER) Stranding Coordinator sent a summary of the entanglement and photos to a team of expert veterinarians and biologists for review and the team concluded the entanglement was life threatening. After reviewing the expert comments, NMFS approved intervention for the calf. The intervention was conducted under the MMHSRP's MMPA/ESA permit.

A planning call was convened by the NMFS SER Stranding Coordinator, which included Stranding Network organizations, veterinarians, and NMFS SER and HQ staff. Resource lists and personnel roles were developed and potential risk factors for the capture scenario and dolphins were identified. A decision was made not to tag the calf because of the highly identifiable dorsal fin of the mom and the frequency of sightings of the pair during photo-identification (photo-ID) studies. On December 11, 2017, Hubbs conducted a survey and found the mom/calf pair. The gear was still present and the entangled calf was showing signs of weight loss.

With this information the SER Stranding Coordinator scheduled the intervention for December 12. The mom and calf were spotted after 1.5 hours of searching for the pair, they were followed for about 1 hour until the pair was in safe catchable waters of (4 foot depth and sandy bottom). Both the mom and the calf were successfully encircled by the catcher on the first attempt and were secured safely by the designated animal handlers. Photographs were taken of the gear on the animal prior to the lead veterinarian removing the gear. The gear consisted of a bungee cord with bio-fouling tightly encircling the calf's head. The gear was later identified as a Keller crab pot hook (trap closure hook) that was secured to the cord with two "hog-ties" and a yellow "zip tie" was wrapped around the cord. The entanglement corresponded with a deep laceration (up to 2 centimeters) that encircled the majority of the head to varying depths. A deep impression was present along the right lateral side that corresponded with the plastic hook and hog ties. The wounds were extensively flushed and blood was collected from both mom and calf. The lead veterinarian administered a dose of a long acting antibiotic (Excede®) to the calf and the animals were released back into open water. After the pair was released, Hubbs conducted a focal follow for another hour or so prior to leaving the pair. Since then, the dolphin pair has been seen fairly regularly during photo ID surveys and the calf has been seen in good nutritional body condition.

Case Photos: C2SEAB

6.2 Trapped /Out of Habitat

An animal is considered out-of-habitat if it is not in the typical range of that species, including offshore waters, coastal waters, or bays, sounds, estuaries and rivers. Most typically for small cetaceans, an out-of-habitat animal is found in an inlet, creek, river, or other body of water that may only be connected with the ocean (or bay/sound/estuary) at certain tidal cycles, or under certain conditions. Out-of-habitat cetaceans may occur after severe weather events such as hurricanes or tropical storms, when dolphins have been reported many miles inland, presumably washed in with storm surge and then left behind in a pond or other waterway as storm waters recede. In other cases, dolphins can become trapped in harbors or up rivers with the path back to typical habitat being clear – such as a pipe or culvert, or through a pass that is shallow at low tide but may provide adequate water at certain high tides – but the animal has remained out-of-habitat due to actual or perceived barriers.

Typically, an animal of concern has an initial assessment conducted in coordination with NMFS, the local Stranding Network, and other experts. This initial assessment will consider the animal's size, age, body condition, behavior, habitat (including environmental parameters such as salinity), social context (more than one animal or a single animal), prey availability, and the overall risk to the small cetacean. In addition, NMFS evaluates whether the animal is prevented from leaving the area, either by a physical barrier or a perceived barrier. If the animal or animals are not in imminent danger, NMFS, in coordination with the local Stranding Network, will continue to monitor the situation for any significant change to the situation.

Once an animal has been deemed out-of-habitat, the next step is to determine if intervention is necessary. When evaluating whether to intervene, NMFS generally considers the likelihood of the animal leaving on its own, its chances of survival if no intervention occurs, if the environment will allow for a reasonably safe capture for the response team and the animal(s), and whether it is possible to relocate or rehabilitate the animal. NMFS generally consults with marine mammal behavior experts, veterinarians, scientists, and other experts when determining the best course of action.

NOTE: For animals displaced as a result of severe weather, the timeliness of the response is essential, therefore, NMFS may intervene without an initial monitoring period as soon as it is feasible, safe for responders, and appropriate. In many cases, severe weather displaced animals are often in completely landlocked inland waterways, with no access to open ocean, gulf, or bay waters and are sometimes in areas with limited to no prey or in areas in which flood/storm surge waters are receding.

Evidence	Located in dam/water-control structure, canal or drainage ditch system; located up a bay or river system; no or limited access to open ocean; possible malnourishment; freshwater or other lesions present; sloughing skin and/or algal mat
Level of Severity	**Conditions**
Serious Outcome	Landlocked, completely out of water, in an area that is unusual for the species such as miles up a freshwater river or confined in a marsh or canal system
Less Serious Outcome	In an inlet or remote location that is connected to the ocean at least at some tidal states, and has some salinity

Capture Method	
Disposition Options	Herding to a more appropriate environment, in-water capture, translocation, and release, rehabilitation, or euthanasia

Case Example: 65IMMS04181 (Blair Mase)

On April 18th, 2016, NMFS was notified of a juvenile bottlenose dolphin that was not leaving a marina basin in Simmons Bayou, in Ocean Springs, MS. It was considered out-of-habitat due to the inland location of the marina, the fact the animal was not leaving the area, and the freshwater in the basin. The Stranding Network visually assessed the location for any potential barriers prohibiting the animal from leaving the area, and to monitor the dolphin's condition and behavior (noting any potential foraging). The animal appeared in good body condition, was observed foraging, and there did not appear to be any objects or construction keeping the animal from leaving the basin; however, there was a bottleneck at the entrance of the basin that may have inhibited the dolphin from leaving. The dolphin was monitored for 10 days in the area during which time skin lesions, associated with prolonged freshwater exposure, developed and a degree of weight loss was noted.

From this information NMFS SER Standing Coordinator approved intervention and started planning of logistics and resource acquisition. Subsequently, due to the limited resources available for a full-blown capture effort, a decision was made to attempt to herd the animal out of the basin using a NMFS-designed hukilau net and aluminum pipes to create a visual and acoustic "barrier". Personnel were spread out in the basin aboard several vessels and slowly herded the animal. The animal swam under the hukilau twice. A break of 30 minutes was taken and on the third attempt, the crew slowed the process down and was able to successfully herd the animal out of the basin and into an open water bay that led into the Gulf of Mexico. The animal was seen associating with two other dolphins after which the team lost sight of it; the dolphin did not reappear in the marina.

Case Photos: 65IMMS04181


Photo credit: IMMS

6.3 Injury (including from watercraft and other injuries)

Collisions between watercraft and cetaceans can have adverse effects on the health of individual animals as well as the population status of endangered species (Kraus *et al*. 2005). For watercraft injuries the trauma can be sharp-force, blunt-force, or a combination of both. The severity and type of this trauma depends on several factors, including vessel speed and size, which direction the animal was traveling when impacted, and where the injury occurs on the body (Rommel *et al*. 2007). In addition to vessel strikes, other commonly seen cetacean injuries include gunshot wounds, bite wounds, arrow wounds, and stab wounds.

Responders should do an initial assessment of the animal's behavior, environment, and condition of the wounds. The local Stranding Network should consult with NMFS to determine the severity of the wound(s) and how likely the injury is to impact the animal's quality of life. If the wounds are considered to be serious or life threatening, intervention to capture the animal, treat in-situ or bring it to a rehabilitation center may be necessary.

Evidence	Abrasions, lacerations, incisions, chop wounds, hemorrhaging, torn muscle, listing, inability to submerge, impaired locomotion, lethargy, skin discoloration, shock, unresponsiveness, fractures

Level of Severity	Conditions
Serious Outcome	
Unlikely Serious Outcome	Shallow wounds (excluding head wounds)
Capture Method	In-water capture for free swimming animals
Disposition	Rehabilitation, euthanasia; immediate release if the veterinary assessment deems the wounds are less severe than believed

Case Example: Baby Face (CMA 2018)

On June 9, 2015 a dolphin was reported with multiple, extensive lacerations to its peduncle, swimming in the John's Pass area in St. Petersburg, FL. After consulting with NMFS, Clearwater Marine Aquarium (CMA) began monitoring the dolphin to observe the animal's overall condition and examine how the injury was affecting the animal's behavior and its potential for survival. The 9-year-old female dolphin, "Babyface", was a known resident of the John's Pass area. After several days of monitoring by CMA, NMFS officials determined it was best for the dolphin to heal in her natural environment. The dolphin was observed traveling with ease, as well as foraging. Observations were discontinued in mid-August because of the dolphin's healing wounds and improved behavior. Babyface was sighted three years later fully healed and with a calf.

Case Photos: Baby Face


Photo credit: FWC

6.4 Oil Spill

During oil spills, efforts to capture and move cetaceans pose significant challenges. Therefore, herding methods may be used initially to deter small cetaceans away from oil prior to considering intervening via translocation efforts. Identifying areas that are safer requires significant interaction with the Scientific Support Coordinators and the Unified Command to identify surface and subsurface oil trajectories. Some programs, such as southern resident killer whales, have pre-identified hazing techniques and best practice documents. Further, the NMFS Cook Inlet and Kodiak Marine Mammal Disaster Response Guidelines (NMFS 2019, Appendix 6) includes a Deterence Method Practicality Analysis to be used as a decision-making tool for Cool Inlet beluga whale deterrence during oil spill response. Moving or relocating healthy small cetaceans to areas that are not oiled poses significant health and safety concerns for the animals and is not guaranteed to provide a greater chance of survival than leaving them in their natural habitat, especially with unsecured spills. Relocating a small cetacean involves capturing a free-swimming animal, which should only be attempted as a measure of last resort due to the risks to the safety of the rescue personnel and animal. Other issues that would need to be considered before moving small cetaceans away from an oiled area are:

- Translocation could overcrowd areas with more dolphins than the habitat can support;
- Translocations could alter the infectious disease ecology of the population or individuals; and
- Translocations might subject dolphins to poor-quality habitats with insufficient resources.

Rescuing healthy animals to place them in rehabilitation facilities to prevent potential impacts from oil is not desirable because it causes stress to the animal and may introduce health problems that could cause the animal's condition to deteriorate. Thus, proactively catching healthy animals could do more harm than good. However, in specific cases, including for threatened and endangered species, in very specific locations, or for particular types of hazardous material spills, capture and translocation or capture and temporary holding may still be implemented. In-depth and specific information regarding small cetaceans and oil spills can be found in the NMFS Marine Mammal Oil Spill Guidelines.

Evidence	Within the "Marine Mammal Designated Spill Area"
Level of Severity	**Conditions**
Serious Outcome	Physical impairment, ingestion, "oiled",
Less Serious Outcome	External irritant, altered energetics/efficiencies, inhalation/aspiration, "unoiled"
Capture Method	Dependent upon on-site evaluation, stranded (beached) live cetaceans will be considered for capture; free-swimming cetaceans will not be considered unless they are in distress, behaving abnormally
Disposition Options	Translocation and release, rehabilitation, euthanasia
Case Example and Photos	For more details, see NMFS Marine Mammal Oil Spill Guidelines

Case example: refer to the NMFS Marine Mammal Oil Spill Guidelines

6.5 Orphaned Calf

Orphaned calves may require intervention, as they are unlikely to survive for an extended period of time without maternal care and investment. In general, free-swimming orphaned calves would only be considered for intervention if they are from a threatened or endangered species (*e.g.*, SRKW) or if the calf was orphaned due to direct human activities.

If a calf is suspected to be orphaned, NMFS, in coordination with the local Stranding Network, will monitor the animal to estimate its age/size, determine whether it is alone and isolated from any social group, and discover whether it may or may not be successfully feeding on its own. NMFS and the local Stranding Network will consult with experts and veterinarians, to determine if the animal is unlikely to survive on its own, based upon field observations of the calf by biologists/researchers, analysis of photos and videos of the animal's behavior, and prior experience with similar situations. If evidence suggests that the animal is too young to feed and thrive on its own and is isolated from an appropriate social group, NMFS may intervene with a capture effort, in which the calf will be transferred to a rehabilitation center. Due to the risky nature of capturing a small calf, and that young animals are unlikely to be a release candidate for return to wild populations except in certain populations with known individuals and social groupings (*e.g.*, SRKW), capturing an orphaned calf is considered only when it is deemed the most appropriate measure available.

Evidence	Lone, out of habitat, stranded small cetacean calf or neonate (generally from ESA species)
Level of Severity	**Conditions**
Serious Outcome	Length of time separated, emaciated, abnormal skin color, foul blow breath
Less Serious Outcome	Response to vessel approaches, logging, erratic behavior
Capture Method	Herding methods for animals in areas with sufficient water depth and water outlets; In-water capture for free swimming animals that cannot be herded or don't respond to herding
Disposition Options	Rehabilitation, euthanasia

Case Example: A73 (Barre *et al.* 2016)

A female killer whale (*Orcinus orca*) calf, A73, part of the Northern Resident killer whale population was separated from her natal pod and living in Puget Sound, WA, far from her home range. Initial field observations of behavior and general health were made from January through June 2002. During this period, a NMFS/Canadian Department of Fisheries and Oceans (DFO) advisory panel met four times to review and discuss the case and species. The Panel advice included that an observational plan be implemented by local researchers and advocates. The whale occupied limited territory, displayed extensive foraging behavior with few observations of successfully feeding, readily approached vessels, showed aberrant behavior (seeking tactile stimulation from humans), and often was observed rubbing on floating debris. Some physical observations consisted of poor body condition (underweight), abnormal skin appearance, and ketone-like odor in exhaled breath. Samples (fecal, skin biopsy, bacterial cultures of the blowhole, fungal cultures) were also completed during this time period. In May 2002, after considering the observation and medical information collected, NMFS approved intervention, capture and temporary holding of A73 for medical treatment and rehabilitation with the intent to reintroduce her back to her natal group in British Columbia. This decision was based on concerns about the whale's nutritional condition, high site fidelity that would likely lead to interactions in the summer with boaters, and a lack of any discernible medical conditions that would preclude her reintroduction in Canada.

NMFS and DFO gathered a team and appropriate resources to rescue A73 using a tail rope to bring her alongside a small vessel and into a sling. She was hoisted with a crane, placed aboard a transport barge, and moved to a temporary holding and rehabilitation net pen enclosure in a protected cove at Manchester, WA, a few kilometers from A73's adopted territory. During transportation, the whale was supported on a water-soaked foam pad where the veterinary team collected measurements and diagnostic samples.

Throughout rehabilitation the veterinary team conducted several medical examinations to monitor for any clinical or subclinical infections or medical conditions that could preclude a successful reintroduction back into the wild. For A73's reintroduction into the wild, a strategy was developed during intervention planning to release the whale in the presence of conspecifics, preferably closely related individuals. NMFS and DFO identified a suitable holding and release site in Canada as well as a means of transportation to the site. In consultation with experts, a protocol was developed to evaluate important factors for release, such as timing, environmental conditions, and proximity to other whales as well as a post-release monitoring plan. Once export/import permits were issued and she met all the release criteria, A73 was transported, fitted with suction cup tags to aid in post-release monitoring, and then released at the designated site. A73 made acoustic contact with members of her pod and was reintroduced to them 18 hours after arrival in July 2002. She has since been sighted with new calves in 2013 and 2017, respectively.

Case Photos: A73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7. Conclusion

Deciding when a free-swimming small cetacean with health concerns is in need of intervention is complex and requires consideration of a variety of different factors. When an animal of concern has been identified, NMFS works with the local Stranding Network as well as outside experts to determine the best course of action based upon variables specific to each case. Once NMFS has made the decision to intervene, an authorized, experienced and trained team of responders should be deployed based upon requirements of the specific situation. There will be regional and state differences in response methods employed based upon the species present (*e.g.*, threatened and endangered) in that region.

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10. Appendix A: Example Response Plan Template

1) Evaluate the scene (*i.e.*, environmental conditions, location) - record salinity, other parameters, not any protected/sensitive habitats that need to be avoided
2) Evaluate the animal(s) - written observations, photographs, video (Appendix B, Part A)
   a. Number of animals
   b. Social grouping - Mom/calf? Single?
   c. Size of animals
   d. Body condition
   e. Respiration Rate - Breaths/minute
   f. Locomotion - ability to swim normally
3) Contact NMFS with observations
4) Determine the team (*e.g.*, the Stranding Network members, researchers, local assistance)
5) Determine method of intervention: hazing/herding/deterrence, remote, shore, or in-water
6) Assess the gear needed
7) NMFS decision to move forward or not
8) Assign roles to Team
   a. Team Lead
   b. Catcher (if in-water capture is planned)
   c. Communications Lead
   d. Handlers
   e. Veterinarian
   f. Safety officer
   g. Law enforcement support (*e.g.*, NOAA OLE, Fish & Wildlife officer, police, sheriff)
9) Once rescued, perform health assessment (see examples in Appendix B)
   a. Determine sex and size class
   b. Obtain morphometrics
   c. Photographs
   d. Weight, if applicable
   e. Samples (*i.e.*, blood, genetics, pathogen testing, etc.)
10) Report assessment to NMFS for determination of next steps
11) Contingencies:
   1. In case rehabilitation proves necessary, prior to intervention
      a. Make sure a facility is available

   b. Organize transportation
   c. Ensure that the necessary equipment is on hand (*e.g.*, closed cell foam mat, stretcher, buckets/sponges/sprayers, etc.)
   d. Monitor vitals en route

2. If can be released, prior to intervention
   a. Plan for post-release monitoring
   b. Does the animal need to be marked or tagged?
   c. Organize handlers for release
   d. Monitor visually post-release, if feasible
   e. Follow-up surveys if warranted over next several days/weeks

3. In case the animal is best euthanized, prior to intervention
   a. Determine with NMFS the best euthanasia method
   b. Perform a pre-capture briefing with the assembled team for preparation
   c. Communicate and organize handlers with handling the animal
   d. Communicate to the public (if present) with appropriate educational information
   e. Transport the carcass for necropsy and disposal (refer to Carcass Disposal Best Practices)
   f. Submit preliminary necropsy report to NMFS

12) Complete documentation and final report and submit to NMFS the Level A and intervention report

13) Afterward debrief and re-evaluate with the Team what worked well, what can be improved, lessons learned for future responses

11. Appendix B: Examples of Standardized Health Assessment Forms

A. Example of a Standardized Health Assessment Form for Captured Animal

Date:

Capture Start Time:

Capture End Time:

GPS Coordinates:

Responders:

Species:

Number of animals:

Sex:

Age Class:

Environmental conditions:

- Cloudy, Sunny, Rain (circle one)
- Visibility
- Sea state
- Water temperature
- Salinity
- Tide

- Location description (note protected/sensitive habitats to avoid):

Morphometrics (with total length as a priority, minimum):

- Total Length: ________cm/in
- See Cetacean Data Record for more detailed measurements collected

Photographs (circle pictures taken):

- Whole animal - left lateral and right lateral
- Close up on the head
- Lesions, abrasions, net marks
- Flukes/Flippers
- Dorsal fin, left lateral and right lateral (best to use a board or some kind of contrasting background)
- Lesions, scars, skin disorders, anything else of note

Body Condition:

- Emaciated, Robust, Normal
- Lesion/abrasion description:
- Entanglement description:
- Human interaction description:
- Injury description:

Vitals:

- Respiration rate - breaths/minute
- Heart Rate - heart beats/minute (pre and post breath)

Samples Collected:

- Skin - Genetics
- Blood - Clinical (hematology and chemistry)
- Serum - Serology (if applicable)
- Swabs - Pathogen testing (if applicable)
- Feces - free catch
- Other, such as special cases (suspected human interaction protocol; large whale protocol; suspected ship strike)
- Retain gear if entangled

Release:

- Roto Tag:
- Dorsal Fin Notching:
- Radio or Satellite Tag:
- Freeze Brand:
- Time of release:

B. Example of a Boat Based Routine Baseline Health Assessment Parameters (specifically Killer whale)

Observation quality

- Good
    - Up-close – naked eye
    - Up-close – binoculars
- Poor

Social grouping

- Mixed in with normal pod or individuals
- Isolating
- Not assessed

Body condition:

- Robust
- Good
- Possibly thin
    - Nuchal depression visible
    - Ribs or spinal processes visible
    - Scapula visible
- Not assessed

Size at age:

- Appropriate

- Small
- Not assessed

Buoyancy

- Normal
- Sits low in water, “plowing”
- Sits high in water, buoyant
- Listing when stationary
- Listing while swimming
- Not assessed

Speed of movement

- Travels with pod
- Trails intermittently
- Trails consistently
- Not assessed

Character of movement

- Appears normal
- Fluking is synchronized during pod swims
- Normal full range fluking movement
- Limited range fluking movement; fluking appears hesitant
- Not assessed

Skin

- Appears normal
- Abnormal
- Wound/trauma: describe
- Rakes/lacerations: describe
- Patchy or generalized discoloration or pigmentation change: describe
- Not assessed

Feeding

- Not observed
- Foraging observed: # events/# minutes observed time
- Feeding observed: # events/# minutes observed time
- Participant in food sharing
- Not assessed

Defecation

- Not observed
- Defecation observed from pod: # events/# minutes observed time
- Defecation observed from subject: # events/# minutes observed time
- Not assessed

Defecation character

- Not observed

- Disperses rapidly
- Floating feces
- Gas bubbles
- Not assessed

Respiratory rate while not travelling

- Respiratory rate: # breaths/# minutes observed time
- Whale breathes more frequently than pod mates
- Whale breathes less frequently than pod mates
- Not assessed

Respiratory rate while travelling

- Respiratory rate: # breaths/# minutes observed time
- Whale breathes more frequently than pod mates
- Whale breathes less frequently than pod mates
- Not assessed

Respiratory character

- Normal
- Breath appears prolonged (slow breath)
- Abnormal or possibly abnormal respiratory sound
- Sputum or phlegm present: describe
- Unusual odor: describe

- Not assessed

12. Appendix C: Example Sample Collection List

Samples collected are dependent on which authority (*i.e.*, permit, 109h, etc.) the intervention is conducted. The types of samples collected can vary due to being regionally taxa specific or situationally specific. (Geraci *et al.* 2005)

Behavioral observations or samples collected remotely:

- Breath count
- Nutritional Condition
- Skin lesions, injuries, wounds
- Identifying characteristics
- Number of animals, including total and sub-groups (if applicable)
- Pre-stranding (*e.g.*, milling, directional swimming)
- Stranding (*e.g.*, determined effort to strand, passive, thrashing)
- Biopsy sample
- Floating fecal sample
- Breath sample
- Samples collected during a field capture.
- Location information
- Photographs
- Morphometrics
- Weight, if possible
- Blood sample, if possible
- Skin biopsy, if possible
- Sex (If female, lactating?)
- Gear retention (if entangled)

13. Appendix D: Photos

Using a Hukilau to haze a bottlenose dolphin out of a canal.

Responders use a human chain to haze a dolphin away from a canal.

Deploying a seine net around a group of bottlenose dolphins. The outside boats are creating an acoustic barrier to ensure the dolphins do not escape the area before the net is fully deployed.

Responders hold up a seine net to contain a captured dolphin.

Responders work to shrink down a seine net to capture a bottlenose dolphin.

Appendix XIII

Marine Mammal Euthanasia Best Practices

Executive Summary

Throughout the marine mammal stranding and response process, it is inevitable to have situations where euthanasia of a marine mammal is the most humane response. The best euthanasia outcomes occur when response personnel are trained and prepared for this challenging decision. This document brings together the best practices and standardized protocols that the National Marine Fisheries Service (NMFS) recommends to make the most appropriate decision and determine a course of action for euthanasia, given a particular stranding scenario. The euthanasia information is a living document that will be updated periodically as more data and observations become available.

Table of Contents

1. Introduction

1.1 Background

In 1992, the Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the Marine Mammal Protection Act (MMPA). The MMHSRP serves to coordinate marine mammal stranding response efforts in the United States by working to standardize regional network operations and define national stranding response policy.

NMFS published the guidance document "Standards for Rehabilitation Facilities" in 2009 as part of the broader Policies and Best Practices: Marine Mammal Stranding Response, Rehabilitation, and Release. The Standards for Rehabilitation Facilities give detailed guidance on facility and husbandry procedures for rehabilitating marine mammals, and discuss that euthanasia should be performed following accepted guidelines (*e.g.,* AVMA 2020), but the best practices did not include detailed euthanasia procedures or protocols specific to marine mammals. Additionally, the MMHSRP holds an MMPA/Endangered Species Act (ESA) research and enhancement permit that allows the program to authorize qualified individuals to administer euthanasia for ESA species when the decision is approved by NMFS. Non-ESA species responses can be conducted, with authorization by NMFS, under a Stranding Agreement (by the Stranding Agreement holder) or by a government employee acting under MMPA Section 109(h). Therefore, the Marine Mammal Euthanasia Best Practices outlined here will provide guidance to both the National Marine Mammal Stranding Network (the Stranding Network) and individuals operating under the MMHSRP MMPA/ESA permit, SA or 109(h).

1.2 Legislation Pertinent to Marine Mammal Euthanasia

There are two key pieces of legislation that govern interactions with marine mammals in the United States.

> Marine Mammal Protection Act (MMPA): The MMPA, signed into law in 1972, prohibits the "take" of sea otters, seals, sea lions, walruses, whales, dolphins, and porpoises, which includes harassing or disturbing these animals, as well as harming or killing, unless such take is specifically exempted in the statute or authorized. The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS has jurisdiction over cetacean and pinniped species (with the exception of walrus), and USFWS has jurisdiction

over walrus, polar bear, sea otters, and manatees. The 1992 amendments to the MMPA included Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health trends of marine mammal populations through the collection of data from strandings, by catch, subsistence harvest, and research.

Endangered Species Act (ESA): The ESA, enacted in 1973, provides for the conservation of species that are listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on "take" including harassment and disturbance as well as injuring and killing.

1.3 Purpose and Intended Use

NMFS and the Stranding Network have developed protocols and procedures for responding to live marine mammals that are stranded and/or otherwise in distress to ensure the health, welfare, and safety of both the human responders and animals. These protocols balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, the reader should consult references such as *Marine Mammals Ashore* (Geraci *et al.* 2005) and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018). Human and animal safety is the top priority for NMFS and the Stranding Network. NMFS, the Stranding Network, and other parties that may have land jurisdiction [*e.g.*, tribes, National Park Service (NPS), state, etc.] evaluate many factors before making a decision to intervene. Each stranding event is unique and requires the consideration of multiple aspects, which are addressed below. This document will aid in the application of professional judgement when an end of life decision needs to be made for a stranded or injured marine mammal.

These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations. These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a "living document," and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

1.4 Funding

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for eligible members of the Stranding Network through an annual competitive grant process. These grants support the rescue and rehabilitation of stranded marine mammals, data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are competitive and limited, individual Stranding Network members often support many of the costs for normal operations, including euthanasia.

2. Planning for Euthanasia and Euthanasia Concerns

2.1 Planning for Euthanasia

There are many situations that could call for the consideration of euthanasia, such as an animal with a severe injury or illness. Each scenario should be evaluated on a case-by-case basis to provide the best outcome for the individual animal.

Euthanasia means “a good death”. It is usually used to describe ending the life of an individual animal in a way that minimizes or eliminates pain and distress (AVMA 2020). Euthanasia reflects the veterinarian or authorized responder’s desire to do what is best for the animal and serves to bring about the most appropriate outcome for an animal that is suffering (AVMA 2020). Stranding Network veterinarians and/or NMFS designated authorized responders possess the expertise to properly care for marine mammals, including assessing the chances of recovery and return to the wild for an individual animal. Additionally, these responders have the experience and training to relieve unnecessary pain and suffering by using euthanasia as a tool, if the recovery and return to the wild of a stranded marine mammal is not possible. The goal of euthanasia is to make the death of an animal as painless, quick, and distress-free as possible by using the best and most effective method for the specific situation.

When preparing for euthanasia, it is important for the responder(s) to contact their NMFS Regional Stranding Coordinator as soon as possible with an assessment. Approval for euthanasia comes from NMFS, either through pre-approval of existing protocols for commonly stranded species, or on a case-by-case basis for uncommon, difficult cases, or ESA-listed species. As part of that approval process, NMFS will discuss euthanasia methods with the relevant federal, state, tribal or other local land authority if applicable.

2.2 Training, Safety, Personnel

Human and animal safety is the top priority for NMFS and the Stranding Network. Euthanasia should only be carried out by an experienced and approved Stranding Network member or veterinarian who is trained in, and familiar with, proper euthanasia methods for that species. Responders of the Stranding Network should maintain training in first aid/CPR, animal handling during euthanasia, general methods and aspects of euthanasia, and communication with the public and media if euthanasia is performed in the field. It is the responsibility of the team lead to know the team's experience, skills, and limitations, and to continually assess the safety of the situation (Barco *et al.* 2016).

Before determining that euthanasia is the most suitable course of action, it is important to fully triage the individual, understand the situation, and be able to answer the following questions:

- Where is the animal located? Is it in the water, surf, or on the beach? Is it in a public or remote area?
- How long has the animal been stranded? Is a trained team available for field assessment and diagnostics, if applicable?
- Are there laws, regulations, or policies that apply to the land jurisdiction of the stranding where communication, coordination, and approval is needed and/or required?
- What equipment is needed? Do you have all the equipment?
- Do you have all of the required data sheets?
- Do you have approval from NMFS to perform euthanasia, and an authorized member that can perform it?
- Are team member assignments clear (*i.e.,* who is performing euthanasia, who is the handling team members, who is addressing the public/media)?
- Do you have an established plan for a "Zone of Safety" around animals/drugs/tools (Barco et al., 2016)?
- Is there a contingency plan in place for accidental human exposure to sedatives or euthanasia drugs, including where is the closest hospital in case of accidental human exposure?
- Has the media/communication plan been reviewed or coordinated with the organizations involved (*e.g.*, NMFS, the Stranding Network, tribes, state, federal, NPS, etc.)? Are talking points and a public information officer ready to address and educate the public?

Concerns and risks during field euthanasia include, but are not limited to the following:

- Human safety concerns while operating close to the animal, in addition to the environmental hazards and conditions. If animals are small enough, they should be removed from the water prior to euthanasia to avoid operating in the water. Working in the active surf zone with larger animals is not preferred and should only be done under very specific protocols that emphasize human safety and minimize risks (Barco *et al.* 2016).

- Risk of accidental human exposure to drugs via an accidental injection, needle stick or spray back of drugs; luer lock syringes are recommended because they reduce the likelihood of accidental needle sticks and spray back (Barco *et al.* 2016).

- Ballistics injuries. There are many considerations when using firearms, such as avoiding using firearms over substrates that carry a high risk of ricochets (*e.g.,* stones and rock platforms) (Hampton *et al.* 2014).

2.3 Administering Euthanasia

Euthanasia methods are commonly classified into two main categories: chemical methods and physical methods (further explained in Section 3). Chemical methods include non-inhalant agents (*i.e.*, injectable) and inhalant agents that include anesthetic gases such as isoflurane. Physical methods of euthanasia include ballistics, explosives, and exsanguination.

There are many ways to administer chemical euthanasia: intravenous (IV), intramuscular (IM), intraperitoneal (IP), intranasal (blowhole), retro-bulbar, intracardiac (IC), etc. For species- and drug-specific chemical euthanasia injection sites (landmarks) refer to section 4. Intracardiac administration requires that the animal be unconscious or anesthetized. Intravascular administration is the most rapid and common method used in marine mammals (Gulland *et al.* 2018), but in some situations it may not be safe or feasible. Most marine mammals will require IM sedation or anesthesia prior to administration of euthanasia drugs. In some cases, sedation administration may result in euthanasia prior to the administration of further physical or chemical means.

Intrahepatic, intrathoracic, intrapulmonary, intrathecal, intraoral/buccal, sublingual injection, and intraglossal are not acceptable forms of administration of chemical euthanasia agents in marine mammals (Barco *et al.* 2016). Intraoral/buccal may be used as an administration method for sedation but is not recommended for administering euthanasia drugs.

Physical euthanasia using ballistics must be carried out by accredited state, local, tribal, or federal law enforcement personnel provided they euthanize the marine mammal in the normal course of their duties as an official or employee under Section 109(h) of the MMPA (50 CFR 216.22). For non-ESA species no further authorization (*e.g.,* a NMFS SA) is required under Section 109(h) as long as euthanasia is for the protection or welfare of the animal or for the protection of the public health and welfare (50 CFR 216.22; Geraci *et al.* 2005). Additionally, a member of the Stranding Network could conduct euthanasia via ballistics under their SA if all other state and local requirements (e.g., permits) were met and they were adequately trained. For ESA species, both 109(h) and SA holders would require authorization under the MMPA/ESA Permit to conduct euthanasia. To administer the ballistics method, it is recommended that the animal be shot in the brain. Refer to section 3.2 for more specific information on physical methods of euthanasia for specific species/taxa.

2.4 Verification of Death

When euthanizing a marine mammal, it is important to verify the death of the animal to ensure the animal does not experience unnecessary pain and suffering. Death may be difficult to determine in cetaceans in some situations. Confirmation of death can be accomplished in a variety of ways. Depending on the species, listening for a heartbeat is not a reliable confirmation method, as the heartbeat may normally be undetectable. Therefore, secondary techniques should be used to verify death. The method(s) used for confirmation may depend on the logistics and safety as well as the species involved, but should include as many applicable methods as feasible. Human safety is critically important to evaluate as decisions are made on how to assess the success of euthanasia. For cetaceans and pinnipeds, these methods may include:

- Loss of jaw or anal tone,
- Absence of menace, palpebral and corneal reflexes,
- Fixed dilated pupils,
- Absence of tongue reflex,
- Prolonged absence of respiration,
- Lack of response to painful stimuli,
- No capillary refill time,

- Ocular/skin temperature differential, and
- ECG indicating cardiac asystole.

2.5 Records

It is important that each event be fully documented with the appropriate data collected. Information should be collected, not only for general stranding and species data, but also to obtain information on the successes and failures of euthanasia protocols and methods. There are also laws that require specific record-keeping for use of pharmaceuticals in wildlife (*e.g.*, AMDUCA). Information on the animal's response to the euthanasia method including behavior, time to death, clinical signs of response, and other factors will be very useful in identifying species differences in responses, especially to chemical methods. This feedback will be used to inform and improve protocols and modify techniques for future events, especially if there are species or situation differences. Any human injuries during euthanasia should also be documented to prevent future injuries. See Appendix A for examples of standardized euthanasia datasheets and forms that can be used during an event.

2.6 Disposition of Euthanized Animal

All carcass disposal should follow local, state, tribal, and federal laws and regulations. An animal euthanized by physical methods can be disposed of by beach burial, leaving in place, landfill, towed out to sea, rendering, composting or incinerating depending on the situation and physical access. If an animal was euthanized by chemical agents that may cause secondary poisoning (*e.g.*, pentobarbital), the carcass needs to be disposed of in a manner that prevents risk to potential scavengers and avoids animal or human food supply chains. Carcasses containing high concentrations of pentobarbital euthanasia solutions must be incinerated, rendered, composted, or buried in licensed landfills that accept pentobarbital carcasses to prevent accidental poisoning of scavengers (Geraci *et al.* 2005). If a carcass is too large to move, and the animal was euthanized using sedatives, the sedative injection site should be excised and disposed of appropriately. Refer to the Carcass Disposal Best Practices for detailed information on marine mammal carcass disposal methods.

2.7 Decision Matrix

Before determining that euthanasia is the most suitable course of action, it is important to fully triage the individual and understand the logistical situation. Once euthanasia has been determined to be necessary, then it is important to determine the best euthanasia method that has the ability to induce loss of consciousness and death with the minimum pain and distress. Selection of the most appropriate method of euthanasia, in any given situation, depends on the species and number of animals involved, animal size, available resources (including means of animal restraint), skill of personnel, available carcass disposal method, safety in administering the methods, need for biological samples for diagnostic testing or other purposes, as well as other criteria.

When selecting a euthanasia method you should consider (AVMA 2020):

1) Time required to induce loss of consciousness
2) Reliability
3) Safety of personnel
4) Irreversibility
5) Compatibility with intended animal use and purpose
6) Documented emotional effect on observers or operators
7) Compatibility with subsequent evaluation, examination, or use of tissue
8) Drug availability and human abuse potential
9) Compatibility with species, age, and health status
10) Ability to maintain equipment in proper working order
11) Carcass disposal options that consider safety for scavengers should the animal's remains be consumed
12) Legal requirements
13) Environmental impacts of the method or disposition of the animal's remains.

When making the final decision on the euthanasia method, it is good practice to go through a decision matrix (Figure 1) to ensure all variables and information have been taken into account.

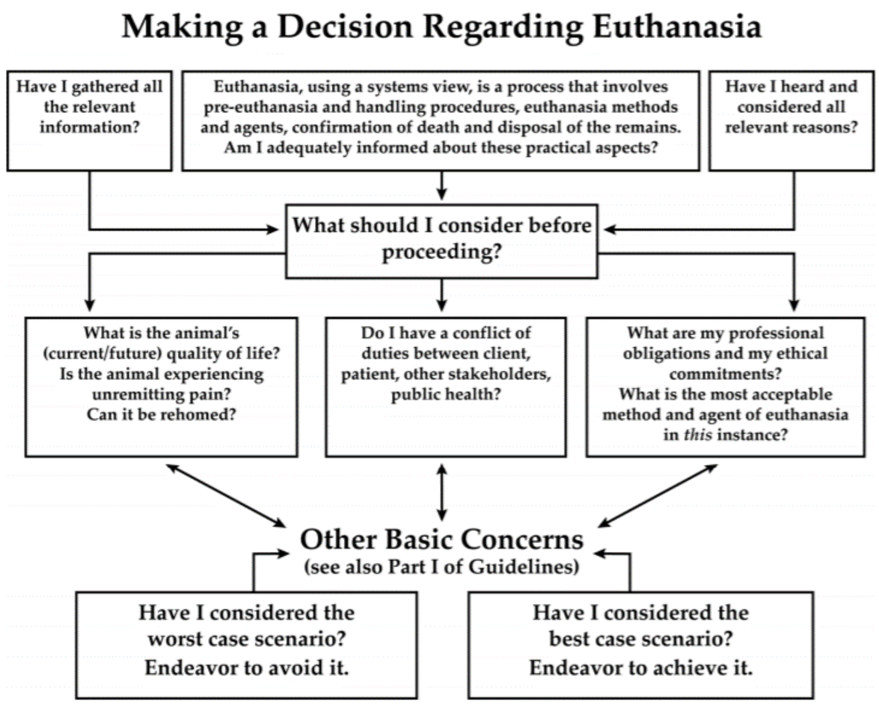


Figure 1: Veterinarians may refer to this decision tree as a way to consider the variables associated with the euthanasia decision. Taken from the AVMA Guidelines for Euthanasia of Animals: 2020 Edition.

3. Methods of Euthanasia

Euthanasia methods are commonly classified into two main categories: chemical methods and physical methods. Intravascular administration of an acceptable pharmaceutical agent is considered the most rapid and reliable means of obtaining euthanasia in mammals (Andrews *et al.* 1993; Close *et al*. 1996), and is the most common method used in marine mammals (Gulland *et al.* 2018). To view more information on euthanasia matrixes and effective euthanasia methods for cetaceans, refer to Appendices B and C. Chemical methods include non-inhalant agents (*i.e.*, injectable) and inhalant agents that include anesthetic gases such as isoflurane. Physical methods of euthanasia include ballistics, explosives, and exsanguination. These physical methods are generally used in remote or logistically constrained situations where the carcass must remain in place and access to euthanasia drugs is limited. All methods have pros and cons. Some methods may have more limitations and concerns than others. There may also be limited information on the outcomes of certain methods for specific species or taxa. Refer to section 4 for the currently available species-specific euthanasia and chemical euthanasia injection sites (landmarks).

3.1 Chemical Methods

Using a chemical method for euthanasia is usually the most rapid and reliable method if it can be administered safely and effectively. In general, it is recommended that a two-step process be used, with administration of a pre-euthanasia sedative agent to render the animal unconscious followed by at least one other euthanasia drug to cause permanent death (Barco *et al.* 2016, AVMA 2020). However, some smaller pinnipeds (*e.g.*, phocids) may not require a pre-euthanasia sedative, if pentobarbital is used. Also in some instances, the sedative may result in the euthanasia of the animal prior to any additional drug administration.

Sedation Drugs

As noted above, to decrease the risk of injury to responders and handlers and to diminish the animal's perception/response to the chosen euthanasia method, it is recommended that a sedative or tranquilizer be administered to the marine mammal prior to euthanasia when appropriate (Harms *et al.* 2018). In some cases, cetaceans may exhibit severe excitatory reactions, including spinning and fluking, when administering an intravenous barbiturate without prior sedation and this reaction puts responders and the public at risk for injury (Barco *et al.* 2016). The sedative or tranquilizer reduces pain and stress that may be experienced by the animal during administration of euthanasia drugs. Provision of sedation is required prior to IC injections. Another benefit to using a sedative is that it may lessen the euthanasia drug volume needed (Barco *et al.* 2016). If an animal is severely debilitated, it is possible that the pre-euthanasia drugs (tranquilizers, sedatives, some injectable anesthetics) may result in the death of the animal without the need for euthanasia drugs.

	Common Sedatives Used
Large Cetaceans	Acepromazine, butorphanol*, midazolam, xylazine*
Small Cetaceans	Butorphanol*, diazepam, midazolam, tiletamine*-zolazepam, xylazine*
Pinnipeds	Butorphanol*, diazepam, midazolam, tiletamine*-zolazepam

*indicates analgesic effects.

Euthanasia Drugs

Barbiturates (*e.g.*, pentobarbital) are the most commonly used chemical euthanasia agents in marine mammals. They are usually administered intravenously or intracardially. If administered intraperitoneally, they can be irritating so a local anesthetic or pre-sedation should be used. These barbiturate chemical agents are rapid and limit discomfort in the animal during euthanasia. Barbiturates act by depressing the medullary respiratory and vasomotor centers to a degree that results in unconsciousness and respiratory and cardiac arrest.

If carcasses must remain in place or will be buried on the beach, the use of intracardiac potassium chloride (KCl) is the preferred chemical method in large cetaceans, small cetaceans, or larger pinnipeds, if carcasses must remain in place or will be buried on the beach, because there is little risk of secondary poisoning to scavengers (Harms *et al*. 2014; WC Network Guidance 2018). A two-step euthanasia process should be used with this method, since the marine mammal must be heavily sedated and at a surgical plane of anesthesia prior to administration of the KCl (Harms *et al*. 2014). Etorphine, T-61, and paralytics are not recommended as chemical agents for marine mammal euthanasia.

3.2 Physical Methods

Ballistics

If chemical methods are not practical, the use of firearms have been demonstrated to be an effective physical method for euthanizing small marine mammals (Blackmore *et al.* 1995). This method is easy to use in remote or logistically challenging situations. While it results in a rapid death and the equipment is typically readily available, the shooter must have anatomical knowledge of the locations of the heart and brain, so that the gunshot is accurately placed and will be most effective. This technique requires skill, training, and legal authorization for the weapon, and public safety must be assessed if it is to be used in a public area. If physical euthanasia methods are the only option on a busy beach, be aware of both animal and human safety concerns (Geraci *et al.* 2005). Ballistics should not be carried out if the animal is in deep water or the surf zone. If ballistics are to be used, make sure to consider any secondary lead poisoning for scavengers if the carcass will remain in place, please see the Carcass Disposal Best Practices for more details.

There are four main components that should be evaluated when assessing the ballistic option (Barco *et al.* 2016):

1) Size and anatomy of the animal(s);
2) Firearm and projectile to be used;
3) Skill and training of the marksman; and

4) Consideration of public safety and perception.

If any of these components are not ideal, then the procedure should be aborted (Harms *et al.* 2018). Ballistics are not recommended for larger (greater than 8 meter) cetaceans because penetration of the skull may not be effective by conventional weapons. Large cetaceans have different skull anatomy and/or extremely tough skin and blubber layers that restrict projectile penetration.

Smaller cetaceans (less than 8 meters) can be euthanized effectively with a firearm. For an immediate and painless result, the shot should be targeted at the brain (preferably the brain stem). Donoghue (2006) recommends a series of three shots in a line halfway between the eye and the insertion of the flipper at the level of the eye. The area can be accessed laterally, dorsally, or ventrally (see Figure 2 below). Another target option is to shoot from the side. Aim about halfway between the posterior margin of the eye and a point above the origin of the pectoral flipper, for added assurance, fire three shots in a line through the targeted area (see Figure 3 below for placement) (Geraci *et al.* 2005)

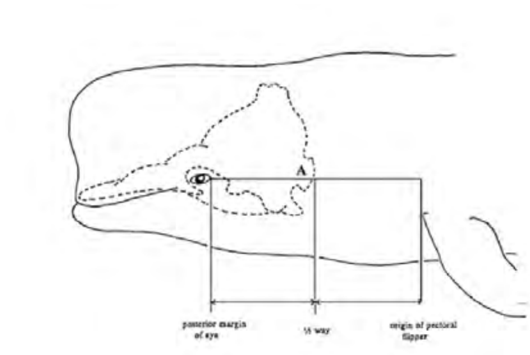
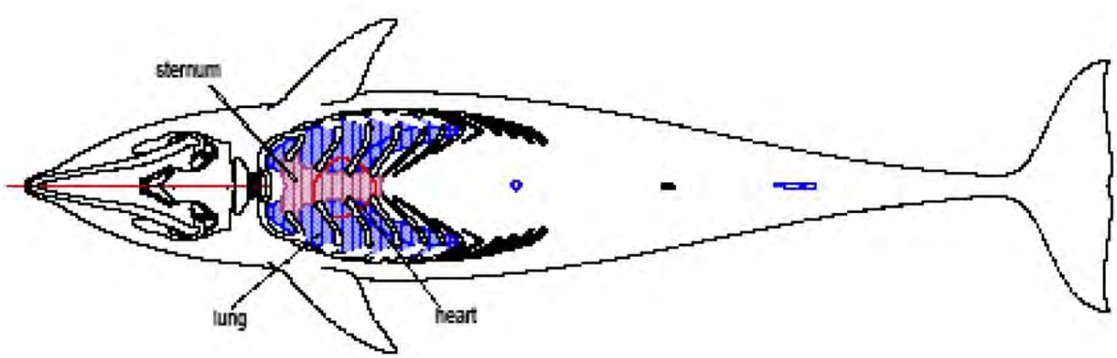


Figure 2: Image adapted from Donoghue 2006



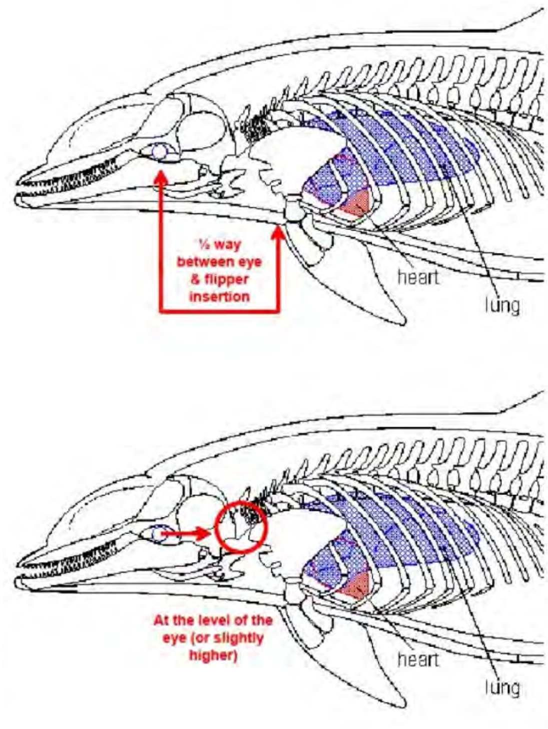


Figure 3: Outline of skeletal elements and target area for small cetacean ballistics euthanasia (images ©Rommel)

The use of ballistics for euthanasia is easier for pinnipeds since they are smaller and conventional guns or rifles can be used to penetrate the skull, resulting in a rapid death. When using this method (Figure 4), target one of three areas (Geraci et al. 2005):

1) Frontal shot- placed slightly behind the line of eyes;

2) Poll shot- from the rear of the skull; or

3) Temporal shot- from the side of the skull.

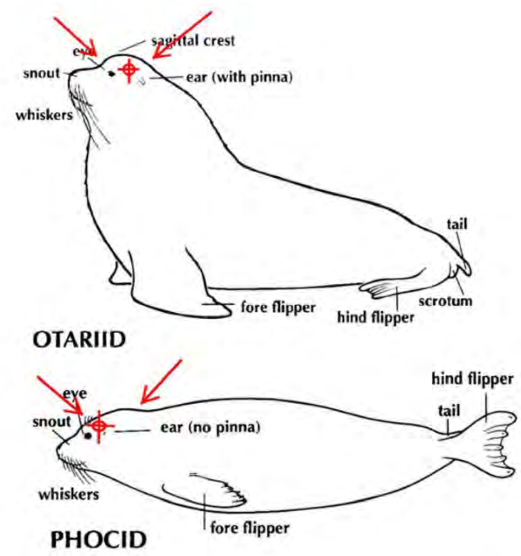


Figure 4: Geraci & Lounsbury, 2005. Arrows added by the Northwest Marine Mammal Stranding Network

Explosives

In other countries, explosives have been used in large whale euthanasia situations when other methods were unavailable or difficult, but these methods are not currently developed, trained, or available for use the U.S. If considered in the U.S. in future, development, training, partnerships, and legal issues will need to be addressed. For more details on this method, see Donoghue 2006.

Other Methods

There are a few other methods of physical euthanasia that are not as common or typically recommended. Exsanguination, although not considered an acceptable primary method, can be used in remote or logistically challenging situations as long as heavy pre-sedation, inducing a deep surgical plane of anesthesia (similar to the KCl method), is used prior to exsanguination (for landmarks see section 4). Consult with NMFS if exsanguination is the only viable euthanasia option. Lastly, depending on the stranding conditions and in the interests of human safety, sometimes the only option is to let the animal expire naturally without assistance.

3.3 Considerations of Chemical versus Physical Methods

There are different items to consider when choosing the best euthanasia method.

Chemical Methods	
PROS	**CONS**
• Reliable/effective when administered correctly • Public perception in the U.S. is that this method is more common since it is used for domestic animals • Pre-euthanasia sedatives/analgesics reduce pain and suffering incrementally prior to euthanasia. • Does not destroy brain for postmortem examination	• Requires specialized expertise and training to administer properly • Majority are controlled substances (require a license) • Limited availability (quantities needed may not be stocked locally especially in the volumes needed for larger animals or for mass situations) • Need of specialized needles for large whales and for different sizes of cetaceans • Can be expensive • Limited carcass disposal options if pentobarbital is used (proper disposal is needed to reduce secondary poisoning risk to scavengers and/or contamination of the environment) • Blood vessel collapse/shunting/inability to access, requiring intracardiac or intraperitoneal administration • Potential human safety risk from accidental exposure to drugs
Physical Methods	
PROS	**CONS**
• Easily attainable equipment (*e.g.*, law enforcement officers) • Rapid death (except exsanguination method or if the target is missed) • Minimal risk to scavengers if non-toxic ammunition is used or measures are taken to prevent exposure to scavengers of the lead fragments	• Licensed marksman • Dependent on familiarity with the anatomy of the species • Loud noise (ballistics) • Possibility of ricocheting (off animal, substrate, etc.), not applicable to exsanguination • Public perception is that these methods are not as humane • Size restrictions (ineffective in animals larger than 8 meters) • May increase human safety concerns and risks of injury

	• Increases pain and distress if not immediately effective and without pre-sedation • Destroys brain, precluding postmortem examination

3.4 General Recommendations and Ethical Considerations

Numerous ethical considerations are factored into the decision to euthanize a marine mammal, which is why the circumstances of every situation needs to be assessed thoroughly with the organizations and authorities involved. If euthanasia is identified as the best course of action, then it must be performed by appropriately trained and experienced staff with appropriate equipment in a safe manner (Hampton *et al.* 2014). All euthanasia methods should strive to provide the most rapid and painless death possible. The carcass must be disposed of per federal, state, tribal, and local requirements. For more detailed information on marine mammal carcass disposal methods, refer to the Carcass Disposal Best Practices.

4. Landmarks and Euthanasia

All figures presented in this section are by illustrator, S. Rommel through the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018) or Barco *et al.* 2016.

4.1 Landmarks for Large Cetaceans

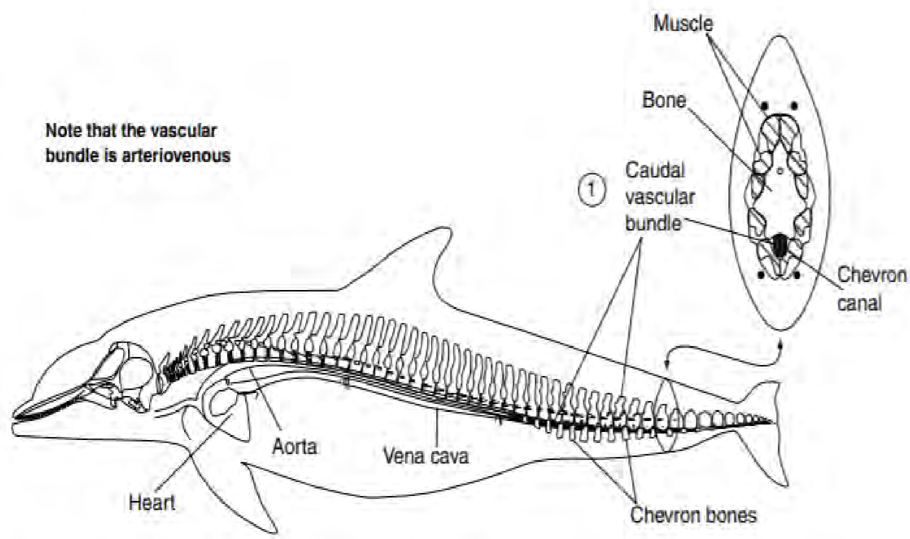
For large cetaceans, intramuscular administration of sedatives is usually injected into the epaxial muscles. The typical landmarks for intravenous injection for large cetaceans are 1) caudal vascular bundle, 2) peduncle veins, 3) dorsal fin vein, and 4) pectoral flipper vein (Gulland *et al.* 2018). However, working near the flukes of large cetaceans can be hazardous, and for more rapid effect, most large cetaceans are euthanized via intracardiac administration following deep sedation. A detailed diagram for intra-cardiac approach can be found in Barco *et al.* 2016 and Harms *et al.* 2014.

Large Cetaceans: Needle Size	
Whale size: 12-25’	12 to 15 in. (30.5-38.1 cm), 16- to 20-gauge
Whale size: >25’	12 to 20 in. (30.5-50.8 cm), >18-gauge

4.2 Landmarks for Small Cetaceans

For small cetaceans, intramuscular administration of sedation drugs is usually injected into the epaxial muscles. The typical landmarks for intravenous injection for small cetaceans are 1) caudal vascular bundle, 2) peduncle (caudal peduncle requires a long needle- 1.5 to 3.5 in.), 3) dorsal fin vein, and 4) pectoral flipper vein (Gulland *et al.* 2018). Additionally, some small cetaceans are euthanized via intracardiac administration of euthanasia drugs, especially if the cetacean is shunting blood from the periphery. See Figure 5a for veins that can be used for chemical euthanasia. Figure 5b shows landmarks for exsanguination.

Small Cetaceans: Needle Size	
Calf	1.0 in (2.5cm), 18- to 22-gauge or butterfly set
Juvenile	1.0 in (2.5cm), 18- to 22-gauge or butterfly set
Adult	1.0 to 2.0 in. (2.5-5.0 cm), 18- to 22-gauge or butterfly set



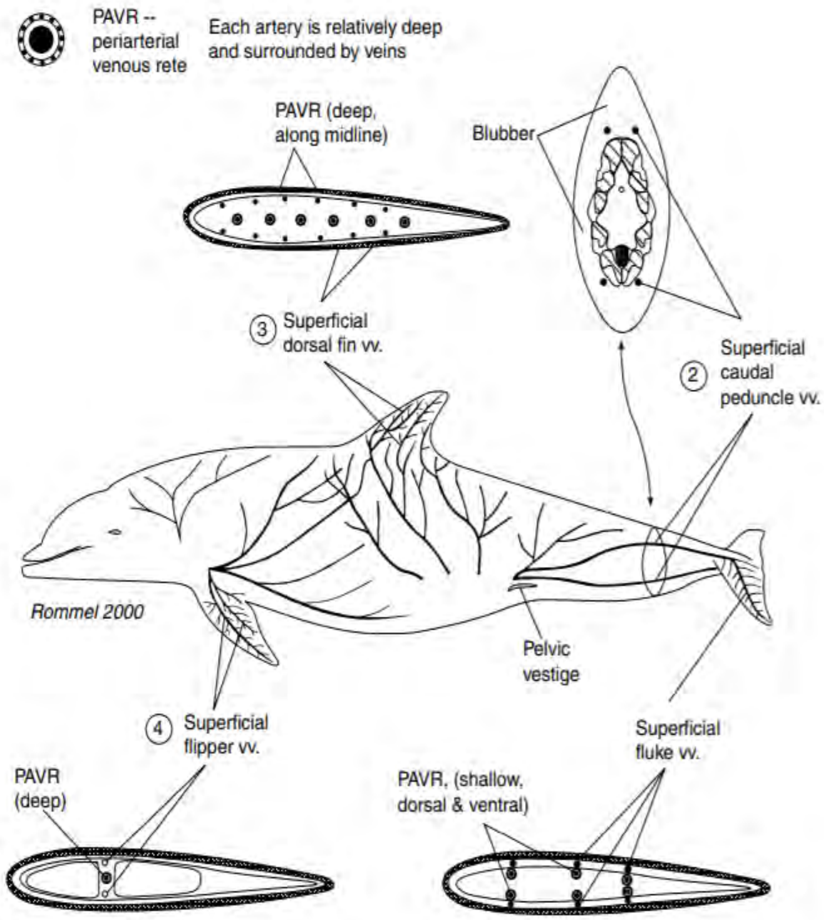


Figure 5a: Veins used for blood collection in small cetaceans

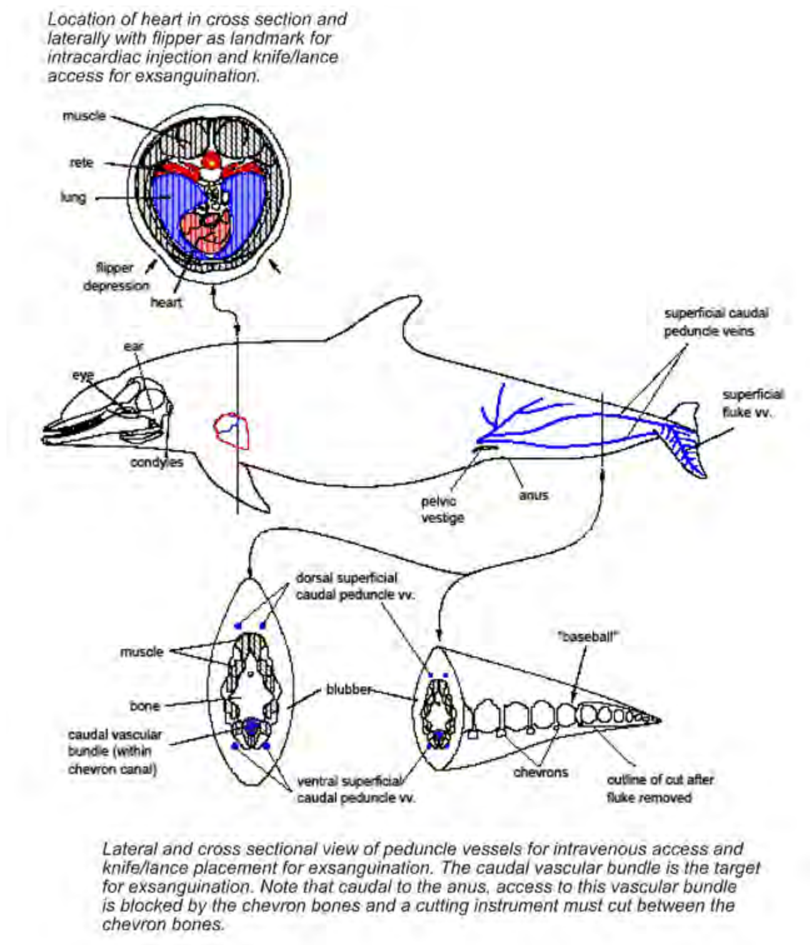


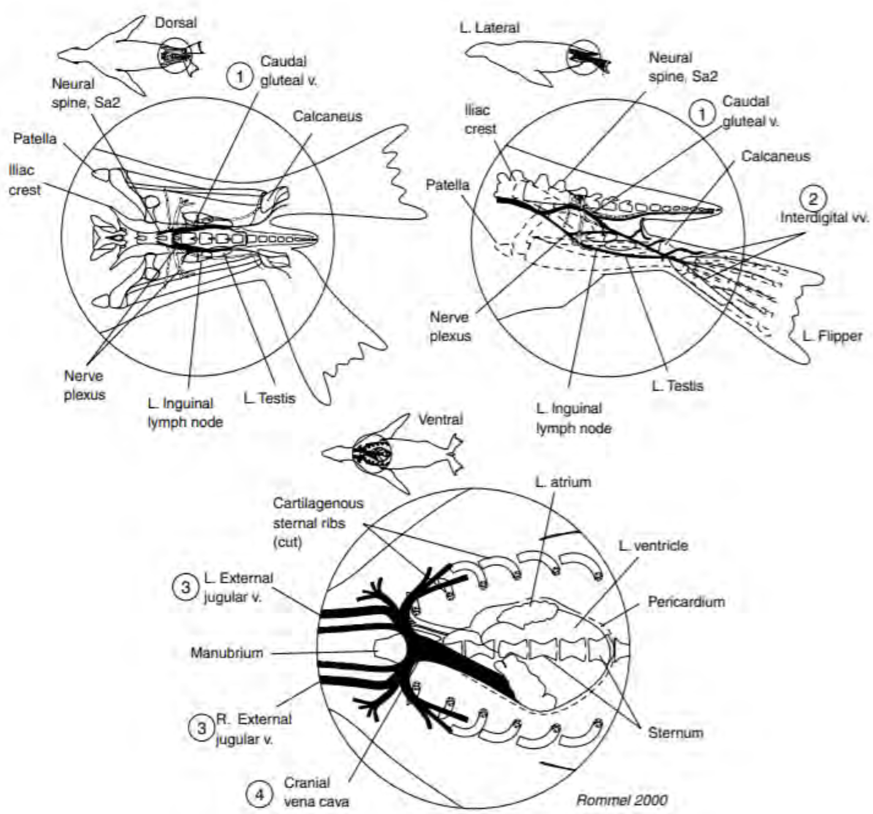
Figure 5b: Landmarks for Exsanguination in Cetaceans

4.3 Landmarks for Pinnipeds

For pinnipeds, intramuscular administration of sedatives is usually injected into the caudal gluteal or epaxial muscles (Figure 6). In otariids, the landmarks (Figure 6) for intravenous administration include the 1) caudal gluteal vein, 2) interdigital veins of hind flipper, 3) subclavian, and 4) jugular vein. The landmarks for intravenous injections in phocids are 1) epidural vertebral vein and 2) interdigital veins of hind flipper (Gulland *et al.* 2018). Additionally, some pinnipeds are euthanized via intracardiac, intraperitoneal, or intrarenal administration of euthanasia drugs.

Pinnipeds: Needle Size

Pup	1.0 to 1.5 in (2.5 - 3.8 cm), 18- to 20-gauge or butterfly set
Juvenile	1.0 to 2.5 in (2.5 - 6.4 cm), 18- to 20-gauge or butterfly set
Adult	1.0 to 5.0in. (2.5 - 12.7 cm), 18- to 20-gauge or butterfly set



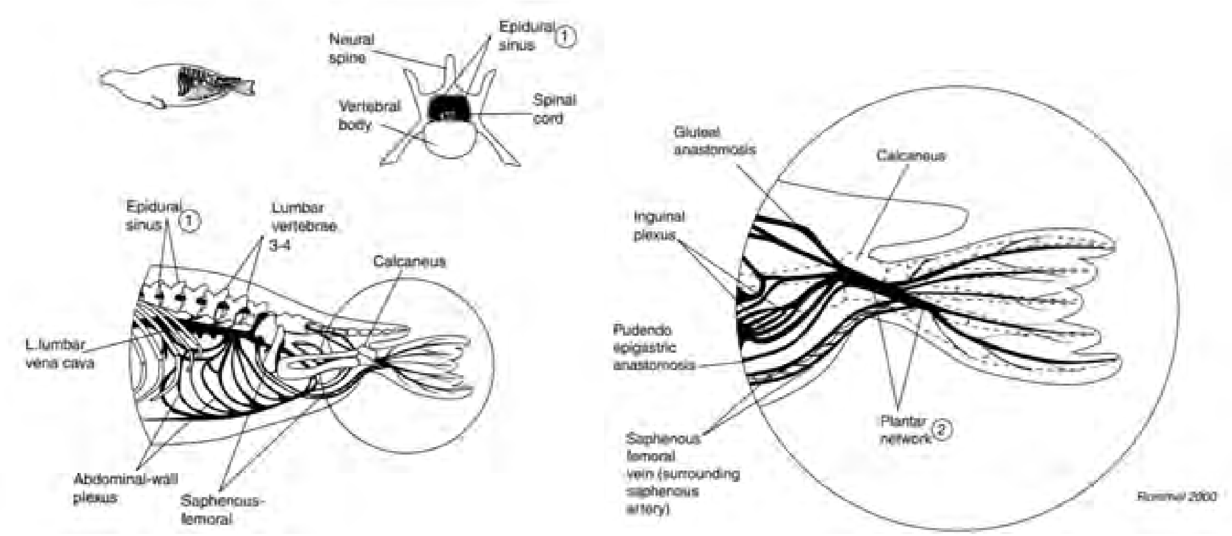


Figure 6: Veins used for blood collection in pinnipeds

4.4 Specific-Species Information

Below are a few cetacean species-specific observations compiled from records that have some drug reaction results and recommendations for administering euthanasia. This list is not all encompassing and documentation still needs to be compiled to learn more about the euthanasia administration effects on different species. This reinforces the need to document future cases because such information can be used to gain more insight on efficacy and safety of different techniques and results. See Appendix B, C, and D for cetacean specific information. See Appendix D for pinniped information.

Species	**Observations/Recommendations** (Barco *et al.* 2016)
Delphinus delphis	• Sensitive animal (minimal handling and noise) • Respond better to enclosed environments • Recommend using a single agent euthanasia (IV) • Common to have violent movement at time of death
Kogia spp.	• Recommend using pre-euthanasia sedation • Shunting may occur, caudal peduncle or intracardiac administration may be needed • *Kogia sima* tend to react more strongly to sedatives • In *K. sima*, sedation alone will take a long time (greater than 45 minutes to several hours)

Grampus griseus	● Not recommended to use Alpha-II agonists for sedation (*e.g.*, xylazine, medetomidine) ● Recommend using Diazepam IV for a sedative
Tursiops spp.	● Recommend pre-euthanasia sedation
Globicephala spp.	● *G. melas* was sedated quietly but slowly (45 minutes) when using acepromazine and xylazine ● *G. macrorhynchus* had an agonal response when KCl was administered after acepromazine and xylazine
Steno bredanensis	● Recommend pre-euthanasia sedation
Eschrichtius robustus	● Not recommended to use xylazine (excitatory reaction)
Mysticetes (excluding xylazine for *Eschrichtius robustus*)	● Typically recommend preanesthetic and anesthetic drugs (midazolam, acepromazine, xylazine +/- butorphanol or other combination) following by saturated KCl with custom needles and basic pressurized canister (Harms *et al.* 2014)

5. Conclusion

Euthanasia reflects the veterinarian or authorized responder's desire to do what is best for the animal and serves to bring about the most appropriate outcome for an animal that is suffering. Stranding Network veterinarians and/or NMFS designated authorized responders have the experience and training to relieve unnecessary pain and suffering by using euthanasia as a tool, if the recovery and return to the wild of a stranded marine mammal is not possible. The goal of euthanasia is to make the death of an animal as painless, quick, and distress-free as possible by using the best and most effective method for the specific situation. No one event is the same and each has their own aspects to consider. This document aids in the decision-making process and assists with providing information and guidance about marine mammal euthanasia.

6. Acknowledgements

We would like to thank the many people who contributed information, protocols, and expertise to this Best Practices document. We would like to especially thank: International Fund for Animal Welfare, Michelle Barbieri, Craig Harms, and Sarah Sharp.

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8. Appendix A: Example Datasheets

Cetacean Euthanasia Data Record (Dec 2011)

Field Number: ____________________ **Species:** ___________________________ **Date:** _____________

Euthanizing Agency: ________________________ **Initial Report Time:** ______ **Time of Arrival:** _______

Officiating Veterinarian: ________________________ **Lead Responder:** ___________________________

Location Description (Circle): ND Marsh/mudflat Beach In surf Still/shallow water Bar/shoal Other _______________

Decision to perform euthanasia authorized by ____________________ @ NOAA and reason for euthanasia:

Pre- Euthanasia Data Time taken:

Heart rate	Palpate/auscultate ___ beats/1 min	**Attitude**	Alert Lethargic Non-responsive
Resp. rate; exudate	_____ breaths/ ____ min ; Y N	**Body position**	ND Upright Left side up Right side up
Resp. character	Strong Weak Regular Irregular Other	**Eyes** (Open / Closed)	Palpebral reflex- Y N Menace reflex- Y N
Body condition	ND Robust Normal Thin Emaciated	**Movement**	None Arch Fluke Swim Tremble Other
Body temp. (°F C)	Skin @ _______ Warm Cool ND	**Other:** *(describe in comments)*	Vocalize Vomit Feces Urine Lesions

Method of Euthanasia: **Pre-euthanasia Sedation** **Chemical Method** **Non-Chemical Method** *(describe)*
(Circle all that apply)

Agent 1:

Location of animal for administration of Agent 1 (Circle): Water Shore Vehicle Facility Other

Time of admin.		**Heart rate**	Palpate/auscultate ___ beats/1 min
Drug & conc.		**Resp. rate**	_____ breaths/ ____ min
Amount		**Resp. character**	Strong Weak Regular Irregular
Route	IM IV IP IH IC Other	**Resp. exudate**	Y N (Clear Foam Blood Other)
Injection site	R L D V Body area:	**Attitude**	Alert Lethargic Non-responsive
Response to agent	Y N	**Movement**	None Arch Fluke Swim Tremble Other
Time observed		**Eyes** (Open/Closed)	Palpebral reflex- Y N Menace reflex- Y N
Type of response	↑ ↓ Activity ↑ ↓ Responsiveness	↑ ↓ Respirations	↑ ↓ Heart rate ↑ ↓ Other

Agent 2:

Location of animal for administration of Agent 2 (Circle): Water Shore Vehicle Facility Other

Time of admin.		**Heart rate**	Palpate/auscultate ___ beats/1 min
Drug & conc.		**Resp. rate**	_____ breaths/ ____ min
Amount		**Resp. character**	Strong Weak Regular Irregular
Route	IM IV IP IH IC Other	**Resp. exudate**	Y N (Clear Foam Blood Other)
Injection site	R L D V Body area:	**Attitude**	Alert Lethargic Non-responsive
Response to agent	Y N	**Movement**	None Arch Fluke Swim Tremble Other
Time observed		**Eyes** (Open/Closed)	Palpebral reflex- Y N Menace reflex- Y N
Type of response	↑ ↓ Activity ↑ ↓ Responsiveness	↑ ↓ Respirations	↑ ↓ Heart rate ↑ ↓ Other

Additional sections for agents and comments are located on the back of this sheet.

Post Euthanasia Data:

Time of death		**Carcass necropsied**	Y N ND
How determined		**Carcass disposal method**	Bury Landfill Render Other

Please use comments section on back of form for additional notes on process and reaction(s)

Cetacean Euthanasia Data Record (Dec 2011)

Agent 3:

Location of animal for administration of Agent 3 (Circle): Water Shore Vehicle Facility Other

Time of admin.		**Heart rate**	Palpate/auscultate ___ beats/1 min
Drug & conc.		**Resp. rate**	_____ breaths/ ____ min
Amount		**Resp. character**	Strong Weak Regular Irregular
Route	IM IV IP IH IC Other	**Resp. exudate**	Y N (Clear Foam Blood Other)
Injection site	R L D V Body area:	**Attitude**	Alert Lethargic Non-responsive
Response to agent	Y N	**Movement**	None Arch Fluke Swim Tremble Other
Time observed		**Eyes** (Open/Closed)	Palpebral reflex- Y N Menace reflex- Y N
Type of response	↑ ↓ Activity ↑ ↓ Responsiveness ↑ ↓ Respirations ↑ ↓ Heart rate ↑ ↓ Other		

Agent4:

Location of animal for administration of Agent 4 (Circle): Water Shore Vehicle Facility Other

Time of admin.		**Heart rate**	Palpate/auscultate ___ beats/1 min
Drug & conc.		**Resp. rate**	_____ breaths/ ____ min
Amount		**Resp. character**	Strong Weak Regular Irregular
Route	IM IV IP IH IC Other	**Resp. exudate**	Y N (Clear Foam Blood Other)
Injection site	R L D V Body area:	**Attitude**	Alert Lethargic Non-responsive
Response to agent	Y N	**Movement**	None Arch Fluke Swim Tremble Other
Time observed		**Eyes** (Open/Closed)	Palpebral reflex- Y N Menace reflex- Y N
Type of response	↑ ↓ Activity ↑ ↓ Responsiveness ↑ ↓ Respirations ↑ ↓ Heart rate ↑ ↓ Other		

Use additional data sheets if needed for additional comments or if more than 4 agents were used

Comments: On a scale of 1-5, where 1=very poorly and 5=very well, how did this event go? 1 2 3 4 5

Please check any areas where problems occurred and elaborate below:

- ☐ Personnel/public safety
- ☐ Animal response/behavior
- ☐ Drug/tool availability
- ☐ Disposal
- ☐ Media/public response
- ☐ Other (please explain)

Please return form to:
Virginia Aquarium
Stranding Response
717 General Booth Blvd
Virginia Beach, VA 23451
vaqstranding@gmail.com
fax 757-437-4933

Instructions for Filling Out the Cetacean Euthanasia Record

Overview

This cetacean euthanasia record has been developed and distributed as part of a NOAA John H. Prescott Marine Mammal Rescue Assistance Grant Program project titled: "The Collaborative Development of Stranded Cetacean Euthanasia Recommendations". The goal of this project is to develop recommendations for stranding networks to facilitate the humane euthanasia of live stranded cetaceans when rehabilitation or release is not an option.

The collection and compilation of data from this euthanasia record is a critical part of the project. These data, as well as national historic cetacean euthanasia information, will be compiled and entered into a database that was specifically designed with this data record for our project. An expert advisory panel will examine and evaluate this information. Potential correlations regarding effects and outcomes as they relate to various methods of euthanasia (ex. techniques, drug types and doses, etc.) and the stranding situations encountered (ex. mass or single stranding, species specific reactions, logistics, environmental conditions, etc.) will be investigated. This information, as well as published information, will be used to assist in the determination of cetacean euthanasia recommendations. A final workshop report including the recommendations will be distributed to all contributors and participants. All participants will be acknowledged for their contribution to this project in any resulting products.

This cetacean euthanasia record will also facilitate standardizing data collection for cetacean euthanasia efforts.

Below we have provided instructions and explanations for entering information and data into the cetacean euthanasia record.

Identification Section

Field Number: Unique identifying number originally assigned to the animal by responder/responding organization. This number should coincide with the same information on the Marine Mammal Stranding Report – Level A Data.

Species: Genus and species and/or common name of the animal

Date: Date that the euthanasia was performed

Euthanizing Agency: Name of the lead Stranding Agreement holder or agency performing the euthanasia

Initial Report Time: Time of earliest known report of the animal to the responding agency

Time of Arrival: Time of arrival on scene by the responding agency

*Be sure to use the **Comments** section on the back of this record to expand on observations, descriptions, etc.*

***Decision to perform euthanasia authorized by __________ @ NOAA and reason for euthanasia*:** enter the name of the NOAA staff person who authorized the euthanasia and document the factor(s) that influenced the decision to euthanize the animal (*example: severe injury, species, size, age, logistics, lack of rehab facility, etc.)*

Pre-Euthanasia Data Section

Pre-euthanasia data time taken: record the time of initial examination

Heart rate: record the number of heart beats per one minute (*example: 30 beats/1 min*)

Circle the method used to determine heart rate:

Palpate: feel heart beat with hand

Auscultate: listen for internal heart sounds, generally with a stethoscope

Resp. rate; exudate (Respiratory exudate): record the number of breaths per 3 minutes (*example: 4 breaths/3 min*)

Circle **Y** if exudate is observed around blowhole and write description in comments section

(*ex. clear, foam, blood, other*); Circle **N** if none is observed

Resp. character (Respiratory character): the quality, depth, ease of breaths

Circle most accurate descriptions regarding strength and regularity:

Strong: "normal" forceful breaths

Weak: depressed or shallow respirations

Pre-Euthanasia Data Section *(continued)*

Body temp.: ***(˚F C)*** If actual body temperature taken, record degrees Fahrenheit or Celsius

Skin @ _______: describe anatomical area used to determine skin temperature

Circle most accurate description of palpated skin temperature:

Warm: a slight, comfortable heat evident

Cool: lacking heat, "clammy"

ND: no data

Attitude: the animal's behavior/action (or lack thereof)

Circle most accurate description(s):

Alert: animal is alert and aware, follows movement with eyes

Lethargic: animal is sluggish or inactive, eyes closed, little reaction to touch/sound

Non-responsive: animal is not reactive to stimuli

Body position: the position of the animal's body upon initial discovery

Circle the most accurate description(s):

ND: no data

Upright: laying on ventrum

Left side up: laying on right side, right lateral recumbency

Right side up: laying on left side, left lateral recumbency

Method of Euthanasia:

Circle all methods that apply:

Pre-euthanasia Sedation: Circle if chemical agent(s) administered to the animal prior to euthanasia, including: tranquilizers (*ex. acepromazine maleate*), sedatives (*ex. xylazine*), immobilizers (*ex. ketamine*) and/or general anesthetics (ex. *tiletamine-zolazepam*)

Chemical Method: Circle if chemical agent(s) administered to euthanize the animal

Non-Chemical Method: Circle if euthanasia method included the use of non-chemical methods

Describe: describe method(s) used (*ex. ballistics – include type of firearm and ammunition used; exsanguination – include type of equipment used and anatomical location; etc.*)

Agent # Sections

We have provided "Agent #" sections for you to record the administration of up to four chemical agents (*#1 & #2 on first page, #3 & #4 on second*). If you did not administer any chemical agents please record N/A after Agent 1. If you used more than 4 agents, please use additional data sheets.
The Agent sections refer to the animal's response to the actual drug or agent (or the effect of the agent on the animal), not the physical reaction to the administration of the agent(s).

Location of animal during administration of Agent #:
Circle most appropriate answer:
- ***Water:*** Circle if "Agent #" was administered while the animal was being maintained in water body
- ***Shore:*** Circle if "Agent #" was administered while the animal was being maintained on a beach, marsh, mudflat, sandbar, etc.
- ***Vehicle:*** Circle if "Agent #" was administered while the animal was being maintained in a vehicle
- ***Facility:*** Circle if "Agent #" was administered while the animal was being maintained at a facility
- ***Other:*** Circle if "Agent #" was administered while the animal was in an area not listed (*example: on boat, etc.*)

Time of admin. (administration): record the time that "Agent #" was administered
Drug and conc. (concentration): record the name of drug(s) administered and its concentration(s) (*example: number of mg/ml*)
Amount: Record the total amount of "Agent #" administered to the animal (*total mls or mgs*)
Route: Circle most appropriate answer(s):
- ***IM (Intramuscular):*** into the muscle
- ***IV (Intravenous):*** into the vein
- ***IP (Intraperitoneal):*** into the peritoneal cavity
- ***IH (Intrahepatic):*** into the liver
- ***IC (Intracardiac):*** into the heart
- ***Other:*** circle if route used is not listed and write in most appropriate answer

Injection site: Circle most appropriate answer(s) and then write the anatomical location(s) in which the agent was administered:
- ***R:*** right
- ***L:*** left
- ***D:*** dorsal
- ***V:*** ventral
- ***Body area:*** anatomical location (*ex. fluke, epaxial muscle, etc.*)
  (*ex. If administered in the dorsal side of right fluke =* ***R L D V body area:*** *fluke*)

Response to agent: Did animal exhibit any reaction to the drug administered
Circle most appropriate answer:
- ***Y:*** if a response was observed after "Agent #" administered (*ex: animal becomes more sedate/agitated, heart rate or respirations decrease/increase, etc.*) and complete the next sections for "time of response" and "type of response"
- ***N:*** if no response was observed. Skip "time of response" and "type of response" and move on to "heart rate", etc.

Time observed: Record time(s) response(s) was observed
Type of response: Describe response(s) to agent(s)
Circle most appropriate answer(s) (↑= increase, ↓= decrease)
- ***Activity:*** amount of body movement (*ex. Twitching, fluking, etc*)
- ***Responsiveness:*** animal's reaction to stimuli
- ***Respirations:*** number and/or strength of respirations/minute
- ***Heart Rate:*** number and/or strength of heartbeats/minute

Agent # Sections (*continued)*

Heart rate: same definitions and instructions as in the "pre-euthanasia" section
Resp. rate: same definitions and instructions as in the "pre-euthanasia" section
Resp. character (Respiratory character): same definitions and instructions as in the "pre-euthanasia" section
Resp. exudate (Respiratory exudate): same definitions and instructions as in the "pre-euthanasia" section
Attitude: same definitions and instructions as in the "pre-euthanasia" section
Movement: same definitions and instructions as in the "pre-euthanasia" section
Eyes: same definitions and instructions as in the "pre-euthanasia" section

Post Euthanasia Data Section

Time of death: record time that the animal was presumed deceased
How determined: record method(s) used to determine death of the animal (*example: no heart beat or respirations for specified amount of time, no palpebral reflex, rigor mortis present, etc.*)
Carcass necropsied: circle **Y** if the animal was necropsied, **N** if carcass was not necropsied or **ND** (no data) if unknown
Carcass disposal method: record method of disposal of the carcass
- ***Bury:*** carcass placed in the ground and covered
- ***Landfill:*** carcass taken to landfill
- ***Render:*** carcass melted down
- ***Other:*** sunk, towed, incinerated, chemically dissolved, etc.

Comments and Observations Section

Indicate, on a scale of 1 to 5 with 1 being worst case and 5 being best case, how the euthanasia proceeded. From the list provided, check any areas where you had concerns about the event and elaborate in the comment area below.

Also use this section to document details and/or explanations regarding the event that may not be captured in other documents.
Information may include:

- weather or other environmental conditions
- comments on the outcome of the event (*ex. did the event go well or poorly and reasons for this opinion*)
- details and/or a timeline of reactions to specific agents
- safety issues
- other personal observations or comments

Use extra pages if needed.

9. Appendix B: Cetacean Euthanasia Matrix Tables (Barco *et al.*, 2016)

Small Cetacean Euthanasia Matrix

							Concerns specific to euthanasia				
#	Method	Drugs	Dose(s)	Route(s)	Pros	Cons	Responder safety	Ecotoxicity	Public perception	Needs	Research needs
	Not chemically limited										
1	Sedation followed by euthanasia solution	see table of effective drugs and dosages	see table of effective drugs and dosages	IM (sedatives) IV, IC, IP,	we know it works	disposal concerns	moderate	high	low	Need more data on best sedatives and drug combinations, moderate length needles needed for larger animals, better guidance on safe IV delivery	Need to research tissue residue levels by disposal method; need more data on lowest effective dose & better weight estimators
2	euthanasia solution only		1ml/10lbs	IV, IC, IP	we know it works; relatively inexpensive	possible negative reactions, disposal concerns	moderate, if not in surf and not administering via fluke	high	low if no rxn		Need more data on lowest effective dose & better weight estimators; tissue residue levels
	Barbiturate limited										
3	Over-sedation	see table of effective drugs and dosages	see table of effective drugs and dosages	IM, IV	no barbiturate, can be achieved without controlled drugs	may take longer (~hour) in deep diving species, higher doses may still be a risk for relay toxicity	moderate	moderate	low	need to compile dosage data and protocol for determining when animal is over-sedated	
4	Sedation followed by KCl	see table of effective drugs and dosages	see table of effective drugs and dosages	IM, IV, IC, IP,	fewer chemicals, no barbiturate; volume KCl readily available and less expensive	requires deep sedation	moderate	low/moderate	low	need to compile dosage data and protocol for determining when animal is sedated enough to adminster KCl	
5	Sedation followed by exsanguination	see table of effective drugs and dosages	see table of effective drugs and dosages	IM, IV	fewer chemicals, no barbiturate, less expensive	requires deep sedation; needs training; disturbing to responders and public	high	low/moderate	high	need to compile dosage data and protocol for determining when animal is sedated enough, need better training and development specialized tools (two-bladed knives)	training and diagram(s) needed
	Chemically limited (for various reasons)										
6	exsanguination		NA	NA	no drugs; inexpensive	method of last resort; disturbing to responders and public	high	zero	high	need better training especially in thorascic cuts, two bladed knife?	training and diagram(s) needed
7	ballistics		NA	NA	no drugs, ammunition inexpensive	some responders need training and access to firearm, may be disturbing to responders and public	low	low	high	need better training, need to acquire appropriate weapons and ammunition; permitting	training and diagram(s) needed
8	natural death		NA	NA	no drugs	can take a long time; public safety; requires constant site/PR management	low	zero	high	need to educate local enforcement; NOAA deputize local enforcement; public safety issues	

Large Whale Euthanasia Matrix

#	Method	Drugs	Dose(s)	Route(s)	Pros	Cons	Concerns specific to euthanasia: Responder safety	Ecotoxicity	Public perception	Needs	Research needs
	Not chemically limited										
1	Sedation followed by euthanasia solution	see table of effective drugs and dosages	see table of effective drugs and dosages	IM, IV, IC, IP, IT, RB, IN	we know it works if we have enough drugs	need large drug volumes on hand; expensive, availabilty issues	moderate	high	low	Safe delivery of drugs for animal in water ; very long needles just developed, may need to stock-pile drugs	Need to research pole delivery of sedation; tissue residue levels
2	Euthanasia solution only			IV, IC, IP, IT	we know it works; inexpensive	need large drug volumes on hand; possible animal reactions	high	high	low if no rxn	Safe delivery of drugs for animal in water; very long needles just developed; may need to stock-pile euthanasia solution	Need to research pole delivery of euthsolution; tissue residue levels
	Barbiturate limited										
3	Over-sedation	see table of effective drugs and dosages	see table of effective drugs and dosages	IM, IV	no barbiturate, can be achieved without controlled drugs	drug volumes needed may not be readily available, may take >hr, higher doses may still be a risk for relay toxicity	moderate	moderate	low	need to compile dosage data and protocol for determining when animal is over-sedated; may need to stock-pile sedatives	
4	Sedation followed by KCl	see table of effective drugs and dosages	see table of effective drugs and dosages	IM, IV, IC, IP, IT, RB, IN	fewer chemicals, no barbiturate; volume KCl readily available and inexpensive	requires deep sedation	moderate	low/moderate, depending on agent, more info needed	low	safe delivery of drugs for animal in water ; very long needles just developed; need to compile dosage data and protocol for determining when animal is over-sedated;	
5	Sedation followed by exsanguination	see table of effective drugs and dosages	see table of effective drugs and dosages	IM, IV	fewer chemicals, no barbiturate	requires deep sedation; need training	high	low/moderate, depending on agent, more info needed	high	need better training; need to compile dosage data and protocol for determining when animal is over-sedated; need to design knife or lance (long, thin double bladed semi-stiff, knife-stiletto)	training and diagram(s) needed
	Chemically limited (for various reasons)										
6	Exsanguination		NA	NA	no drugs; inexpensive	method of last resort	high	zero	high	need better training, need to design knife or lance	training and diagram(s) needed
7	Cranial implosion (Cochran et al. 2012)		NA	peri-cranial	no drugs	logistics, training, carcass destruction, not foolproof	high	zero	unknown/needs education	legal issues regarding explosives handling, supply,	Can only be a reality in the US if federally supported for training/deployment (DOD; mining, demolition expts) directed by NOAA
8	Ballistics		NA	NA	no drugs, ammunition inexpensive	not on animals >7m	low	zero	high	need better training, need to acquire appropriate weapons and ammunition; permitting	training and diagram(s) needed
9	Natural death		NA	NA	no drugs	can take a long time; public safety; requires constant site/PR management	low	zero	high	need to educate local enforcement NOAA deputize; local enforcement public safety issues	

10. Appendix C: Effective Cetacean Euthanasia Methods (Barco *et al.* 2016)

Category	# of agents	*Acceptability	AGENT 1 Generic Name	AGENT 1 Dose	AGENT 1 Route	AGENT 1 Comments	AGENT 2 Generic Name	AGENT 2 Dose	AGENT 2 Route	AGENT 2 Comments	AGENT 3 Generic Name	AGENT 3 Dose	AGENT 3 Route	AGENT 3 Comments	AGENT 4 Generic Name	AGENT 4 Dose	AGENT 4 Route	AGENT 4 Comments
CONTROLLED DRUG LIMITED																		
Oversedation *It may require 3 x the normal dosage to accomplish euthanasia. Over-sedation with other drugs would also be acceptable, refer to the survey-based tables and use clinical judgement*	2	*Acceptable *(Once effects of IM administration are realized, it is acceptable to administer subsequent drugs IC)*	Acepromazine	1 mg/kg	IM	Allow approximately 10 minutes between administrations. Repeat as needed to accomplish euthanasia. Adverse reaction has been observed when administered to Delphinus.	Xylazine	2 mg/kg	IM	Allow approximately 10 min for acepromazine to take effect prior to xylazine administration. Adverse reactions have been observed when administered to Grampus without prior administration of another sedative/tranquilizer. Repeat as needed to accomplish euthanasia.								
Heavy Sedation followed by KCl		**Conditionally Acceptable ONLY if animal is heavily sedated	Midazolam	0.05-0.1 mg/kg	IM	Omit if not available or if controlled drugs are not an option. Allow approximately 10 minutes between administrations. Administer sedatives prn sequentially to effect prior to KCL.	Acepromazine	0.2-1 mg/kg	IM	Allow approximately 10 minutes between administrations. Administer sedatives prn sequentially to effect prior to KCL. Adverse reaction has been observed when administered to Delphinus.	Xylazine	3-4 mg/kg	IM (or IV if safe)	Allow approximately 10 minutes between administrations. Administer sedatives prn sequentially to effect prior to KCL. Adverse reactions have been observed when administered to Grampus.	KCL Administer complementary doses of sedatives as necessary to render animal unresponsive to KCL injection	1-2 mmol/kg (75-150 mg/kg)	IC	IV may require higher dose than IC. Especially when carcass removal is an issue (ecotoxicological impact)
Heavy Sedation followed by exanguintation		**Conditionally Acceptable ONLY 1) if animal is heavily sedated; 2)personnel is skilled and knowledge about proper severing sites	Midazolam	0.05-0.1 mg/kg	IM	Omit if not available or if controlled drugs are not an option. Allow approximately 10 minutes between administrations. Administer sedatives prn sequentially to affect prior to exsanguination.	Acepromazine	0.2-1 mg/kg	IM	Allow approximately 10 minutes between administrations. Administer sedatives prn sequentially to effect prior to KCL. Adverse reaction has been observed when administered to Delphinus.	Xylazine	3-4 mg/kg	IM (or IV if safe)	Allow approximately 10 minutes between administrations. Administer sedatives prn sequentially to effect prior to KCL. Adverse reactions have been observed when administered to Grampus.	Exsanguinate	Need better information and training. This method requires a solid anatomic knowledge, training and appropriate tools. Sites may include: ventral peduncle, brachial artery, *deep neck area (*noting that cetaceans do not have large superficial carotid arteries)		
Ballistics		**Conditionally Acceptable in small cetaceans ONLY if personnel are well trained and knowledgeable	Need better information and training. Techniques can be found in RSPCA (1997) for small cetaceans, Blackmore (1995) for pilot whales and Suisted (1999) for baleen whales				Shooter must have proper equipment and knowledge of cetacean cranial anatomy. Site must have strict crowd contral.			Disarticulating the brain from the spinal cord at the occipital condyles is the goal. The recommended target area in guidelines is 1/2 way between the eye and flipper insertion with either dorsal or lateral entry. Never fire with barrel in direct contact with the animal. Be sure caliber size matches animal. Projectiles track off target with thick soft tissue coverage. Do NOT fire at the melon from the front of the animal, bullet may ricochet.					Not acceptable with sperm whales >7m. Conditionally acceptable in cetaceans under 7m in length			
Explosives		Not currently acceptable in US	See Coughran *et al.* 2012				Must have qualified, permitted personnel and directional or shaped charges (see reference).								Permitting is likely to be a problem in the US.			

"Normal Sedation" drug dosages for cetaceans

Butorphanol	0.05 to .1mg/kg IM	Has been used in right whales at 0.1 mg/kg with midazolam at 0.1 mg/kg
Diazepam	0.05 to 0.1 mg/kg IM	Less consistant than midazolam IM Meperidine 0.5 to 2 mg/kg IM. Has been used in conjunction with midazolam at 1 mg/kg or higher
Midazolam	.05 to .1 mg/kg IM	Can be given at higher levels and in combinition with

Cetacean stranding situations and species can be extremely complex and diverse. Taking this into consideration ,below we have listed dosages for several agents NOT typically used in clinical cetacean sedation for those times when these are the only options available. These drugs are not generally used in healthy animals but may be considered for euthanasia if no other drugs are available. Typically the dosage for euthanasia is three times the theoretical dose in order to avoid suffering and promote a quiet death.

Other drugs used for cetacean euthanasia protocols BUT NOT USED FOR CLINICAL CETACEAN SEDATION

Acepromazine (1 mg/kg); Medetomidine (40-80 mcg/kg); Detomidine (30-60 mcg/kg); Xylazine (2mg/kg)

** Acceptable methods: most consistently result in most humane cetacean euthanasia and fewer public safety hazards.*

***Conditionally Acceptable methods: not considered humane and greater potential for public safety hazards.*

11. Appendix D: Large Whale Sedation and Euthanasia Drug Examples

In beached whales, sedation has been used to reduce resistance to limit the risk during procedures (Moore *et al.* 2010) or used prior to administering euthanasia. Below are Tables 1 and 2 outlining drug combinations for use in live stranded whales that may be released and sedation drugs to be used prior to euthanasia.

Table 1: Large whale sedative dosage for whales that might be released (Moore *et al.* 2010, Moore *et al.* 2012)

Sedation Drug	**Dosage**
Midazolam (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Midazolam (regular conc.)	0.1 mg/kg x 10,000 kg = 1000mg = 200 ml of 5mg/ml solution
Butorphanol (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Butorphanol (regular conc.)	0.1 mg/kg x 10,000 kg = 1000 mg =100 ml of 10mg/ml solution
Reversal Drug	**Dosage**
Naltrexone (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution

Table 2: Large whale sedative dosage prior to euthanasia (IFAW based on Harms *et al.* 2014)

Sedation and Euthanasia Drugs Option 1 – Smaller Whales	**Dosage**
Midazolam (compounded conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 10 ml of 50mg/ml solution
Midazolam (regular conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 100 ml of 5mg/ml solution

Butorphanol (compounded conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 10 ml of 50mg/ml solution
Butorphanol (regular conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 50 ml of 10mg/ml solution
Acepromazine	0.2 mg/kg x 2,500 kg = 500 mg = 50 ml of 10mg/ml solution
Xylazine	1-3 mg/kg x 2,500 kg = 2,500-7,500 mg = 25-75 ml of 100mg/ml solution
Pentobarbital	87 mg/kg x 2,500 kg = 217,500 mg = 558 ml of 390mg/ml solution
Sedation and Euthanasia Drugs Option 2 – Larger Whales	**Dosage**
Midazolam (compounded conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 40 ml of 50mg/ml solution
Midazolam (regular conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 400 ml of 5mg/ml solution
Butorphanol (compounded conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 40 ml of 50mg/ml solution
Butorphanol (regular conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 200 ml of 10mg/ml solution
Acepromazine	0.2 mg/kg x 10,000 kg = 2,000 mg = 200 ml of 10mg/ml solution
Xylazine	1-3 mg/kg x 10,000 kg = 10,000-30,000 mg = 100-300 ml of 100mg/ml solution
Potassium chloride (KCL saturated soln ~300mg/ml.)	100 mg/kg x 10,000 kg = 1,000,000 mg= 3,333 ml of 300mg/ml solution

Protocol for sedation prior to euthanasia in large baleen whales (IFAW based on Harms et al. 2014):

Option 1: For smaller baleen whales (subadult minkes, humpback calves), sedation & sodium pentobarbital. This may be utilized if the carcass can be disposed of properly to minimize secondary poisoning and environmental contamination.

<u>Sedation and traditional pentobarbital euthanasia:</u>

- Midazolam +/- Butorphanol 0.2 mg/kg IV/IM
- Wait 10-20 min, then acepromazine 0.2 mg/kg IV/IM
- Wait 20+ min, then Xylazine 1-3 mg/kg IV (IM)
- Wait 5 min (until sedation apparent) then sodium pentobarbital 1ml/10 lbs (87mg/kg) IV

Option 2: For larger baleen whales. If leaving a carcass in situ after using this option, all IM injection sites should be excised and disposed of properly.

<u>Sedation and intra-cardiac KCL chloride:</u>

- Midazolam +/- Butorphanol 0.2 mg/kg IV/IM
- Wait 10-20 min, then acepromazine 0.2 mg/kg IV/IM
- Wait 20+ min, then Xylazine 1-3 mg/kg IV (IM)
- Wait 5 min – assess sedation level, if not unconscious repeat dosing as needed
- Once the whale is unresponsive (no palpebral reflex, no menace response, no jaw tone, no blowhole tone, no flipper tone, no nociception/pain), inject 100 mg/kg supersaturated KCL solution via appropriate length intracardiac needle.

12. Appendix E: Pinniped Sedation and Euthanasia Drug List

The following table lists the drugs currently used in pinnipeds, possible adverse effects, and the pharmacokinetics of each drug (i.e., known information on how the body responds to the drug, including how the drug is absorbed, distributed, the rate of action and duration of effect, chemical changes in the body, and effects and routes of excretion of metabolites).

Drug Name	Dosage/Route of Administration	Use in pinnipeds	Possible Adverse Effects	Pharmacokinetics
Butorphanol	0.05-0.2 mg/kg PO, SQ, IV, IM (higher doses up to 1-5 mg/kg can be used for sedation pre-euthanasia) (Haulena and Schmidt 2018)	Opiate partial agonist/antagonist. Used in combination with midazolam or diazepam to aid in deeper sedation, as necessary; mildly analgesic	Adverse effects in dogs/cats include ataxia, anorexia or diarrhea (rare) and are typically less severe than adverse effects reported in full opiate agonists. May cause CNS depression or excitation in dogs. Can increase parasympathetic tone and decrease blood pressure and heart rate; these cardiovascular effects are similar to but lesser than opiate agonists. (Plumb 2008)	Fully absorbed with oral administration but undergoes substantial first-pass effect. Fully metabolized in liver. Onset of action is 3 min. in horses with peak effect at 15-30 min and duration of action up to 4 hours. (Plumb 2008)
Diazepam	0.1-0.3 mg/kg IV (up to 0.5-1 mg/kg IV for heavy sedation prior to euthanasia) (Haulena and Schmidt 2018, Plumb 2008)	A benzodiazepine used as a sedative (anxiolytic, muscle relaxant, hypnotic) for capture events or as a pre-anesthetic.	Dogs may exhibit CNS excitement; in horses may cause muscle weakness and ataxia; in cats may cause irritability, depression, aberrant demeanor.	Highly lipid soluble and widely distributed throughout the body; readily crosses blood-brain barrier and is highly bound to plasma proteins; metabolized in liver to active metabolites nordiazepam, temazepam, and oxazepam, which are eliminated primarily in urine.

Midazolam	0.15-0.3 mg/kg IV, IM (higher doses up to 1-2 mg/kg can be used for sedation pre-euthanasia)	An injectable benzodiazepine used as a sedative for capture events or as a pre-anesthetic.	Few adverse effects have been reported in humans including effects on respiratory and cardiac rates and blood pressure; other effects reported in humans include pain on injection, local irritation, headache, nausea, vomiting, and hiccups. Possibility of respiratory depression is a principal concern in veterinary patients.	Rapidly and nearly completely absorbed after IM injection; highly protein-bound and rapidly crosses the blood-brain barrier; metabolized in liver; elimination half-life in dogs averages 77 minutes and in humans is approximately 2 hours.
Potassium Chloride	100mg/kg IV (saturated solution 300mg/ml)	Euthanasia. Requires heavy pre-sedation with other sedatives prior to use.		
Sodium pentobarbital	60-120 mg/kg IVCRC Handbook, 6th Ed.)	Euthanasia.	Barbiturates depress the CNS in descending order starting with the cerebral cortex and loss of consciousness progressing to anesthesia; with overdose, deep anesthesia progresses to apnea due to depression of the respiratory center, followed by cardiac arrest (AVMA 2020).	Onset of action within 1 minute after IV administration. Distributes rapidly to all body tissues with highest concentrations in the brain and liver.
Tiletamine/ Zolazepam (Telazol)	1 mg/kg IM, IV (higher doses up to 5-10mg/kg can be used for sedation pre-euthanasia)	Anesthetic/tranquilizer would be used for pre-medication to make animal more amenable to handling for euthanasia.	Apnea, bradycardia, tremors reported in multiple phocid species; mortalities have occurred in small numbers of animals at higher doses (Haulena and Schmidt 2018). Can cause respiratory depression and apnea in most species, temporary pain is associated with IM injection (likely due to low pH).	Little pharmacokinetic information is available. Rapid onset of action (within 8 min in cats/dogs); mean duration of anesthesia is 27 min in dogs.

*References: Haulena, M. and T. Schmitt. 2018. Anesthesia. In: CRC Handbook of Marine Mammal Medicine, Third Edition, L.A. Dierauf, F.M.D. Gulland, and K. L. Whitman (eds.), CRC Press LLC, Boca Raton. Pp. 587-606; Plumb, D.C. 2008. Veterinary Drug Handbook, Sixth Edition. Blackwell Publishing, Minnesota. 1120p.

Appendix XIV

Marine Mammal Carcass Disposal Best Practices

Executive Summary

Every year in the United States, thousands of marine mammals strand dead or strand alive and subsequently die. While not all carcasses can or will be disposed of due to a variety of factors (*e.g.,* location, available resources, etc.), the Stranding Network should strive to conduct proper handling and disposal of marine mammal carcasses when disposal is feasible. There are a variety of methods that can be used to dispose of marine mammal carcasses, but they generally fall into two categories- *remain in the environment* and *remove from the environment*. Every method has benefits and drawbacks and no one method is suitable for every stranding situation. **Planning for general carcass disposal should be part of normal stranding response planning efforts with disposal methods and facilities pre-identified for normal carcass types encountered. For rare live strandings (*e.g.,* large whales) planning for carcass disposal should begin as soon as the responders determine that the animal will not survive the stranding event or the animal has expired.** This document will weigh the benefits and drawbacks of all carcass disposal methods, which can help you make decisions as to the best course of action, given a particular stranding scenario.

Table of Contents

1. Introduction

2. Background

From 2009-2017, an average of 3,800 marine mammals stranded each year within the U.S., either dead or alive but subsequently died. Marine mammals may carry infectious diseases that can spread to humans or domesticated animals, if the public or domesticated animals interact with the carcass. Additionally, some marine mammal species may carry loads of contaminants in their tissues. Lastly, some of the marine mammals that strand are euthanized using veterinary drugs. Chemical euthanasia, including sedation and euthanasia drugs, may have impacts on the environment if the carcass is not disposed of properly.

Carcass disposal methods for stranded marine mammals fall into two main categories- *remain in the environment* and *remove from the environment*. *Remain in the environment* methods use decomposition to slowly breakdown the carcass over many months or years. While these methods mimic what would have naturally happened to a carcass that had no stranding response, there are some disadvantages to using these methods. Conversely, *remove from the environment* methods use controlled means to breakdown a carcass faster than would naturally occur. However, these methods also have some disadvantages including effectively removing the carcass from the ecosystem and associated food webs. No one method is recommended for every stranding, and several factors will need to be considered in order to determine the best carcass disposal option for each particular stranding event.

2.1 Legislation Pertinent to Marine Mammal Carcass Disposal

Congress delegates the responsibility for implementing the Marine Mammal Protection Act (MMPA) to the Secretary of Commerce and the Secretary of the Interior. Cetaceans and pinnipeds, exclusive of walruses (*Odobenus rosmarus*), are the responsibility of the National Marine Fisheries Service (NMFS). Walruses, polar bears (*Ursus maritimus*), manatees (*Trichechus manatus*), and sea otters (*Enhydra lutris*) are the responsibility of the US Fish and Wildlife Service (FWS). This document only addresses best practices for marine mammal species under NMFS jurisdiction – cetaceans and pinnipeds excluding walrus.

For NMFS species, MMPA section 112 (c) Stranding Agreements (SAs; formerly Letters of Agreement or LOAs) are formally established between the *NMFS Regions* and *Stranding Network Participants* as part of Title IV under the MMPA. The NMFS SA states that the Stranding Network Participant will obey laws, regulations, and guidelines governing marine mammal stranding response and rehabilitation. This includes requirements for communications with NMFS, humane care, husbandry, and veterinary care of rehabilitated marine mammals, and documentation of each stranding response and rehabilitation activity. Additionally, federal, state, and local government authorities may respond to stranded marine mammals under Section 109(h) of the MMPA. Neither 109(h) authority nor the SA authorizes the taking of any marine mammal species listed as endangered or threatened under the Endangered Species Act of 1973 (ESA), as amended. However, authorization to take ESA-listed species by the Stranding Network is currently provided under a NMFS MMPA/ESA Permit issued to the NMFS Marine Mammal Health and Stranding Response Program (MMHSRP), and requires authorization and direction from the NMFS Regional Stranding Coordinator in the event of a stranding involving a threatened or endangered marine mammal. **Understanding and following the MMPA and implementing regulations, policies, and guidelines, is the responsibility of all persons involved in marine mammal response.** These best practices are founded on and support the MMPA and related regulations. Nothing should be construed in these best practices to preempt state and local laws.

2.2 Purpose and Intended Uses

These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations. These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a “living document,” and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

The proper disposal of marine mammal carcasses is an important aspect of stranding response. There are several carcass disposal methods that can be employed, and the appropriate choice will vary based upon different factors, such as the species, the number of carcasses, the size of the animal, location of the carcass, and other logistics. Another important consideration when weighing options is if the carcass contains drugs (euthanasia or other medications). These Best Practices are provided by NMFS’ MMHSRP for use by authorized marine mammal stranding network organizations (including rehabilitators), other natural resource management agencies, On-Scene Coordinators, and necropsy team leaders, as a guide and recommendations to choosing the best carcass disposal method based upon a variety of factors in a specific case. More specifically, these Best Practices provide key information to standardize activities of carcass disposal based upon several factors, including:

- The size of the carcass;
- The accessibility and conditions at the location where the stranding occurred; and
- The amount and type of drugs in the carcass (if any)

These best practices are a "living document" and are not intended for independent use as a training manual. They have been developed to serve as guidance and recommendations for appropriate marine mammal carcass disposal, as such, we plan to periodically review and update them as new information becomes available.

2.3 Funding

Marine mammal stranding events can present challenges in carcass disposal, often requiring personnel and equipment resources of local or state agencies. Authorized marine mammal stranding response organizations may choose to collect or perform a necropsy in the field on select carcasses to aid in scientific data collection, in which they will be responsible for arranging or coordinating with partner agencies for disposal. Local or state government agencies may be responsible for disposal of marine mammal carcasses stranded on public property, and likewise federal agencies are responsible for disposal of carcasses that strand on federal property. If the marine mammal is listed as an endangered species, local, state, or federal government agencies are required to consult with NMFS to acquire authorization for disposal activities, and coordinate appropriate disposal methods with the local marine mammal response organization. Many local or state governments have annual funds allocated to wildlife carcass disposal, and it is recommended for coastal communities to consider allocating funds toward marine mammal carcass disposal. Coastal communities may experience an increase in stranding events during disease outbreaks or Unusual Mortality Events (UME), requiring handling and disposal of an increased amount of marine mammal carcasses. Coastal communities should coordinate with local stranding response organizations to prepare for increased demands and costs for disposal activities associated with elevated marine mammal mortality. Costs associated with carcass disposal during a Marine Mammal UME are not reimbursable through the UME National Contingency Fund (in accordance with section 405 of the MMPA). For additional information regarding UME expense reimbursement, contact the UME Executive Secretary or the NMFS regional or national stranding coordinator. The John H. Prescott Marine Mammal Rescue Assistance Grant Program is an annual competitive grant program that is also available as a funding source for marine mammal stranding response. Funds awarded under the Prescott Grant

Program can be used for carcass disposal. More information on this program can be found on the following website: https://www.fisheries.noaa.gov/grant/john-h-prescott-marine-mammal-rescue-assistance-grant-program.

3. Planning, Types of Carcass Disposal, and Euthanasia Concerns

3.1 Planning for Carcass Disposal

Plans for general carcass disposal should be evaluated annually by the stranding network organization to identify the appropriate methods and facilities to be used for carcass disposal based upon common carcass types encountered. This could include pre-identifying facilities that can receive carcasses or equipment needed to bury or remove carcasses from the beach. Communication with respective state, federal or local land management agencies within the area covered by the stranding network organization should also be part of the planning process to ensure that appropriate plans or permits as necessary for stranding response activities within managed areas are established prior to a stranding incident. Additionally, in many areas of the U.S., coordination with Native American, Alaska Natives, and cultural practitioners may be necessary to ensure that they are able to conduct their customs and cultural practices on the animal. Planning for carcass disposal for rare strandings (*e.g.,* live large whales) should begin as soon as the responders determine that the animal will not survive the stranding event, especially if chemical euthanasia methods are considered.

In some instances, certain disposal methods may not be possible due the geography or logistics at the stranding location. Moving the carcass may help to increase the disposal options and/or minimize the drawbacks of a desired carcass disposal method. In these instances, the carcass may be transported to a secondary location before the appropriate disposal methods are employed. Carcasses can be transported by boat, road, or on foot, and the size and condition of the carcass as well as the distance from the stranding location and the secondary site will help to determine the best way to transport the carcass. The accessibility to foot, boat, or vehicle traffic at both the stranding location and the secondary site should be considered if the carcass will be moved.

Regardless of the specific carcass disposal method chosen, responders should be sure to use sufficient protection against infection with zoonotic pathogens, contaminants, and other risks associated with handling decomposing carcasses. When conducting any carcass disposal activities, responders should wear protective clothing, gloves, face masks and safety goggles, as necessary. Additionally, any equipment used to move and dispose of carcasses should be cleansed and disinfected to remove any zoonotic pathogens or contaminants.

3.2 Types of Carcass Disposal

Carcass disposal methods fall under two broad categories, *remain in the environment* methods and *remove from the environment* methods. *Remain in the environment* methods involve leaving the marine mammal carcass to decompose naturally. While it may take months or years for a carcass to fully breakdown, these methods are often more cost-effective, less complicated, and allow all of the nutrients in a marine mammal to be recycled into the natural environment. However, all toxins, medications, and certain euthanasia drugs (*e.g.*, pentobarbital) in the carcass may eventually be re-released into the environment or become a source of secondary poisoning for scavengers. *Remove from the environment* methods entail moving the carcass from the stranding site for disposal through controlled, often industrial, means. Removing and shipping a carcass to a proper disposal facility can be costly, but any toxins, medications, and euthanasia drugs in the carcass will be removed from the immediate environment.

3.3 Euthanasia and Carcass Disposal

Euthanasia is only administered after considering all aspects of the case, including the welfare of the animal, human safety, eco-toxicological hazards of euthanasia on-hand, carcass disposal options, and the availability of trained and licensed individuals (NMFS-OPR-56 [1]). Euthanasia methods for marine mammals have been summarized previously (AVMA 2020, Barco *et al.* 2016, Harms *et al.* 2018). When chemical euthanasia is used for wildlife, depending upon the chemicals used, precautions should be taken to minimize secondary poisoning of the environment and to minimize risks to scavengers. Animal scavengers may be adversely impacted by certain drugs, particularly euthanasia chemicals such as barbiturates, which may kill or severely injure any wildlife and domestic pets that prey upon a chemically euthanized marine mammal carcasses (O'Rourke 2002, Bischoff *et al.* 2011, Harms *et al*. 2014). Certain chemical euthanasia methods, such as saturated potassium chloride solutions in conjunction with heavy sedation, have a low risk of secondary poisoning for scavengers and may be used when other methods of disposal of the remains (*e.g.,* deep burial, rendering, incineration) are not available (AVMA 2020, Harms *et al.* 2014, Barco *et al.* 2016). Additionally, federal laws, such as the Migratory Bird Treaty Act, the Endangered Species Act, and the Bald and Golden Eagle Protection Act, protect wildlife from secondary poisoning from animals that have been chemically euthanized with barbituates, and violations may result in imprisonment for up to two years and fines up to $250,000 for individuals and $500,000 for organizations. Therefore, it is imperative that animals that are euthanized with chemicals known to cause secondary poisoning (*e.g.,* pentobarbital) are disposed of in a responsible manner (*e.g.,* rendering, incineration, composting) that removes the risk of secondary poisoning from the environment. Similarly, some animals may be euthanized using physical methods (*i.e.*, ballistics), and lead ammunition may be poisonous to scavengers. Therefore, non-lead ammunition is recommended. If lead ammunition is used, it should be removed from the carcass prior to using *remain in the environment* disposal methods.

3.4 Considerations for Remain in the Environment Methods

Remain in the environment methods use natural decomposition to dispose of marine mammal carcasses. These methods include:

- *Remain in place* – the carcass is left above ground, in the tidal zone, or in shallow water areas, either in the original stranding location or moved to another site
- *Burial* – the carcass is buried
- *Return to the sea* – the carcass is towed offshore and released floating at sea
- *Sinking* – the carcass is towed offshore and sunk

Remain in the environment methods have many benefits. First, these methods allow for the carcass to naturally break down, which allows nutrients to return to the environment. Marine mammal carcasses are an important component of the ecosystem serving as an important food and nutrient source for terrestrial scavengers when on a beach (including ESA-listed species such as the California condor), insects, and microbes. Marine mammal carcasses that sink at sea are an important food and nutrient source for entire seafloor communities (Stockton and DeLaca 1982; Smith and Baco 2003; Fallows *et al.* 2013). A single large whale carcass provides a substantial contribution of nutrients to the environment; while pinniped and small cetacean carcasses are individually smaller, the volume of these species also provide a significant contribution. As large whale carcasses may be too large to easily remove from the stranding location, leaving them in the environment to naturally decompose can also be cost-effective. Similarly, marine mammals may strand in remote or inaccessible areas, which may also prevent or make unnecessary the removal of the carcass from the stranding location. In these situations, leaving the carcass to slowly decompose will help to conserve the responding organization, local, state, or federal agencies' resources and allow the carcass to serve multiple ecological functions. Ideally, with approval from the proper authorities, steps should be taken to ensure that a carcass left at the stranding site is not easily accessible to humans or domesticated animals, to prevent the possibility of infectious disease transmission.

There are some drawbacks to disposal methods that leave carcasses in the environment. These methods rely on microbes, and in some cases scavengers, to breakdown the carcass. As a result, these methods take longer to fully dispose of a carcass when compared to *remove from the environment* methods.

Another potential disadvantage when using these methods is that all of the components of the marine mammal carcass are returned to the environment. Marine mammal carcasses may contain toxic chemicals and substances that may be present in high levels through the process of bioaccumulation (Gray 2002). When these carcasses are allowed to remain in the environment to slowly breakdown, these chemicals are released back into the environment. Some larger marine mammal species, such as whales, may contain significant loads of these materials. It is important to note that if the marine mammals did not strand ashore, but died and sank at sea or came ashore in a remote location where it was not observed, these chemicals would be released back into the environment and therefore are generally part of the natural cycle.

Similar to toxic material that may bioaccumulate in marine mammal tissues over the animal's lifetime, certain chemical euthanasia drugs (*e.g.*, pentobarbital) that were administered to the animal may also be released into the environment if these disposal methods are employed. Consequently, the MMHSRP does not recommend that *remain in the environment* methods are used if the animal was euthanized using pharmaceuticals, such as pentobarbital, that is known to cause secondary poisoning in scavengers.

Return to the sea methods and sinking carcass disposal require authorization under the Marine Protection, Research and Sanctuaries Act (MPRSA), sometimes referred to as the Ocean Dumping Act. The MPRSA prohibits the transport of any material, including marine mammal carcasses, for the purpose of ocean dumping, except as authorized by a permit. The Environmental Protection Agency (EPA) has issued
a general permit under the MPRSA to authorize the transport and disposal of marine mammal carcasses in ocean waters under specified conditions. The general permit authorization is available for any officer, employee, agent, department, agency, or instrumentality of federal, state, tribal, or local unit of government, as well as any MMHSRP Stranding Agreement Holder, and any Alaskan Native, who already may take a marine mammal under the MMPA and ESA, to transport from the United States and dispose of a marine mammal carcass in ocean waters. The general permit is intended to expedite required authorizations for ocean disposal when there is a need for such disposal. For certain situations where the general permit may not be applicable, EPA may issue MPRSA emergency permits for the ocean disposal of marine mammal carcasses. EPA's permit process, among other things, requires consideration of hazards to navigation and may include coordination with the United States Coast Guard (USCG). For more information about the MPRSA general permit and EPA contacts for marine mammal carcass ocean

disposal inquiries, please see: https://www.epa.gov/ocean-dumping/ocean-disposal-marine-mammal-carcasses.

If a marine mammal carcass strands in a highly public area, and *remain in the environment* methods are determined to be an appropriate disposal method, efforts should be made to bury or remove the carcass to a more remote location, if practicable. If a carcass is located in a public area that precludes burial (*e.g.,* rocky beaches, areas with high water tables, protected or sensitive habitats, areas with protected cultural resources, etc.), if feasible, the animal could be moved to a nearby location that would allow burial or sinking.

3.5 Considerations for Remove from the Environment Methods

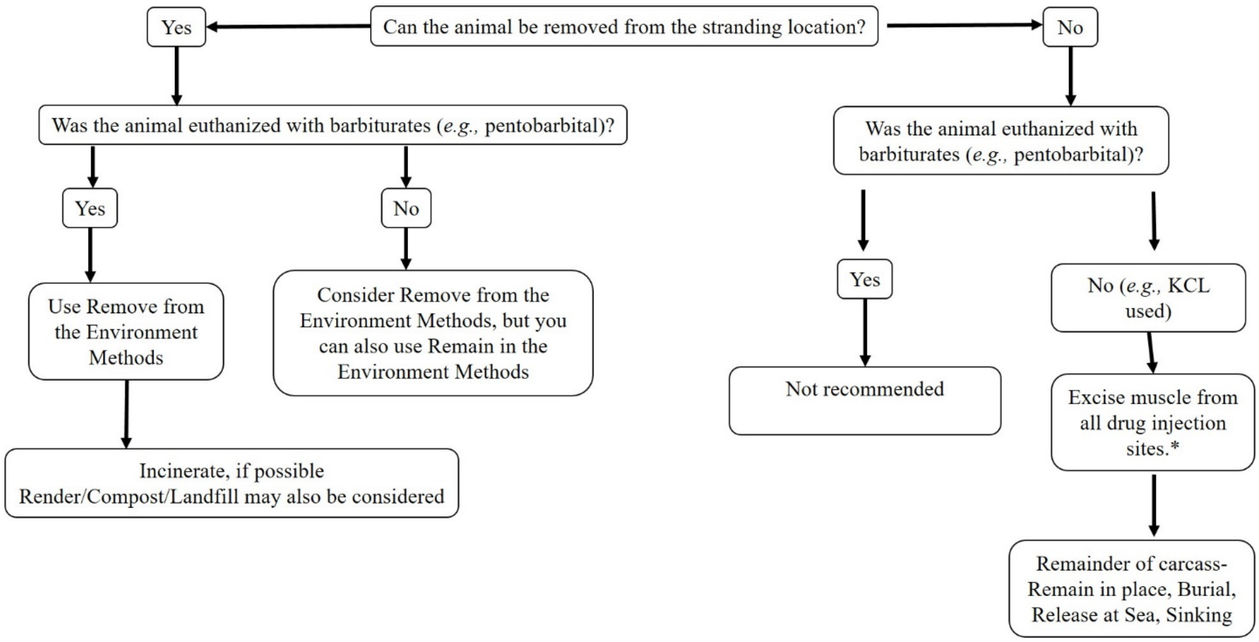
Remove from the environment methods involve physically moving the marine mammal carcass from the stranding location to a disposal facility. These methods include:

- *Landfill* – the carcass is buried in a licensed landfill
- *Render* – the carcass is brought to a rendering plant, where the tissues are repurposed for other uses
- *Incinerate* – the carcass is brought to an incineration plant
- *Compost* – the carcass is composted in a designated compost facility or site, or carcass digester

One benefit of these methods is that as the carcass is removed from the environment, minimizing the likelihood of infectious disease transmission to humans, domesticated animals, and wildlife. These methods either sequester the carcass or destroy the carcass and any associated pathogens. Therefore, these methods should be considered if the animal is suspected to have died from a disease that can easily spread to human or other animal populations. This can also be beneficial if the carcass is thought or known to contain toxic chemicals, such as certain chemical euthanasia agents (*e.g.*, pentobarbital), as some of these methods will effectively remove these substances from the environment. It should be noted that not all of these methods fully mitigate the dangers of some euthanasia chemicals, such as barbiturates. Therefore, networks should work with their local disposal facilities to ensure that those facilities are able to accept carcasses that contain these chemicals and will be able to mitigate the risk of secondary poisoning of scavengers and domesticated animals.

One of the drawbacks to these methods is that they are often more costly and may have more logistical constraints than *remain in the environment* methods. Additionally, they do not allow the carcass to serve as a food source for scavengers and recycle the nutrients contained within the carcass. Another drawback is that the removal method may have some adverse impacts to the surrounding habitat, especially if heavy machinery is used.

3.6 Decision Matrix



**Dispose of this tissue with* remove from the environment *methods*

This decision tree is intended to help outline how to determine the best option(s) for carcass disposal or a single animal in a given situation. All decisions on a specific disposal option should also take into account all federal, state, and local regulations as well as local disposal facility capabilities and coordination with appropriate officials.

3.7 Quick Reference Table

Method	Type	Size	Appropriate for Animals Euthanized with Drugs known to Cause Secondary Poisoning (*e.g.*, pentobarbital)?	Estimated Expense
Remain In Place	*Remain in the Environment*	Large or small	Not recommended	$
Burial	*Remain in the Environment*	Large or small	Not recommended	$-$$
Return to the Sea	*Remain in the Environment*	Large	Not recommended	$$-$$$
Sinking	*Remain in the Environment*	Large	Not recommended	$$$$
Landfill	*Remove from the Environment*	Large or small	Yes, if the facility's policy allows	$$
Render	*Remove from the Environment*	Small	Yes, if the facility's policy allows	$$$
Incinerate	*Remove from the Environment*	Small	Yes	$$$$
Compost	*Remove from the Environment*	Large or small	Yes, if the facility's policy allows	$$

4. Remain in the Environment Methods

4.1 Remain In Place

The remain in place method in the most basic carcass disposal method. This method involves leaving the marine mammal carcass to naturally break down in the same, or similar, area in which it was found stranded. This method requires minimal resources from the stranding network and landowner (if the stranding location is on private land). This method can be used for both small and large animals, and can be useful if the size of the animal or remoteness of the location creates logistical issues. This method can also be useful in protected and sensitive habitats, where minimal disturbance to the natural environment is preferred or where disturbance may impact another endangered species (*e.g.,* Snowy Plovers).

However, care must be taken when employing the remain in place method. This disposal method should not be used for animals that were chemically euthanized with drugs known to cause secondary poising, such as pentobarbital. The natural decomposition process often attracts scavengers, which may be secondarily poisoned by pentobarbital (AVMA 2020; Harms *et al*. 2014). Pets may also be attracted to the carcass, and may also be secondarily poisoned from pentobarbital (Bischoff *et al.* 2011). However, the remain in place method can be used with carcasses that have been euthanized with certain chemical euthanasia methods, such as saturated potassium chloride solutions in conjunction with heavy sedation, which have a low risk of secondary poisoning for scavengers (AVMA 2020, Harms *et al.* 2014, Barco *et al.* 2016).

Another consideration is the location of the stranding. Marine mammals may be vectors of infectious diseases which can be transferred to responders and domestic animals (Hunt *et al.* 2008). This method may allow the spread of these diseases to humans or domesticated animals, as the carcass is exposed and allowed to slowly breakdown on the beach. However, many pathogens naturally breakdown or are no longer viable after ultra-violet (sunlight) exposure, changes in temperatures (too hot or too cold), and anaerobic and acidic environments that may occur in a decomposing carcass so the amount of viable pathogens present in a carcass diminishes over time. Therefore, this method can generally be employed if the carcass is in an inaccessible or remote area, with minimal exposure to humans or domestic animals.

If the carcass is in a highly visible area, the smell may cause a negative public reaction. There has also been public concern in recent years that decaying marine mammal carcasses on beaches may attract sharks to the area, increasing the likelihood of shark-human interactions. However, there are no studies that have demonstrated that sharks are attracted to decaying marine mammal carcasses on land, and more research is needed to determine if marine mammal carcasses on land attract sharks (Tucker *et al.* 2018). Application of hydrated lime, or calcium hydroxide, can control odorous smells and facilitate faster decomposition. Hydrated lime has been applied to decaying large whale carcasses that are left in place to naturally decompose. This technique has also been used in remote areas that are inaccessible to heavy equipment, areas where burial is not an option, or the carcass was not in a condition to allow for towing offshore for disposal. While this product is easily obtained from hardware retailers, care should be taken when applying hydrated lime, as it can irritate skin and cause respiratory issues. Therefore, it is recommended that gloves and a mask are used when applying hydrated lime.

Benefits	**Drawbacks**
Cost-effective	Should not be used for animals euthanized with chemicals known to cause secondary poisoning (*e.g.*, pentobarbital)
Minimal effort	Does not reduce disease transmission

Minimal disturbance for protected and sensitive habitats	May be unsightly and cause offensive odors, leading to a negative public reaction
Nutrient source in ecosystem for scavengers, etc.	Possibility of vandalism and illegal harvesting of marine mammal parts
May be logistically necessary	
Ideal for inaccessible or remote areas	
May be required in some areas (*i.e.,* protected and sensitive habitats)	

4.2 Burial

The burial method is one of the more cost-effective carcass disposal options. This method involves burying the carcass in the same, or similar, location where the animal stranded. This method is useful when the size of the animal makes it difficult to safely or easily move, and the carcass is not located in an area that is recommended for Remain in Place (*i.e.,* is located in a highly trafficked area).

Burial offers some advantages. First, burying the carcass creates a barrier that reduces the likelihood of infectious disease transmission. Burial also reduces the likelihood of attracting scavengers, as the smell of the decaying carcass is minimized (Vantassel and King 2018). This may be advantageous in areas where attracting scavengers can become a nuisance or a danger to the public.

While this method may reduce predation on the carcass, burying carcass of animals euthanized with euthanasia drugs that are known to cause secondary poisoning to scavengers (*e.g.*, pentobarbital) is still not recommended. Pentobarbital may leach into the surrounding sediments and water table, and these substances may persist in the environment for a long time (Peschka *et al.* 2006). However, the burial method can be used with carcasses that have been euthanized with certain chemical euthanasia methods, such as saturated potassium chloride solutions in conjunction with heavy sedation, which have a low risk of secondary poisoning for scavengers (AVMA 2020, Harms *et al.* 2014, Barco *et al.* 2016).

Another consideration is that similar to the remain in place method, public perception of beach burials is that the decaying carcass will attract sharks. However, a recent study suggests that buried carcasses are unlikely to attract sharks, as the leachate plume is very small if the carcass is buried above the high tide line and above the groundwater table (Tucker *et al.* 2019). Therefore, it is recommended that marine mammal carcasses are buried deeply but as far from the high tide line as possible. Carcasses should also be buried above the groundwater table, as the leachate plume may spread farther if it comes in contact with groundwater. If these recommendations are followed, beach burial can be a safe and environmentally responsible way of disposing of a marine mammal carcass.

While burial may have advantages when compared to the remain in place method, there are some drawbacks to this method. One issue is that this method can only be used in areas with fine sediments; if the animal stranded along a rocky coastline, another carcass disposal method must be used. Similarly, heavy machinery will be required to bury large carcasses, and some locations may preclude the use of this equipment (*e.g.,* a remote area with limited access or an area with very soft substrate, such as a marsh).

Benefits	Drawbacks
More cost-effective compared to other methods	Should not be used for chemically euthanized animals with drugs that cause secondary poisoning (e.g., pentobarbital)
Minimal effort compared to other methods	Cannot be used along rocky shorelines, may not be used in protected or sensitive habitats
May reduce disease transmission	Need for greater resources to ensure that carcasses are be buried above the high tide line and above the groundwater table
Reduces the possibility of attracting scavengers	May not always be logistically feasible
Nutrients remain in environment	

4.3 Return to the Sea

In some areas, access to a carcass stranding site from the land has very limited access (no roads, high cliffs, etc.), but access from a vessel on the ocean is more straightforward. If a carcass cannot be moved to a secondary site and left above ground or buried, it can be towed offshore and released at sea (if the carcass condition allows), where it may float for a while but will eventually sink. In areas where this method is feasible, it allows marine mammal carcasses to remain in the environment and contribute the nutrients contained within the animal to the environment. This may be especially beneficial for large whale carcasses, as whale falls can be a significant food source to a wide community of scavengers and microbes (Smith and Baco 2003). As the ultimate goal of the return to the sea method is for the carcass to sink, it is recommended that the body cavity of the animal is pierced. This will aid sinking, as the carcass can off-gas more easily. Accelerating the sinking will help prevent the carcass from restranding.

Care must be taken to choose a proper release site, to ensure that the carcass will eventually sink in an appropriate area. Drift modeling can be employed before towing a carcass to select the best release location, which will help prevent the carcass from being pushed back onshore and restranding, becoming a hazard to navigation, and damaging protected and sensitive habitats. The U.S. Coast Guard should be consulted to ensure that the chosen release site will not allow the carcass to become a hazard to navigation. Additionally, proper planning will help to reduce the possibility of human-shark interactions, as floating carcasses have been known to attract sharks (Fallows et al. 2013). In areas with strong onshore currents and winds, the carcass must be towed very far offshore before it can be released. This will be very time consuming and could be cost prohibitive. In general, this method is more involved and more costly than other *remain in the environment* methods, and therefore is most practicable for large whale carcasses.

Towing a large whale carcass off of its stranding site (either off of a beach or intercepting a floating carcass and towing it to a new location) is potentially dangerous to human responders and bystanders. Experience dealing with lines under tension is ideal, and only trained experts should attempt to tow carcasses. It is important to evaluate the condition of the carcass, select the appropriate equipment (vessel), select ideal environmental conditions including high tide, and, if necessary, to prepare the beach to facilitate the carcass' path to the water. Once the carcass is floating, the tow is relatively straightforward, but may be more time-consuming than anticipated.

In the U.S., return to the sea methods require authorization from the EPA under the MPRSA. The MPRSA prohibits the transport of any material, including marine mammal carcasses, for the purpose of ocean dumping, except as authorized by a permit. .The EPA has issued a general permit under the MPRSA to authorize the transport and disposal of marine mammal carcasses in ocean waters under specified conditions. The general permit authorization is available for any officer, employee, agent, department, agency, or instrumentality of federal, state, tribal, or local unit of government, as well as any MMHSRP Stranding Agreement Holder, and any Alaskan Native, who already may take a marine mammal under the MMPA and ESA, to transport from the United States and dispose of a marine mammal carcass in ocean waters. For certain situations where the general permit is not applicable, EPA may issue a MPRSA emergency permit for the ocean disposal of marine mammal carcasses.. EPA's permit process, among other things, requires consideration of hazards to navigation and may include coordination with the USCG). Therefore, if return to the sea is the disposal method proposed, you must contact your regional stranding coordinator for permission to use the EPA MPRSA general permit or to request an MPRSA emergency permit for ocean disposal from EPA. More information on the EPA general permit as well as EPA contacts for inquires about the ocean disposal of marine mammal carcasses can be found here: https://www.epa.gov/ocean-dumping/ocean-disposal-marine-mammal-carcasses.

Benefits	Drawbacks
Promote nutrient cycling	Can be expensive and time consuming
Carcass can serve as an important food source	Must have a good understanding of local geography and conditions to select release site, to avoid the carcass restranding
Can be logistically more feasible than land removal	Should pierce body cavity to promote sinking
[redacted]	Must use EPA MPRSA general permit or acquire a MPRSA emergency permit for ocean disposal (may delay disposal)
	Should not be used for animals euthanized with chemicals known to cause secondary poisoning (*e.g.,* pentobarbital)
	Cannot be used for carcasses in a state of advanced decay, as they may break up during the tow
	Requires experience with lines under load; can be safety hazard to responders and other personnel
	Possibility of vandalism and illegal harvesting of marine mammal parts

4.4 Sinking

Intentionally sinking a carcass is similar to return to the sea, as the ultimate goal for both methods is to have a marine mammal carcass sink and contribute nutrients back into the marine environment. One additional benefit with this method is that the location where the carcass is sunk can be chosen and therefore controlled, which can maximize its benefits to the environment, while also avoiding damage to protected and sensitive habitats. This method is also more desirable if the stranding location is in a semi-enclosed body of water (*e.g.,* Puget Sound), where towing the carcass to a release location where it would not restrand is not possible. However, the sinking location must be chosen carefully, so sinking requires more planning and resources than releasing a carcass to float until it naturally sinks in a random location. As this method can have even higher costs and more intensive planning compared to return to the sea, this method is also most commonly used for large whale carcasses.

When selecting a site to sink a carcass, you must ensure that the carcass is submerged in deep enough water that it does not become a hazard to navigation. Similar to return to the sea, the U.S. Coast Guard should be consulted when planning to sink a carcass. Additionally, protected and sensitive habitats (*i.e.,* coral reefs, essential fish habitat, etc.) should be avoided when selecting a site. Sinking methods in ocean waters require authorization from the EPA under the MPRSA. As noted above for return to the sea methods, the EPA has issued a general permit under the (MPRSA to authorize the transport and disposal of marine mammal carcasses in ocean waters under specified conditions. If a determination is made that the carcass must be sunk, rather than released at the disposal site, the transportation and disposal of materials necessary to ensure the sinking of the carcass are also authorized for ocean dumping under the MPRSA general permit. The permittee must first consult with and obtain written concurrence (or if a time-critical safety situation by telephone) from the applicable EPA Regional Office on the selection of materials used to sink the carcass. For some circumstances where the general permit is not applicable, EPA may issue MPRSA emergency permit for ocean disposal of marine mammal carcasses. For more information about the MPRSA general permit can be found here: https://www.epa.gov/ocean-dumping/ocean-disposal-marine-mammal-carcasses

Another consideration is how the carcass will be weighted down. Even when the body cavity is pierced to allow for more efficient off-gassing, without weights, the carcass could float for some time. Therefore weights need to be used to hold down the carcass on the seafloor until it is more decomposed. A carcass will only need to be weighed down for a limited amount of time, and all weights that do not breakdown over time will become marine debris once the carcass has decomposed. A wide range of weights can be used to ensure the carcass does not refloat, depending upon the size of the carcass. For larger carcasses, heavier, non-decomposable weights such as chains and concrete blocks, may be necessary to ensure that the carcass does not refloat. For smaller carcasses, lighter but decomposable weights may be used such as sandbags and jute rope. Information on the types of items that can be used for sinking carcasses can be found here: https://www.epa.gov/ocean-dumping/ocean-disposal-marine-mammal-carcasses#What_type.

Benefits	Drawbacks
Promote nutrient cycling	Very expensive and time consuming
Carcass can serve as an important food source	Must ensure will not be a hazard to navigation
Can serve in future scientific studies of whale fall communities	Should pierce body cavity to promote sinking, should use weights that degrade
	Must use EPA MPRSA general permit or acquire an emergency permit for ocean disposal (may delay disposal)

[redacted]	Should not be used for animals euthanized with chemicals known to cause secondary poisoning (*e.g.,* pentobarbital)
	Cannot be used for carcasses in a state of advanced decay, as they may break up during the tow
	Requires the addition of sinking materials (*i.e.*, weights, chains, concrete, etc.) to the environment.

5. Remove from the Environment Methods

5.1 Disposal in Licensed Landfill

The most widespread *remove from the environment* method is disposal in a landfill. With this method, the carcass is removed from the stranding location and brought to a nearby landfill in a lined or contained transport vehicle. This is one of the more cost-effective *remove from the environment* methods. As with all *remove from the environment* methods, this method is more practical if the animal is small enough to be easily transported from the stranding location. While it is possible to cut a larger carcass into smaller sections for transport, the stranding location must also be easily accessible for a lined vehicle to easily remove the carcass and transport it to a licensed landfill. While these are similar requirements for removing a carcass to a secondary site, there are some benefits to bringing the carcass to a landfill.

One of the drawbacks for all *remain in the environment* methods is that toxic substances contained in carcasses, including euthanasia drugs (*e.g.*, pentobarbital), may be released back into the environment. Disposal in a licensed landfill can minimize the impact of releasing these substances, as they will be contained to one location. However, not all licensed landfills may be able to accept animals that have been euthanized with barbiturates. Therefore, local landfills must be contacted to ensure that they can accept carcasses that contain these drugs. It is also recommended that all chemically euthanized carcasses are placed in a 3mm plastic bag before they are disposed of in the landfill (Vantassel and King 2018). This will minimize odors and reduce the likelihood of attracting scavengers.

Benefits	Drawbacks
Removes any toxic substances from the environment	Does not allow for nutrient recycling

Can sometimes mitigate the use of barbiturates as a euthanasia drug	Carcass not available as a food source
More cost-effective than other *remove from the environment* methods	More difficult for larger animals; may be space limitations
	Cost

5.2 Composting

Composting marine mammal carcasses has become more widespread in recent years. This method may involve bringing a carcass to a licensed commercial composting facility[1], to a site set aside specifically for marine mammal carcasses, or composting in a carcass digester. In order to compost marine mammals there are several things that should be considered in finding a suitable location (King *et al.* 2018).

The composting method combines many of the benefits of landfill disposal, with fewer drawbacks. In general, composting, while similar to disposal in a landfill, has the added benefit that the nutrients contained within the carcass will eventually be made biologically available. Similar to landfills, compost facilities serve to effectively sequester toxic materials and infectious diseases that may be contained in the carcass. Given enough time toxic substances, including barbiturates such as pentobarbital, will often break down, either due to the heat generated by the compost pile or through microbial activity (Schwarz *et al*. 2013). Once these substances have broken down, the compost can be safely used. However, it is important to notify your composting facility that a carcass contains euthanasia drugs, as some facilities may not be able process these carcasses effectively to ensure that the toxic materials have fully broken down. Additionally, consultation with the local facilities should occur to ensure that all marine mammal compost will be used in accordance with local and state regulations on wildlife compost.

The major shortcoming of this method is that commercial composting facilities are not common in many regions. However, if a smaller facility is identified in the local area, ensuring that marine mammal disposal needs will fit within their policies and guidelines is recommended. For example, some facilities may only be able to compost larger animals if they are first broken into smaller pieces. Another

[1] Salvaged marine mammal parts may not be sold or traded for commercial purposes (pursuant to regulations at 50 CFR 216.22 and 50 CFR 216.37). However, commercial facilities that repurpose marine mammal carcasses or parts thereof (i.e., composting and rendering facilities) significantly alter the marine mammal carcass or part so that the resulting byproducts are no longer considered marine mammal parts, as these processes destroy the marine mammal DNA. Therefore, these commercial enterprises may sell the byproducts that were originally sourced from marine mammal carcasses or parts, provided that those byproducts do not contain and are not marketed as containing marine mammal parts.

consideration is the distance from the stranding site to the composting facility, as longer distances may increase transportation costs.

Benefits	Drawbacks
Removes any toxic substances from the environment, excluding heavy metals	Not widely available
Can mitigate the use of barbiturates as a euthanasia drug, given enough time	Carcass not available as a food source
Can effectively remove infectious diseases from the environment	More difficult for larger animals

5.3 Rendering

Rendering is an industrial process in which livestock and wildlife carcasses are broken down and recycled into new products[2]. This process uses all parts of the animal and often creates a protein by-product (*e.g.,* protein meal) and a fat by-product (*e.g.,* tallow and grease). So while this process does not allow the carcass to contribute to nutrient recycling, like the composting method, the carcass will be recycled into useful products. Rendering can be very expensive, and these plants are not commonly found in all areas of the U.S. Therefore, the cost may be prohibitive when transporting marine mammal carcasses to a rendering plant, especially for larger carcasses. However, in areas where these facilities do exist, rendering can be a useful carcass disposal option, and it may be helpful to work with your local facility to identify ways in which you may be able to offset some of the costs.

One of the main benefits of the rendering method is that this process exposes the carcass to high heat, which will eliminate any pathogens. Therefore, if the animal is suspected to carry infectious diseases, this

[2] Salvaged marine mammal parts may not be sold or traded for commercial purposes (pursuant to regulations at 50 CFR 216.22 and 50 CFR 216.37). However, commercial facilities that repurpose marine mammal carcasses or parts thereof (i.e., composting and rendering facilities) significantly alter the marine mammal carcass or part so that the resulting byproducts are no longer considered marine mammal parts, as these processes destroy the marine mammal DNA. Therefore, these commercial enterprises may sell the byproducts that were originally sourced from marine mammal carcasses or parts, provided that those byproducts do not contain and are not marketed as containing marine mammal parts.

option can be considered. As one of the products of rendering is often protein meal that is used in animal feed, some facilities may not be able to accept or process carcasses that contain certain veterinary drugs, if they will not be effectively broken down in the rendering process. Therefore, it is imperative that preplanning and consultation with the local rendering facility occurs to fully understand their policies for disposal of animals that were chemically euthanized (*e.g.*, pentobarbital).

Benefits	Drawbacks
Carcass is recycled into other useful products	Not widely available
Prevents the spread of infectious diseases	Not every facility will accept animals that contain barbiturates
	Expensive
	More difficult for larger animals

5.4 Incinerating

Incinerating is similar to the Rending method, in that it is an industrial process in which livestock and wildlife carcasses are broken down by burning. Unlike rendering, the incineration method completely destroys the carcass and the remaining ashes and hard parts (*i.e.*, teeth, bones, etc.) are buried in a landfill. This process does not allow the carcass to contribute to nutrient recycling. This can be beneficial as it also helps to prevent the spread of diseases, toxic materials, and veterinary drugs contained in the carcass from entering the environment. Incinerating can be very expensive, and these plants are not commonly found in all areas of the United States. Therefore, the cost may be prohibitive when transporting marine mammal carcasses to an incinerator, especially for larger carcasses. However, if the marine mammal was administered euthanasia drugs known to cause secondary poisoning (*e.g.,* pentobarbital), incinerating can be a useful carcass disposal option. Marine mammal, especially large whale remains have high blubber/fat content that may pose a problem for an incineration facility due to the high flash point of the oil. The biological load that the incineration facility can handle should be discussed in advanced to determine the weight and content of carcass material that can be safely disposed of at each facility.

Benefits	Drawbacks
Removes any toxic substances from the environment	Not widely available
Prevents the spread of infectious diseases	Very expensive
	More difficult for larger animals

6. Conclusion

The proper disposal of carcasses is an important aspect of marine mammal stranding response. Proper disposal prevents the spread of disease, minimizes the effects of harmful substances on wildlife and the environment, and can maximize the benefits that marine mammal carcasses provide to the environment. Stranding networks, in consultation with local and state agencies, should be comfortable using a combination of disposal methods, as no one method is recommended or required to be used in every single stranding situation. However, preferred disposal methods may vary by geographic regions, coastal topography, and highly populated areas. Planning for general carcass disposal should be part of normal stranding response planning efforts with disposal methods and disposal facilities pre-identified for normal carcass types encountered. For uncommon strandings (*e.g.,* large whales and mass stranding events) planning for carcass disposal should begin as soon as it becomes apparent that it will be warranted in a specific stranding event, and factors should be considered to determine which disposal option(s) may be most appropriate.

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Appendix XV

Cetacean Mass Stranding Best Practices

Executive Summary

When more than two cetaceans strand at the same time in the same general area it is known as a mass stranding. Mass stranding responses are more complex than responses to single animals, and the best mass stranding outcomes occur when response personnel are trained and prepared for unforeseen and changing conditions, and equipped to make challenging decisions. This document brings together the best practices and standardized protocols that the National Marine Fisheries Service (NMFS) recommends to make the most informed decisions and determine the best course of action during responses to mass cetacean strandings.

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1. Introduction

1.1 Background

In 1992, the Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the Marine Mammal Protection Act (MMPA). The MMHSRP serves to coordinate marine mammal stranding response efforts in the United States by working to standardize regional network operations and define national stranding response policy.

NMFS published the guidance document “Standards for Release” in 2009 as part of the broader Policies and Best Practices: Marine Mammal Stranding Response, Rehabilitation, and Release. The Standards for Release give detailed protocols for making determinations about when a rehabilitated marine mammal can be released back to the wild, but there are no detailed guidelines for response to mass stranded cetaceans prior to admission to rehabilitation. The MMHSRP also holds a MMPA/Endangered Species Act (ESA) research and enhancement permit that allows the program to authorize qualified individuals to conduct interventions for ESA-listed cetaceans for which there is a health concern. Most non-ESA species responses can be conducted under Stranding Agreements (SAs). One exception is that hazing/deterrent activities are not authorized in every SA. Therefore, if the responder is not authorized under their SA, then the hazing/deterrence would be conducted under the MMPA/ESA permit or by a government employee acting under MMPA Section 109(h).

1.2 Legislation Pertinent to Marine Mammal Strandings

There are two key pieces of legislation that govern interactions with marine mammals in the United States.

> Marine Mammal Protection Act (MMPA): The MMPA, signed into law in 1972, prohibits the “take” of sea otters, seals, sea lions, walruses, whales, dolphins, and porpoises, which includes harassing or disturbing these animals, as well as harming or killing, unless such take is specifically exempted in the statute or authorized. The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS has jurisdiction over cetacean and pinniped species (with the exception of walrus), and USFWS has jurisdiction over walrus, polar bear, sea otters, and manatees. The 1992 amendments to the MMPA included

Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health of marine mammals and health trends of marine mammal populations through the collection of stranding data.

Endangered Species Act (ESA): The ESA, enacted in 1973, provides for the conservation of species that are listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on "take" including harassment and disturbance as well as injuring and killing. The MMHSRP holds a MMPA/ESA research and enhancement permit that allows the program to authorize qualified individuals to conduct interventions on ESA-listed cetaceans for which there is a health concern.

1.3 Purposes and Intended Uses

These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations. These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a "living document," and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

The U.S. Marine Mammal Stranding Network (the Stranding Network) has developed protocols and procedures for responding to live marine mammals that are stranded and/or otherwise in distress to ensure the health, welfare, and safety of both the human responders and animals. These protocols balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, the reader should consult references such as *Marine Mammals Ashore* (Geraci *et al.* 2005) and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018).

These Cetacean Mass Stranding Best Practices (Best Practices) highlight general protocols and procedures specific to events when groups of cetaceans strand. Additionally, these Best Practices are designed to be paired with more specific Regional Annexes that include species-specific issues that are more appropriately addressed at regional or state levels. For further information on general protocols and procedures specific to events involving single animals, the reader should refer to Appendix XII (Small Cetacean Intervention) and/or Appendix XVI (Live and Dead Large Whale Emergency Response Best Practices).

1.4 Funding

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for eligible members of the Stranding Network through an annual competitive grant process. These grants support the rescue and rehabilitation of stranded marine mammals (including cetacean mass stranding response), data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are limited and competitive, individual Stranding Network members often also support many of the costs for normal operations. Determining whether funding is available for a response is an important first consideration, as lack of funds or available in-kind donations (*e.g.*, boat use) may limit options for response.

2. Planning for Mass Strandings

"Mass strandings" describes a simultaneous, often live-stranding, of two or more cetaceans at the same time and place (other than mother-calf pairs) (Geraci *et al.* 1999). Types of mass stranding responses include Live-Stranded: in Surf and/or High and Dry; Live-Out of Habitat (nearshore milling, near mass stranding); Dead-Stranded: in Surf and/or High and Dry; both Live-Stranded and Dead-Stranded: in Surf and/or High and Dry. These events can include stranded cetaceans all in one area or scattered in the same general geographic region, and animals can be high and dry, in surf, and milling near shore. Mass strandings typically require more coordination than a stranding event involving a single animal, as depending on the time of year, location, and size of the event, there will be multiple animals to assist, and they often generate more attention (*e.g.,* public and media). The main response components (*i.e.*, initial assessment, securing the scene, providing supportive care [if necessary], staff assessment, and decision-making) are similar to a single response event, however, group responses can be larger and require more logistical planning and permit approvals.

2.1 Authorization, Training and Safety

Generally, a mass stranding response can be conducted under a Stranding Agreement (by the Stranding Agreement holder) or by a government employee acting under MMPA Section 109(h). However, for ESA species, mass stranding responses are conducted under a MMPA/ESA permit that is issued to the MMHSRP. Only responders who have been authorized by NMFS and who have the training, experience, equipment, and support needed should attempt a mass stranding response. Authorized response efforts may also rely on partners at tribal, local, state and federal agencies (including law enforcement agencies and the United State Coast Guard (USCG)), non-governmental organizations, fishermen, and other groups to assist with the event.

Stranding Network members are trained or have experience in proper techniques for safe response, assessment, handling and restraint, sampling and release (if needed). Training workshops have been offered to members of the Stranding Network. Depending on the role that the individual may fulfill, different levels of training (both required and recommended) will be necessary. Others are mandated to ensure activities are conducted safely, such as recognizing and minimizing the risk of injuries and physical hazards associated with a live or dead mass stranding response operation. Basic Incident Command System (ICS) training should be encouraged to all personnel, as a baseline understanding of the principles and tenets will benefit everyone involved in the response. Free ICS courses are available online:

ICS 100 is available here: https://training.fema.gov/is/courseoverview.aspx?code=IS-100.c;

ICS 200 is available here: https://training.fema.gov/is/courseoverview.aspx?code=IS-200.c

Some responders may be required to hold other authorizations or licenses (*e.g.*, driver's license for transport, captain's license for vessel operation, FAA authorization for unmanned aerial system (UAS) use). However, all respondents should be trained in First Aid, cardiopulmonary resuscitation (CPR), boat safety, and live animal handling. It is important to emphasize that **human safety comes first**, during both training and responses.

Human and animal safety is the top priority for NMFS and the Stranding Network. Responding to multiple animals at once can be very stressful and physically and emotionally draining for everyone involved, which could lead to compromised safety during response operations. It is important for teams to recognize and understand an individual's capabilities and limits, and for responders to communicate before their limits are reached.

Each event is unique and there are multiple possible hazards that responders should take into consideration such as:

- dangerous substrates (*e.g.*, mud, shells, rocks, ice) or wave conditions,
- changeable weather conditions,
- tidal changes,
- time of day (*e.g.*, close to sunset limiting light)
- thrashing animals,
- predators (*e.g.,* sharks, killer whales, bears, alligators)
- exposure to infectious diseases, and
- accidental injury from response tools (*e.g.*, needles, medications, knives, etc.).

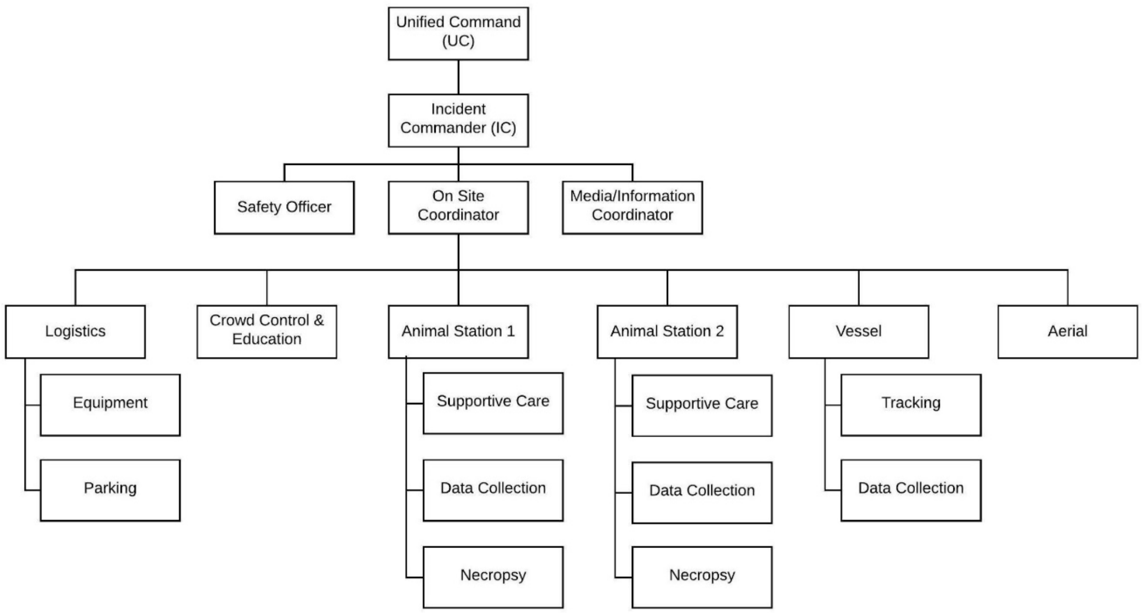
Responders should always be aware of immediate surroundings, follow instructions, know the location of the safety equipment (*e.g.*, first aid kit, eye wash, sharps containers, flash lights, radios, etc.), and wear the appropriate personal protection equipment (PPE) specific to the event and responder role.

2.2 Mass Stranding Structure and Roles

2.2.1 Incident Command Center (ICS) Overview

ICS is defined by the Occupational Safety and Health Administration (OSHA) as "a standardized on-scene incident management concept designed specifically to allow responders to adopt an integrated organizational structure equal to the complexity and demands of any single incident or multiple incidents without being hindered by jurisdictional boundaries" (OSHA 2008). The ICS allows for flexibility on scene, a clear chain of command, and consistency when working with other stranding response organizations and other federal agencies. The ICS is an effective way to manage stranding response efforts, particularly when integrating individuals from multiple response groups. The overall flexibility allows for the incorporation of certain roles and processes currently used during stranding response, while providing a common vocabulary and operating picture for all of the potential responders. A response typically grows from a small, localized approach with a single organization to fit the level necessary for a specific incident. Developing a full ICS structure takes time and should ideally be developed prior to an event and used in a progressive manner during an event, as the situation evolves. The size and focus of the ICS is dependent on the magnitude of the incident, and can be expanded or contracted as necessary. Only the positions that are required for an adequate response should be filled, and in some cases one person can fill more than one role. Organization levels (*e.g.*, section chiefs, coordinators) should be kept as small as possible to accomplish ICS objectives and maximize effectiveness.

An example of a basic ICS organizational structure for a mass stranding event:



ICS will be used to provide the on-scene management structure that guides response efforts, and typically consists of at minimum these four functions:

- **Planning section**: responsible for developing a plan to accomplish response objectives, including collection and evaluation of information, tracking resources, and documenting response effort
- **Operations section**: conducts tactical operations to carry out an action plan; directs resources
- **Logistics section**: provides the resources, support and services to meet plan needs
- **Financial section**: monitors costs related to the incident.

2.2.2 Unified Command

The ICS structure may expand to become a Unified Command (UC). The UC is an expansion of the ICS organization in cases in which the response impacts the jurisdictional or functional responsibility of more than one agency. To be a member of the UC, an agency must have the authority and jurisdiction to respond to the event. As a component of the ICS, the UC is a structure that brings together decision-makers from the major organizations that have responsibility for the incident to coordinate a more safe and effective response within their own jurisdictional missions. The UC is then responsible for the overall management of the incident and provides a forum for consensus decisions regarding the incident. It establishes incident strategies and objectives so that all agencies can function as a team and melds resources and responders for an effective operation. To be effective, the number of personnel should be kept to a minimum.

The makeup of the UC may change as an incident progresses. The composition of the UC will be determined on a case-by-case basis. It must be noted that participation in the UC occurs without any agency abdicating authority, responsibility, or accountability. Specifically for responses conducted under the MMHSRP MMPA/ESA Permit, MMHSRP headquarters staff must be part of the UC. The UC may include:

- United States Coast Guard (USCG), if involved
- National Marine Fisheries Services National Marine Mammal Stranding Response Coordinator or Veterinary Medical Officer
- National Marine Fisheries Services Regional Stranding Coordinator (RSC)
- State Stranding Coordinator, if applicable
- Local Stranding Network responder
- Necropsy Team Leader (NTL)

The necessity for an UC increases when multiple agencies are involved or the incident becomes more complex. There are many advantages to implementing UC, such as: single set of objectives, collective strategy approach, increased communication, performance optimization, and cost effectiveness.

2.2.3 Command Staff

The Safety Officer, the Public Information Officer (PIO), and the Liaison Officer are part of what is known as the Command Staff; they support the UC and report to the Incident Commander. The Safety Officer is a single person with responsibility for monitoring on-scene safety conditions (including weather conditions) and developing measures to ensure the safety of all assigned personnel. The PIO is a single person who has responsibility for all interaction between Command and the media and who coordinates the release of information on the incident situation and response efforts from Command to the media. The Liaison Officer acts as the on-scene contact point for representatives of assisting agencies assigned to the incident. In a large response, each of these positions would have a dedicated person, which could be someone from the Stranding Network, a NMFS employee, or another agency representative. In a smaller response, some or all of these positions may be filled by the Incident Commander or combined with other roles – the crucial aspect is that these positions are intended to reduce confusion by creating a single point of contact for each of these functions

2.2.4 Planning Staff

The Planning Staff includes the Planning Section Chief who supports the organizational framework for the stranding event and ensures things are running smoothly. Other positions in this include the Documentation Officer and the Personnel Unit Leader. The Documentation Officer is responsible for compiling/tracking all the paper and digital documentation of the incident, including, but not limited to, photographs, sample checklists, necropsy notes, and data sheets. The Personnel Unit Leader oversees and is responsible for all personnel on-scene, making sure people are accounted for, fed, and housed (includes check-in and check-out of personnel on scene). In a smaller response, some or all of these positions may be filled by the Incident Commander or combined with other roles – the crucial aspect is that these positions are intended to reduce confusion by creating a single point of contact for each of these functions.

2.2.5 Operations Staff

The Operations Section Chief (OPS) oversees all the incident tactical operations and on-site activities, including air and vessel activities, equipment use, and resources in daily operations. Typically, during mass stranding responses the OPS role can be combined with the IC role; however, for larger more complex events the OPS and IC roles will be different people. Actual operations and specific roles needed will vary depending upon if the response is for a few to tens to hundreds of animals. Depending on the specifics of the response there may be other Operations Branches needed to oversee operational activities such as Air Support (aerial survey/animal relocation), Vessel Support (vessel survey/animal relocation), Telemetry, Hazing, Carcass Disposal, Veterinary Support, etc. More details on specific operational needs for specific response types are listed in subsequent sections (*i.e.*, Sections 4, 5 and 7).

2.2.6 Administration Staff (Logistics and Finance)

The Logistics Staff consists of the Logistics Section Chief (LOG) who directs and coordinates the logistics on-site and identifies equipment needs, including air and vessel support and heavy equipment. The LOG works with county, state, and private entities to obtain the necessary logistical resources for the response activities. Ideally, many of these resources will have been identified prior to a response. The LOG may also end up taking on the role of the Planning Section Chief. The Logistics Section can also include the Equipment and Resource Coordinator (may be located off-site) who makes arrangements to ship or move equipment to the site and reports to the LOG and the Vessel or Aerial Coordinator (may be located off-site) who is responsible for identifying and coordinating vessel or aerial support.

The Finance Staff includes the Finance Section Chief who is responsible for tracking expenses needed for recovery, necropsy, and disposal operations, including vessel support, air support, and specialized equipment. Depending on the event there may also be a Procurement Officer, who is responsible for setting up contracts and processing invoices related to vessel support, air support, and other resources used during the event.

2.2.7 Categories of Personnel

Similar to the different personnel classifications of Stranding Network organizations, there are different levels of personnel or resource teams that can be involved in a response; each level has different requirements for skills, training, knowledge, abilities, and responsibilities. Some of these personnel or team classifications can oversee different areas of the response, while others will perform specific tasks. These classifications (Table 1) roughly break down into the following:

Table 1: Examples of categories of personnel and/or team classification

Personnel/Team Classification	Role
Branch Director	Assigned to the upper manager for each of the key response functions during a response, and likely involves multiple agencies. This can include the Animal Response Branch (staffed by NOAA and Stranding or Working Group on Unusual Mortality Events members), the Shore-side Security Branch (law enforcement agencies), the Waterside Safety Branch (USCG), Air Operations (variable depending on the agencies involved) and/or any other broad category where multiple organized functions (each with a Supervisor) fall under it. This position is responsible for developing the vision and direction of the Branch, collating information from Group Supervisors to move to the Branch Director and ultimately Incident Commander while projecting operational needs into the next period.

Group Supervisor	Assigned to the lead staff member with specific function and multiple personnel under him/her. Established to divide the incident management structure into functional areas of operation. This can include Manned and Unmanned Air Operations, Animal Observation/Documentation, Sample Collection, and other discrete functions, depending on the response scenario. This position is responsible for enacting all protocols and procedures for the group (and suggesting/implementing adjustments when necessary), and collating information from each area for reporting to the Group Supervisor.
Divisions	When the geographic scope of the response is large, Operations may be broken into geographically focused Divisions. For example, if a response may cross state lines, there may be two divisions, one for each state. Each is led by a Division Supervisor and reports to the Branch Director.
Task Forces or Resource Teams	Units of personnel, each with a Leader, within the response to support an operational need. Can report to the Group Supervisor or directly to the Branch Director.
Technical Specialists	Key personnel with specialized training and experience that fills individual roles within the response. This can include deterrence, mass stranding euthanasia, or other key elements that may or may not be necessary within each response scenario. Veterinarians with marine mammal experience may also be considered technical specialists within any of the Groups, Task Forces, or Areas.

2.3 Communication and Media

2.3.1 Public

The PIO is a single person who has responsibility for all interaction between Command and the media (including social media) and who coordinates the release of information on the incident situation and response efforts from Command to the media and public. It is important to be prepared for how the situation is to be communicated (*e.g.*, information provided is consistent). There should always be a primary designated spokesperson when interacting with the public and this person should be in contact with the PIO so messaging is consistent. In some larger events there may be spokespersons from multiple agencies or stranding network facilities, to maintain a consistent message they should all be in contact with the PIO. Distributing informational brochures to the public on site or electronically can be helpful for consistent messaging and awareness. This literature should contain basic information on the regional stranding network, a fact sheet on the species that have stranded, a questionnaire for recruitment, guidelines on appropriate conduct and health and safety measures, and stranding network contact numbers. It should also outline the range of actions possible with stranded animals, from immediate release to euthanasia (Geraci *et al.* 2005).

2.3.2 Media

Press releases to social media (*e.g.,* Twitter, Facebook, etc.), the media is a great way to inform and engage the public. The key is to provide clear and accurate information, and emphasize the message you are trying to get across. The PIO serves as the coordinator for all media - traditional and social. The media team with representatives from many or all of the participating partner agencies can help manage the media and be responsible for responding to media inquiries during an event. This Coordinator/Team can proactively reach out to the press, post updates on social media accounts, and create and drive the media strategy for providing consistent information and coverage during an event.

During high-profile events, additional media coordination takes place between the IC, MMHSRP, RSC, and the NMFS Office of Communications, as necessary. Media interview requests should be coordinated through the Public Information Officer or designated individual, who will work with a NOAA Office of Communications Public Affairs Communications Specialist. NOAA Office of Communications Public Affairs can assist with news media, such as news releases, news conferences, and media interviews. All media interviews should be considered “on the record.”

2.3.3 Elected Officials

It is important to make sure elected officials at all levels (mayors, council representatives, state representatives, etc.) are communicated with when there is a large mass stranding event within their jurisdiction. If possible, the officials or their representatives should be made aware of any developments or changes prior to the public, and may have a voice in decision-making. Elected officials and their offices can be an asset to helping meet needs of the event on a management level by using connections to help identify or escalate resources for the response. Some examples might include identification of resources to provide crowd control at a beach site, or help with expediting approvals needed to necropsy and dispose of multiple carcasses on a particular beach for examination.

2.3.4 Agencies

For each response situation, there should always be a communication plan in place. This plan is helpful to have developed and in place ahead of the emergency need with an appropriate communication tree and updated contacts (both weekday and weekend/holiday contacts). Similarly to elected officials, the inclusion of particular agencies will depend on the situation and the geographic location. It may include Federal agencies (Army Corps of Engineers, other Department of Defense Agencies, the US Coast Guard, U.S. Fish and Wildlife Service, National Parks Service, etc.), state agencies (State wildlife or environmental departments, state park agencies, etc.), and other county or local environmental agencies. There are times when, for example, USCG is needed to help regulate or secure an area around a mass stranding of cetaceans or a state wildlife agency is needed to help verify the location or condition of the animals, and it is important to know and be able to call the appropriate manager of those resources to get assistance. It is recommended that both NMFS (Regional Stranding Coordinator) and stranding network responders have good working relationships with these agencies.

An additional subset of Agencies is law enforcement agencies that can assist with crowd control of a scene. This can frequently be NMFS Office of Law Enforcement, but through Joint Enforcement Agreements, or the needs of a particular situation, this role may be filled by others (*e.g.*, County sheriff, state or local police, state game wardens, etc.).

2.3.5 Stranding Networks

It is important to communicate with all stranding network members in the geographic locality when an event is first reported. While primary responsibility will typically default to the organization in the closest proximity to the stranding site, nearby stranding network members should be notified as they may be able to supply additional responders, equipment, and experience. It is also helpful to notify all nearby response organizations as soon as possible in case they receive calls about the same event. Being able to collaborate quickly and effectively saves time and decreases duplicate work. In some cases, NMFS will request or require that a Necropsy Team Leader Co-investigator be in charge of the response especially for ESA responses, and this individual may be from outside the immediate geographic area.

2.3.6 Research Community (*e.g.*, Photo-ID, taggers, etc.)

During mass stranding response events, there will likely be a need for experienced researchers for specific needs. If possible, prior to the event a standard list of research needs will be developed, which can be modified depending upon the species involved. Communicating with these individuals at the start of a response will help make sure the right plan is in place. For example, an early priority may be to see if there is any life history information available on the subject animals, including age class length cut-offs, normal range, etc. Early communication with researchers that maintain catalogs of individuals of the specific cetacean species will help ensure that the appropriate images (body parts and angles) are collected and matching attempted as soon as possible. Additionally, certain researchers may have expertise in the collection of specific sample types or have a particular protocol that needs to be followed. This requires notice as early as possible to accommodate logistics and speed during a mass stranding response. Having a list of experts and/or talking with your RSC to help coordinate with experienced researchers for the species and location will result in a more efficient response. However, the response should not be delayed for specific research requests and NMFS can help with prioritizing requests.

2.3.7 Feedback mechanism to provide data and information to resource managers (*i.e.*, SARS, TRTs, Recovery Teams, etc.)

It is the responsibility of the RSC to collate and relay information about the event to the resource managers. The RSC, or another individual specifically assigned to this task, is responsible for coordinating reporting to applicable and relevant teams (*i.e.*, SARS, TRTs, Recovery Teams, Working Group on Marine Mammal Unusual Mortality Events, etc.) during responses as well as providing a designated area for event information/data (*i.e.*, Google Drive folder). To have a central location for data allows the resource managers to share and view the same information. This allows for consistent messaging and availability of full data evaluation of the event.

2.4 Logistics

When planning for a mass stranding response, in addition to assembling the appropriate team members with the correct expertise (as discussed above), several other logistical considerations need to be addressed. Below are some typical questions to consider when planning logistics.

- Vessels: Are vessels needed? If so, how many (at least two should be required for safety after the initial observations), what type of vessel (*e.g.*, motor, kayak, paddleboard), how many people are available, do vessels have navigation lights if the return trip is after dark?

- Aerial Assets: Are aerial assets needed? If so, how many, what type of aerial asset (*i.e.*, planes, helicopters or UAS), how many people are available or can partners (*e.g.*, USCG) supply planes?
- Equipment: communication equipment (*i.e.*, marine radios, cell phones, satellite phones, etc.), stretchers, marking and tagging equipment, sampling equipment, transport vehicles, and euthanasia capabilities whenever possible. Also, while a particular course of action may be deemed the most likely based upon the assessment and planning, it is important to be as prepared as possible for any eventuality, to have the maximum flexibility. Preparation and flexibility are essential.
- Environmental conditions: At what stage is the tide cycle? What is the sea state? Is it a gently sloping beach or is there a steep drop-off? Is the substrate and weather (*e.g.*, thunderstorms, snow, etc.) in the area conducive to safely responding to the animals? What time of day is it (*i.e.,* close to sunset)?
- Accessibility: Is there access to the beach for vehicles or trailers? Are there boat launches or other access points available for the vessels to use? How far away are the access points from the stranding location(s)? If access is tidally dependent, how much time will the team have at the stranding location(s)?
- Team availability: How many responders are needed? Are there an appropriate number of experienced responders available? Are there role-specific experienced members?

2.5 Equipment and Supplies

Each type of mass stranding response (Live-Out of Habitat; Live-Stranded: in Surf and/or High and Dry; Dead-Stranded: in Surf and/or High and Dry; both Live-Stranded and Dead-Stranded: in Surf and/or High and Dry) requires specific equipment. Table 2 below summarizes general equipment used for the various types of responses.

Table 2: General equipment used for different response scenarios

General Equipment	Examples of Specific Equipment	Live - Out of Habitat	Live - Stranded (in Surf and/or High and Dry)	Dead - Stranded (in Surf and/ or High and Dry)	Both Live-Stranded and Dead - Stranded (in Surf and/ or High and Dry)

Communications	Marine radio, cell phone, satellite phone	X	X	X	X
Data Collection Supplies	Datasheet forms, clipboards, pencils	X	X	X	X
Safety equipment/Personal Protective Equipment and clothing	Coveralls, raingear, life vests, non-permeable gloves, knee pads, eye wear, footwear, sunscreen	X	X	X	X
Medical equipment for humans	First aid kit, Automated External Defibrillator (AED)	X	X	X	X
Medical equipment for animals	Wound care kit, blood collection, IV fluids, antibiotics, anti-inflammatories, antioxidants, ballistics, euthanasia solutions	X	X		X
Sampling and tagging equipment	Measuring kit (tape measurer, calipers, rulers), tagging kit (suction cup tags, satellite tags, tagging equipment), marking kit (paint stick), breath and fecal sampling supplies, coolers, ice packs	X	X	X	X
Vehicles	Response vehicles	X	X	X	X
Vessels	Kayak, motor boat	Possible	X		Possible
Local sedation equipment	Hand inject, pole syringe		X		X

Remote sedation equipment	Dart projector, darts		X		X
Recording equipment	Cameras, GoPro, SD cards, batteries	X	X	X	X
Cleaning/disinfectant supplies	Dawn, hand sanitizer, disinfectant solution, garbage bags, buckets, brushes	X	X	X	X
Capture/Restraint/Towing equipment	Ropes, nylon straps, stretchers	X	X	X	X
Transport equipment	Cetacean carts, mats, stretchers, transport trailers		X	X	X
Beach equipment	Cranes, front-end loaders, bulldozers		X	X	X
Necropsy equipment	Knife sharpeners, 6-12" knives, meat hooks, forceps, ball shears, bow saw, sharpies, Tyvek bags, plastic cutting boards, formalin, 95% alcohol, needles, plastic syringes, histology cassettes, buckets, ruler, measuring tape, DMSO vial			X	X

2.6 Records, Data Collection Protocols and Documentation

It is important that each event is fully documented, and the appropriate data collected. Many mass strandings span over several days so data should be collected consistently on every day of the event. Information should be collected not only to document the stranding, but also to evaluate the successes and challenges of the responses. This feedback will be informative, and used to improve protocols and modify techniques for future events. This information can also be valuable for other stranding network members for use in similar situations. It is a continuous cycle of preparation, response, assessment, disposition, evaluation, protocols/training, as new tools and techniques are developed and tested.

Data is typically gathered by qualified individuals and the amount of data collected may depend on the level of response and capacities. It is important to document the event, record the day, time and location, and condition of the animal(s) being monitored (*i.e.*, respiration rates, abnormal behavior, etc.). The animals should be documented with photographs and/or video, as photo-documentation can help identify individual animals and assess their condition for future release/transfer to rehabilitation facilities or euthanasia determinations. Recording the animal(s) behavior is helpful in assessing and determining the best course of action. At a minimum, collect field information to complete NOAA's Level A data form. This will include a unique identifying number for each animal (*i.e.*, Field ID#, per Regional stranding network protocols) and a unique identification number for the mass stranding event (*i.e.*, Group Event#, per Regional stranding network protocols). Live animals and group events must also be indicated in the appropriate section of the Level A form. Level A forms may be completed electronically via direct entry into the National Stranding Database. See Appendix A for examples of standardized datasheets and forms that can be used during a mass stranding response.

2.7 Transportation

Some mass strandings require animal(s) to be transported for relocation, release, or rehabilitation. Transport can occur via a cart or stretcher to the transport vessel or vehicle/trailer. See Appendix B for photo examples of various transportation methods. Stranded cetaceans are generally transported using dry transport (*e.g.*, closed or open cell foam pads or similar padding). Since cetaceans cannot thermoregulate efficiently out of water, rescuers must continually monitor their temperature by palpating their dorsal fin, pectoral flippers or flukes and providing the appropriate care (application of water via bucket, sprayer, etc. to cool a warm animal or warm dry blankets to warm a cold animal). It is important to remember that dolphins do not have to be wet at all times, and in cases when they are exposed to cold air temperatures during a stranding, wetting the animal(s) may cause additional damage to the skin and be counterproductive in attaining normothermia. In some non-emergencies, including transport for releases, "wet transport" (*e.g*., water-filled boxes) may be used for cetacean transport. Depending on the situation, an animal also may be transported in a stretcher in the water alongside a boat or in a boat to transfer the animal to a more suitable release location. When transporting, animals should be kept calm to avoid struggling or thrashing, which may cause overheating, stress, or physical trauma. All necessary equipment and supplies for maintaining the animal's body temperature and safety should be available. For more specific information on how to transport marine mammals safely, refer to the Pinniped & Cetacean Transport Best Practices.

2.8 Carcass Disposal

All carcass disposal should follow local, state and federal laws and regulations. An animal euthanized by physical methods (*e.g.*, ballistics or exsanguination) can be disposed of by being left in place, beach burial, landfill, towed out to sea, rendering, composting, or incinerating. An animal euthanized by chemical agents that can cause secondary poisoning needs to be disposed of in a manner that minimizes risk to potential scavengers and avoids animal food supply chains. Carcasses containing high concentrations of pentobarbital euthanasia solutions should be incinerated, rendered, composted, or buried in licensed landfills that accept pentobarbital carcasses to prevent accidental poisoning of scavengers (Geraci *et al.* 2005). For more detailed information on marine mammal carcass disposal, the Marine Mammal Carcass Disposal Best Practices.

2.9 Decision Making to Intervene

Mass stranded animals may be beached in surf or shallow inlets, high and dry, and/or milling nearshore (near mass stranding). The reason for the stranding event could be due to various causes such as natural disasters (*i.e.*, hurricanes or atypical weather), oceanographic barriers or conditions, anthropogenic causes (*e.g.*, sonar), disease, social structure, etc. When making the decision to respond, be aware of the different causes as well as other assessment considerations (*i.e.*, behavior, body condition, size, number, injuries, rehabilitation space, human safety, accessibility, etc.) that make each event unique.

The decision of whether (or not) to intervene is made by NMFS, after discussions between multiple parties – the local stranding network organizations that have “boots on the ground” responsibility for response, the NMFS RSC, and other MMHSRP staff. Ideally, these consultations include marine mammal veterinarians and experts in the biology and life history of the affected species. The decision to intervene takes into consideration the following questions, as well as others pertinent to the situation:

- What field observations have been reported?
- What is the health status of the animals?
- How many animals?
- Where are the animals located?
    - Is it accessible?
    - Are there protected/sensitive habitats that should be avoided?

- Is there a medical diagnosis?
- What are the potential causes of the animals' observed condition?
- What is the estimated or known life history (sex, age, size)?
- What is the conservation status/reproductive potential?
- Are there safety concerns (for the responders, public, and/or animals)?
- Is a response believed to be feasible?
- What resources are available?
- Are there risks to other species?
- Is there a contingency plan in place if response is not successful?

3. Prevention

There are times when it may be necessary to attempt to prevent marine mammals from encountering or persisting in a potentially harmful situation, such as an oil spill or a group of cetaceans entering shallow water that are likely to mass strand (*e.g.,* in Cape Cod Bay). For mass strandings, preventative measures can sometimes be used, but only if there is advance notice of cetaceans swimming close to shore or in areas considered out of habitat. The goal of mass stranding prevention efforts is to safely encourage animals to move away from a dangerous, or potentially dangerous location, into deeper, open water by utilizing vessel movement, acoustics, or other deterrents (*i.e.*, hazing).

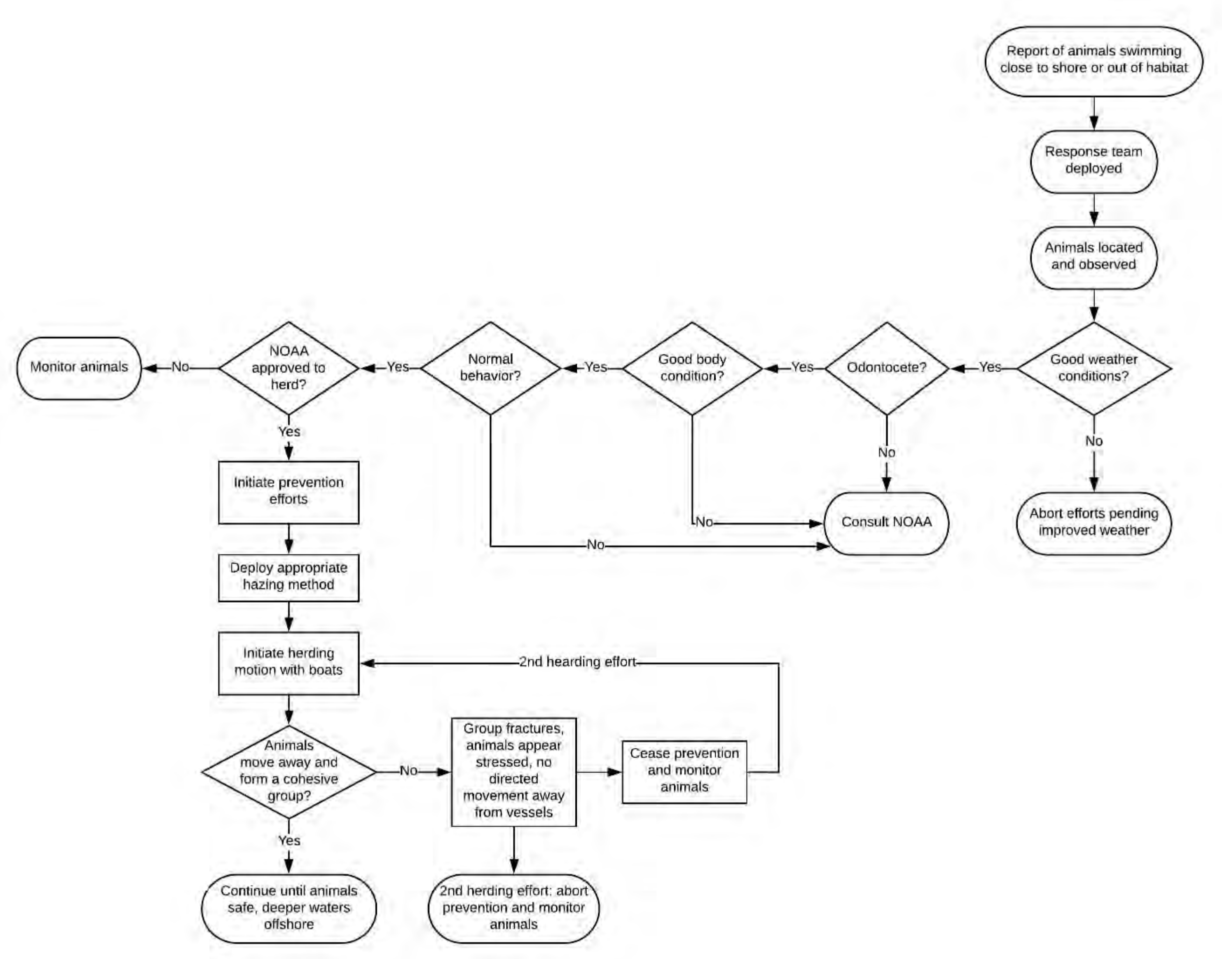
All prevention measures are initiated and suspended based upon three variables:

1) Approval from NMFS to initiate
2) Safe operations - is it safe to conduct these operations?
3) Animals' response to efforts

The decision to employ deterrence methods or hazing is a cost/benefit analysis of the potential harm to the animals from remaining in the negative situation, the potential harm to the animals from the deterrence technique(s) that would be employed (including potential harm to non-target animals), the potential risks to the responders that would be conducting the deterrence, the costs (financial and logistical) of conducting the deterrence, and the believed efficacy. There is no one hazing technique that will work in all situations or for all species. Most hazing activities are conducted under the MMHSRP's MMPA/ESA permit, and require approval from the permit Principal Investigator (PI) (*i.e.*, the MMHSRP coordinator). There are, however, limited instances where hazing operations may be conducted under the authority of the SA. To be conducted under the SA, the hazing must be for individuals or small groups of non-ESA listed small cetaceans, and must use only non-lethal deterrence techniques (85 FR 53763).

3.1 Decision Tree

The decision tree below illustrates the flow of events and decision-making processes involved in mass stranding prevention. It is impossible to articulate every possible scenario, thus these protocols strive to provide a basic understanding of the principles and actions involved in successful mass stranding prevention.



3.2 Herding

Herding is performed via vessels that help safely encourage free-swimming cetaceans to move from shallow water to deeper water or away from a hazardous situation. This tactic can take several hours to produce results, may not produce any results, or may worsen the situation. Responses from animals are often unpredictable. In addition, vessel traffic and communication issues can complicate coordination efforts as well as the sea state and environmental conditions.

Smaller, more maneuverable vessels should have a propeller guard and all vessels should have appropriate PPE (*i.e.*, personal floatation devices, first aid kit). Communication is extremely important during the operation, and each vessel should be able to communicate with each other and with spotters on land (*i.e.,* by cell phone, walkie-talkie, marine VHF radio, etc.). The herding event should be documented via photo and/or video.

In most narrow coastal estuaries, two vessels may be sufficient for herding animals in areas less than 300 feet wide, though three are optimal in areas greater than 300 feet. Herding animals in large open spaces can be extremely difficult. As the width of the estuary increases, the number of boats may be increased to ensure sufficient coverage. Additional vessels, jet skis, or kayaks may be strategically posted at the mouth of small tributaries to deter animals from entering them as they are herded out (IFAW pers. comm.). The primary challenge in adding additional vessels is communication. A lead vessel must have radio communication with all other vessels involved in the herding effort and must direct everyone's actions. A coordinated effort is key to success. In addition, starting with a minimalist approach and increasing intensity (*e.g.,* number of vessels, type of vessel movements, addition of acoustic or visual deterrents, etc.) in respnse to a lack of cooperation from the animals increases the chances of success. The principles of operant conditioning should be applied: reinforcing the animals for movement in the proper direction by decreasing stimuli, and increasing stimuli when they head in the wrong direction.

When herding, stay a safe distance (50-100 feet) behind the group of animals. Swing the vessel(s) in a coordinated crescent-shaped pattern, back and forth behind the animals to urge them to swim away from the vessel towards open water. If multiple vessels are necessary, each vessel should be assigned a section of the larger herding arc: left or right with two vessels; left, center, or right with three. Dividing the area into these sections or flight zones, allows each vessel to cover their assigned area by making sweeping motions. Be prepared to react to changes in animal behavior such as splintering of the group or changes of direction or speed. Progress, or lack thereof, should be assessed at frequent intervals (every 10 minutes) to ensure that the desired outcome is being achieved and the animals are not becoming unduly stressed by the herding efforts. If progress is not being made, herding efforts should be paused to allow the animals a break while the herding team decides on the next best step. This could include a different herding tactic, addition of visual or acoustic deterrents, or ending herding operations altogether. If the animals move toward open water, the vessels should slowly, in a coordinated manner, move forward. Once the animals reach a safe distance into deeper, open water and are no longer in danger of stranding (*e.g.*, no longer in a tidally influenced area), herding measures can be discontinued. If possible, the vessels should remain to observe the animals' behavior and movement, in order to ensure the animal safety and to prevent the animals from returning to the dangerous location. (IFAW pers. comm.). See Appendix C for example diagrams of herding techniques.

3.3 Acoustic Deterrence

Pingers, which are typically used in the commercial fishing industry, produce high-frequency pulses of sound to deter animals. Generally, 2-3 pingers are sufficient in an area less than 600 feet wide. Wider areas may require more pingers; however, it is important to remember that sounds can travel great distances through water and may attenuate at different distances based on bathymetry, bottom composition, temperature, etc. When the vessels are positioned behind the animals, the pingers can be deployed. It is best if the pingers are initially deployed when the vessels are stationary to better evaluate the animal's response. Success of pingers may vary with the species and specific situation (IFAW pers. comm.).

Oikomi pipes, also known as "Banging Pipes", are about eight feet long metal pipes with a cap on the top that can be lowered into the water from the side of a vessel and struck with a hammer to make a loud noise. Numerous pipes can be used in multiple lines. The expected end result is to deter the animals from a specific unwanted area and/or influence the cetaceans' direction of travel.

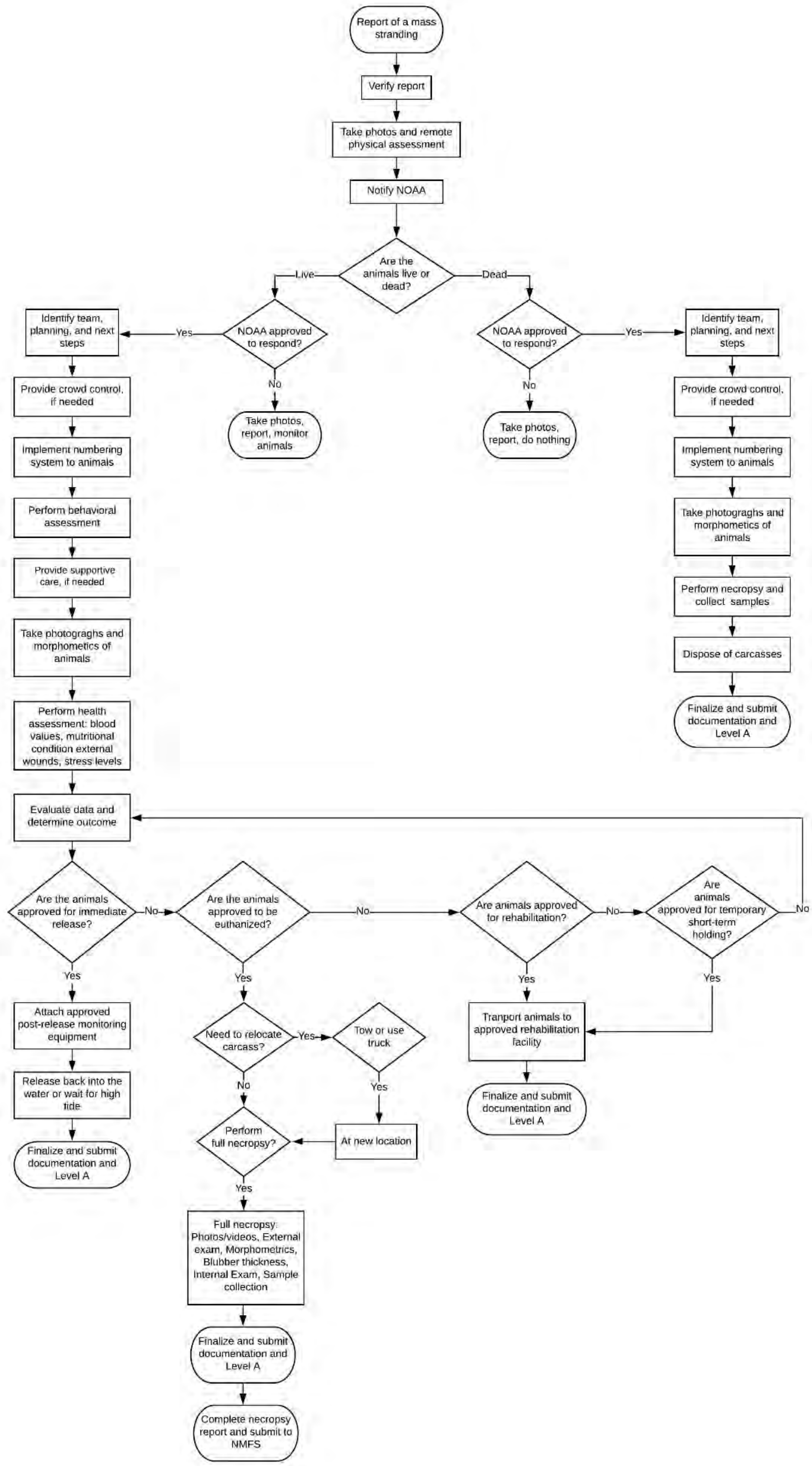
If the acoustic deterrence method used results in the animals responding positively by forming a cohesive group and moving away from the moving vessels, continue efforts until animals are in safer waters. However, if the animals show signs of stress (*i.e.*, increased respiration, excessive chuffing or tail slapping) or the group begins to separate into sub-groups or individuals, the prevention team should step down incrementally until the animals exhibit normal or positive behavior. If negative responses continue, efforts may need to be aborted.

4. Live Mass Stranding

Logistical planning begins with the first report of live cetacean mass stranding. Plans need to be made that take into account available resources, accessibility of the stranding location, weather and tidal conditions, transport (if applicable), necropsy, palliative care, sampling, disposal, resources (heavy equipment and experience of team members), and handling the media. Additionally, responders should document and avoid damaging protected and sensitive habitats (*i.e.*, marsh, seagrass, coral reefs, oyster reefs) as much as possible.

4.1 Decision Tree

The decision tree below illustrates the flow of events and the decision-making process involved in a mass stranding event. It is impossible to articulate every scenario, thus these protocols strive to provide a basic understanding of the principles and actions involved in successful mass stranding response.


Report of a mass stranding
Verify report
Take photos and remote physical assessment
Notify NOAA
Are the animals live or dead?
Live
Dead
NOAA approved to respond?
Yes
No
Identify team, planning, and next steps
Provide crowd control, if needed
Implement numbering system to animals
Perform behavioral assessment
Provide supportive care, if needed
Take photograghs and morphometrics of animals
Perform health assessment: blood values, nutritional condition external wounds, stress levels
Evaluate data and determine outcome
Take photos, report, monitor animals
NOAA approved to respond?
Take photos, report, do nothing
Identify team, planning, and next steps
Provide crowd control, if needed
Implement numbering system to animals
Take photograghs and morphometrics of animals
Perform necropsy and collect samples
Dispose of carcasses
Finalize and submit documentation and Level A
Are the animals approved for immediate release?
Attach approved post-release monitoring equipment
Release back into the water or wait for high tide
Finalize and submit documentation and Level A
Are the animals approved to be euthanized?
Need to relocate carcass?
Tow or use truck
At new location
Perform full necropsy?
Full necropsy: Photos/videos, External exam, Morphometrics, Blubber thickness, Internal Exam, Sample collection
Finalize and submit documentation and Level A
Complete necropsy report and submit to NMFS
Are animals approved for rehabilitation?
Tranport animals to approved rehabilitation facility
Finalize and submit documentation and Level A
Are animals approved for temporary short-term holding?

4.2 Photo Documentation

Most photographic data are in digital format and it is necessary to designate cameras and photo cards for documenting responses, prior to the event. A placard that includes identifiers, such as stranding number date, and a scale should appear in the photos, when feasible. It is good practice to begin each case with a photo placard labeled “start” and the time, and end the photographic series for a case with a placard labeled “end” and the time. It is critical that photos remain unaltered and sequential. While photos may be reviewed on the camera to ensure that necessary parts of the image were captured and are in focus, do not delete any photos on the camera (even if they do not provide useful evidence). Fixed-wing airplanes, helicopters, and/or UAS can be used to collect aerial images. The use of UAS has been increasing due to their quiet sound footprint, ability for increased travel range, increased safety, and cost effectiveness.

4.3 Behavioral Observations

In each event, every animal should be assessed through physical, behavioral, and environmental observations. These observations will enable better decision-making and ensure the appropriate course of action is followed. Additionally, these observations will provide important baseline information that can be used in future cases. Important behavioral observations include overall responsiveness, demeanor (calm or fractious), activity (arching or thrashing), hyperesthesia (exaggerated responsivenss to touch), fluttering or twitching of tail, and voclaizations. These behavioral observations assist in the overall health assessment of the animal, inform the best way to handle individuals, and may pertain to disposition decisions (*e.g.,* a fractious animal may not be the best candidate for relocation and release if it cannot be safely handled by personnel). Behaviroal evaluations are part of a comprehensive health assessment and may indicate underlying disease. It is important to make note of behvaiors and take video, if possible, to help inform immediate supportive care or health assessment needs.

4.4 Health/Physical Assessments

A health assessment is necessary in order to determine the best outcome (*i.e.*, rehabilitation, euthanasia, or release) for the animals. Mass stranded animals often do not have chronic pre-existing illnesses or injuries (Bogomolni *et al.* 2010). However, the trauma of the stranding event itself can compromise the animal’s health. Therefore, health assessment and in particular evaluation of shock, are extremely important for stranded cetaceans. A comprehensive health assessment includes all available history information (duration of stranding, number of times stranded, etc.), physical examination data, behavioral observations, and environmental considerations. The animals should be monitored throughout the stranding event for trends in their condition: whether they are stable, improving, or declining, and this information must be considered when making disposition decisions for the animals. Advanced diagnostics including in-field blood analysis, ECG, and utlrasonography can provide additional data points to inform disposition decisions but are not always feasible. A standardized health form *may* be available. If so, it should capture all necessary information. The sooner this assessment can be performed, the sooner the best course of action can be determined for each individual animal, which ultimately may increase some animals' chance of survival. After a health assessment is performed, technical specialists will coordinate with the site coordinator to discuss the best option for each animal based on each animal's assessment.

A thorough health assessment includes evaluation of the following categories (although not all may be available at every response):

- Blood values
- Nutritional or body condition
- Vital signs (respirations, heart rate, temperature)
- External wounds
- Behavior and stress level

4.4.1 Blood Values

When feasible getting blood results as soon as possible will help determine the health of the animal and the next steps. If there is time and the animal's condition permits, blood samples should be drawn for bloodwork and banking. In cetaceans, blood is typically drawn from the central or lateral tail veins (caudal vascular bundle on the flukes), dorsal fin vein, or pectoral flipper vein. In the field, blood can be evaluated in real-time using an I-Stat or other portable patient-side blood machine. Blood can also be collected for baseline blood work that can include a complete blood count (CBC) and standard serum chemistry tests, these samples will usually be processed after the animal is off the beach (*e.g.*, released, in rehabilitation or euthanized). For more details on blood collection (including necessary supplies) and normal blood values for marine mammal species refer to Gulland *et al.* 2018.

Standard blood tests include:

- I-Stat Blood: Depending upon the cartridge type, blood can be collected to evaluate hematocrit, glucose, lactate and other parameters that can be useful to evaluate an animal's status on the beach. Two to three milliliters of whole blood in a heparinized syringe or blood tube.

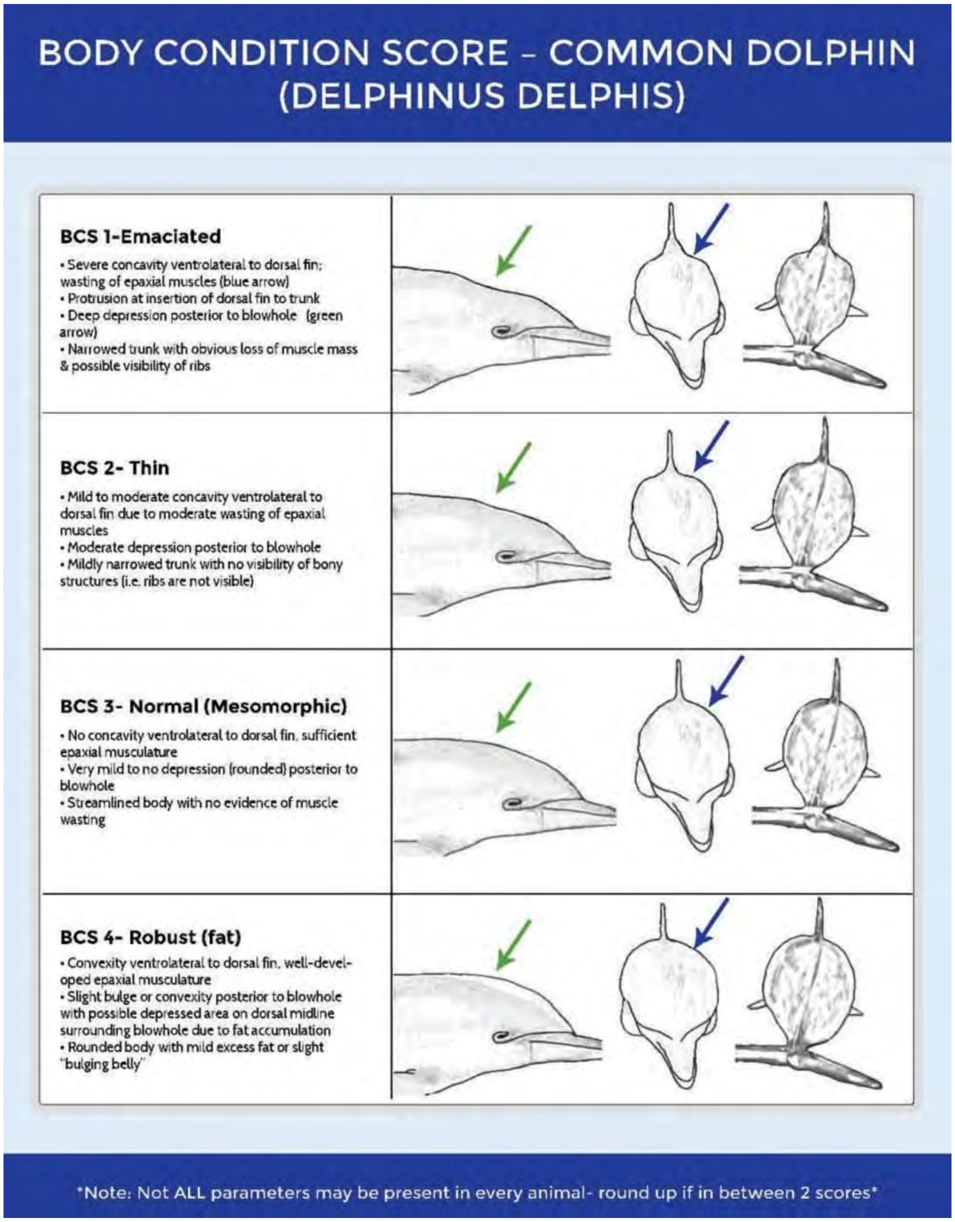
- Complete Blood Cell (CBC): A standard CBC will include the following - White cell blood count, red cell blood count, hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), mean corpuscular hemoglobin (MCH), a differential cell count, platelet and reticulocyte counts. One full lavender-top tube (EDTA) (1 or 3 ml) is taken and refrigerated until analysis.
- Chemistry Profile: Standard serum chemistry profiles will include albumin, alkaline phosphatase, bicarbonate, bilirubin (total and direct), BUN, calcium, chloride, cholesterol, CK, creatinine, globulin, glucose, phosphorus, potassium, total protein, sodium, AST (SGOT), ALT (SGPT), GGT, and ratios of albumin:globulin, BUN:creatinine, and sodium:potassium. Blood should be placed in a serum separator tube or red top tube, allowed to clot, centrifuged within two hours of collection, and refrigerated prior to analysis. Excess serum can be saved and banked (frozen) at the rehabilitation facility.

4.4.2 Nutritional and Physical Condition

When conducting a comprehensive physical exam to determine the best course of action for the animal, Technical Specialists should evaluate these areas in detail (IFAW pers. comm.):

1. Body Condition
    a. Is the animal emaciated (very sunken post-nuchal fat pad/prominent neck, sunken epaxial muscles), thin, or robust?
        i. Note: post-nuchal fat pad can be seen on the dorsal surface (top) of the body just caudal to the blowhole. Sunken epaxial muscles can be observed along the right and left dorsolateral body.
    b. What is the degree of emaciation, if present? The body condition scoring system can be used to evaluate the degree (Figure 1).

Figure 1: Delphinid Body Condition Scoring (BCS) chart using common dolphins (*Delphinus delphis*) as an example. Sketches highlight the primary areas of interest. This chart is meant to serve as a field guide for determining body condition during a stranding triage (Joblon *et al.* 2015).



2. External Wounds / Lesions
    a. Are there any wounds, lesions, or abrasions (note location, size, depth, number; take photos if possible)?
    b. What is the skin condition (note any cracking, blistering, skin sloughing, or sunburn)?
    c. Any additional notes?

3. Mouth
    a. Are there any wounds or discharge?
    b. Is the mouth open or closed?
    c. Belching?
    d. What is the mucous membrane color?

	Color	Indication
Normal	Pink/light pink	Healthy
Abnormal	Pale/white	• Anemia • Heart Failure • Blood loss • Hypothermia • Hypodynamic shock
	Bright red	Hyperdynamic shock
	Blue/purple	Poor oxygenation

    e. What is the capillary refill time (CRT)?

	Time	Indication
Normal	1-2 seconds	Healthy
Rapid	Less than 1 second	Compensated shock
Delayed	Greater than 2 seconds	• Hypovolemia • Hypodynamic shock

    f. Any notes about the teeth (*e.g.*, erupted, worn, missing, etc.) and tongue (*e.g.*, lesions, lingual papillae, etc.)?
4. Blowhole
    a. Is there abnormal discharge, froth, blood, and/or wounds?
    b. Any additional notes?
5. Eyes
    a. Are there wounds, abnormalities, or abnormal discharge?
    b. Is assessing the ocular discharge palpebral reflex needed?
    c. What is the pupil size?
6. Feces
    a. What is the color, amount, and consistency of any feces produced and any parasites?
    b. Is there flatulence, vomiting, or foamy feces?
    c. Any additional notes?
7. Urogenital
    a. What is the color, clarity, and amount of urine produced?
    b. Any lesions on genital slit or penis?

c. Any additional notes?

8. Human Interaction (HI)

a. Is human interaction suspected (describe and document as much as possible)?

b. Has the HI form been completed?

c. Is there thorough documentation through photos, evidence retention, and completion of datasheets?

9. Heart Rate

a. What is the number of heart beats in one-minute (if it is not possible to count heart beats for an entire minute, count for 15 seconds and multiply by 4)?

b. Is the heart rate rhythmic, irregular, or erratic (if apparent)?

c. Monitor and record heart rate every 10-15 minutes.

Rate and Rhythm	Indication
Split*	Normal sinus arrhythmia
No Split	Stress (no sinus arrhythmia)
Other Rhythms	• Sneakers in a dryer (atrial fibrillation) • Premature beats (+/- tachycardia SVT or ventricular in origin • Conduction delays (bradycardia)
Abnormal Sounds	• Murmur ("swish" instead of "lub dub") • Need to listen to multiple locations, ventrally
*Spilt=fastest after breath, slows as animal hold breath (as if diving)	

10. Respirations

a. Are there breaths (one breath=blowhole will open and an exhalation will be followed by an inhalation)?

b. Count breaths for a 2-minute period.

c. Are there any harsh breath sounds, gurgling, sputtering, leakage of air after the blowhole closes, double breaths, chuffing, or any other irregular breaths?

d. Are breaths grouped together or spread apart?

e. Are the respirations short and crisp or long and drawn out?

f. Is there blood, froth, fluid, or obvious odor coming from the blowhole?

g. Monitor and record respirations every 10 minutes (more often if conditions surrounding the animal change).

Auscultations	Indication
Normal	• Fast, deep breaths • Same sound throughout entire lung field

Abnormal	• Harsh • Wheezes (rhonchi) • Crackles (rates) • Decreased or absent lung sounds

11. Additional clinical parameters to be assessed by Technical Specialists
    a. What is the hydration status of the animal?
    b. What is the core body temperature?
    c. Are reflexes normal?
    d. Is the animal pregnant? Is the animal lactating?
    e. Is the animal a dependent calf or geriatric (*e.g.*, severely worn teeth)?
    f. Collect blood for in-the-field and laboratory tests.

4.5 Tagging and Marking

For a mass stranding response, only animals that are approved by NMFS for immediate release will be evaluated for tagging and marking. The decision about which technique(s) to use for tracking live stranded cetaceans for post-release monitoring will generally be made on a case-by-case basis. If the stranded animal is approved by NMFS as releasable, the animal(s) can be marked or be affixed with a NMFS approved tag to facilitate re-sightings and provide quick identification should the cetacean re-strand (Ziccardi *et al*. 2015). The tools available for evaluating post-release outcomes range from the re-sighting of natural or applied markings, to VHF/satellite tag tracking.

Natural markings include pigmentation patterns on the fluke or body, callosity shape and size, dorsal fin shape and notches, or other skin marking depending on the species involved. It is important to acquire a comprehensive series of species-relevant images of all such marks before release to enable recognition later.

Artificial marks are sometimes applied by Stranding Network responders during the response and release. Paint sticks (such as cattle paint stick markings) can be used on the dorsal fin to number stranded animals on the beach or free-swimming (but part of the stranding event). These marks are temporary, and will only last for a few days. Other methods to short-term mark animals also include affixing plastic cattle ear tags in the dorsal fin (for those species with a dorsal fin) or notching of the dorsal fin to create a distinctive fin, which can last for many months to years.

An electronic tag is another type of applied mark. These tags use either VHF (radio) or are satellite-linked and can provide near real-time location data, Tag attachment options include suction cup tags, single pin attachments in the trailing edge of the dorsal fin (for those species with a dorsal fin), or Low Impact Minimally Percutaneous External-electronics Transmitter (LIMPET) tags.

Several types of monitoring can be used in tandem. For example, photos of natural markings can be coupled with applied marks or tags to increase the likelihood of re-sighting animals at multiple time periods (*i.e.,* short-term and long-term) to assess post-release outcomes. Marking and tagging should only be conducted by trained individuals. For more specific details on tagging and marking, refer to the Report of the Joint US Office of Naval Research, International Whaling Commission and US National Oceanic and Atmospheric Administration Workshop on Cetacean Tag Development, Tag Follow-up and Tagging Best Practices.

4.6 Supportive/Palliative Care

Between the actual stranding and the implementation of options, there is a period of time in which live animals must be provided with supportive care and this should be started as soon as possible. The goal is to minimize stress, combat the effects of shock, prevent injury, and increase the likelihood of survival. For those that ultimately do not survive, the animals are kept as comfortable as possible while alive to alleviate suffering. General supportive care (Table 3) can include minimizing noise around the animal(s), keeping birds away, monitoring behavior, minimizing handling, keeping animals wet, and enforcing crowd control.

For cetaceans stranded in surf and/or high and dry, it is important to provide palliative care while assessments and decisions are being made for next steps. This care should be provided regardless of the animals' location at the site and basic monitoring should be conducted on heart rate, respirations (one respiration: exhalation followed by an inhalation), and other behavioral conditions. Cetaceans in shallow water are less encumbered than cetaceans that are high and dry because 1) cetaceans can regulate their temperature in the water, and 2) cetaceans are adapted to life in the water not on land, so responders do not have to worry about the pressure of the animal's body weight in a non-buoyant environment. However, responders must ensure that animals in shallow water are kept in sternal recumbency and are capable of clearing their blowhole easily to breathe. Some species (*e.g.*, beluga) may have natural behaviors for dealing with live strandings including moving and digging in soft mud to create pools of water, dig trenches for pectoral fins and flukes, and/or alleviate pressure. In water, responders must ensure that the animal can breathe without support. If the current is rocking the animal from side to side, responders can help stabilize the animal(s) by placing a hand gently on the leading edge of the dorsal fin. For animals high and dry, it is necessary to make sure the animal(s) rest on their ventrum to help alleviate the weight of the animals' bodies out of water, minimize breathing difficulties, muscle cramping, and to prevent blood from pooling. When exposed, the animal(s) should be kept moist by pouring buckets of water over the animal (ensuring water is not poured near the blowhole) to prevent overheating. To prevent sunburns, tarps can be used to provide overhead shading, light colored sheets can be draped directly on the animal, or zinc oxide can be applied to exposed skin. Moist towels can be used to place over the animals to protect the skin from the sun, ensuring towels are kept moist throughout the duration of the event. In colder weather, animals should be sheltered from the wind and precipitation by covering the extremities with blankets. During any type of care, human safety takes precedence and responders should always check for hazards initially and throughout the event as the situation may change.

Table 3: Supportive Care Checklist

On Land	
	Check scene for safety
	Get animal in an upright position
	Protect from surf
	Rinse sand and debris from eyes
	Protect from sun and wind
	Place on padding or remove sharp or irritating objects
	Cover with a light-colored sheet or towel
	Dig trenches for pectoral flippers
	Maintain body temperature or treat for hyper- or hypothermia
In the Water	
	Check the scene for safety
	Protect from surf
	Keep blowhole above water
	Support the animal with appropriate hand placement

	General
	Minimize handling and contact
	Approach from the front/side
	Monitor condition

4.7 Sample Collection

A variety of samples may be collected from live-stranded marine mammals during a mass stranding response, and may differ depending on the species, animal's stress level, physical condition of the animal, and likely outcome of the animal (*e.g.,* immediate release, transfer to rehabilitation, etc.). These samples include, but are not limited to, morphometrics (*e.g.*, length and girth measurements); skin for genetics; blood for I-Stat, CBC, blood chemistry and/or serology; and swabs (*e.g.*, oral, nasal, blowhole, fecal). Collecting samples helps assess the overall health of the animal, and in determining the best course of action.

Data collection is typically performed by qualified individuals and the amount of data collected may depend on the level of response and capacities. It is important to document the event, including the location and start/end time. Monitoring the animal(s) is essential. Obtain good photographs and/or video of the animals because it can help identify individuals and aid in assessing their condition for further determinations. Recording the animals' behavior is also helpful, as it can aid in the overall assessment of the animal's condition and help determine the best course of action. At a minimum, field information necessary for completion of NOAA's Level A data and human interaction forms must be collected. This will include the assignation of a unique identifier (Field ID#, per Regional stranding network protocols). Level A forms may be completed electronically via direct entry into the National Stranding Database.

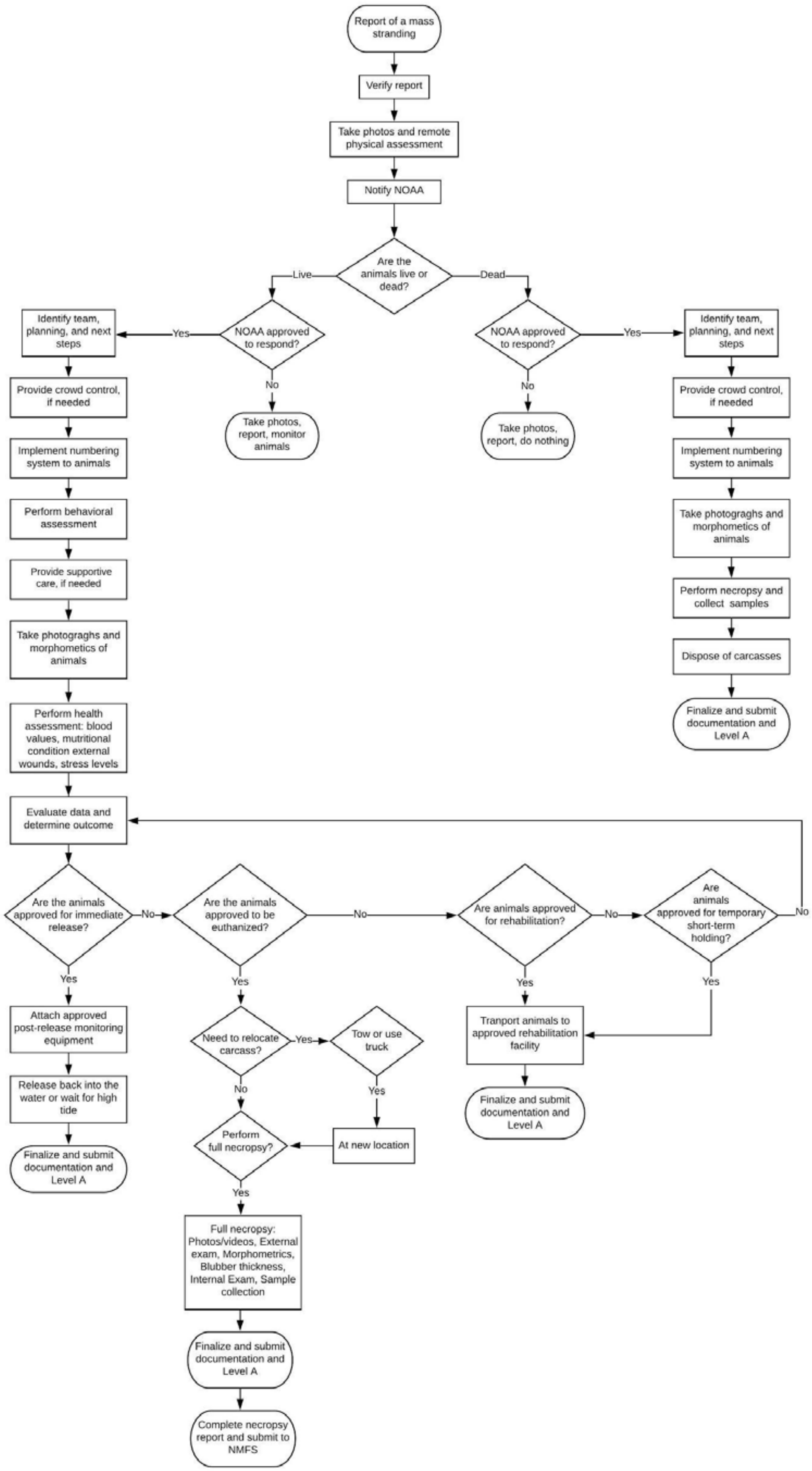
A sample list or log should be created to document the samples collected. Photo logs are a record of each photo taken, which helps to identify the photographer and date/time taken. During data collection, photos should be taken with a label that has the ID number, date, species, log number, and should have a size scale. With all the data collected, a report should be finalized with the photos documented, complete recording of all pertinent findings, and all samples collected and their disposition should be recorded.

5. Dead Mass Stranding

Logistical planning begins with the first report of mass stranded dead cetaceans. Plans need to be made regarding carcass location, tides and weather conditions, transport (if applicable), necropsy, sampling, disposal, resources (heavy equipment and experience of team members), and the media.

5.1 Decision Tree

The decision tree below illustrates the flow of events and the decision-making process involved in a mass stranding event. It is impossible to articulate every scenario, thus these protocols strive to provide a basic understanding of the principles and actions involved in a successful mass stranding response.


Report of a mass stranding
Verify report
Take photos and remote physical assessment
Notify NOAA
Are the animals live or dead?
Live
Dead
NOAA approved to respond?
Yes
No
Take photos, report, monitor animals
Identify team, planning, and next steps
Provide crowd control, if needed
Implement numbering system to animals
Perform behavioral assessment
Provide supportive care, if needed
Take photograghs and morphometics of animals
Perform health assessment: blood values, mutritional condition external wounds, stress levels
Evaluate data and determine outcome
Are the animals approved for immediate release?
Attach approved post-release monitoring equipment
Release back into the water or wait for high tide
Finalize and submit documentation and Level A
Are the animals approved to be euthanized?
Need to relocate carcass?
Tow or use truck
At new location
Perform full necropsy?
Full necropsy: Photos/videos, External exam, Morphometrics, Blubber thickness, Internal Exam, Sample collection
Complete necropsy report and submit to NMFS
Are animals approved for rehabilitation?
Tranport animals to approved rehabilitation facility
Are animals approved for temporary short-term holding?
NOAA approved to respond?
Take photos, report, do nothing
Identify team, planning, and next steps
Provide crowd control, if needed
Implement numbering system to animals
Take photograghs and morphometics of animals
Perform necropsy and collect samples
Dispose of carcasses
Finalize and submit documentation and Level A

5.2 Sample Collection and Photo Documentation

A variety of samples may be collected from dead-stranded marine mammals during a mass stranding response. These samples include, but are not limited to, morphometrics (length and girth measurements), tissues for histopathology, samples for genetics, pathogen, or contaminant analyses, and collection of parasites. It is recognized that it is not possible or practical to collect maximal samples and data in all cases; the effort must be tailored to the conditions (Perrin and Geraci 2002).

The necropsy is extremely important; it provides valuable insight into the health of these animals, could also indicate why they stranded, and the data collected may help animals in the future. A necropsy sample inventory list (Appendix D) is helpful during the necropsy to ensure that all the samples collected are stored appropriately. The quantity and quality of samples taken may diminish as carcass decomposition progresses, so it is important to understand the priority of samples to be collected (Table 4). When in doubt, collect it, and unnecessary samples can be disposed of at a later time (Pugliares-Bonner *et al.* 2007).

Table 4: Example of sample analysis collected per decomposition code (Pugliares-Bonner *et al.* 2007)***:**

Code 2: **Fresh Carcass**	Histology, cytology, pathogens (swabs, tissue), parasitology, contaminants, biotoxins, life history, genetics
Code 3: **Moderate Decomposition**	Histology (limited), pathogens, parasitology, contaminants, biotoxins, life history, genetics
Code 4: Advanced Decomposition	Histology (limited), biotoxins, life history, genetics
Code 5: Mummified/Skeletal Remains	Life history, genetics

*Code 1 is not included as it refers to live animals.

A necropsy report should be completed if partial or complete necropsies are performed, and, at a minimum, a Level A form is required to be completed for each animal and a human interaction is required for code 2 or 3 animals. A sample list or log should be created to document the samples collected. Photo logs are a record of each photo taken, which helps to identify the photographer and date/time taken. During necropsies, photos should be taken with a label that has the ID number, date, species, log number, and should have a size scale. With all the data collected, a report should be finalized with the photos documented, complete recording of all pertinent findings, and all samples collected.

5.3 Necropsy

Animals can be necropsied onsite or, depending on the situation and available resources, transported to another location or facility. Some facilities have freezer or cold room space to store carcasses, allowing for delayed necropsies of small cetaceans, if necropsy on arrival is not possible, though freezing will impact some samples collected. The necropsy process begins with 1) photos and videos, 2) human interaction and external evaluation, 3) morphometrics, 4) blubber thickness, 5) internal examination, 6) and a completed necropsy report.

1. **Photo and videos:** make another careful assessment of the external condition, noting swellings, scars, lacerations, contusions and other lesions. If abnormalities are found, take as many photos as needed to document including a ruler in the photo when possible. Work with the dedicated photographer/data recorder to make sure all needed photos are obtained. Some species require specific images; for example, a right whale needs images of all callosities, scars, flukes, and flippers; humpbacks require ventral fluke images, bottlenose dolphins need images of the dorsal fin and beluga whales need images of lateral sides. Ensure images are taken of all aspects that will assist with photo-identification of the individual as well as record the standard suite of measurements (Pugliares-Bonner *et al.* 2007).

2. **Human interaction evaluation:** the carcass should be examined for evidence of human interaction (vessel strike wounds/scars, entanglement marks or scars, entanglement gear, etc.). When examining for human interaction, any suspect evidence should be fully documented (*i.e.,* photos) and the area sampled for histology, if possible. A human interaction form should also be filled out for all code two and three animals.

3. **Morphometrics:** Depending on the location of the carcass, it may be hard to measure the total length of the animal. In some cases, some of the carcass may be underwater so a reasonable “estimate” will suffice. If the carcass is high and dry, the total length can be measured by laying the tape next to the carcass.

4. **Blubber thickness:** If the carcass is fresh and not bloated, at minimum measure blubber thickness at the front of the dorsal fin or ridge dorsally, midline and ventrally.

5. **Internal examination:** Report all areas of hemorrhage, edema, swelling and abscessation. Look for focal changes in color pattern and texture of organs. If the carcass is fresh to moderately decomposed (code 2 or 3) take histology samples of identifiable as well as suspect tissues. Proceed logically through the carcass using a gross necropsy report form as a prompt to ensure all organ systems are examined (Pugliares-Bonner *et al.* 2007).

6. **Necropsy report:** Refer to section 5.2 and to *Marine Mammal Necropsy: An Introductory Guide for Stranding Responders and Field Biologists* (Pugliares-Bonner *et al.* 2007).

5.4 Carcass Disposal

The cause of death influences the options available for carcass disposal. Animals that expire naturally can be disposed of in a number of ways. If the animal is euthanized with chemicals known to cause secondary poisoning in scavengers (*e.g.*, pentobarbital), disposal options may be more limited (*e.g.*, deep burial, rendering, incineration). Certain chemical euthanasia methods, such as saturated potassium chloride solutions in conjunction with heavy sedation, have a low risk of secondary toxicity for scavengers and can be used when preferred methods of disposal of chemically euthanized remains (*e.g.*, deep burial, rendering, incineration) are not available (AVMA 2020, Harms *et al.* 2014, Barco *et al.* 2016). For more information, refer to the Marine Mammal Carcass Disposal Best Practices.

6. Animal Disposition Options

Responding to a cetacean mass stranding involves balancing different factors. Generally, the process involves initial observations, decisions from NMFS whether to intervene, assessing the animals to determine their health status (including collecting all of the necessary samples), and finally identifying the best disposition option for each animal. There are four options for an animal’s disposition: immediate release, temporary short-term holding, rehabilitation, and euthanasia.

6.1 Immediate Release At-Site, Relocation and Release

Immediate release is when an animal is rescued, assessed, and approved to be released back into the wild during the same event. Before an animal is released, a hands-on physical assessment is performed by the response team, the stranding is documented, and the animal is often marked or tagged for post-release monitoring (including determining if the same animal strands again later). Most animals that strand as part of a mass stranding event are healthy (Bogomolni *et al.* 2010; Jefferson *et al.* 2011), and can be released together as a group, depending on the context of the stranding. Because much of cetacean behavior is learned, mass stranded juveniles should be released with adults or in the presence of conspecifics and mothers released with their dependent young, when feasible.

Immediate release is an option if the following factors are met:

- The animal is healthy or medically stable, and able to function normally as determined by NMFS, the capture lead, and the stranding network veterinarian (on-site or via phone consultation);
- Social requirements can be met (*e.g.*, maternal care for young); and
- It is highly recommended the animal be marked or tagged in some manner prior to release, using NMFS approved methods such as:
    - Marking – paint stick/crayon marking;
    - Notching or freeze-branding of the dorsal fin; or
    - Tagging - a single-bolt roto tag or cattle ear tag or a single-pin radio or satellite tag (if available).

The animal may be released at the stranding site if:

- Beach and environmental conditions are favorable;
- The animal is believed unlikely to strand/re-strand; and
- The location of capture is near the animal's natural habitat.

The animal may be relocated to a different site and released immediately if:

- A different beach site is a more suitable site for release;
- The animal is manageable and adequate logistical support is available, including transport vehicles; and
- The new site is believed to improve the chances of a successful release for the captured cetacean, and reduce the likelihood of a stranding.

6.2 Short-term holding (less than 96 hours)

During the event, it may be decided that an animal needs short-term holding. Short-term holding is defined as holding an animal in an authorized facility for less than 96 hours. The facility should hold a Stranding Agreement that specifies that it has met minimum standards for rehabilitation and has specific accommodations available. During an emergency and approval of NMFS, it is also possible that a facility not previously approved for short-term holding or long-term rehabilitation can serve as a temporary stabilization location; however, the facility must comply with all requests and recommendations for stabilization care from NOAA or consulting veterinary experts. These facilities need to meet the minimum standard of appropriate veterinary medical care. The attending veterinarian should be available on-call 24 hours a day. When drafting a release plan, the veterinarian needs to consult with the MMHSRP permit PI and RSC. The MMHSRP permit requires that the PI approve release determinations for all rehabilitated threatened and endangered marine mammals. For more information on the minimum standards for marine mammal rehabilitation facilities refer to NMFS' *Policies and Best Practices for Marine Mammal Response, Rehabilitation, and Release – Standards for Rehabilitation Facilities*.

6.3 Rehabilitation

Rehabilitation, per 50 CFR 216.3, is defined as treatment of beached and stranded marine mammals taken under section 109(h)(1) or 112 (c) or imported under section 109(h)(2) of the MMPA, with the intent of restoring the marine mammal's health (including normal behavior). An authorized animal care facility provides treatment with the goal of releasing the animal back to the wild. Rehabilitation is an appropriate option when:

- The onsite examination by the veterinarian determines that the animal needs more medical treatment than can be provided in a short handling session;
- NMFS approved facilities are available and equipped for the species and number of animals involved;
- Arrangements can be made for a safe and expeditious transport to the rehabilitation facility;
- There are sufficient funds and staff to provide care for a reasonable amount of time; and
- There is a good chance that the animal can be restored to health and successfully released back to the wild.

6.4 Euthanasia

There are many situations that could call for the consideration of euthanasia, such as severe injury or illness. Each scenario should be evaluated on a case-by-case basis to provide the most humane and best outcome for the individual animal.

Euthanasia is an option when:

- The veterinarian determines that euthanasia is the most humane course of action to take given the animal's prognosis:
  - The animal(s) is deemed to be critically injured or ill with little chance of recovery;
  - The animal(s) is suffering or unlikely to survive if released; and
  - It is necessary to end the suffering of an animal.

- No rehabilitation facilities are available and immediate release is deemed inhumane or unlikely to succeed.

The decision to euthanize is made in consultation with the RSC and the procedure must be conducted by:

- A Stranding Network veterinarian;
- An experienced, trained and authorized stranding network member;
- An appropriately trained local, state, tribal, or federal law enforcement, wildlife or animal control agent; or
- A non-marine mammal veterinarian in consultation with an experienced Stranding Network veterinarian.

For more detailed information on marine mammal euthanasia, see Marine Mammal Euthanasia Best Practices, Marine Mammal Euthanasia, *Marine Mammals Ashore* (Geraci *et al.* 2005), and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018).

7. Other Categories of Mass Stranding Scenarios

7.1 Trapped/Out of Habitat (*e.g.*, Natural Disasters)

An animal is considered out of habitat if it is not in the typical range (*i.e.*, melon-headed whales (*Peponacephala electra*) in Hanalei Bay, Kaua'i, Hawai'i in 2004, Southall *et al.* 2004) of that species, including offshore waters, coastal waters, or bays, sounds, estuaries and rivers. Most typically for cetaceans, out of habitat animal(s) is found in an inlet, creek, river, or other body of water that may only be connected with the ocean (or bay/sound/estuary) at certain tidal cycles, or under certain conditions. Out of habitat cetaceans may occur after severe weather events, such as hurricanes or tropical storms, when animals have been reported many miles inland, presumably washed in with storm surge and then left behind as the storm waters have receded.

Typically, animals of concern have an initial assessment conducted in coordination with NMFS, the local stranding network, and other experts. This initial assessment will consider the animal's size, age, body condition, behavior, habitat (including environmental parameters such as salinity), social context (juveniles or cow/calf pairs), prey availability, and the overall health risk. In addition, NMFS evaluates whether the animals are prevented from leaving the area, either by a physical barrier or a perceived barrier. If the animals are not in imminent danger, NMFS, in coordination with the local stranding network, will continue to monitor the situation for any significant changes.

Once animals have been deemed out of habitat, the next step is to determine if response is necessary. When evaluating whether to intervene, NMFS generally considers the likelihood of the animals leaving on their own, chances of survival if no intervention occurs, if the environment will allow for the capture to be safe for both the response team and animals, if there are protected/sensitive habitats (*i.e.*, seagrass, coral reefs, and oyster reefs) that should be avoided during the intervention, and whether it is possible to relocate or rehabilitate the animal. NMFS generally consults with marine mammal behavior experts, veterinarians, scientists, and other experts when determining the best course of action.

NOTE: For severe weather associated with displaced animals, the timeliness of the response is essential. Therefore, NMFS may intervene without an initial monitoring period as soon as is feasible and appropriate.

7.2 Oil Spill

During oil spills, there may be efforts to capture and move cetaceans, which may pose significant challenges. Herding methods may initially be used to haze cetaceans away from oil. If those efforts fail, intervention and relocation may be considered. Moving or relocating healthy animals to areas that are not oiled poses significant health and safety concerns for the animals and is not guaranteed to provide a greater chance of survival than leaving them in their natural habitat. Relocating animals involves capturing a free-swimming animal, which should only be attempted as a measure of last resort due to the risks to the safety of the rescue personnel and animals. Other issues that would need to be considered before moving cetaceans away from an oiled area are:

- Relocation could overcrowd areas with more cetaceans than the habitat can support;
- Relocations could alter the infectious disease ecology of the population or individuals; and
- Relocations might subject cetaceans to poor-quality habitats with insufficient food and shelter needs.

Rescuing healthy animals to place them in rehabilitation facilities to prevent potential impacts from oil is not desirable because it causes stress to the animal and may introduce health problems that could cause the animal's condition to deteriorate. Thus, proactively catching healthy animals could do more harm than good. However, in specific cases, including for threatened and endangered species, and in very specific locations, or for particular types of hazardous material spills, capture and relocation or capture and short-term holding may still be implemented. In-depth and specific information regarding cetaceans and oil spills can be found in the NMFS Marine Mammal Oil Spill Guidelines (Ziccardi *et al.* 2015).

8. Conclusion

The Stranding Network is often faced with complex events that require consideration of a variety of different factors. No one event is the same, and each has their own aspects to consider. This document outlines the decision-making process during cetacean mass strandings and provides guidance on responding to these complex events. There may be regional and state differences in response methods used, as well as differences in response methods based upon the species present (*e.g.*, threatened and endangered).

9. Acknowledgements

We would like to thank the many people who contributed information, protocols, and expertise to this Best Practices document. We would like to especially thank the International Fund for Animal Welfare.

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11. Appendix A: Example Datasheets

The below datasheet is an example provided by IFAW.

Date: ________	**Stranding Location:** ________________________	**Lat/Long:** ___________________	GPS GE Cell
Time Init Rpt: _______	**Init Rpt'd:** □ swimming □ stranded (□ dry □ in some wtr)		**Est. Time Stranded:** ______
On-scene @: ________	**Admit @:** _______ **Loc in Veh:** ___________	**# Animals:** _______	□ Susp Mom/calf
Str. Length: _______cm	**Max Width:**_____cm	**Photos:** □ pre-tagging □ post-tagging	□ lesions
Sex: M F CBD NE	**Weight:** _________kg	**Species:** ___________ **HI:** N Y CBD	□ HI form

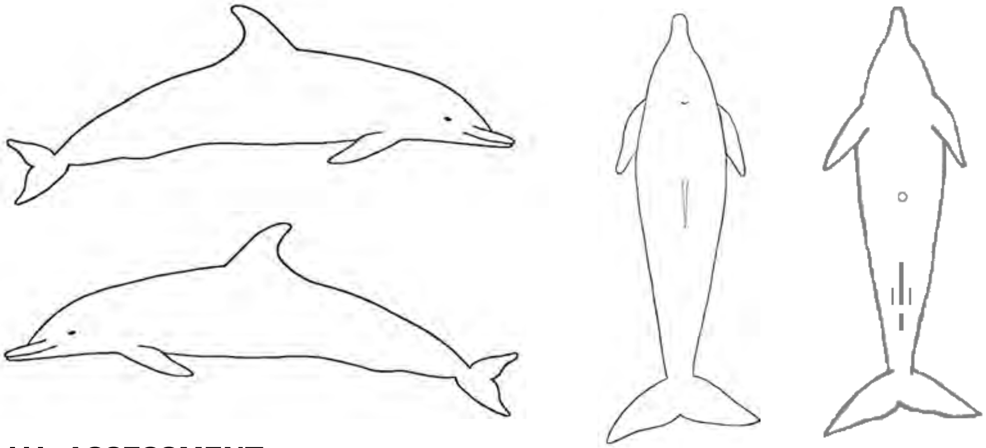
I. SUBJECTIVE:

Abnormal/Normal

Attitude	BAR QAR lethargic non-responsive	A / N
Disposition	calm but responsive arching thrashing hyperesthetic tail fluttering vocalizing	A / N
Body condition	emaciated (1) thin (2) slightly thin (3) mesomorphic (4) robust (5)	A / N
MM Color	pink pale pink white gray cyanotic (purple) injected (bright red) N/E	A / N

II. OBJECTIVE: **Rectal Temp:** ______°F **HR** (bpm): _____ /_____ @ ___:____ **RR** (bpm): ____ @ ____:_____

Post Nuchal Fat Pad	Concave (1) Spongy (2) Firm (3) Convex (4)	A / N
Neurologic	Alert Dull Stuporous **Nystagmus** (repetitive eye motion)**:** N Y (vert OR horiz / bilat OR unilat) **Strabismus** (abnormal eye position): N Y (dorsally ventrally cranially caudally) **Other Abnorm**:	A / N
Ophthalmic OD (right eye)	**Palpebral:** NE, 0, 1, 2 **PLR:** NE, 0, 1, 2 **Blepharospasm** (squinting): + / - **Visual Tracking**: + / - **Globe Intact**: N Y **Discharge:** N Y (describe): If corneal lesion, stain uptake: NE NA N Y (describe/draw):	A / N
Ophthalmic OS (left eye)	**Palpebral:** NE, 0, 1, 2 **PLR:** NE, 0, 1, 2 **Blepharospasm** (squinting): + / - **Visual Tracking**: + / - **Globe Intact**: N Y **Discharge**: N Y (describe): If corneal lesion, stain uptake: NE NA N Y (describe/draw):	A / N
Oral (mouth, tongue, teeth)	**Dentition** (broken, worn, missing, partially erupted teeth): **Lesions/Masses/Other**:	A / N
Cardiovascular	**Heart Rate** (bpm): _______(Brad) _______ (Tach) @ ____:____ **ECG Tracing:** N Y **Rhythm:** Sinus arrhythmia ("split") OR Normal sinus rhythm (steady = "no split") Tachycardia (fast, sustained) Bradycardia (slow, sustained) Other Abnorm: ___________ **Murmur**: NMA Murmur (note systole vs diastole, Grade 1-6):	A / N
Respiratory	**Respiratory Rate** (bpm): _________ @ ____:____ **Malodorous Blow:** N Y **Blowhole Seal Intact:** N Y **Blowhole Discharge**: N Y (describe): **Character:** WNL Full Shallow Apneustic Uniform Rapid Double breathing (freq occ) Exhale only (freq occ) Chuffing (freq occ) Blowhole Leaking (freq occ) **Lung sounds** (note affected lung field and % lung for abnormalities): R: Clear (NBVS) Harsh (crackles, wheezes, increased BVS) Absent L: Clear (NBVS) Harsh (crackles, wheezes, increased BVS) Absent	A / N
Gastrointestinal	**Feces:** N Y (describe color, amt, blood present, consistency (FOAMY?), parasites): **Flatulence:** N Y **GI Sounds Auscultated:** N Y NE **Vomiting:** N Y	A / N
Urogenital	**Sex:** M F NE **Urine:** N Y (Describe color, amt, USG): **Lactating:** NE NA N Y (describe): **Lesions/Discharge:**	A / N
Musculoskeletal:	**Scoliosis:** N Y ("C" shape open to: L R / mild moderate marked) **Other Abnorm:** N Y	A / N
Integument (skin)	**Rake Marks:** N Y (fresh healed) **Skin sloughing:** N Y (mild, mod, marked) **Lesions:** N Y (describe and draw on reverse):	A / N



Example Conditions (not all-inclusive):
- *Shock (foamy feces, unresponsive, pale mm, rapid HR)*
- *↑ HR/no split*
- *↑RR, harsh lung sounds*
- *Anemia*
- *Elevated liver values (ALT, GGT, TBili)*
- *Elevated muscle enzymes (CK, AST)*
- *Dehydration (mild ↑BUN, creatinine, hemoconcentrated)*
- *Scoliosis*
- *Ruptured globe (eye)*
- *Significant wounds/scav dam*
- *Single strander/release*
- *Pregnant*

III. ASSESSMENT:

MASTER PROBLEM LIST:

1. ______________________________ 4. ______________________________
2. ______________________________ 5. ______________________________
3. ______________________________ 6. ______________________________

CONDITION DURING TRANSPORT: □ Stable □ Improving □ Declining

RELEASE CRITERIA: *good=0, fair=1, poor=2, grave=3* ***Dependent calves should be scored '6' on the social component***

PE____+ Behavior____+ Blood____+ Social____ = ______ *(0-2 = good release candidate, 3-5 = borderline, 6-12 DNR)*

IV. PLAN:

DIAGNOSTICS:

Bloodwork: Draw Time: _______ Site: DFL VCP DFN IC Method: Syr / Vac / Pico

In-House: □ CG4+ □ HM5 □ Vetscan / □ CHEM 8+ IDEXX: □ Dolphin Profile □ CBC/Chem

Ultrasound: □ L side □ R side □ Brief □ Full □ Thoracic □ Abdominal □ Blubber Thickness

Results: □ WNL □ Renal Gas □ Pulmonary Lesions □ Pregnant (1st, 2nd, 3rd trimester, CBD) Initials:________

Other DX: □ ECG □ capnography □ AEP □ blowhole swab □ rectal swab □ skin □ other:_________________

TREATMENTS: (*E/Se (2.5mg/mL Se): 0.06mg/kg Se IM)*

E/Se: _______mL Time:________ Inj Site:_____________ / Other: ________________ Time:______ Inj Site:____________

Fluids: ____________mL Type: □LRS □0.9% NaCl Site(s): VCP / DFL / DFN *(22.5 mL/kg IV bolus in 30 min, can repeat once)*

1st bag: Start Time: ______________ End Time: _______________

2nd bag (only if indicated): Start Time: ______________ End Time: _______________

DISPOSITION: **Tag:** Roto / Caisley Tag #: _______ Sat. Tag #: ___________ Pin length: _____mm □ Not tagged

□ **Reloc/ Rel** Site:________________________ □ **Released at site** □ **LAS** Time: __________ Total # dolphins: ________

Release Conditions (great=0, 3=bad):____

Animal Release Score (How well did the animal swim off? well=0, 3=badly)_____________________________

□ **Euthanized** Staff Init: _____ Vet Init: ______ Bottle #: _______ Volume: _____mL Inj time: ________ TOD: _________

□ **Died** TOD: ___________ Notes:____

Tagging & Disposition Justification:____

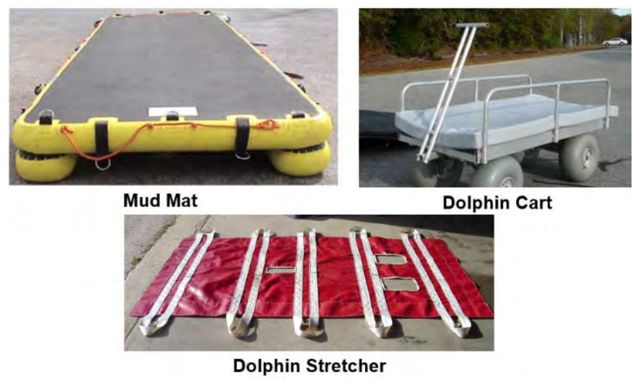
OVERALL PROGNOSIS: → Tally scores from above: Release Criteria + Release Conditions + Animal Release Score = ________

→ *(0-3 = good, 4-8 = borderline/fair, 9+ = poor)*

Primary examiner: ________ **Signature:** ________________________________ □ **vet consult** ________

12. Appendix B: Photos of various transportation methods

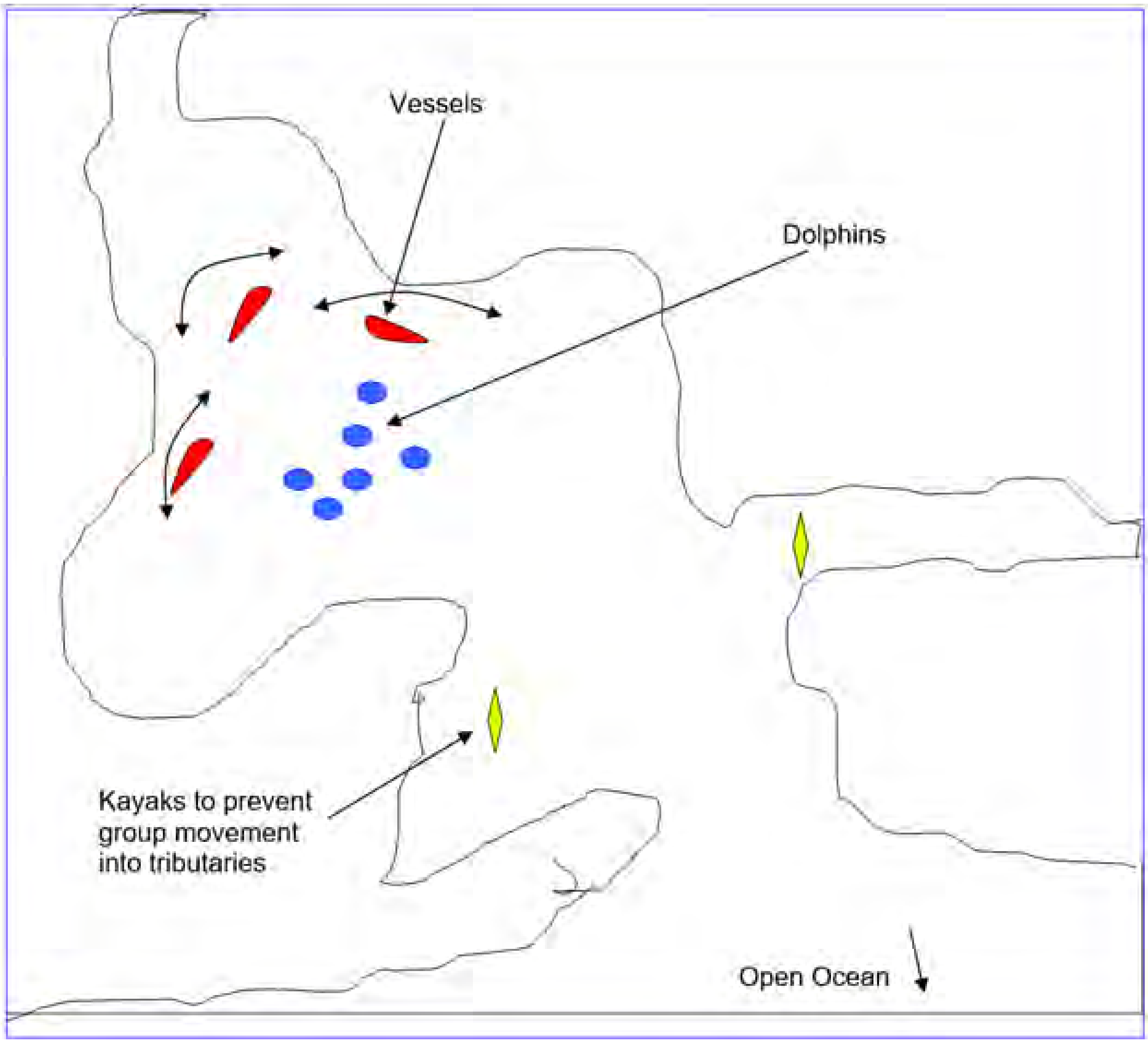
Photo credits: IFAW



Transport of numerous carcasses during a mass stranding.

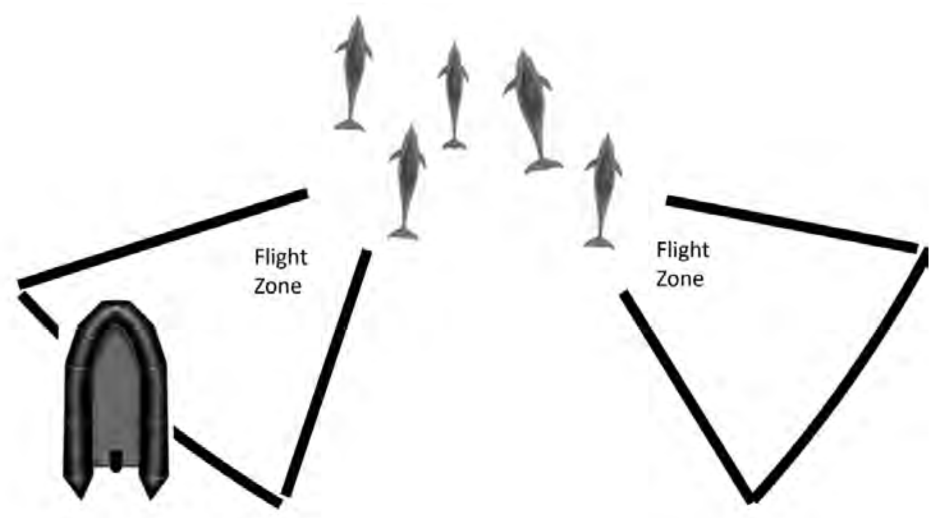
13. Appendix C: Example diagrams of herding techniques

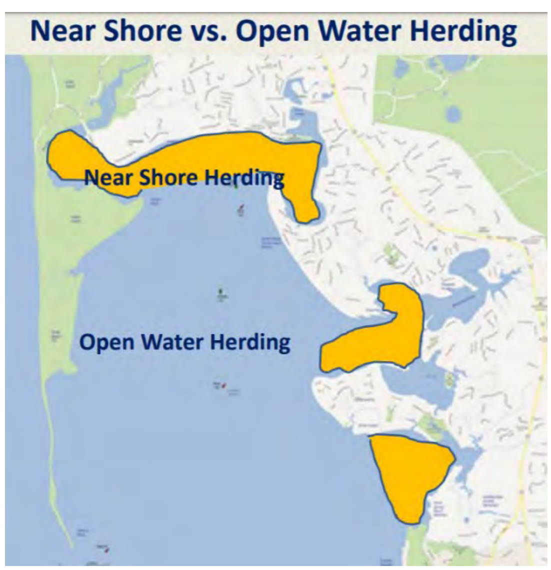
Images and information provided by IFAW.

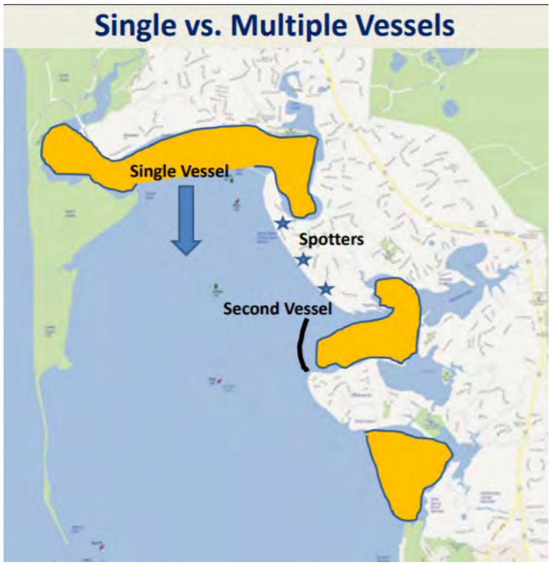


Note: The red vessels move back and forth (along the arrows) behind the animals, driving them toward open water. The yellow kayaks (or small vessels) can be used to deter animals from moving into smaller tributaries during the herding process. These vessels can use pingers or just banging on the sides of the boat to deter the animals. It is very important that these vessels NOT deploy pingers until the animals have moved just seaward of them or are attempting to travel into the tributary.

Example flight zones and herding techniques (images provided by IFAW):






Single vs. Multiple Vessels
Single Vessel
Spotters
Second Vessel

14. Appendix D: Example necropsy sample list

This is only an example and sampling should not be limited to this list (Pugliares-Bonner *et al.* 2007).

	Standard Samples				Pinn. Only			UME ONLY
	Life History	Genetics	Contam.	Histo.	Herpes	Morbilli	Brucella	Biotox
Tissue	(Frozen or fixed as below)	(Frozen &/or DMSO)	(Foil wrapped and frozen)	(2 sets in 10% NBF)	(Frozen)	(Frozen)	(Frozen)	(Frozen -80º)
Skin		☐ ☐		☐ ☐				
Teeth	FR ☐							
Oral mucosa					☐			
Blubber			☐	☐ ☐				
Muscle			☐	☐ ☐				
Liver			☐	☐ ☐	☐		☐	☐
Kidney (R)			☐	☐ ☐	☐		☐	☐
Kidney (L)				☐ ☐				
Stomach				☐ ☐				
Lung (R)				☐ ☐			☐	
Lung (L)				☐ ☐		☐		
Tracheobronchial Lymph				☐ ☐		☐	☐	
Spleen				☐ ☐		☐	☐	
Blood/Serum					☐	☐		☐
Esophagus				☐ ☐				
Trachea				☐ ☐				
Prescapular Lymph				☐ ☐		☐	☐	
Heart				☐ ☐				
Diaphragm				☐ ☐				
Pancreas				☐ ☐			☐	
Mesenteric Lymph				☐ ☐		☐	☐	
Intestine				☐ ☐				
Adrenal (L)				☐ ☐				
Adrenal [R]				☐ ☐				
Colon				☐ ☐				
Bladder				☐ ☐				
Testis	FX ☐			☐ ☐			☐	
Uterus	FX ☐			☐ ☐			☐	
Ovary	FX ☐			☐ ☐			☐	
Feces								☐
Stomach Contents	CH ☐							☐
Urine								☐
Aqueous humor								☐
Milk/Mammary Discharge	FR ☐							
Brain				☐ ☐			☐	
Other:								
Lesions (list)	FR ☐			☐ ☐				
Fungal growths	FR ☐ SW ☐			☐ ☐				
Parasites (EtOH)	☐							
Culture (swab)	SW ☐	List sites:						

Appendix XVI

Live and Dead Large Whale Emergency Response Best Practices

Table of Contents

1. Introduction

1.1 Background

The National Marine Fisheries Service's (NMFS) Large Whale Emergency Response Best Practices was developed to standardize procedures and roles to enhance large whale stranding response for both live and dead whales through improved coordination and communication.

For the purpose of this Best Practice, large whales include the following federally protected species:

Endangered Species

Mysticetes:

North Atlantic right whales (*Eubalaena glacialis*)
North Pacific right whales (*Eubalaena japonica*)
Fin whales (*Balaenoptera physalus*)
Sei whales (*Balaenoptera borealis*)
Blue whales (*Balaenoptera musculus*)
Bowhead whales (*Balaena mysticetus*)
GOMEX Bryde's whale (*Balaenoptera brydei*)
Western North Pacific Gray whales (*Eschrichtius robustus*)
Central American Humpback DPS (*Megaptera novaeangliae*)
Western North Pacific Humpback DPS (*Megaptera novaeangliae*)

Odontocetes:

Sperm whales (*Physeter macrocephalus*)
Southern Resident Killer whales (*Orcinus orca*)

Protected Species

Humpback whales (*Megaptera novaeangliae*)
Non-GOMEX Bryde's whale (*Balaenoptera brydei*)
Eastern North Pacific Gray whales (*Eschrichtius robustus*)
Minke whales (*Balaenoptera acutorostrata*)

This document also applies to any extra-limital mysticetes (*e.g.*, those that do not routinely occur in the United States (U.S.) waters, such as the Southern right whale (*Eubalaena australis*) or the Antarctic minke whale (*Balaenoptera bonaerensis*) if they are found in U.S. waters.

Additionally, much of the information found in this Best Practice is applicable or can be scaled when responding to larger odontocetes (*e.g.*, beaked whales). Additional guidance for these species may also be found in the Small Cetacean Intervention and the Cetacean Mass Stranding Response Best Practice documents.

This Best Practice was developed to guide the response to an emergency involving one or more of these whales in the waters and on the shores of the U.S. Such emergencies for live whales include:

- Out of habitat events - where large whales are observed far from their typical habitat. This could include animals in freshwater rivers or bays, or an extra-limital "wanderer" such as a gray whale observed in the Atlantic
- Observed at sea significantly injured or moribund
- Entangled and free-swimming or anchored
- Stranded alive in the surf zone or on land or ice

Such emergencies for dead animals include:

- Floating carcasses
- Stranded dead in the surf zone, on land, or ice

1.2 Authorities

There are two key pieces of legislation that govern interactions with marine mammals in the U.S. These are:

- The Marine Mammal Protection Act (MMPA)
  The MMPA, signed into law in 1972, prohibits the "take" of sea otters, seals, sea lions, walruses, whales, dolphins, and porpoises, which includes harassing or disturbing these animals, as well as actual harming or killing, unless such take is specifically exempted in the statute or authorized. The MMPA divides responsibility for marine mammal species between the Secretary of Commerce (overseeing NOAA and the NMFS) for cetaceans and pinnipeds with the exception of walrus, and the Secretary of the Interior (overseeing the USFWS) for walrus, polar bear, sea otter, and manatee. Title IV of the MMPA establishes the Marine

Mammal Health and Stranding Response Program (MMHSRP) under the leadership of the Department of Commerce, NMFS in consultation with the Department of Interior and Marine Mammal Commission.

- The Endangered Species Act (ESA)
  The ESA, enacted in 1973, provides for the conservation of species that are listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on "take" including harassment and disturbance as well as injuring and killing.

Marine mammal stranding responders thus need to be authorized to respond under both of these statutes. The Marine Mammal Stranding Network (the Stranding Network) consists of approximately 100 organizations that have applied for and received an authorization, called a Stranding Agreement (SA). The SA is issued under Section 112(c) of the MMPA, and allows the take of marine mammals that are stranded. Organizations may receive authorization for the take of dead animals, live animal first response and triage, and/or rehabilitation; additionally, authorization may be different depending upon species or taxa (*e.g.*, cetaceans vs. pinnipeds). Additionally, State, local, Federal, and tribal government employees, when acting in the course of their duties, may take marine mammals for the protection and welfare of the animal or the protection of public health and welfare under Section 109(h) (with or without a SA in place).

For marine mammals listed under the ESA (which includes most of the species of large whales), authorization for take is provided under a scientific research and enhancement permit issued to the NOAA MMHSRP. Response to strandings involving a threatened or endangered marine mammal, requires authorization and direction from the MMPA/ESA permit Principal Investigator (*i.e.,* the MMHSRP coordinator) or a Co-Investigator (*e.g.*, Regional Stranding Coordinators (RSC), MMHSRP Headquarters (HQ) staff, etc.). Existing relationships with authorized Stranding Network partners are used to delegate authority under the permit for endangered species response activities, provided activities are done in coordination with NMFS.

1.3 Purposes and Intended Uses

These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations. These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a "living document," and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

2. Roles and Responsibilities

2.1 Incident Command System Overview

The Incident Command System (ICS) is one of the most important best practices to be incorporated into marine mammal stranding response including strandings, entanglements, oil spills (refer to Cetacean and Pinniped Oil Spill Response Guidelines), and injured or ill free swimming individuals. An ICS, as adopted and defined by the National Response Team, is "a standardized on-scene incident management concept designed specifically to allow responders to adopt an integrated organizational structure equal to the complexity and demands of any single incident or multiple incidents without being hindered by jurisdictional boundaries" (NRT 1996). The ICS will allow for flexibility on scene, a clear chain of command, and consistency when working with other response organizations and other federal, state, local or tribal agencies.

The ICS has proven to be an effective way to manage emergency response efforts, particularly those where there are capacity needs that require including individuals from multiple response organizations such as those required by most large whale emergency responses. The overall flexibility allows for the incorporation of certain roles and processes currently used during the response, while providing a common vocabulary and operating picture for all of the potential responders. A large whale response typically grows from a small, localized approach with a single organization and then is often expanded to fit the level necessary for a specific large whale incident. A tiered level approach for large whale events has been developed to help identify the type of ICS structure that may be needed to effectively respond to an event (Table 1). Developing a full ICS structure takes time and should ideally be developed prior to an event, used in training (drills), and used in a progressive manner during an event, as the situation evolves. The size and focus of the ICS is dependent on the magnitude of the incident, and can be expanded or contracted as necessary. Only the positions that are required for an adequate response need to be filled and one person can often fill more than one position. Organization levels (*e.g.*, section chiefs, coordinators) should be kept as small as possible to accomplish ICS objectives and maximize effectiveness.

Table 1. Tiered approach to ICS for large whale stranding events

	TIER I	**TIER II**	**TIER III**
Type of Event (Examples)	Single whale stranding, other than a right whale	Right whale calf; large whale associated with an UME; entangled or vessel struck dead large whale; live large whale out of habitat response; live or dead whale stranding in protected area	Adult or subadult right whale or other ESA species; multiple whales of any species on beach or out of habitat; strandings during natural or anthropogenic disaster
Number of Organizations Involved	2 or fewer, or organizations that typically work together (*e.g.*, local Network, harbormaster, and local Law Enforcement)	1-2+ Network organizations, with likely involvement of a Law Enforcement agency or other Federal partner (*e.g.*, National Marine Sanctuary, National Park, US Coast Guard).	2+ Network organizations, Law Enforcement, U.S. Coast Guard, National Park, National Marine Sanctuary, etc.
ICS Organizational Level	Minimum	ICS structure expanded, not to full scale	Full scale ICS- Unified Command

ICS will be used to provide the on-scene management structure that guides response efforts, and typically consists of at minimum these four functions:

- **Planning section**: responsible for developing a plan to accomplish response objectives, including collection and evaluation of information, tracking resources, and documenting response effort; accomplished through the completion of Incident Action Plans (IAPs) (see example in Appendix A), which project plans and resources needed for the next operational period
- **Operations section**: conducts tactical operations to carry out an action plan; directs resources
- **Logistics section**: provides the resources, support and services to meet plan needs
- **Financial section**: monitors costs related to the incident.

2.2 Large Whale Response Structure and Roles

2.2.1 Unified Command

The ICS structure may expand to become a Unified Command (UC). The UC is an expansion of the ICS organization in cases in which the response impacts the jurisdictional or functional responsibility of more than one agency. To be a member of the UC, an agency (federal, state, local, tribal) must have the authority and jurisdiction to respond to the event. As a component of the ICS, the UC is a structure that brings together decision-makers from the major organizations that have responsibility for the incident to coordinate a more safe and effective response within their own jurisdictional missions. The UC is then responsible for the overall management of the incident and provides a forum for consensus decision making regarding the incident. It establishes incident strategies and objectives so that all agencies can function as a team and melds resources and responders for an effective operation.

The makeup of the UC may change as an incident progresses. The composition of the UC will be determined on a case-by-case basis. It must be noted that participation in the UC occurs without any agency abdicating authority, responsibility, or accountability. Specifically for responses conducted under the MMHSRP MMPA/ESA Permit, MMHSRP HQ staff must be part of the UC. The UC may include:

- United States Coastal Service (USCG), if involved
- NMFS National Marine Mammal Stranding Response Coordinator or Veterinary Medical Officer
- NMFS Regional Stranding Coordinator (RSC)
- NMFS Regional Entanglement Coordinator (if applicable)
- State Stranding Coordinator, if applicable
- Local Stranding Network responder
- Necropsy Team Leader (NTL)

The necessity for a UC increases when multiple agencies are involved or the incident becomes more complex. There are many advantages to implementing UC, such as: single set of objectives, collective strategy approach, increased communication, performance optimization, and cost effectiveness.

2.2.2 Command Staff

The Safety Officer (SO), the Public Information Officer (PIO), and the Liaison Officer are part of what is known as the Command Staff; they support the UC and report to the Incident Commander (IC). The

Safety Officer is a single person with responsibility for monitoring on-scene safety conditions (including weather conditions) and developing measures to ensure the safety of all assigned personnel. The Public Information Officer is a single person who has responsibility for all interaction between Command and the media and who coordinates the release of information on the incident situation and response efforts from Command to the media. The Liaison Officer acts as the on-scene contact point for representatives of assisting agencies assigned to the incident. In a large response, each of these positions would have a dedicated person, which could be someone from the Stranding Network, a NMFS employee, or another agency representative. In a smaller response, some or all of these positions may be filled by the IC or combined with other roles – the crucial aspect is that these positions are intended to reduce confusion by creating a single point of contact for each of these functions

2.2.3 Planning Staff

The Planning Staff includes the Planning Section Chief who supports the organizational framework for the stranding event and ensures things are running smoothly. Other positions in this include the Documentation Officer and the Personnel Unit Leader. The Documentation Officer is responsible for compiling/tracking all the paper and digital documentation of the incident, including, but not limited to, photographs, sample checklists, necropsy notes, and data sheets. The Personnel Unit Leader oversees and is responsible for all personnel on-scene, making sure people are accounted for, fed, and housed (includes check-in and check-out of personnel on scene). In a smaller response, some or all of these positions may be filled by the IC or combined with other roles – the crucial aspect is that these positions are intended to reduce confusion by creating a single point of contact for each of these functions.

2.2.4 Operations Staff

The Operations Section Chief (OPS) oversees all the incident tactical operations and on-site activities, including air and vessel activities, equipment use, and resources in daily operations. Typically, during smaller large whale responses the OPS role can be combined with the IC role. However, for larger more complex events the OPS and IC roles will be different people. Actual operations and specific roles needed will vary depending upon if the response is for a live or dead whale. Specifically for large whale necropsies, Operations Staff can include the OPS, NTL, and Technical Specialists (*e.g.,* Taggers, Vessel Operators, Cutters, Sample Coordinator, Photographer, and Data Recorder). The NTL is NMFS approved and responsible for all aspects of the necropsy including: conducting and assigning tasks during the necropsy; ensuring NMFS necropsy protocols are followed; sample collection; gear collection; photo-documentation; writing the draft and final gross necropsy report (and reviewing the case report for right whales); and sample dissemination and tracking, including following chain of custody procedures, if applicable. NTLs that regularly necropsy ESA large whales will also be Co-Investigators (CI) under the NMFS MMHSRP MMPA/ESA Permit. Technical Specialists report to the NTL and are people with specialized skills or knowledge (*i.e.,* trained biologists, veterinarians or pathologists). These Specialist roles can include the Cutter(s) who assists the NTL and is responsible for examining the carcass and organs, collecting samples, and dismembering the carcass; Sample Coordinator who is responsible for sample tracking and recording during the event; the Photographer who is responsible for taking photographs of the carcass, lesions, unusual markings, or injuries for the veterinary assessment team; and the Data Recorder is responsible for recording all information related to gross observations noted during the necropsy, morphometrics, and filling out any associated datasheets. Depending on the specifics of the response there may be other Operations Branches needed to oversee operational activities such as Air Support (aerial survey/animal relocation), Vessel Support (vessel survey/animal relocation), Telemetry, Hazing, Towing, Carcass Disposal, Veterinary Support, etc. More details on specific operational needs for specific response types are listed in subsequent sections (*i.e.,* Sections 4 and 5).

2.2.5 Administration Staff (Logistics and Finance)

The Logistics Staff consists of the Logistics Section Chief (LOG) who directs and coordinates the logistics on-site and identifies equipment needs, including air and vessel support and heavy equipment. The LOG works with county, state, and private entities to obtain the necessary logistical resources for towing, landing, necropsy, and disposal of a large whale. Ideally, many of these resources will have been identified prior to a response. The LOG may also end up taking on the role of the Planning Section Chief. The Logistics Section can also include the Equipment and Resource Coordinator (may be located off-site) who makes arrangements to ship or move equipment to the site and reports to the LOG and the Vessel Coordinator (may be located off-site) who is responsible for identifying and coordinating vessel support to tow whales into shore or for tagging carcasses.

The Finance Staff includes the Finance Section Chief who is responsible for tracking expenses needed for recovery, necropsy, and disposal operations, including vessel support, air support, and specialized equipment. Depending on the event there may also be a Procurement Officer, who is responsible for setting up contracts and processing invoices related to vessel support, air support, and other resources used during the event.

2.3 Equipment and Supplies

Each type of response (live-out of habitat, live-at sea: seriously injured, live-entangled, live-stranded: in surf or high and dry, dead-at sea: floating, dead-stranded: in surf or high and dry) requires specific equipment. Table 2 below summarizes general equipment used for the various types of responses. To view an example of a large whale supportive care equipment list, refer to Appendix B.

Table 2: General equipment used for different response scenarios

General Equipment	Examples of Specific Equipment	Live - Out of Habitat	Live - At Sea (Seriously Injured or in need of apparent medical attention)	Live - Entangled	Live - Stranded (in Surf or High and Dry)	Dead - At Sea (Floating)	Dead - Stranded (in Surf or High and Dry)
Communications	Marine radio, cell phone, satellite phone	X	X	X	X	X	X
Data Collection Supplies	Datasheet forms, clipboards, pencils, electronic, notebooks, platforms, or data sheets	X	X	X	X	X	X
Safety equipment/Personal Protective Equipment and clothing	Coveralls, raingear, life vests, non-permeable gloves, knee pads, eye wear, footwear, sunscreen, ID vests or clothing, public health related requirements such as occurred during the SARS-CoV-2 pandemic or other zoonotic diseases	X	X	X	X	X	X
Medical equipment	First aid kit, AED	X	X	X	X	X	X

for humans							
Medical equipment for animals	Wound care kit, blood collection, ballistics, euthanasia solutions, sedation drugs	X	X	X	X		
Sampling and tagging equipment	Measuring kit (tape measurer, calipers, rulers), photoscales/cards, tagging kit (suction cup tags, satellite tags, carcass tag, blood collection tag, tagging equipment), marking kit (paint stick), breath and fecal sampling supplies, remote biopsy supplies, subsampling containers, storage devices which may include coolers, liquid nitrogen	X	X	X	X	X	X
Capture/Restraint/Towing equipment	Ropes, nylon straps, chains	X	X	X	X	X	X
Vehicles		X	X	X	X	Possible	X
Vessels		Possible	Possible	X	X	X	Possible
Local sedation or other chemical administration equipment	Hand inject, pole syringe	Possible	Possible	X	X		

Remote sedation or other chemical administration equipment	Dart projector, darts	Possible	Possible	X	X		
Documentation and Recording equipment	Cameras, GoPro, SD cards, hydrophones, playback equipment, drone with photogrammetry, still photography, or videography	X	X	X	X	X	X
Cleaning/sterilization/ disinfecting supplies	Dawn, hand sanitizer, disinfectant solution, garbage bags, buckets	X	X	X	X	X	X
Entanglement response equipment	Knives, hooked pole knife, large buoys, telemetry buoy, ropes, helmets			X			
Beach equipment	Cranes, front-end loaders, bulldozers (also straps, chains)				X	Possible	X
Necropsy equipment	Knife sharpeners, 6-12” knives, meat hooks, forceps, ball shears, bow saw, sharpies, Tyvek bags, plastic cutting boards, formalin, 95% alcohol, needles, plastic syringes, histology cassettes, buckets					X	X

2.4 Personnel

2.4.1 Categories of Personnel

Similar to the different classifications of response organizations, there are different levels of personnel or resource teams that can be involved in a response – each of which has different requirements for skills, training, knowledge, abilities and responsibilities. These classifications roughly break down into the following Table 3:

Table 3: Classifications of levels or personnel or resource teams.

Personnel Classification	Role
Branch Director	Assigned to the upper manager for each of the key response functions during a response, and likely involves multiple agencies. This can include the Animal Response Branch (staffed by NOAA and Stranding or Entanglement Network Members), the Shore-side Security Branch (law enforcement agencies), the Waterside Safety Branch (USCG or local marine patrol), Air Operations (variable depending on the agencies involved) and/or any other broad category where multiple organized functions (each with a Supervisor) fall under it. This position is responsible for developing the vision and direction of the Branch, collating information from Group Supervisors to move to the Section Chief and ultimately Incident Commander while projecting operational needs into the next period.
Group Supervisor	Assigned to the lead staff member with a specific function and multiple personnel under him/her. Established to divide the incident management structure into functional areas of operation. This can include manned and unmanned air operations, animal observation/documentation, sample collection, and other discrete functions, depending on the response scenario. This position is responsible for enacting all protocols and procedures for the group (and suggesting/implementing adjustments when necessary), and collating information from each area for reporting to the Group Supervisor.
Divisions	When the geographic scope of the response is large, Operations may be broken into geographically focused Divisions. For Example, if a response may cross state lines, there may be two divisions, one for each state. Each is led by a Division Supervisor and reports to the Branch Director.
Task Forces or Resource Teams	Units of personnel, each with a Leader, within the response to support an operational need. Can report to the Group Supervisor or directly to the Branch Director.
Technical Specialists	Key personnel with specialized training and experience that fills individual roles within the response. This can include deterrence, large whale euthanasia, or other key elements that may or may not be necessary within each response scenario. Veterinarians with marine mammal experience may also be considered technical specialists within any of the Groups, Task Forces, or Areas.

2.4.2 Training

Depending on the role that the individual will be filling, different levels of training (both required and recommended) will be necessary. Some training requirements will directly relate to the tasks that the person will fill, including those directed at mastering specific marine mammal rescue and rehabilitation tasks. Others are mandated to ensure the safe accomplishment of activities, such as recognizing and minimizing the risk of injuries and physical hazards associated with a live or dead whale response operation. Basic training on the fundamentals of ICS should be required of all personnel, as these courses are free and available online, and a baseline understanding of the principles and tenets will help everyone that is part of a response.

ICS 100 is available here: https://training.fema.gov/is/courseoverview.aspx?code=IS-100.c;

ICS 200 is available here: https://training.fema.gov/is/courseoverview.aspx?code=IS-200.c

Minimum standards and qualifications may be established for particular roles (refer to Sections 4.1.2, 4.2.2, 4.3.2, 4.4.2, 5.1.2, and 5.2.2). Responders may be required to hold other required authorizations or licenses (*e.g.*, driver's license for transport, captain's license for vessel operation, FAA authorization for unmanned aerial system (UAS) use). However, respondents should be trained in first aid, cardiopulmonary resuscitation (CPR), boat safety, and/or live animal handling, if responding to live animals. It is important to emphasize during training and events, that **human safety comes first**.

3. Communication

3.1 Outreach and Social Media for Audiences

3.1.1 Public

The PIO is a single person who has responsibility for all interaction between Command and the media (including social media) and who coordinates the release of information on the incident situation and response efforts from Command to the media and public. The public has a range of perspectives during live or dead large whale responses. It is important to be prepared on how to communicate the situation and that information given is consistent. There should always be at least one primary designated spokesperson when dealing with the public and this person should be in contact with the PIO so messaging is consistent. In some larger events there may be spokespersons from multiple agencies or Stranding Network facilities, to maintain a consistent message they should all be in contact with the PIO or a Joint Information Center (JIC) should be established. Distributing informational brochures or Q&As (example Q&A in Appendix G) to the public on site or electronically can be helpful for consistent messaging and awareness. This literature should contain basic information on the regional stranding network, a fact sheet on the species that has stranded, a questionnaire for recruitment, guidelines on appropriate conduct and health and safety measures, and stranding network contact numbers. It should also outline the range of actions possible with stranded animals, from immediate release to euthanasia (Geraci *et al.* 2005).

3.1.2 Media

Press releases to social media (*e.g.,* Twitter, Facebook, etc.), the media is a great way to influence the public. The key is to provide accurate information and emphasize the message you are trying to get across. The PIO serves as the coordinator for all media - traditional and social. A Media Team with representatives from many or all of the participating partner agencies can help manage and be responsible for dealing with media inquiries during an event. This Coordinator/Team can take initiative to contact the press, post updates on social media accounts, and create and drive the media strategy for providing consistent information and coverage during an event.

The IC must coordinate with the MMHSRP, RSC, and the NMFS National and Regional Office of Communications concerning media contacts relating to all events conducted under the MMHSRP MMPA/ESA Permit and other high-profile large whale response events, as necessary. Media interview requests should be coordinated through the PIO or JIC, who will work with the NOAA Office of Communications Public Affairs Specialist. NOAA Office of Communications Public Affairs can assist with news media, such as news releases, news conferences, and media interviews. All media interviews should be considered “on the record.”

3.1.3 Elected Officials

It is important to make sure elected officials at all levels (*e.g.*, mayors, council representatives, state representatives, etc.) are communicated with when there is a large whale event within their jurisdiction. If possible, the officials or their representatives should be made aware of any developments or changes prior to the public, and may have a voice in decision-making. Elected officials and their offices can be an asset to helping meet needs of the event on a management level by using connections to help identify or escalate resources for the response. Some examples might include identification of resources to provide crowd control at a beach site, or assist with expediting approvals needed to land a whale carcass on a particular beach for examination.

3.1.4 Agencies

For each response situation, there should always be a communication plan in place. This plan is helpful to have developed and in place ahead of the emergency need with an appropriate communication tree and updated contacts (both weekday and weekend/holiday contacts). Similarly, to elected officials, the inclusion of particular agencies will depend on the situation and the geographic location. It may include Federal agencies (*e.g.*, Army Corps of Engineers, other Department of Defense Agencies, the USCG, U.S. Fish and Wildlife Service, National Parks Service, etc.), state agencies (*e.g.*, State wildlife or environmental departments, state park agencies, etc.), and other county or local environmental agencies. There are times when, for example, USCG is needed to help regulate or secure an area around a floating whale at sea, or a state wildlife agency is needed to help verify the location or condition of a carcass, and it is important to know and be able to call the appropriate manager of those resources to get assistance. It is recommended that both NMFS (RSC) and Stranding Network responders have good working relationships with these agencies.

An additional subset of Agencies is law enforcement agencies that can assist with crowd control of a scene. This can frequently be NMFS Office of Law Enforcement, but often through Joint Enforcement Agreements, or the needs of a particular situation, this role may be filled by others (*e.g.*, county sheriff, state or local police, state game wardens, etc.).

3.1.5 Stranding Network

It is important to communicate with all Stranding Network members in the geographic locality when an event is first reported. While primary responsibility will typically default to the appropriate response organization that is geographically situated where the event is happening, nearby response stranding network members may be able to supply more personnel, equipment, experience in particular situations, etc. In some cases, NMFS will request or require that a NTL CI be in charge of the response especially for ESA responses, and this individual may be from outside the immediate geographic area. It is also helpful to l*et al*.l nearby response organizations know about the event as soon as possible in case they are also receiving calls about the same situation. Being able to collaborate quickly and effectively saves time and decreases duplicate work so that an event and its needs can be responded to in a timely manner.

3.1.6 Research Community (*e.g.*, Photo-ID, taggers, etc.)

During large whale response events, there will likely be a need for experienced researchers for specific needs. If possible, prior to the event a standard list of research needs will be developed, which can be modified depending upon the species involved. Communicating with these individuals at the start of a response will help make sure the right plan is in place. For example, an early priority may be to see if there is any life history information available on the subject animal, including age, previous sighting history, etc. Early communication with researchers that maintain catalogs of individuals of the specific whale species will help ensure that the appropriate images (*e.g.*, body parts and angles) are collected and matching attempted as soon as possible. Additionally, certain researchers may have expertise in the collection of specific sample types or have a particular protocol that needs to be followed. This requires notice as early as possible to accommodate logistics and speed during a large whale response. Having a list of experts and/or talking with your RSC to help coordinate with experienced researchers for the species and location will result in a more efficient response. However, the response should not be delayed for specific research requests and NMFS can help with prioritizing requests.

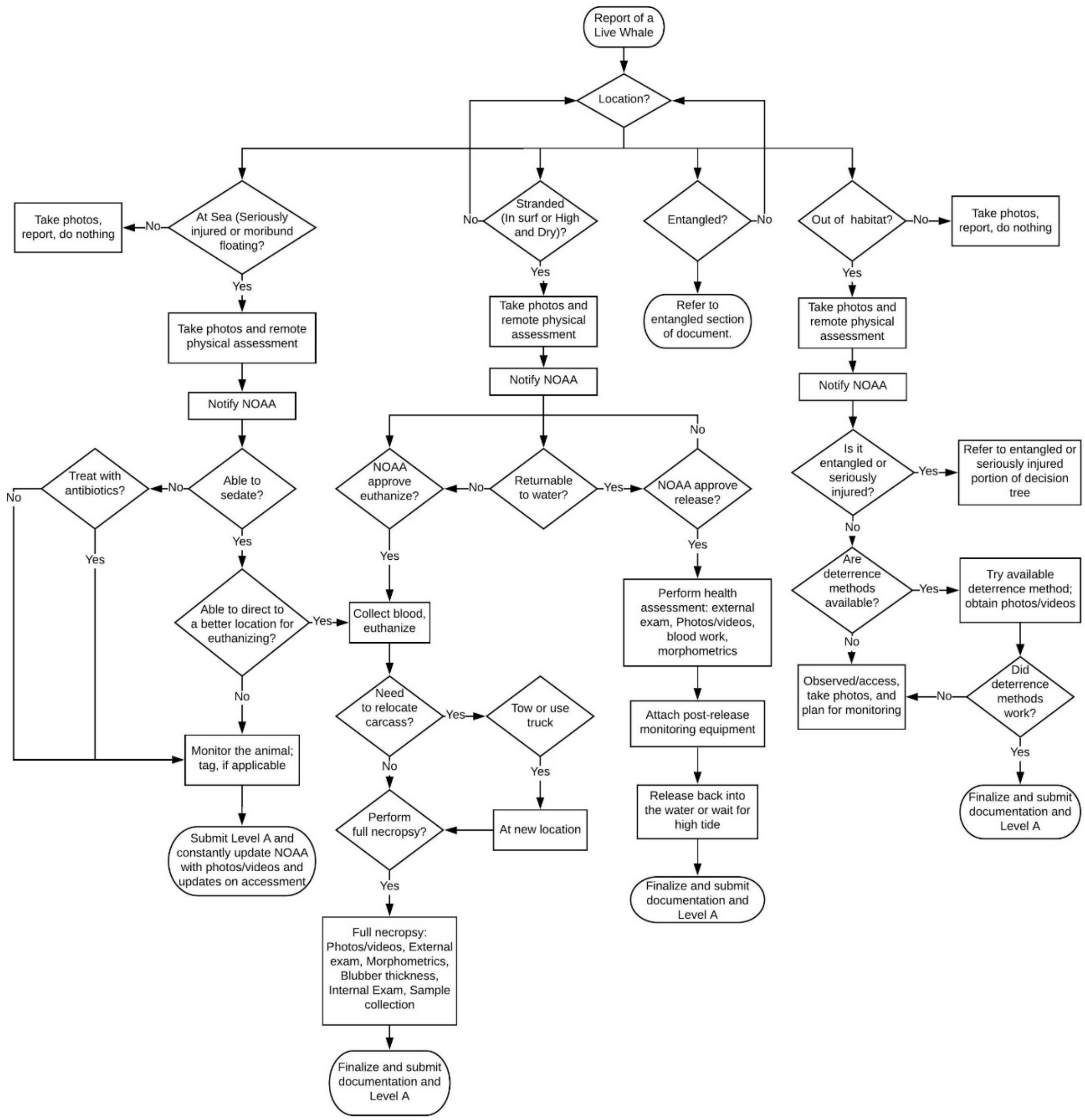
3.2 Feedback mechanism to provide data and information to resource managers (*e.g.*, SARS, TRTS, Recovery Teams, etc.)

It is the responsibility of the RSC to collate and relay information about the event to the resource managers. The RSC, or another individual specifically assigned to this task, is responsible for coordinating reporting to applicable and relevant teams (*e.g.*, SARS, TRTs, Recovery Teams, Working Group on Marine Mammal Unusual Mortality Events, etc.) during responses as well as providing a designated area for event information/data (*e.g.*, Google Drive folder). To have a central location for data allows the resource managers to share and view the same information. This allows for consistent messaging and availability of full data evaluation of the event.

4. Live Large Whale Emergency Response Medical and Physical Interventions

Logistical planning begins with the first report of live large whale stranding. Plans need to be made that take into account available resources, logistics of the stranding location (*e.g.*, accessibility, protected/sensitive habitats such as seagrass and corals that should be avoided, etc.), transport (if applicable), necropsy, palliative care, sampling, disposal, resources (*e.g.*, heavy equipment and experience of team members), and handling the media.

The decision tree below encompasses the overall process of different responses for live large whale events. It is impossible to articulate every scenario, thus the individual sections below will provide a basic understanding of principles and actions involved in a successful response for those live scenarios.



4.1 Out of Habitat

An animal is considered out of habitat if it is not in the typical range for that species, including offshore waters, coastal waters, or bays, sounds, estuaries and rivers. Typically for large whales, an out of habitat animal is found in an inlet, creek, river, coastal, or other body of water that may be directly connected to the continental shelf or open ocean, connected through river mouths, but may only be connected with the ocean (or bay/sound/estuary) at certain tidal cycles, or under certain conditions.

An animal of concern has an initial assessment conducted in coordination with NMFS, the local response or research Stranding Network, or other experts. This initial assessment will consider the animal's size, age, body condition, skin condition including injuries, behavior, habitat (including environmental parameters such as salinity), social context (more than one animal or a single animal), prey availability, season of year, and the overall risk to the whale. In some cases, mom/calf pairs have been out of habitat together. In addition, the responders evaluate whether the animal is prevented from leaving the area, either by a physical barrier or a perceived barrier. If the animal or animals are not in imminent danger or showing signs of significant illness or injury, NMFS, in coordination with the local Stranding Network or research community, will continue to monitor the situation for any significant change to the situation and collect additional assessment information if requested by NMFS.

Once an animal has been deemed out of habitat, the next step is to determine if intervention is necessary and to gather information on how long the animal may have been in the area. When evaluating whether to intervene, NMFS generally considers the likelihood of the animal leaving on its own or leaving after hazing, its chances of survival if no intervention occurs, if the environment will allow for the intervention to be safe for both the response team and animal, and whether it is possible to relocate or rehabilitate the animal (rehabilitation would only be considered for certain age classes of ESA species). NMFS generally consults with marine mammal behavior experts, veterinarians, scientists, and other experts when determining the best course of action.

4.1.1 Decision Trees and Triage Criteria for Response

For live free-swimming trapped or out of habitat large whales, the Stranding Network should only intervene (*e.g.*, haze, catch, relocate, or euthanize) under the following conditions which are not mutually exclusive:

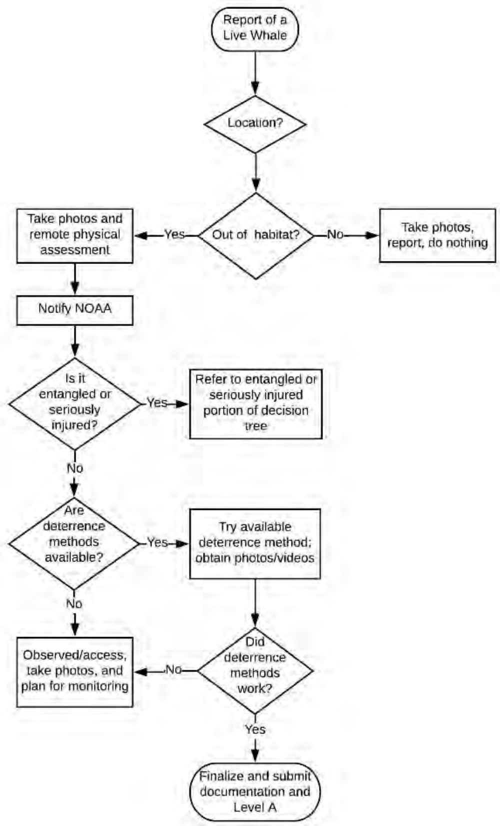
1) If the animal is suffering from a life-threatening condition; or

2) Evidence suggests the animal is unlikely to survive in its immediate surroundings and is prevented from returning to its natural habitat by a physical or perceived barrier (*e.g.*, unable to feed or forage appropriately, animals displaced to inland waters due to hurricanes, trapped, etc.)

The decision of whether (or not) to intervene is made by NMFS, after discussions between multiple parties – the local Stranding Network or response organizations that have "boots on the ground" that are responsible for response, the NMFS RSC, the MMHSRP at OPR HQ, and other parties that may have jurisdiction (*e.g.*, tribes, NPS, state, etc.). Ideally, these consultations also include marine mammal veterinarian(s) and experts in the biology and life history of the affected species. The decision to intervene is made by NMFS after taking into consideration the following minimum questions (others questions may be developed) that help evaluate the benefits and risks based upon the specific situation:

- What field observations have been reported and how recently have they been reported?
- What is the health status of the individual?
- Is there a medical diagnosis?
- What are the potential causes of the animals' observed condition?
- What is the estimated or known life history (*e.g.*, sex, age, size)? Is it a known individual?
- What is the conservation status/reproductive potential?
- Are there safety and logistical concerns for intervention (for the responders and/or animals)?
- What resources are available and is an intervention logistically feasible?
- What potential risks are there for conspecifics or other species?
- Is there a contingency plan in place if intervention is not successful (*i.e.,* if the animal dies in the course of intervention, if the intervention is unsuccessful, or if the animal requires rehabilitation)?
- What are the environmental conditions (*i.e.,* tidal cycle, are there protected/sensitive habitats that should be avoided, etc.)?

Below is a decision tree that can help when deciding the appropriate action for an out of habitat response:



4.1.2 Specific Training and Qualifications (including CI letters)

Most free-swimming large cetacean responses are conducted under a MMPA/ESA permit that is issued to the MMHSRP. In very particular circumstances for non-ESA listed species, a response can be conducted under a SA (by the SA holder after consultation with the Regional Stranding Coordinator) or by a government employee acting under MMPA Section 109(h). Therefore, only responders who have been authorized by NMFS and who have the training, experience, equipment, and support needed should attempt large cetacean interventions. Authorized response efforts may also rely on partners at tribal, local, state and federal agencies (including law enforcement agencies and the USCG), non-governmental organizations, fishermen, and other groups to assist with some responses.

Stranding Network members are trained or have experience in proper techniques for assessment, hazing, safe capture, restraint, and removal of gear from various marine mammal species. Occasional training workshops have been offered to members of the Stranding Network. Specific training requirements may be more appropriate to address at regional or state levels by working with your RSC. Table 4 and 5 below provides an example of the suggested number of personnel and roles required for a typical large whale out of habitat response effort.

The Stranding Network is made up of individuals who are qualified and experienced with large whales, and for certain activities are issued a CI letter under the MMPA/ESA permit for responding to large whale scenarios. A CI remains authorized to respond to large whales as long as their CI letter is valid (which is typically the life of the MMPA/ESA permit, with some exceptions). These CIs are expected to coordinate to the extent possible with the NMFS Large Whale Coordinators and the MMHSRP. All response actions are reviewed after the event with the participating responders and MMHSRP staff.

Table 4: Suggested number of personnel and roles required for a typical large whale out-of-habitat first response effort.

Team member roles	Number of personnel required
Incident Commander/Safety Officer	1-2
Vessel Captain (also may represent Safety Officer)	1-2
Crew (vessel dependent)	1-3 (roles can be shared with other roles)
Data Collector	1
Documentation personnel including photographer, videographer	1-3 (roles can be shared with other roles)
Biopsy Sampling	1 (roles can be shared with other roles)
Deterrence Coordinator	1
Communications Person (PIO or JIC)	1 (role can be shared with other roles)
Optional – UAS Pilot (see UAS; Section 6)	2-3 (roles can be shared with other roles)

Table 5: Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, IC and SO; 2º documentation and data collection).

Team Member Role	Role Description	Role Qualifications
Incident Commander (IC)	The IC, working closely with shoreside (or otherwise remote) authorizing parties (*e.g.*, Park director, USCG, NMFS Regional Stranding Coordinator [RSC]/ HQ), is responsible for the on-scene oversight and supervision of the first response operation. The IC may participate directly in the operation depending on circumstances, but typically does not directly participate (*i.e.,* hands-on) in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that safety is maintained for responders, the public, and animals.	Completion of the ICS free or paid courses, experience with close-approach assessment of large whales, including hazing, tagging and biopsying. Must be trained and/or experienced in protocols, procedures, risks, and risk mitigation in all aspects of the first responder mission being carried out. Must have the authority to carry out operations.
Safety Officer (SO)	The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate with the team and adjust the strategy of the response as needed. The SO works very closely with the IC. Under certain circumstances and depending on experience, the role of the SO can overlap with that of the vessel operator of the support or approach vessels, and if necessary and otherwise appropriate, the role of IC and SO can be performed by one person.	Experience in previous large whale entanglement response efforts, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.,* not adhering to protocols, presence of other animals, incoming environmental or weather changes, and time of day considerations). Willingness and ability to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.
Vessel Operator(s)	This person(s) is/are responsible for the safe transit and operations of the vessel(s), including the safe maneuvering around and approach to whales. Vessel operator(s) should have experience operating the vessel around the animal and all aspects of the response operation. They typically take on the key role of operational safety and may take on the role of SO. As such, the vessel operator role whether on the transit, support, or approach vessels is one of the most important roles beyond that of the IC.	Experience, training, and in some cases certifications (*e.g.*, USCG license, NOAA certified components course) in order to "captain" a vessel. Vessel operators should have experience operating the vessel around large whales and all aspects of the response operation.
Data Collector	The data collector is essential in recording all aspects of the response. This person is responsible	Familiarity with procedures and data sheet/dataloggers, attention to details. Ability

	for ensuring all data is complete on data sheets and data loggers, including the assessment of the animal, recording identity of associated documentation, behavior of animal (*e.g.*, respirations, changes due to response), the response efforts (*e.g.*, an outline of response steps taken, risk factors encountered, who was involved), and sampling if any.	to accurately and completely compile a great deal of information. Lacking a disposition to seasickness is valuable.
Documenter(s)	This person(s) is/are responsible for obtaining and maintaining (*e.g.*, identifying and safe storage) still and video imagery on all aspects of the response. They work closely with the Data Collector and the vessel operator. This person may also serve as the data collector. Under certain circumstances, responders with other roles may take on, in part, the role of documenter, through use of helmet or vessel-mounted POV cameras. However, such persons must maintain focus on their primary role and maintain safety. POV cameras should be turned on and forgotten by the user and instead either tended to or operated remotely by a dedicated documenter.	Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response.
Biopsy Sampling	This role is responsible for maintaining biopsy gear (*e.g.*, crossbow or air guns, darts, and collection vials), safely obtaining the sample, and its storage and processing (*e.g.*, labelling).	The person needs to be trained and otherwise familiar with the safe use of the crossbow or pneumatic gun. Additional training, like gun handling, is recommended. The person obtaining the biopsy sample must work closely with the helmsperson and the data person.
Deterrent Lead	This role is responsible for deterrent or hazing operations. This person has experience with various hazing techniques (*e.g.,* vessel approach, pingers, pipes, etc.). The hazing lead must work closely with the IC and SO to ensure all hazing activities are safe for personnel and the whale.	The person needs to be trained and otherwise familiar with the safe use of various hazing techniques with large whales (*e.g.,* vessel approach, pingers, pipes, etc.). The hazing lead must have experience assessing large whale behavior and responses to hazing techniques.
Communications Person	This person is responsible for maintaining all-important communications aboard vessels, between vessels (*e.g.*, a supporting partner vessel) and to shoreside contacts, including float plan contact and NMFS authorizing agents (*e.g.*, Regional and/or National LWERCs). Shoreside	Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and

	contacts typically take on the role of further disseminating information, including to agency partners/leads, any other authorizing agencies, and media coordinators. Communications at this stage do not involve the media as this is the role of media coordinator and others at later stages.	ability to post-process photos/video after the response.
Optional – UAS Pilot (see UAS; Section 6)	If permitted to operate a UAS during the response, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success or safety of the operation, or causing disturbance to any animals.	Pilots must have an FAA Part 107 license, follow all existing FAA and other regulations, and be trained and/or experienced operating a UAS over water from a vessel during response operations. More detail on UAS use is addressed in Section 6.

4.1.3 Communication/Public Relations (specific for out of habitat free-swimming)

For an out of habitat free-swimming whale, there can be a lot of groups involved and it is important the communication regarding this event is constant and consistent. Depending on the scenario and locality of the event, spearheading communication may be escalated to the NMFS Communication Team who will work with the local communication team on the event's publicity. This may include social media and posting frequent updates as well as broadcasts with local news agencies. Managing expectations is the key. If the response decision is to perform hands-off monitoring, then it needs to be communicated with all agencies, communities/the public, tourist sight-seeing retailers (*e.g.*, whale watch boats) so they know something is currently being done about the situation even if it doesn't look like it. Having everyone be on the same page and know what is going on makes the response go more smoothly and allow for more information to be collected. Making sure updates are constantly provided via social media and to the groups will also ease the concerns of response in general as well as hands-off monitoring.

4.1.4 Data Collection Protocols

Data collection is typically performed by qualified individuals and the amount of data collected may depend on the level of response and capacities. It is important to document the event with recording the location and time of each sighting. Monitoring the animal(s) is essential and data can be collected on a form such as the Free Swimming Whale Assessment Form and Monitoring Datasheet (see example in Appendix C). Obtain good photographs and/or video of the animal because it can help identify individual animals and also assess their condition for further determinations. Recording the animal(s) behavior when observed is helpful to aid in the assessment and in determining the best course of action. At minimum, field information necessary for completion of NOAA's Level A form must be collected. This will include the assignation of a unique identifier (Field ID#, per Regional Stranding Network protocols). Live animals must also be indicated in the appropriate section of the Search Effort Log on the Level A form. Level A forms may be completed electronically via direct entry in the National Stranding Database.

Anytime samples are collected and/or handed-over they should be recorded. Photo logs are a record of each photo taken, which helps to identify the photographer and date/time taken. During data collection, photos should be taken with a label with ID, date, species, log number, and have a size scale (see examples in Appendix D). With all the data collected, a report should be finalized with the photos documented, complete recording of all pertinent findings, and all samples collected.

4.1.5 Available Tools and Techniques

Deterrent, hazing and herding strategies, techniques and equipment should be considered as tools that can be useful in out of habitat situations to help guide, lead (attractant), or force (deterrent) the animals out of dangerous areas. Deterrents seek to exclude animals from areas by discouraging them from entering into an area or encourage them to leave an area through either acoustic or physical means. Attractants may include playing sounds from conspecifics (particularly those associated with feeding) in the downstream or “open” area in an attempt to encourage the animal to move in that direction to investigate the sounds. Acoustic deterrence means vary from the most basic, such as slapping the water with paddles to the use of targeted acoustical deterrents (not effective for baleen whales), such as oikomi pipes or commercially available pingers used in fisheries. Physical deterrents can also be useful in some situations. These methods include, but are not limited to, fire boats with hose spraying and bubble nets. In any situation where deterrents or herding techniques are utilized, the situation needs to be constantly monitored and regularly assessed to determine if the actions are producing the desired effects and to monitor the impact on the animal from a health and welfare perspective. If possible, a D-Tag can be used to document the animal's response to any deterrence or attractant methods. While determining which methods to implement requires experience, consulting outside experts is highly recommended. See Section 4.1.5.4 for more specific information on deterrence methods.

- #### 4.1.5.1 *Remote Physical Assessment (including respiration rate and behavior)*

Each case/event should be assessed through physical and behavioral observations or sample collection from the animal(s) and environmental observations at the site and any obstacles between the current location and the target exit from the situation. These observations and data will improve better decision-making and adaptive management of the situation to determine the appropriate course of action for that particular individual and situation. Careful planning and adaptive management will also provide important information that can be used to inform decision making for future cases. Lessons learned from each situation through thorough debriefing also is critical to inform tools and techniques and species reactions to either attractants or deterrents. A standardized health assessment form *may* be available, depending on the region and taxa. If so, it should capture all necessary information. If there is no form available then the questions below should be determined (Cape Cod Stranding Network 2008) in order to more generally assess the whales status and condition. Below are examples of some questions that might inform decision making. In the future, regional health assessment forms, if not already available, may be developed.

- Determine the species involved and use identification characteristics and catalogs for the species or stock to determine if this is a known individual. The identification characteristics for the species may include the size, coloration, rostrum and callosities, fluke, pectoral fin, and dorsal fin. Is this a known individual? If so, what do we know about the individual, behavior and normal habitat?
- Estimate the total length, estimate the age class, and potential weight (using weight charts).
- Note the body condition. If able to determine, is there an indentation behind the cranium (peanut head)? Are ribs and/or scapula visible? Is the animal concave or convex in the epaxial region on a longitudinal view? Are there any skin lesions or wounds? If the animal is out of habitat in lower salinity areas, evaluate the skin for freshwater lesions and mat formation.
- If possible, count respirations (number of respirations per minute), note respiratory effort, is there any respiratory exudate, odor, abnormal sound? (Normal breathing intervals for large whales are once every fifteen to twenty minutes (Geraci *et al.* 2005))
- Are there any other animals in the area? How many? Is the animal frequently in close association with any of them (*e.g.*, mom/calf, bachelor pair, etc.)?
- Take photos and/or video to document injuries, disease or behavioral changes

Following remote observations, it is critical to share the information and have a discussion with a group of experts (*e.g.*, marine mammal veterinarians, biologists with experience with a given species, etc.). This is possible when the case is not immediately life threatening and the animal's behavior/sighting history is somewhat predictable in the habitat such that the animal can be relocated for future interventions.

● 4.1.5.1.1 Breath Sampling

Breath sampling is sampling from the cloud of “blow” (Figure 1) from a whale when they exhale as they reach the surface. They may blow several consecutive times between dives and some species may start an exhalation underwater and the second breath may be easier to target. It is appropriate to collect several breaths from an individual being assessed. For mom/calf pairs, it may be difficult to focus the collection to only one of the two if they are surfacing together especially in shallow water. This sampling is non-invasive and can be collected easily. There are different ways a breath sample can be collected (Table 6) (Hunt *et al.* 2013):

- Long poles positioned over the blowholes which can have nylon fabric suspended across a 15-centimeter ring or a plastic framework, an inverted funnel, and/or Petri dishes
- A remote-controlled helicopter/unmanned aircraft system (UAS) with Petri dishes

Figure 1: Respiratory vapor samples (“blow”) from large whales can be collected by a variety of pole-based or remote-controlled helicopter-based methods. This photograph shows collecting “blow” droplets from a North Atlantic right whale (*Eubalaena glacialis*) using a nylon-fabric sampler suspended on the end of a carbon-fiber pole. (Photo: Amy Knowlton, New England Aquarium, SARA Permit #325863, NMFS Permit #14233, Hunt *et al.* 2013.)

Nitrile gloves should be worn by anyone involved with sample collection and should be changed after accidental contact with skin, surfaces or saltwater to avoid contamination. Gloves should also be changed between sampling different animals.

The exhaled breath and condensate should be collected on at least two sterile Petri dishes with no media. Sampling multiple exhaled breaths on the same plates is ideal. Collect a small volume of surface seawater (minimum one milliliter) on a plate in the vicinity of the whale.

Process the samples on board if conditions allow, or keep the plates cool until they can be processed on land. Sampling will not provide immediate information for decision making and may need to be sent to a lab for analyses unless cytology would be informative.

Sample processing: (one example below, sample collection may differ based upon situation)

Plate #1:

a. Collect one swab to prepare smears on three glass microscope slides. Label and place the slides in a secure area and air dry.
b. Collect two swabs in transport media for bacteriology (Ames), keep chilled. Do not freeze.
c. Collect two swabs for fungal culture. Keep the swabs for fungal culture dry and in separate sterile containers. Keep chilled. Do not freeze.
d. Collect two swabs and place in RNA Later® or a dry sterile container for pathogen testing (*e.g.*, viral, etc.). Ok to freeze.

Plate #2: To avoid contamination, do not collect this sample from a Petri plate that has been previously swabbed:

a. Using a sterile pipette, transfer a minimum of 0.1 milliliters of blow into a sterile Nalgene cryovial

Table 6: Breath sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Respiratory vapor (“breath”)	● Pole-based samplers ● Remote-controlled devices possible (?)	Medium	● Non-invasive ● Targeted biomarker sampling	● Novel technique; many validations remain to be done ● Target	● Several hormones detectable ● May contain a large variety of other

	● Different methods for droplets, exhaled breath condensate, and gases (these provide different types of information)		possible ● Repeated sampling possible ● Wide range of metabolites can be studies simultaneously ● Mostly requires remote laboratory analyses and little real time data	biomarkers at trace concentrations ● Advanced detection strategies needed for quantitative analysis	detectable compounds (?) ● May be proxy for blood, as has been observed in human studies ● Respiratory microbiome ● Host immune response

● 4.1.5.1.2 Fecal Sampling

Fecal sampling (Figure 2) can be collected from well-formed floating semi-solid clumps to a more fluid, dispersed plume which can be scooped from the water surfaces using a fine-mesh nylon dipnet, draining off as much seawater as possible (Hunt *et al.* 2013). Refer to Table 7 below for more information on the fecal sampling technique.

Figure 2: NOAA researchers collecting fecal samples. Photo taken under federal research permit. Photo credit: NWFSC.

When collecting fecal samples:

a. Place replicate samples of 2-4 milliliters of feces in three separate sterile containers
b. Place one sample of 1.0 milliliters of feces in a sterile container for molecular analysis and possible electron microscopy
c. Swab the fecal sample. Place the swab either in RNA Later® or a dry sterile container

Table 7: Fecal sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Feces	• Locate visually or with a dog • Surface collection with scoop or net; subsurface collection with divers • Not possible in some environments and conditions and not applicable in all large whales	• Low without dog • Medium with dog	• Non-invasive • Extremely high steroid content (easily detectable) • Well-established steroid hormone technique • Long 'sampling time frame' may enable study of	• Low sampling rate • Targeted sampling difficult • Individual not always known (cannot always be genotyped due to DNA degradation) • Cannot sample fasting seasons	• Diet analysis • Endoparasites • Lipophilic hormones • Fatty acid and stable isotope analysis of diet • Toxin exposure (*e.g.*, domoic acid) • Gut microbiome and relationships to stress, immunity, and disease • Some

			chronic stress • Repeated sampling possible		immunoglobulins and other hormones may be detectable (?)

• 4.1.5.1.3 Photogrammetry (UAS or Other)

Photogrammetry is a laser system that allows for quantitative measurements (morphometrics) from photographs. It adjusts pixel measurements to real size by an estimate of scale (distance/focal length). Fixed-wing airplanes, helicopters, and/or UAS are used to collect vertical images from precisely-measured altitudes directly above the whale. There has been great success using UAS because of the quiet sound footprint, vessel standoff, ability for increased range, increased safety, and cost effectiveness. Table 8 provides more information on the photographic analysis technique.

Table 8: Photographic analysis technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Photographic analysis	• Lateral view with boat-based photography • Dorsal view/body outline with aeroplanes or remote-control devices • Infrared thermography	• Very high	• Non-invasive • Best sampling rate • Repeated sampling possible	• External appearance only • Aeroplane-based photography has cost/safety issues	• Blubber reserves/nutritional state • Epidermal lesions • Ectoparasites • Entanglement and injury • Thermal physiology (infrared) • Watercraft wound analysis

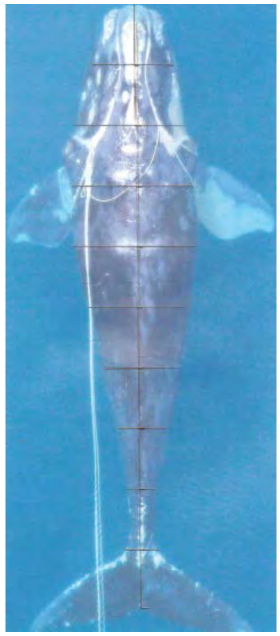


Figure 3: Example of aerial photography. This image was marked for length-to-width ratio analysis to access likely body weight prior to dosing with sedatives for disentanglement efforts (Hunt *et al.* 2013).

4.1.5.1.4 Sample Collection (Biopsy or Other)

Responders may collect biological samples (Table 9) such as biopsy and/or skin samples in the course of responding to an entangled animal. These samples can be used to assess some aspects of the health of the animal. Skin can be collected through the use of a remote dart, the collection of tissues from the removed gear or line, or the collection of sloughed skin from the water. Biopsy sampling typically involves discharging a projectile dart with a hollow tip that collects a small plug of skin and blubber. Higher-powered delivery devices, such as compound crossbows or black-powder Larsen guns, are more likely to be used at a distance of more than twenty meters from the vessel (typically used when targeting large baleen whales). Lower-powered delivery devices such as recurve crossbows or adjustable-power guns are used at shorter ranges (less than twenty meters) from small vessels. Responders may sample the area from the dorsal flank (well behind the blowhole). After the biopsy dart hits the animal, it bounces off as its penetration is limited by a stopper, and floats at the surface of the water where the biopsy sample/dart can be retrieved.

Responders may also use a handheld pole with a dart tip on the end to manually collect a biopsy sample if the disposition and behavior of the entangled animal is conducive to a closer vessel approach (*i.e.,* the whale is anchored in place). In this instance, the responder would slowly and cautiously approach the animal, to within one body length, to quickly jab the pole into the dorsal surface or flank of the animal, while avoiding more sensitive areas such as the head, eyes, and the area around the blowhole.

Table 9: Biopsy sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Epithelium and blubber biopsies	• Biopsy dart used with crossbow, pole, or pneumatic rifle • Sloughed skin may also be collected	Medium/high	• Good sampling rate • Many archived samples available • Tissue sample obtained; living cells present; properly handled high protein and nucleic acid content	• Invasive causes small wound • Permit restrictions • Repeat sampling not always possible if animal is not visible • 'Lag' time of blubber hormones unknown	• Lipophilic hormones in blubber • Lipid/fatty acid analysis of contaminant load (POPs, lipophilic cpds and some metals), diet, age, sex, identity, etc. • Epidermal microbiome, skin lesions and epidermal diseases • Epidermal proteomics (CYP450-related enzymes for contaminants, SRPs for stress studies) • Transcriptomic and genomic approaches possible (?)

4.1.5.2.1 Sedation

Typically for an out of habitat situation, there is no need to administer sedatives unless the animal is also seriously injured or entangled. Refer to Sections 4.2.4.2.1 and 4.3.4.3.1 if the large whale is seriously injured or entangled.

4.1.5.2.2 Medications

Antibiotic, analgesic, or other drug therapy can be administered depending on the scenario, the clinical assessment of the animal. For out of habitat large whale response, typically antibiotics are not needed unless the animal is seriously injured or entangled as well, seriously debilitated with respiratory or other signs. Refer to Sections 4.2.4.2.2 and 4.3.4.3.2 if the large whale is seriously injured or entangled.

4.1.5.3 *Tagging and Marking*

The decision on which technique(s) to use for tracking an out of habitat, live injured or entangled whale, marking a carcass, or tagging or marking for post-release monitoring will generally be made on a case-by-case basis. Gathering data on the survival of large whales that have been released after a live stranding is an essential part of the intervention. Without the data on post-release outcomes, one cannot assess the value of the overall response, nor evaluate the combined suite of protocols employed. The tools available for monitoring post-release outcomes range from the re-sighting of natural or applied markings, to VHF/satellite tag tracking.

Natural Markings are typically used for out of habitat whales. Some species have specific criteria for identification and some also have catalogs so that if matched to a known individual more information about the animal is possible. These include pigmentation patterns on the fluke or body, callosity shape and size, dorsal fin shape and notches, or other skin marking depending on the species involved. It is important to acquire a comprehensive series of species-relevant images of all such marks before release to enable recognition later.

Applied marks are those artificial markings applied by the Stranding Network responders during the intervention and release. They may be very temporary, such as cattle paint stick markings that last only a few days. Short-term marks could include plastic cattle ear tags in the dorsal fin (for those species with a dorsal fin), that can last for many months.

An electronic tag, with options including VHF (radio) and satellite, is another type of applied mark. Tag attachment options include suction cup tags, single pin attachments in the trailing edge of the dorsal fin (for those species with a dorsal fin), or LIMPET tags.

All these types of monitoring can be used in tandem, so photos of natural markings can be coupled with applied marks or tags to increase the likelihood of re-sighting whales at multiple time periods (*i.e.*, short-term and long-term) to assess post-release outcomes. See Table 4 for the pros and challenges of each tagging/marking type. For more specific details on tagging and marking, refer to the Report of the Joint US Office of Naval Research, International Whaling Commission and US National Oceanic and Atmospheric Administration Workshop on Cetacean Tag Development, Tag Follow-up and Tagging Best Practices.

Table 4: Pros and challenges of each tagging/marking type

Natural Markings	
Pros	• Natural markings tend to persist after healing and have more lasting value, especially where the individual's markings are archived from stranding event images • Many areas have Photo-ID catalogs for various whale species or stocks • Re-sights may occur over many years, allowing for long-term information on the success of the intervention
Challenges	• The whale appearing in an area where photo-id or re-sights may occur for recognizing applied or natural marks • Belonging to a species that has an existing photo-id catalog that can be used for matching • Appropriate photos being collected during the stranding event to match with the photo-id catalog (*i.e.,* fluke photos of humpback whales may be difficult to obtain when they are on a beach) • Communication between researchers with photo-id catalogs and the Stranding Network responders may be challenging, particularly over large geographic distances (multi-country ranges of most migratory large whales) • Data on re-sights may not occur in the short term (days/weeks/months), leading to uncertainty • Lack of re-sight data may not necessarily mean the intervention wasn't successful – the fate of the whale remains unknown
Applied Markings	
Pros	• Easy to apply (paint sticks require no training) • Inexpensive and readily available (on hand with many/most Stranding Network responders)
Challenges	• Not feasible to be applied safely to out of habitat whales • Re-sight information depends upon high level of effort (especially boat-based, but could be shore-based) to identify free-swimming whale ("success")
Electronic Tags	
Pros	• Allow for longer term tracking (days/weeks/months) • Allow for targeted tracking over a large geographic area, with the tag aiding in the ability to locate and re-sight the free-swimming animal (radio or satellite) • Allow for remote tracking (satellite)
Challenges	• An appropriate tag available with a trained applicator • A suitable permit to tag in hand (tagging can be conducted under the national MMHSRP permit with pre-approval) • Funding for the tag acquisition or replacement • Time to focus on the tagging plan while rescue process is ongoing • Potential for added impact or stress to the whale

4.1.5.4 *Deterrence Methods*

While more commonly used to prevent mass strandings, herding or deterrence actions may be appropriate for single or small groups of out of habitat animals. Various methods of deterrence have been used by experienced individuals but efficacy is low, including:

- Vessel action, close approaches, percussive slaps on the water from motorized vessel
- Pingers or other acoustic devices (*e.g.*, pipes)
- Hukilau, Oikomi pipes, streamers, non-entangling nets

For a more in-depth discussion of various non-lethal deterrence options, see the NMFS Marine Mammal Non-Lethal Deterrence Guidance (85 FR 53763; https://www.govinfo.gov/content/pkg/FR-2020-08-31/pdf/2020-18718.pdf).

4.1.5.4.1 Fire boat

A fire boat (Figure 4) is a specialized boat that can pump and spray water from the hoses attached to the boat. It is typically used for shoreline or dock fires, but it has also been used to deter large whales from a specific area or direction. It can create a water column disturbance/barrier (*e.g.*, bubble curtain) and/or surface disturbance.

Advantages: It is an available resource through fire departments and can safely be used.

Disadvantages: This method may not work for all large whale species. It may also not be successful if used for a long duration or consistently in an individual incident due to the possibility that the whale may eventually ignore the deterrence.

Figure 4: Fire boat (Photo by Paul Chinn, San Francisco Chronicle)

4.1.5.4.2 Oikomi pipes

Oikomi pipes, also known as "Banging Pipes", are about eight feet long metal pipes with a cap on the top that can be lowered into the water from the side of a vessel (Figure 5) and struck with a hammer to make a loud noise. Numerous pipes can be used in multiple lines. The expected end result is to deter the whales from a specific unwanted area and/or move the whales' direction of travel. The Oikomi pipes have been tested to ensure that they do not cause permanent damage to the whales' hearing (Washington State Department of Ecology 2018).

Advantages: Shown effective for some species of toothed whales and dolphins (in particular, orca); safe; little training or experience required; high public acceptance level

Disadvantages: Not as efficacious for very large area; requires coordination of multiple vessels; could be dangerous at night or during poor sea conditions; tactic requires a high degree of seamanship, not effective for all species of marine mammals; not effective for mysticetes

Figure 5: Deployment of Oikomi pipe (Washington State Department of Ecology 2018)

4.1.5.4.3 Other Methods.

Refer to NMFS Marine Mammal Non-Lethal Deterrence Guidance (85 FR 53763; https://www.govinfo.gov/content/pkg/FR-2020-08-31/pdf/2020-18718.pdf) for other non-lethal deterrence options.

Some other methods that have been considered and implemented but not proven effective include:

- Disturbance from boat traffic can create a noise barrier and surface disturbance.
- Acoustic deterrents could be used but not proven effective for baleen whales.

These methods could benefit from additional testing, and it is possible that they could be effective for different species/life stages/sexes, or could be improved by using modified equipment (*e.g.*, more powerful underwater speakers) or changing operational practices (*e.g.*, where the boats or speakers are located relative to the whale). More work should be done.

Some other methods that have been discussed in theory but never implemented with a live large whale include:

- Creation of bubble curtain using air and PVC or other piping/tubing
- Creation of an electric field

These methods could be explored, but would need to be much more fully developed and tested, and authorized under the MMPA/ESA permit before they could be implemented.

4.2 At Sea (seriously injured or moribund/floating)

Collisions between watercraft and cetaceans can have adverse effects on the health of individual animals as well as the population status of endangered species (Kraus *et al.* 2005). For watercraft injuries the trauma can be sharp-force and/or blunt-force. The severity and type of this trauma depends on several factors, including vessel speed and size, the type of propulsion system, severity of interaction with the propulsion system, and where the injury occurs on the animal's body (Rommel *et al.* 2007). In addition to vessel strikes, other commonly seen injuries in small cetaceans include gunshot wounds, bite wounds, and stab wounds, although these are rarely reported in large whales. Additionally, large whales may become moribund due to natural causes such as illness and disease leading to malnutrition and other health impacts that could lead to floating behavior.

Responders should do an initial assessment of the animal's behavior, environment, and condition of the wounds. The local Stranding Network should consult with NMFS to determine the severity of the wound(s) or illness and how likely the injury or illness is to impact the animal's quality of life. If the wounds or illness are considered to be serious or life threatening, response to the animal may be considered in certain circumstances.

4.2.1 Decision Trees and Triage Criteria for Response

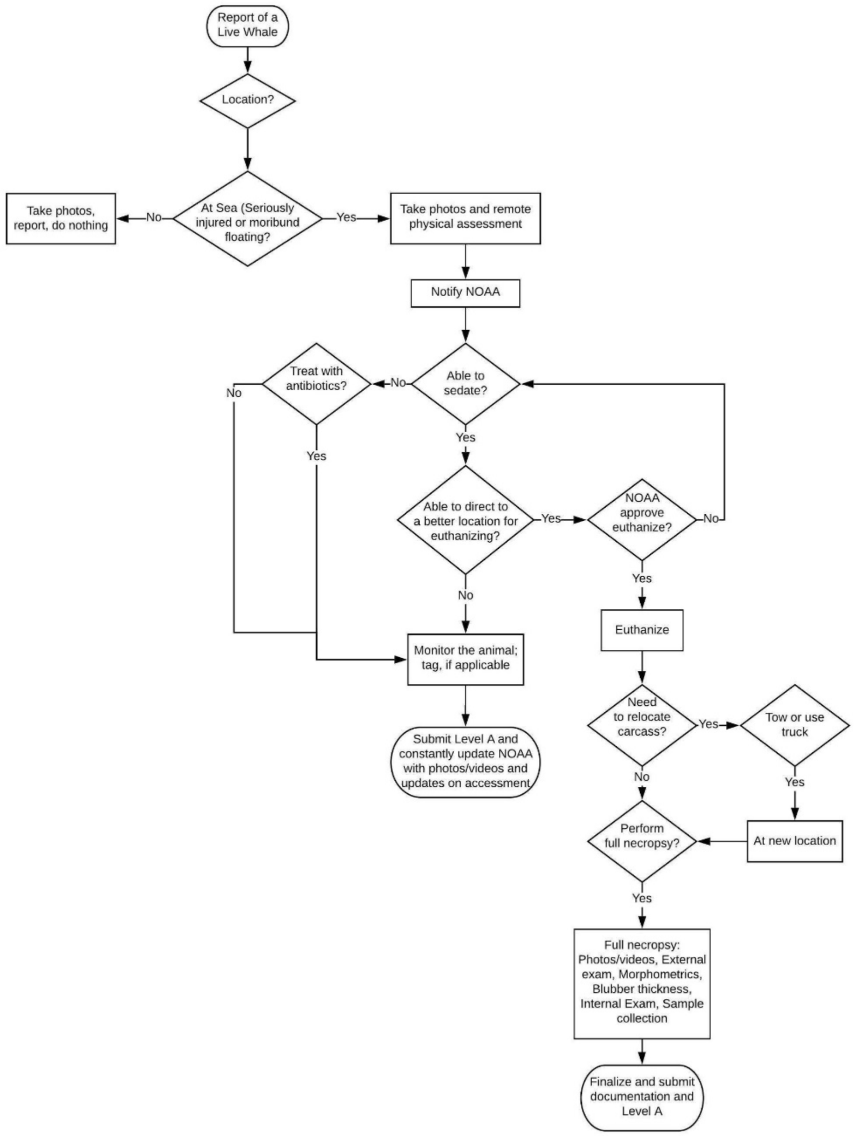
For live free-swimming injured marine mammals that are not entangled or out of habitat, response options are very limited (*e.g.,* remote injection of medications) and the decision to intervene would come from NMFS after discussion with experts.

The decision of whether (or not) to intervene is made by NMFS, after discussions between multiple parties – the local Stranding Network or response organizations that have "boots on the ground" that are responsible for response, the NMFS RSC, the MMHSRP at OPR HQ, and other parties that may have jurisdiction (*e.g.*, tribes, NPS, state, etc.). Ideally, these consultations also include marine mammal veterinarian(s) and experts in the biology and life history of the affected species. The decision to intervene is made by NMFS after taking into consideration the following minimum questions (others questions may be developed) that help evaluate the benefits and risks based upon the specific situation:

- What field observations have been reported and how recently have they been reported?

- What is the health status of the individual?
- Is there a medical diagnosis?
- What are the potential causes of the animals' observed condition?
- What is the estimated or known life history (*e.g.*, sex, age, size)? Is it a known individual?
- What is the conservation status/reproductive potential?
- Are there safety and logistical concerns for intervention (for the responders and/or animals)?
- What resources are available and is an intervention logistically feasible?
- What potential risks are there for conspecifics or other species?
- Is there a contingency plan in place if intervention is not successful (*i.e.,* if the animal dies in the course of intervention, if the intervention is unsuccessful, or if the animal requires rehabilitation)?
- What are the environmental conditions (*i.e.,* tidal cycle, are there protected/sensitive habitats that should be avoided, etc.)?

Below is a decision tree that can help when deciding the appropriate action for an at-sea (seriously injured or moribund/floating) response:



4.2.2 Specific Training and Qualifications (including CI letters)

Most free-swimming large cetacean responses are conducted under a MMPA/ESA permit that is issued to the MMHSRP. In very particular circumstances for non-ESA listed species, a response can be conducted under a SA (by the SA holder after consultation with the Regional Stranding Coordinator) or by a government employee acting under MMPA Section 109(h). Therefore, only responders who have been authorized by NMFS and who have the training, experience, equipment, and support needed should attempt large cetacean interventions. Authorized response efforts may also rely on partners at tribal, local, state and federal agencies (including law enforcement agencies and the USCG), non-governmental organizations, fishermen, and other groups to assist with some responses.

The Stranding Network members are trained or have experience in proper techniques for safe capture, restraint, and removal of gear from various marine mammal species. Training workshops have been offered to members of the Stranding Network. Additionally, opportunities for apprenticeships or assistant roles to gain the necessary hands on expertise can be arranged. Specific training issues or requirements may exist for certain activities (*e.g.*, in-water captures) and are more appropriate to address at regional or state levels by working with your RSC.

The Stranding Network is made up of individuals who have been evaluated on their qualifications and past experience, and for certain activities are issued a CI letter under the MMPA/ESA permit for large whale response. A CI remains authorized to respond to large whales as long as their CI letter is valid (which is typically the life of the MMPA/ESA permit, with some exceptions). These CIs are expected to coordinate to the extent possible with the NMFS Large Whale Coordinators and the MMHSRP. However, given the uncertain communication abilities at sea, and the need for quick decision-making, CIs are empowered to use their best judgment and act independently if the situation requires it. All response actions are reviewed after the event with the participating responders and MMHSRP staff. Table 10 and 11 below provides an example of the suggested number of personnel and roles required for a typical large whale at sea severely injured or ill response effort.

If the animal needs to be euthanized, euthanasia should only be carried out by an experienced and approved Stranding Network member or veterinarian who has training on proper euthanasia methods. Currently animals may only be safely euthanized once they have beached on land or ice. No safe at sea euthanasia methods currently exist for large whales that the Stranding Network are authorized to use. All of the Stranding Team should be trained to understand the general aspects of euthanasia, animal handling during euthanasia, general first aid/CPR, and interfacing with the public and media. It is the responsibility of the team lead to know the team's experience, skill and limitations, and to continually assess the safety of the situation (Barco *et al.* 2016).

Table 10: Suggested number of personnel and roles required for a typical large whale at sea severely injured or ill first response effort.

Team member roles	Number of personnel required
Incident Commander/Safety Officer	1-2
Vessel Captain (also may represent Safety Officer)	1-2
Crew (vessel dependent)	1-3 (roles can be shared with other roles)
Data Collector	1

Documenters	1-3 (roles can be shared with other roles)
Biopsy Sampling	1 (roles can be shared with other roles)
Veterinary Staff (remote administration of medications)	1-3
Tagger	1-2
Communications Person	1 (role can be shared with other roles)
Optional – UAS Pilot (see UAS; Section 6)	2-3 (roles can be shared with other roles)

Table 11: Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, IC and SO; 2º documentation and data collection).

Team Member Role	Role Description	Role Qualifications
Incident Commander (IC)	The IC, working closely with shoreside (or otherwise remote) authorizing parties (*e.g.*, NMFS Regional Stranding Coordinator [RSC]/ HQ), is responsible for the on-scene oversight and supervision of the first response operation. The IC may participate directly in the operation depending on circumstances, but typically does not directly participate (*i.e.,* hands-on) in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that safety is maintained for responders, the public, and animals.	Completion of the ICS free or paid courses, experience with close-approach assessment of large whales, including hazing, tagging and biopsying. Must be trained and/or experienced in protocols, procedures, risks, and risk mitigation in all aspects of the first responder mission being carried out. Must have the authority to carry out operations.
Safety Officer (SO)	The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate with the team and adjust the strategy of the response as needed. The SO works very closely with the IC. Under certain circumstances and depending on experience, the role of the SO can overlap with that of the vessel operator of the support or approach vessels, and if necessary and otherwise appropriate, the role of IC and SO can be performed by one person.	Experience in previous large whale entanglement response efforts, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.,* not adhering to protocols, presence of other animals, incoming environmental or weather changes, and time of day considerations). Willingness and ability to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.
Vessel Operator(s)	This person(s) is/are responsible for the safe transit and operations of the vessel(s), including the safe maneuvering around and approach to whales. Vessel operator(s) should have experience	Experience, training, and in some cases certifications (*e.g.*, USCG license, NOAA certified components course) in order to “captain” a vessel. Vessel operators should

	operating the vessel around the animal and all aspects of the response operation. They typically take on the key role of operational safety and may take on the role of SO. As such, the vessel operator role whether on the transit, support, or approach vessels is one of the most important roles beyond that of the IC.	have experience operating the vessel around large whales and all aspects of the response operation.
Data Collector	The data collector is essential in recording all aspects of the response. This person is responsible for ensuring all data is complete on data sheets and data loggers, including the assessment of the animal, recording identity of associated documentation, behavior of animal (*e.g.*, respirations, changes due to response), the response efforts (*e.g.*, an outline of response steps taken, risk factors encountered, who was involved), and sampling if any.	Familiarity with procedures and data sheet/dataloggers, attention to details. Ability to accurately and completely compile a great deal of information. Lacking a disposition to seasickness is valuable.
Documenter(s)	This person(s) is/are responsible for obtaining and maintaining (*e.g.*, identifying and safe storage) still and video imagery on all aspects of the response. They work closely with the Data Collector and the vessel operator. This person may also serve as the data collector. Under certain circumstances, responders with other roles may take on, in part, the role of documenter, through use of helmet or vessel-mounted POV cameras. However, such persons must maintain focus on their primary role and maintain safety. POV cameras should be turned on and forgotten by the user and instead either tended to or operated remotely by a dedicated documenter.	Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response.
Biopsy Sampling	This role is responsible for maintaining biopsy gear (*e.g.*, crossbow or air guns, darts, and collection vials), safely obtaining the sample, and its storage and processing (*e.g.*, labelling).	The person needs to be trained and otherwise familiar with the safe use of the crossbow or pneumatic gun. Additional training, like gun handling, is recommended. The person obtaining the biopsy sample must work closely with the helmsperson and the data person.
Veterinary Staff	This role is responsible for veterinary operations including remote administration of medications (*e.g.*, antibiotics or sedation). This person has experience with marine mammal medications and	The person needs to be experienced and authorized to administer sedating drugs or other veterinary medications, and

	medicine. The veterinarian or veterinary technician may or may not administer the drug remotely but will be responsible for drawing up the medications safely and providing the loaded dart to the trained darter.	experienced with use of delivery equipment (if the darter).
Taggers	This role is responsible for the pre-deployment preparation, including the testing of the transmitters and receivers and setup of the telemetry tag, the appropriate deployment of telemetry, receiving Argos, GPS and real-time VHF fixes, and the interpretation and forecasting of telemetry data towards use in relocating the animal for future efforts.	These persons need to be trained or otherwise familiar with the appropriate preparation (*i.e.,* testing, tuning, and mounting to the telemetry buoy) of telemetry gear, deployment, reception, and interpretation of telemetry. The two-person team attaching a tag must work closely with a vessel operator. Both persons - one making the attachment (*e.g.*, dart gun, crossbow, pole) and the other person dedicated towards documenting the tag placement via photography, need to be physically capable, trained and experienced in the procedure, and familiar with all risk factors.
Communications Person	This person is responsible for maintaining all-important communications aboard vessels, between vessels (*e.g.*, a supporting partner vessel) and to shoreside contacts, including float plan contact and NMFS authorizing agents (*e.g.*, Regional and/or National LWERCs). Shoreside contacts typically take on the role of further disseminating information, including to agency partners/leads, any other authorizing agencies, and media coordinators. Communications at this stage do not involve the media as this is the role of media coordinator and others at later stages.	Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response.
Optional – UAS Pilot (see UAS; Section 6)	If permitted to operate a UAS during the response, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success or safety of the operation, or causing disturbance to any animals.	Pilots must have an FAA Part 107 license, follow all existing FAA and other regulations, and be trained and/or experienced operating a UAS over water from a vessel during response operations. More detail on UAS use is addressed in Section 6.

4.2.3 Data Collection Protocols

Data collection is typically performed by qualified individuals and depending on the level of response and capacities may determine the amount of data collected. It is important to document the event with recording the location and time of each sighting. Monitoring the animal(s) is essential and data can be collected on a form such as the Free Swimming Whale Assessment Form and Monitoring Datasheet (see example in Appendix C). Obtain good photographs and/or video of the animal because it can help identify individual animals and in assessing their condition. Recording the animal(s) behavior when observed is helpful to aid in the assessment and in determining the best course of action. For any large whale response, at minimum, field information necessary for completion of NOAA's Level A form must be collected. This will include the assignation of a unique identifier (Field ID#, per Regional Stranding Network protocols). Live animals must also be indicated in the appropriate section of the Search Effort Log on the Level A form. Level A forms may be completed electronically via direct entry in the National Stranding Database.

Anytime samples are collected and/or handed-over they should be recorded. Photo logs are a record of each photo taken, which helps to identify the photographer and date/time taken. During data collection, photos should be taken with a label with ID, date, species, log number, and have a size scale. With all the data collected, a report should be finalized with the photos documented, complete recording of all pertinent findings, and all samples collected.

4.2.4 Available Tools and Techniques

4.2.4.1 *Remote Physical Assessment (including respiration rate and behavior)*

Each case/event should be assessed through physical, behavioral, and environmental observations. Some of these observations include open wounds, lacerations, buoyancy issues, lethargy, and surface behaviors. These observations and data will improve better decision-making and adaptive management of the situation to determine the appropriate course of action for that particular individual and situation (refer to the Mass Stranding Best Practices for information on groups of animals). Careful planning and adaptive management will also provide important information that can be used to inform decision making for future cases. Lessons learned from each situation through thorough debriefing also is critical to inform tools and techniques. A standardized health assessment form *may* be available, depending on the region and taxa. If so, it should capture all necessary information. If there is no form available then the questions below should be determined (Cape Cod Stranding Network 2008) in order to more generally assess the whale's status and condition. Below are examples of some questions that might inform decision making. In the future, regional health assessment forms, if not already available, may be developed.

- Determine the species involved and use identification characteristics and catalogs for the species or stock to determine if this is a known individual. The identification characteristics for the species may include the size, coloration, rostrum and callosities, fluke, pectoral fin, and dorsal fin. Is this a known individual? If so, what do we know about the individual, behavior and normal habitat?
- Estimate the total length, estimate the age class, and potential weight (using weight charts).
- Note the body condition. If able to determine, is there an indentation behind the cranium (peanut head)? Are ribs and/or scapula visible? Is the animal concave or convex in the epaxial region on a longitudinal view? Are there any skin lesions or wounds?
- If possible, count respirations (number of respirations per minute), note respiratory effort, is there any respiratory exudate, odor, abnormal sound? (Normal breathing intervals for large whales are once every fifteen to twenty minutes (Geraci *et al.* 2005))
- Are there any other animals in the area? How many? Is the animal frequently in close association with any of them (*e.g.*, mom/calf, bachelor pair, etc.)?
- Take photos and/or video to document injuries, disease or behavioral changes

Following remote observations, it is critical to share the information and have a discussion with a group of experts (*e.g.*, marine mammal veterinarians, biologists with experience with a given species, etc.). This is possible when the case is not immediately life threatening and the animal's behavior/sighting history is somewhat predictable such that the animal can be relocated for future interventions. In an emergency case (*e.g.*, an animal is in imminent danger of death, such as a lethal vessel strike), immediate intervention (following approval from NMFS) may be warranted.

4.2.4.1.1 Breath Sampling

Breath sampling is sampling from the cloud of "blow" (Figure 1) from a whale when they exhale as they reach the surface. They may blow several consecutive times between dives and some species may start an exhalation underwater and the second breath may be easier to target. It is appropriate to collect several breaths from an individual being assessed. For mom/calf pairs, it may be difficult to focus the collection to only one of the two if they are surfacing together especially in shallow water. This sampling is non-invasive and can be collected easily. There are different ways a breath sample can be collected (Table 6) (Hunt *et al.* 2013):

- Long poles positioned over the blowholes which can have nylon fabric suspended across a 15-centimeter ring or a plastic framework, an inverted funnel, and/or Petri dishes
- A remote-controlled helicopter/UAS with Petri dishes

Figure 1: Respiratory vapor samples ("blow") from large whales can be collected by a variety of pole-based or remote-controlled helicopter-based methods. This photograph shows collecting "blow" droplets from a North Atlantic right whale (*Eubalaena glacialis*) using a nylon-fabric sampler suspended on the end of a carbon-fiber pole. (Photo: Amy Knowlton, New England Aquarium, SARA Permit #325863, NMFS Permit #14233, Hunt *et al.* 2013.)

Nitrile gloves should be worn by anyone involved with sample collection and should be changed after accidental contact with skin, surfaces or saltwater to avoid contamination. Gloves should also be changed between sampling different animals.

The exhaled breath and condensate should be collected on at least two sterile Petri dishes with no media. Sampling multiple exhaled breaths on the same plates is ideal. Collect a small volume of surface seawater (minimum one milliliter) on a plate in the vicinity of the whale.

Process the samples on board if conditions allow, or keep the plates cool until they can be processed on land. Sampling will not provide immediate information for decision making and may need to be sent to a lab for analyses unless cytology would be informative.

Sample processing: (one example below, sample collection may differ based upon situation)

Plate #1:

a. Collect one swab to prepare smears on three glass microscope slides. Label and place the slides in a secure area and air dry
b. Collect two swabs in transport media for bacteriology (Ames), keep chilled. Do not freeze.
c. Collect two swabs for fungal culture. Keep the swabs for fungal culture dry and in separate sterile containers. Keep chilled. Do not freeze.
d. Collect 2 swabs and place in RNA Later® or a dry sterile container for pathogen testing (*e.g.*, viral, etc.). Ok to freeze.

Plate #2: To avoid contamination, do not collect this sample from a Petri plate that has been previously swabbed:

a. Using a sterile pipette, transfer a minimum of 0.1 milliliter of blow into a sterile Nalgene cryovial

Table 6: Breath sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Respiratory vapor ("breath")	• Pole-based samplers • Remote-controlled devices possible (?) • Different methods for droplets, exhaled breath condensate, and gases (these provide different types of information)	Medium	• Non-invasive • Targeted biomarker sampling possible • Repeated sampling possible • Wide range of metabolites can be studies simultaneously • Mostly requires remote laboratory analyses and little real time data	• Novel technique; many validations remain to be done • Target biomarkers at trace concentrations • Advanced detection strategies needed for quantitative analysis	• Several hormones detectable • May contain a large variety of other detectable compounds (?) • May be proxy for blood, as has been observed in human studies • Respiratory microbiome • Host immune response

4.2.4.1.2 Fecal Sampling

Fecal sampling (Figure 2) can be collected from well-formed floating semi-solid clumps to a more fluid, dispersed plume which can be scooped from the water surfaces using a fine-mesh nylon dipnet, draining off as much seawater as possible (Hunt *et al.* 2013). Refer to Table 7 below for more information on the fecal sampling technique.

Figure 2: NOAA researchers collecting fecal samples. Photo taken under federal research permit. Photo credit: NWFSC.

When collecting fecal samples:

a. Place replicate samples of 2-4 milliliter of feces in three separate sterile containers
b. Place one sample of 1.0 milliliters of feces in a sterile container for molecular analysis and possible electron microscopy
c. Swab the fecal sample. Place the swab either in RNA Later® or a dry sterile container

Table 7: Fecal sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Feces	• Locate visually or with a dog • Surface collection with scoop or net; subsurface collection with divers • Not possible in some environments and conditions and not applicable in all large whales	• Low without dog • Medium with dog	• Non-invasive • Extremely high steroid content (easily detectable) • Well-established steroid hormone technique • Long 'sampling time frame' may enable study of chronic stress • Repeated sampling possible	• Low sampling rate • Targeted sampling difficult • Individual not always known (cannot always be genotyped due to DNA degradation) • Cannot sample fasting seasons	• Diet analysis • Endoparasites • Lipophilic hormones • Fatty acid and stable isotope analysis of diet • Toxin exposure (*e.g.*, domoic acid) • Gut microbiome and relationships to stress, immunity, and disease • Some immunoglobulins and other hormones may be detectable (?)

4.2.4.1.3 Photogrammetry (UAS or Other)

Photogrammetry is a laser system that allows for quantitative measurements (morphometrics) from photographs. It adjusts pixel measurements to real size by an estimate of scale (distance/focal length). Fixed-wing airplanes, helicopters, and/or UAS are used to collect vertical images from precisely-measured altitudes directly above the whale. There has been great success using UAS because of the quiet sound footprint, vessel standoff, ability for increased range, increased safety, and cost effectiveness. Table 8 provides more information on the photographic analysis technique.

Table 8: Photographic analysis technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Photographic analysis	• Lateral view with boat-based photography • Dorsal view/body outline with aeroplanes or remote-control devices • Infrared	• Very high	• Non-invasive • Best sampling rate • Repeated sampling possible	• External appearance only • Aeroplane-based photography has cost/safety issues	• Blubber reserves/nutritional state • Epidermal lesions • Ectoparasites • Entanglement and injury • Thermal physiology

	thermography				(infrared) • Watercraft wound analysis

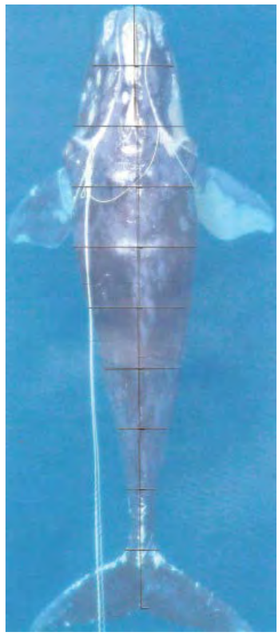


Figure 3: example of aerial photography. This image was marked for length-to-width ratio analysis to access likely body weight prior to dosing with sedatives for disentanglement efforts (Hunt *et al.* 2013).

4.2.4.2 *Medical Intervention Strategies*

4.2.4.2.1 Sedation

If a whale is seriously injured or ill at sea, the scenario needs to be accessed to decide if sedation is the best course of action. At sea sedation has rarely been used for injured or ill whales, but could be used to slow a whale down to administer antibiotics or be able to relocate a whale to a suitable and humane area to euthanize. If using sedatives, it is important to obtain the right dosage because if too much is administered there is risk that the whale could inhale water because it is still swimming and diving (Moore *et al.* 2010) and possibly drown. To administer the sedative, a pole syringe, dart gun or crossbow has been used depending upon the size of the whale and its behavior. Midazolam and butorphanol (Table

12) have been successfully used in sedating large whales. For more details on the procedure for sedating large whales please see the Large Whale Entanglement Best Practices.

Table 12: Large whale sedative dosage (Moore *et al.* 2010, Moore *et al.* 2012)

Sedation Drug	**Dosage**
Midazolam (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Butorphanol (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Reversal Drug	**Dosage**
Naltrexone (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution

4.2.4.2.2 Medications

After discussion with NMFS and experts, administering antibiotic, analgesic, or other drug therapy may be considered depending on the scenario and if the treatment could lead to the improved condition of the whale. Typically, a long-acting antibiotic, such as ceftiofur or cefovecin, is administered by remote dart to free-ranging live whales and may require a series of treatments, if possible. Antibiotics may be used to treat live whales with injuries to help prevent septicemia.

4.2.4.3 *Tagging and Marking*

The decision on which technique(s) to use for tracking a live injured whale will generally be made on a case-by-case basis. Gathering data on the survival of large whales that have been released after a live stranding is an essential part of the intervention. Without the data on post-release outcomes, one cannot assess the value of the overall response, nor evaluate the combined suite of protocols employed. The tools available for monitoring post-intervention outcomes range from the re-sighting of natural or applied markings, to VHF/satellite tag tracking.

Natural Markings are typically used for identification. Some species have specific criteria for identification and some also have catalogs so that if matched to a known individual more information about the animal is possible. These include pigmentation patterns on the fluke or body, callosity shape and size, dorsal fin shape and notches, or other skin marking depending on the species involved. It is important to acquire a comprehensive series of species-relevant images of all such marks before release to enable future recognition.

Applied marks are those artificial markings applied by the Stranding Network responders during the intervention and release. They may be very temporary, such as cattle paint stick markings that last only a few days. Short-term marks could include plastic cattle ear tags in the dorsal fin (for those species with a dorsal fin), that can last for many months.

An electronic tag, with options including VHF (radio) and satellite, is another type of applied mark. Tag attachment options include suction cup tags, single pin attachments in the trailing edge of the dorsal fin (for those species with a dorsal fin), or LIMPET tags.

All these types of monitoring can be used in tandem, so photos of natural markings can be coupled with applied marks or tags to increase the likelihood of re-sighting whales at multiple time periods (*i.e.,* short-term and long-term) to assess post-release outcomes. See Table 4 for the pros and challenges of each tagging/marking type. For more specific details on tagging and marking, refer to the Report of the Joint US Office of Naval Research, International Whaling Commission and US National Oceanic and Atmospheric Administration Workshop on Cetacean Tag Development, Tag Follow-up and Tagging Best Practices.

Table 4: Pros and challenges of each tagging/marking type

Natural Markings	
Pros	• Natural markings tend to persist after healing and have more lasting value, especially where the individual's markings are archived from stranding event images • Many areas have Photo-ID catalogs for various whale species or population • Re-sights may occur over many years, allowing for long-term information on the success of the intervention
Challenges	• The whale appearing in an area where photo-id or re-sights may occur for recognizing applied or natural marks • Belonging to a species that has an existing photo-id catalog that can be used for matching • Appropriate photos being collected during the stranding event to match with the photo-id catalog (*i.e.,* fluke photos of humpback whales may be difficult to obtain when they are on a beach) • Communication between researchers with photo-id catalogs and the Stranding Network responders may be challenging, particularly over large geographic distances (multi-country ranges of most migratory large whales) • Data on re-sights may not occur in the short term (days/weeks/months), leading to uncertainty

	• Lack of re-sight data may not necessarily mean the intervention wasn't successful – the fate of the whale remains unknown
Applied Markings	
Pros	• Easy to apply (paint sticks require no training) • Inexpensive and readily available (on hand with many/most Stranding Network responders)
Challenges	• Not feasible to be applied safely for at sea whales • Re-sight information depends upon high level of effort (especially boat-based, but could be shore-based) to identify free-swimming whale ("success")
Electronic Tags	
Pros	• Allow for longer term tracking (days/weeks/months) • Allow for targeted tracking over a large geographic area, with the tag aiding in the ability to locate and re-sight the free-swimming animal (radio or satellite) • Allow for remote tracking (satellite)
Challenges	• An appropriate tag available with a trained applicator • A suitable permit to tag in hand (tagging can be conducted under the national MMHSRP permit with pre-approval) • Funding for the tag acquisition or replacement • Time to focus on the tagging plan while rescue process is ongoing • Potential for added impact or stress to the whale

4.3 Entangled

For entangled cetaceans (for specific information refer to Large Whale Entanglement Response Best Practice), NMFS, in consultation with experts and veterinarians, determines if the entanglement is an actual serious injury and life-threatening. This is achieved through field observations by biologists/researchers/veterinarians, analysis of photos and/or videos, the animal's behavior, and prior experience with similar entanglements. NMFS Serious Injury Guidance may be consulted to assess the injury (https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations#distinguishing-serious-from-non-serious-injury-of-marine-mammals).

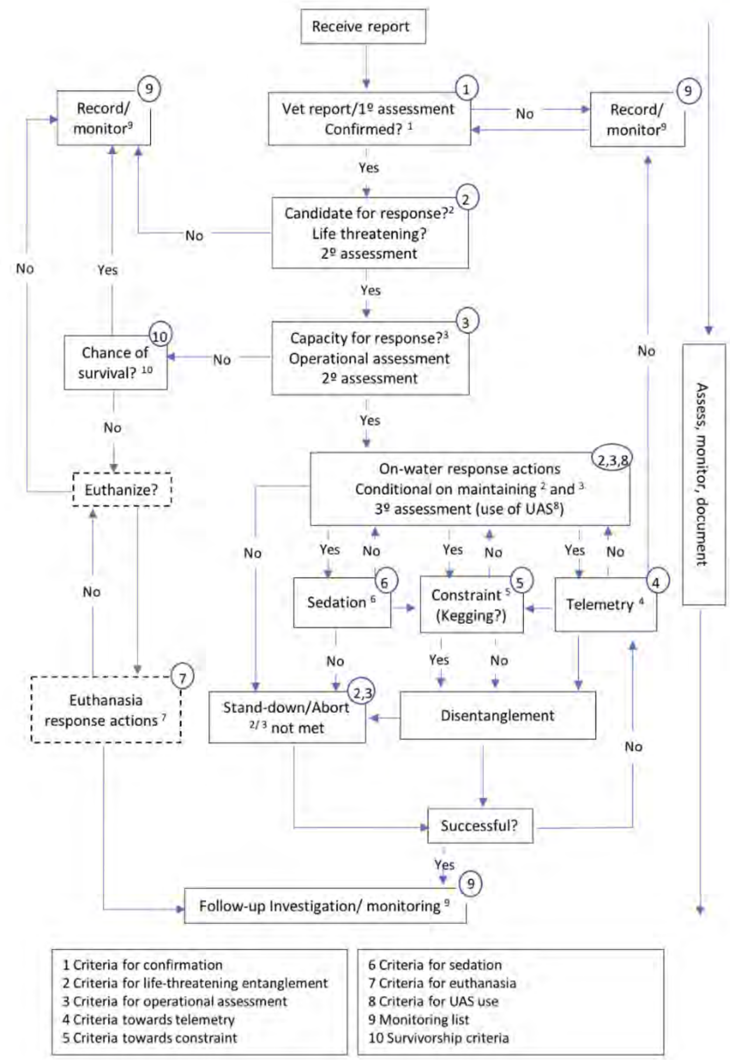
If the entanglement is determined to be life threatening, the next step is to determine the appropriate type of intervention effort. Responders must ensure that the logistical and resource requirements can be met for a safe and effective intervention. These requirements include the availability of trained personnel, equipment, and the animal's behavior, sighting history, and location, including whether it is an appropriate location (*e.g.*, water depth, sea state, weather, will not adversely impact protected/sensitive habitats, etc.). If intervention is not an option, the animal may be monitored, usually by the Entanglement and/or Stranding Network or trained biologists, to determine whether a response may be possible at a later date (*e.g.*, the animal moves to a more suitable area for rescue, the animal live strands, the animal becomes lethargic and easily approachable).

4.3.1 Decision Trees and Triage Criteria for Response

The decision of whether (or not) to intervene is made by NMFS, after discussions between multiple parties – the local Entanglement Network organizations that have “boots on the ground” that are responsible for response, the NMFS RSC, and the MMHSRP at OPR HQ or authorized responders may have pre-approval from NFMS to respond in real-time without consultation. Ideally, these consultations also include marine mammal veterinarian(s) and experts in the biology and life history of the affected species.

Communication is essential before, during, and after an entanglement response. There must be clear communication when planning for the response, and among team members during the response (*e.g.*, between boat operators, between boat operators and shore personnel, between response team and emergency personnel, members of the public, law enforcement, harbor masters, native communities, etc.).

Below is a decision tree adapted from the Welfare Issues Associated with Entanglement of Large Whales Workshop 2010 report that can help when deciding the appropriate action for an entangled response. Refer to the Large Whale Entanglement Best Practices for more detailed information.



4.3.2 Specific Training and Qualifications (including CI letters)

The Large Whale Entanglement Response Network (the Entanglement Network) is made up of individuals who have been evaluated on their qualifications and past experience, and then issued a CI letter under the MMPA/ESA permit for certain levels of entanglement response to large whales (*e.g.,* Level 3, 4 and 5). In order to become a CI, applicants must provide NMFS with a resume summarizing any previous experience with entanglement response, including the roles they played in each event, their vessel experience around large whales, entanglement response training history, and any other pertinent information. This resume is reviewed by the regional NMFS Entanglement Response Coordinators and relevant subject matter experts who are already authorized within the Stranding Network. The review panel provides comments, and a confidential recommendation to the MMPA/ESA permit PI, on whether the individual should be authorized as an entanglement responder (and therefore a MMPA/ESA permit

CI), and at which level of responsibility. Refer to the Large Whale Entanglement Response Best Practices for more detailed information on the five levels of responders and their roles and responsibilities. After the review, the MMPA/ESA Permit PI decides if a candidate should receive a CI letter. Each level of responder must have completed different levels of certifications to qualify for the role.

Responder Qualifications:

Level 1= Completed Level 1 classroom or virtual training and demonstrated equivalent knowledge and experience (submit resume)

Level 2= Completed Level 2 on-water or training and demonstrated equivalent knowledge and experience (submit resume)

Level 3= Completed Level 1 & 2 certifications; basic Level 3 training or Advanced Level 3 training (apprenticeship with an approved trainer) and experience in the following elements, which will be evaluated:

- Large whale species identification and behavior, and the ability to safely follow a free swimming, entangled whale
- Boat handling and safety including basic seamanship, driving, and close approaches to whales
- Line handling and safety including knowledge of knots, handling lines under pressure, and an understanding of how working lines behave
- Follows instructions and response plans

Level 4= Basic or Advanced Level 3 certification; direct experience in a supervised (by Entanglement Network coordinators or NMFS) large whale disentanglement, documentation of that experience, and a positive evaluation from NMFS using information provided by Entanglement Network Coordinators and any hard documentation (*e.g.*, video); and when possible, commitment to consultation as detailed in Level 5 below

Level 5= Level 4 certification; experience with right whale behavior and/or includes a person on the team directly involved in the whale disentanglement (in the boat with the whale) that is experienced in right whale behavior; documented participation in a right whale disentanglement and/or NMFS review of video of participation in a right whale disentanglement that followed NMFS protocol; commitment to consultation which include:

- Immediate Consultation: when possible, use satellite/cell phones to bring in additional ideas/experience from other Level 5s and Level 4s (and vets and behaviorists if appropriate) while on scene with an entangled right whale
- Action Plan Development: For a tagged right whale, consultation required with NMFS, Level 5s and Level 4s, veterinarians, behaviorists, etc.

More details about qualifications and team member roles (Table 13 and 14) can be found in the Large Whale Entanglement Response Best Practices. At present, a CI remains authorized to respond to entangled large whales as long as their CI letter is valid (which is typically the life of the five-year MMPA/ESA permit, with some exceptions). These CIs are expected to coordinate to the extent possible during responses with the NMFS Entanglement Response Coordinators and the MMHSRP. However, given the uncertain communication abilities at sea, and the need for quick decision-making, CIs are empowered to use their best judgment and act independently if the situation requires it. All entanglement response actions are reviewed after the event with the participating responders, the MMHSRP staff, and high level responders (optional). At any time, members of the Large Whale Entanglement Response Network may be called upon to respond to ESA-listed or non-listed entangled large whales. Large whale entanglement response efforts may include physical or chemical restraint, attachment of scientific instruments (*i.e.,* satellite tags), biological sampling for health studies, and disentanglement. Refer to the Large Whale Entanglement Best Practices for specific details.

Table 13: Suggested number of personnel required for a typical large whale entanglement response effort (not including sedation).

Team member roles	Number of personnel required
Incident Commander (IC)	1
Safety Officer (SO)	1 (dedicated role)
Vessel Captain (also may represent Safety Officer)	1
Crew (vessel dependent)	1-3 (roles can be shared with other roles)
Disentanglers	2-3 (roles can be shared, but not concurrently)
Data Collector	1 (role can be shared with other roles)
Documenters	1-3 (roles can be shared with other roles)
Biopsy Sampling	1 (role can be shared with other roles)
Gear Person	1 (role can be shared with other roles)
Tagger (familiar with tag setup and deployment; takes 2 people, along with helm position to deploy)	2 (roles can be shared with other roles)
Communications Person	1 (role can be shared with other roles)

Optional – UAS PIC and VO (see UAS; Section 6)	2-3 (roles can be shared with other roles)

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, IC and SO; 2º documentation and data collection).

Table 14: Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, IC and SO; 2º documentation and data collection).

Team Member Role	Role Description	Role Qualifications
Incident Commander (IC)	The IC, working closely with shoreside (or otherwise remote) authorizing parties (*e.g.*, NMFS RSC/ LWERCs, National LWERC), is responsible for the on-scene oversight and supervision of the first response operation. The IC may participate directly in the operation depending on circumstances, but typically does not directly participate (*i.e.,* hands-on) in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that safety is maintained for responders, the public, and animals.	The IC needs to be at least a level 3 or higher for any close-approach assessment or tagging operations, a level 4 for overseeing the disentanglement of all large whales except right whales, and a level 5 for right whales (unless otherwise authorized). Under Heightened Consultation protocol tagging required a level 4 designation, the disentanglement of other species beyond right whales a level 5 designation. If unable to consult RLWERC or experts, right whale disentanglement efforts must be aborted. The IC must be trained and/or experienced in protocols, procedures, risks, and risk mitigation in all aspects of the first responder mission being carried out. Must have the authority to carry out operations.
Safety Officer (SO)	The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate with the team and adjust the strategy of the response as needed. The SO works very closely with the IC. Under certain circumstances and depending on experience, the role of the SO can overlap with that of the helmspersons of the support or approach vessels, and if necessary and otherwise appropriate, the role of IC and SO can be performed by one person.	Experience in previous large whale entanglement response efforts, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.,* not adhering to protocols, presence of other animals, incoming environmental or weather changes, and time of day considerations). Willingness and ability to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.
Helmsperson/Vessel Captain	This person(s) is/are responsible for the safe transit and operations of the vessel(s), including the safe maneuvering around and approach to entangled whales and the trailing gear that might exist.	Experience, training, and in some cases certifications (USCG license, NOAA certified components course) in order to "captain" a vessel. Helmspersons should

	Helms persons should have experience operating the vessel around the animal and all aspects of the response operation. They typically take on the key role of operational safety and may take on the role of SO. As such, the helmsperson role whether on the transit, support, or approach vessels is one of the most important roles beyond that of the IC.	have experience operating the vessel around large whales and all aspects of the response operation.
Vessel Operator(s)/Crew	This person(s) is/are responsible for the safe transit and operations of the vessel(s), including the safe maneuvering around and approach to whales. Vessel operator(s) should have experience operating the vessel around the animal and all aspects of the response operation. They typically take on the key role of operational safety and may take on the role of SO. As such, the vessel operator role whether on the transit, support, or approach vessels is one of the most important roles beyond that of the IC.	Experience, training, and in some cases certifications (*e.g.*, USCG license, NOAA certified components course) in order to “captain” a vessel. Vessel operators should have experience operating the vessel around large whales and all aspects of the response operation.
Disentanglers	These persons are responsible for cutting the animal free. The role involves, as appropriate, the establishment of a working line, the safe handling of the working lines and entangling gear towards additional assessment (3º assessment) and accessing the animal and entanglement, the adding of constraint - kegging buoys and sea anchors, and the handling of various knives towards safely cutting the animal free. This higher-risk role may overlap with other roles only to a limited extent. For instance, documentation through use of a pole, vessel or helmet-mounted POV camera, communications, or operating the helm position. However, focus needs to be maintained on the animal, the gear, and the other members of the team. The best-case scenario is to have a dedicated experienced helmsperson who can cover communications, with two dedicated, experienced, trained and approved disentanglers.	At least two of the distanglers in the approach/task vessel need to be experienced in their roles and/or have level 3 designation or higher. Disentangling right whales requires even greater experience and/or designation of a level 4 or higher. Disentanglers should be familiar with the tools and procedures they will use, the vessel they are working from, and the entangling gear and the species of whale they are working on.
Data Collector	The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets and data loggers, including the assessment of the animal, recording identity of associated documentation, the entanglement (*e.g.*,	Familiarity with procedures and data sheet/data loggers, attention to details. Ability to accurately and completely compile a great deal of information. Lacking a disposition to seasickness is valuable.

	nature of the entanglement, gear type), behavior of animal (*e.g.*, respirations, changes due to response), the response efforts (an outline of response steps taken, risk factors encountered, who was involved), and telemetry (*e.g.*, tag identity, frequency of VHF, fine tuning).	
Documenter(s)	This person(s) is/are responsible for obtaining and maintaining (*e.g.*, identifying and safe storage) still and video imagery on all aspects of the response. They work closely with the data collector and the helmsperson. This person may also serve as the data collector. Under certain circumstances, responders with other roles may take on, in part, the role of documenter, through use of helmet or vessel-mounted POV cameras. However, such persons must maintain focus on their primary role and maintain safety. POV cameras should be turned on and forgotten by the user, and instead either tended to or operated remotely by a dedicated documenter.	Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response

4.3.3 Data Collection Protocols

Data collection is typically performed by qualified individuals and depending on the level of response and capacities may determine the amount of data collected. It is important to document the event with recording the location and time of each sighting. Monitoring the animal(s) is essential and data can be collected on a form such as the Free Swimming Whale Assessment Form and Monitoring Datasheet (see example in Appendix C). Obtain good photographs and/or video of the animal because it can help identify individual animals and in assessing their condition. Recording the animal(s) behavior when observed is helpful to aid in the assessment and in determining the best course of action. For any large whale response, at minimum, field information necessary for completion of NOAA's Level A form must be collected. This will include the assignation of a unique identifier (Field ID#, per Regional Stranding Network protocols). Live animals must also be indicated in the appropriate section of the Search Effort Log on the Level A form. Level A forms may be completed electronically via direct entry in the National Stranding Database.

Disentanglement and sampling equipment and data needs must be well thought out prior to the start of any entanglement response program. Data forms and instructions should be completed during a response. Capture and sampling equipment checklists should be developed and used. Important forms for preparation prior to response may include: applicable permits; Level A and Human Interaction Forms; gear checklists; disentanglement forms; remote sedation worksheets; and drug interaction forms. Every effort should be made to retain all or representative sections of entangling gear (where possible), documented on the Level A and Human Interaction Form, and stored in a centralized location or submitted to the regional or appropriate Take Reduction Team gear identification team.

Ideally, when samples or gear are transferred between parties, it should be done under Chain of Custody if there is the potential of an enforcement action or litigation. These forms should start as soon as possible, and especially when samples are transferred from the field responders to the analyzers or storage facility, and at every subsequent transfer. The form is signed by both parties, and the original form should remain with the sample/gear. Photo logs are a record of each photo taken, which helps to identify the photographer and date/time taken. During data collection, it is helpful to take an initial photo that contains a label with ID, date, species, location, and any other pertinent information (photographer's name or vessel). For any photos documenting samples or gear removed from the animal, a label and a size scale should be included in the photo. With all the data collected, a report should be finalized with the photos documented, complete recording of all pertinent findings, and all samples collected.

4.3.4 Available Tools and Techniques

Depending on the situation, an entangled large whale may be either physically or chemically restrained. Physical restraint may be used to slow down an animal, provide responders with greater control, and to help maintain large whales at the surface. Physical restraint is accomplished by attaching or determining if any part of the entanglement can be used as control line(s); attaching floats or buoys, and/or sea anchors to the entangling gear with a grappling hook or other means (*e.g.*, skiff hook deployed from pole); or by attaching new gear (*e.g.*, tail harnesses) to the animal to support it. The drag and buoyancy from small boats may also be used to slow down an animal and maintain it at the surface. Remote sedation may also be used to restrain the animal. Remote administration of chemical agents (*e.g.*, antibiotics) may be used to improve the animal's prognosis. More details on both types of restraint can be found in the Large Whale Entanglement Response Best Practices.

4.3.4.1 *Remote Physical Assessment (including respiration rate and behavior)*

Each case/event should be assessed through physical, behavioral, and environmental observations. Some of the observations that may be related to being entangled include thrashing, seeing gear on the animal, breaching (surface behaviors), length of dive times, increased respirations, and body condition. These observations and data will improve better decision-making and adaptive management of the situation to determine the appropriate course of action for that particular individual and situation (refer to the Mass Stranding Best Practices for information on groups of animals). Careful planning and adaptive management will also provide important information that can be used to inform decision making for future cases. Lessons learned from each situation through thorough debriefing also is critical to inform tools and techniques. A standardized health assessment form *may* be available, depending on the region and taxa. If so, it should capture all necessary information. If there is no form available then the questions below should be determined (Cape Cod Stranding Network 2008) in order to more generally assess the whales status and condition. Below are examples of some questions that might inform decision making. In the future, regional health assessment forms, if not already available, may be developed.

- Determine the species involved and use identification characteristics and catalogs for the species or stock to determine if this is a known individual. The identification characteristics for the species may include the size, coloration, rostrum and callosities, fluke, pectoral fin, and dorsal fin. Is this a known individual? If so, what do we know about the individual, behavior and normal habitat?
- Estimate the total length, estimate the age class, and potential weight (using weight charts)
- Note the body condition. If able to determine, is there an indentation behind the cranium (peanut head)? Are ribs and/or scapula visible? Is the animal concave or convex in the epaxial region on a longitudinal view? Are there any skin lesions or wounds?
- Note entanglement (*e.g.*, type of gear, location, etc.)
- If possible, count respirations (number of respirations per minute), note respiratory effort, is there any respiratory exudate, odor, abnormal sound? (Normal breathing intervals for large whales are once every fifteen to twenty minutes (Geraci *et al.* 2005))
- Are there any other animals in the area? How many? Is the animal frequently in close association with any of them (*e.g.*, mom/calf, bachelor pair, etc.)?
- Take photos and/or video to document injuries, disease or behavioral changes

Following remote observations, it is critical to share the information and have a discussion with a group of experts (*e.g.*, marine mammal veterinarians, biologists with experience with a given species, etc.). This is possible when the case is not immediately life threatening and the animal’s behavior/sighting history is somewhat predictable such that the animal can be relocated for future interventions. In an emergency case (*e.g.*, an animal is in imminent danger of death, such as an anchored animal), immediate intervention (following approval from NMFS) may be warranted.

4.3.4.1.1 Breath Sampling

Breath sampling is sampling from the cloud of “blow” (Figure 1) from a whale when they exhale as they reach the surface. They may blow several consecutive times between dives and some species may start an exhalation underwater and the second breath may be easier to target. It is appropriate to collect several breaths from an individual being assessed. For mom/calf pairs, it may be difficult to focus the collection to only one of the two if they are surfacing together especially in shallow water. This sampling is non-invasive and can be collected easily. There are different ways a breath sample can be collected (Table 6) (Hunt *et al.* 2013):

- Long poles positioned over the blowholes which can have nylon fabric suspended across a 15-centimeter ring or a plastic framework, an inverted funnel, and/or Petri dishes
- A remote-controlled helicopter/UAS with Petri dishes

Figure 1: Respiratory vapor samples (“blow”) from large whales can be collected by a variety of pole-based or remote-controlled helicopter-based methods. This photograph shows collecting “blow” droplets from a North Atlantic right whale (*Eubalaena glacialis*) using a nylon-fabric sampler suspended on the end of a carbon-fiber pole. (Photo: Amy Knowlton, New England Aquarium, SARA Permit #325863, NMFS Permit #14233, Hunt *et al.* 2013.)

Nitrile gloves should be worn by anyone involved with sample collection and should be changed after accidental contact with skin, surfaces or saltwater to avoid contamination. Gloves should also be changed between sampling different animals.

The exhaled breath and condensate should be collected on at least two sterile Petri dishes with no media. Sampling multiple exhaled breaths on the same plates is ideal. Collect a small volume of surface seawater (minimum one milliliter) on a plate in the vicinity of the whale.

Process the samples on board if conditions allow, or keep the plates cool until they can be processed on land. Sampling will not provide immediate information for decision making and may need to be sent to a lab for analyses unless cytology would be informative.

Sample processing: (one example below, sample collection may differ based upon situation)

Plate #1:

a. Collect one swab to prepare smears on three glass microscope slides. Label and place the slides in a secure area and air dry.
b. Collect two swabs in transport media for bacteriology (Ames), keep chilled. Do not freeze.
c. Collect two swabs for fungal culture. Keep the swabs for fungal culture dry and in separate sterile containers. Keep chilled. Do not freeze.
d. Collect two swabs and place in RNA Later® or a dry sterile container for pathogen testing (*e.g.*, viral, etc.). Ok to freeze.

Plate #2: To avoid contamination, do not collect this sample from a Petri plate that has been previously swabbed:

a. Using a sterile pipette, transfer a minimum of 0.1 milliliter of blow into a sterile Nalgene cryovial

Table 6: Breath sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Respiratory vapor (“breath”)	• Pole-based samplers • Remote-controlled devices possible (?) • Different methods for droplets, exhaled breath condensate, and gases (these provide different types of information)	Medium	• Non-invasive • Targeted biomarker sampling possible • Repeated sampling possible • Wide range of metabolites can be studies	• Novel technique; many validations remain to be done • Target biomarkers at trace concentrations • Advanced detection strategies needed for quantitative	• Several hormones detectable • May contain a large variety of other detectable compounds (?) • May be proxy for blood, as has been observed in human studies • Respiratory

			simultaneously ● Mostly requires remote laboratory analyses and little real time data	analysis	microbiome ● Host immune response

4.3.4.1.2 Fecal Sampling

Fecal sampling (Figure 2) can be collected from well-formed floating semi-solid clumps to a more fluid, dispersed plume which can be scooped from the water surfaces using a fine-mesh nylon dipnet, draining off as much seawater as possible (Hunt *et al.* 2013). Refer to Table 7 below for more information on the fecal sampling technique.

Figure 2: NOAA researchers collecting fecal samples. Photo taken under federal research permit. Photo credit: NWFSC.

When collecting fecal samples:

a. Place replicate samples of 2-4 milliliters of feces in three separate sterile containers.
b. Place one sample of 1.0 milliliter of feces in a sterile container for molecular analysis and possible electron microscopy.

c. Swab the fecal sample. Place the swab either in RNA Later® or a dry sterile container.

Table 7: Fecal Sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Feces	• Locate visually or with a dog • Surface collection with scoop or net; subsurface collection with divers • Not possible in some environments and conditions and not applicable in all large whales	• Low without dog • Medium with dog	• Non-invasive • Extremely high steroid content (easily detectable) • Well-established steroid hormone technique • Long 'sampling time frame' may enable study of chronic stress • Repeated sampling possible	• Low sampling rate • Targeted sampling difficult • Individual not always known (cannot always be genotyped due to DNA degradation) • Cannot sample fasting seasons	• Diet analysis • Endoparasites • Lipophilic hormones • Fatty acid and stable isotope analysis of diet • Toxin exposure (*e.g.*, domoic acid) • Gut microbiome and relationships to stress, immunity, and disease • Some immunoglobulins and other hormones may be detectable (?)

4.3.4.1.3 Photogrammetry (UAS or Other)

Photogrammetry is a laser system that allows for quantitative measurements (morphometrics) from photographs. It adjusts pixel measurements to real size by an estimate of scale (distance/focal length). Fixed-wing airplanes, helicopters, and/or UAS are used to collect vertical images from precisely-measured altitudes directly above the whale. There has been great success using UAS because of the quiet sound footprint, vessel standoff, ability for increased range, increased safety, and cost effectiveness. Table 8 provides more information on the photographic analysis technique.

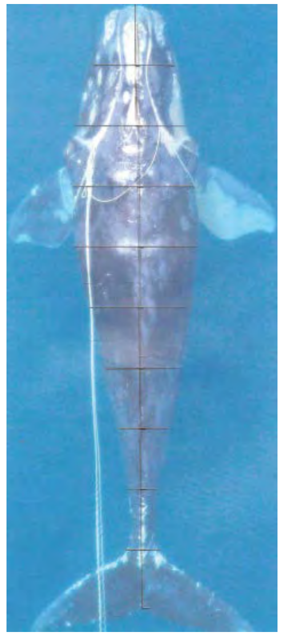


Figure 3: Example of aerial photography. This image was marked for length-to-width ratio analysis to access likely body weight prior to dosing with sedatives for disentanglement efforts (Hunt *et al.* 2013).

Table 8: Photographic analysis technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Photographic analysis	• Lateral view with boat-based photography • Dorsal view/body outline with aeroplanes or remote-control devices • Infrared thermography	• Very high	• Non-invasive • Best sampling rate • Repeated sampling possible	• External appearance only • Aeroplane-based photography has cost/safety issues	• Blubber reserves/nutritional state • Epidermal lesions • Ectoparasites • Entanglement and injury • Thermal physiology (infrared) • Watercraft wound analysis

4.3.4.1.4 Sample Collection (Biopsy or Other)

Responders may collect biological samples (Table 9) such as biopsy and/or skin samples in the course of responding to an entangled animal. These samples can be used to assess some aspects of the health of the animal. Skin can be collected through the use of a remote dart, the collection of tissues from the removed gear or line, or the collection of sloughed skin from the water. Biopsy sampling typically involves discharging a projectile dart with a hollow tip that collects a small plug of skin and blubber. Higher-powered delivery devices, such as compound crossbows or black-powder Larsen guns, are more likely to be used while targeting large baleen whales at a distance of more than twenty meters from the vessel (typically used when targeting large baleen whales). Lower-powered delivery devices such as recurve crossbows or adjustable-power guns are used at shorter ranges (less than twenty meters) from small vessels. Responders may sample the area from the dorsal flank (well behind the blowhole). After the biopsy dart hits the animal, it bounces off as its penetration is limited by a stopper, and floats at the surface of the water where the biopsy sample/dart can be retrieved.

Responders may also may use a handheld pole with a dart tip on the end to manually collect a biopsy sample if the disposition and behavior of the entangled animal is conducive to a closer vessel approach (*i.e.,* the whale is anchored in place). In this instance, the responder would slowly and cautiously approach the animal, to within one body length, to quickly jab the pole into the dorsal surface or flank of the animal, while avoiding more sensitive areas such as the head, eyes, and the area around the blowhole.

Table 9: Biopsy sampling technique information (Hunt *et al.* 2013)

Sample Type	Typical collection methods	Typical sampling rate	Positive aspects	Potential limitations	Information relevant to conservation physiology
Epithelium and blubber biopsies	• Biopsy dart used with crossbow, pole, or pneumatic rifle • Sloughed skin may also be collect	Medium/high	• Good sampling rate • Many archived samples available • Tissue sample obtained; living cells present; high protein and nucleic acid content	• Invasive causes small wound • Permit restrictions • Repeat sampling not always possible if animal is not visible • ‘Lag’ time of blubber hormones unknown	• Lipophilic hormones in blubber • Lipid/fatty acid analysis, of contaminant load (POPs, lipophilic cpds and some metals), diet, age, sex, identity, etc. • Epidermal microbiome, skin lesions and epidermal diseases • Epidermal proteomics (CYP450-related enzymes for

					contaminants, SRPs for stress studies) • Transcriptomic and genomic approaches possible (?)

4.3.4.2 *Entanglement Response*

Whale disentanglement involves small boat handling, ropes under tension, and sharp knives/blades which makes the response complex and dangerous. There are safety and legal protocols, and a number of detailed assessments that must be made including condition of the animal, nature of the entanglement, weather and conditions, and available resources. The goal of an entanglement response is to safely remove all detrimental gear from the whale. It is important to document each event and obtain the gear so responders can continue to learn from the events and help prevent entanglements from occurring. More details on tools and techniques needed for a safe entanglement response can be found in the Large Whale Entanglement Response Best Practices.

4.3.4.2.1 Tools and Techniques

Techniques are largely based on historic whaling methods and are inherently dangerous. All techniques are conducted from small, maneuverable vessels. Work in "safe zones" with long reaching tools. Cutting tools on the end of telescoping or long poles are most often used to cut the entanglement; however, specialized crossbow tips fitted with cutting blades can be used to cut ropes remotely. These are rarely used, but are always used by skilled sharpshooters when there is no alternative available to access the entanglement. Cutting of lines and possibly flesh (when the line is embedded and not accessible) may occur during disentanglement through the typical use of pole-mounted and remotely-delivered cutting tools.

4.3.4.2.2 Tagging and Marking

The decision on which technique(s) to use for tracking a live injured or entangled whale, marking a carcass, or tagging or marking for post-release monitoring will generally be made on a case-by-case basis. Gathering data on the survival of large whales that have been released after a live stranding is an essential part of the intervention. Without the data on post-release outcomes, one cannot assess the value of the overall response, nor evaluate the combined suite of protocols employed. The tools available for monitoring post-release outcomes range from the re-sighting of natural or applied markings, to VHF/satellite tag tracking.

Natural Markings are typically used for identification. Some species have specific criteria for identification and some also have catalogs so that if matched to a known individual more information about the animal is possible. These include pigmentation patterns on the fluke or body, callosity shape and size, dorsal fin shape and notches, or other skin marking depending on the species involved. It is important to acquire a comprehensive series of species-relevant images of all such marks before release to enable future recognition.

Applied marks are those artificial markings applied by the Network responders during the intervention and release. They may be very temporary, such as cattle paint stick markings that last only a few days. Short-term marks could include plastic cattle ear tags in the dorsal fin (for those species with a dorsal fin), that can last for many months.

An electronic tag, with options including VHF (radio) and satellite, is another type of applied mark. Tag attachment options include suction cup tags, single pin attachments in the trailing edge of the dorsal fin (for those species with a dorsal fin), or LIMPET tags. Large whales may be tagged with buoys, telemetry devices or other scientific instruments to monitor their location and enhance the probability of relocating the individual. Similar to physical restraint, tethered buoys are typically attached to the entangling gear, and may use Very High Frequency (VHF), Global Positioning System (GPS), and/or satellite-linked tags to track the animal. As responses may occur over several days, the attachment of scientific instruments allows responders to quickly locate the entangled whale on subsequent days.

Additionally, types of monitoring can be used in tandem, so photos of natural markings can be coupled with applied marks or tags to increase the likelihood of re-sighting whales at multiple time periods (*i.e.,* short-term and long-term) to assess post-release outcomes. See Table 4 for the pros and challenges of each tagging/marking type. For more specific details on tagging and marking, refer to the Report of the Joint US Office of Naval Research, International Whaling Commission and US National Oceanic and Atmospheric Administration Workshop on Cetacean Tag Development, Tag Follow-up and Tagging Best Practices.

Table 4: Pros and challenges of each tagging/marking type

Natural Markings	
Pros	● Natural markings tend to persist after healing and have more lasting value, especially where the individual's markings are archived from stranding event images ● Many areas have Photo-ID catalogs for various whale species or population ● Re-sights may occur over many years, allowing for long-term information on the success of the intervention
Challenges	● The whale appearing in an area where photo-id or re-sights may occur for recognizing applied or natural marks ● Belonging to a species that has an existing photo-id catalog that can be used for matching ● Appropriate photos being collected during the stranding event to match with the photo-id catalog (*i.e.,* fluke photos of humpback whales may be difficult to obtain when they are on a beach) ● Communication between researchers with photo-id catalogs and the Stranding Network responders may be challenging, particularly over large geographic distances (multi-country ranges of most migratory large whales) ● Data on re-sights may not occur in the short term (days/weeks/months), leading to uncertainty ● Lack of re-sight data may not necessarily mean the intervention wasn't successful – the fate of the whale remains unknown
Applied Markings	
Pros	● Easy to apply (paint sticks require no training) ● Inexpensive and readily available (on hand with many/most Stranding Network responders)
Challenges	● Not feasible to be applied safely for entangled whales ● Re-sight information depends upon high level of effort (especially boat-based, but could be shore-based) to identify free-swimming whale ("success")
Electronic Tags	
Pros	● Allow for longer term tracking (days/weeks/months) ● Allow for targeted tracking over a large geographic area, with the tag aiding in the ability to locate and re-sight the free-swimming animal (radio or satellite) ● Allow for remote tracking (satellite)
Challenges	● An appropriate tag available with a trained applicator ● A suitable permit to tag in hand (tagging can be conducted under the national MMHSRP permit with pre-approval) ● Funding for the tag acquisition or replacement ● Time to focus on the tagging plan while rescue process is ongoing ● Potential for added impact or stress to the whale

4.3.4.3 *Medical Intervention Strategies*

4.3.4.3.1 Sedation

Sedation has been used during entanglement responses to help slow down the animal to remove the gear instead of trying to tire and restrict movement of the whale by using buoys, drogues and small boats (Moore *et al.* 2010). To administer the sedative, a pole syringe or dart gun or crossbow syringe has been used. Midazolam and butorphanol (Table 12) have been successfully used in sedating large whales. For more details on the procedure for sedating large whales please see the Large Whale Entanglement Best Practices.

Table 12: Large whale sedative dosage (Moore *et al.* 2010, Moore *et al.* 2012)

Sedation Drug	**Dosage**
Midazolam (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Butorphanol (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Reversal Drug	**Dosage**
Naltrexone (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution

4.3.4.3.2 Medications

The Entanglement Network can consider administering antibiotic, analgesic, or other drug therapy depending on the scenario and if the treatment could likely improve the condition of the whale. Typically, the long-acting antibiotic, such as ceftiofur or cefovecin, is administered by dart to the free-ranging live whales and may require a series of treatments, if possible. Antibiotics can be used to treat live whales with concerning injuries from the gear entanglement to help prevent septicemia.

4.4 Stranded (In Surf or High and Dry)

It is important to note that beached cetaceans should not be pushed back out to sea without first being examined by a NMFS-approved marine mammal veterinarian or qualified responder and the action approved by NMFS (Ziccardi *et al.* 2015). When a whale strands onshore a primary concern is that gravitational effects (increased pressure from being out of water) can lead to respiratory and cardiovascular decompensation (Geraci *et al.* 2005). The animal can also experience severe skin blistering (sunburn), predation, hyperthermia, muscle damage (myopathy), distress and serious injury, and physical trauma from rocks and or high energy beach. In general, the first step in the response, while carrying out a medical evaluation and assembling the team/resources, is to keep the animal as comfortable as possible while it is stranded by administering supportive or hospice care for the first 1-2 tidal cycles. If the animal remains on shore after 1-2 tidal cycles without refloating or expiring, euthanasia may be considered. In certain circumstances a euthaniasa may be administered prior to 1-2 tidal cycles (*e.g.*, severe injuries, dependent calf). The decision to euthanize is not taken lightly and will be discussed by the RSC, local stranding response group, MMHSRP staff and the attending veterinarian.

If return to the open ocean is the approved course of action, re-sighting of the released individual is a priority and could be done by recognizing natural markings, and/or applying marks (including VHF/satellite tags) during the intervention and release. Gathering data on the survival of large whales that have been released after a live stranding is an essential part of the intervention.

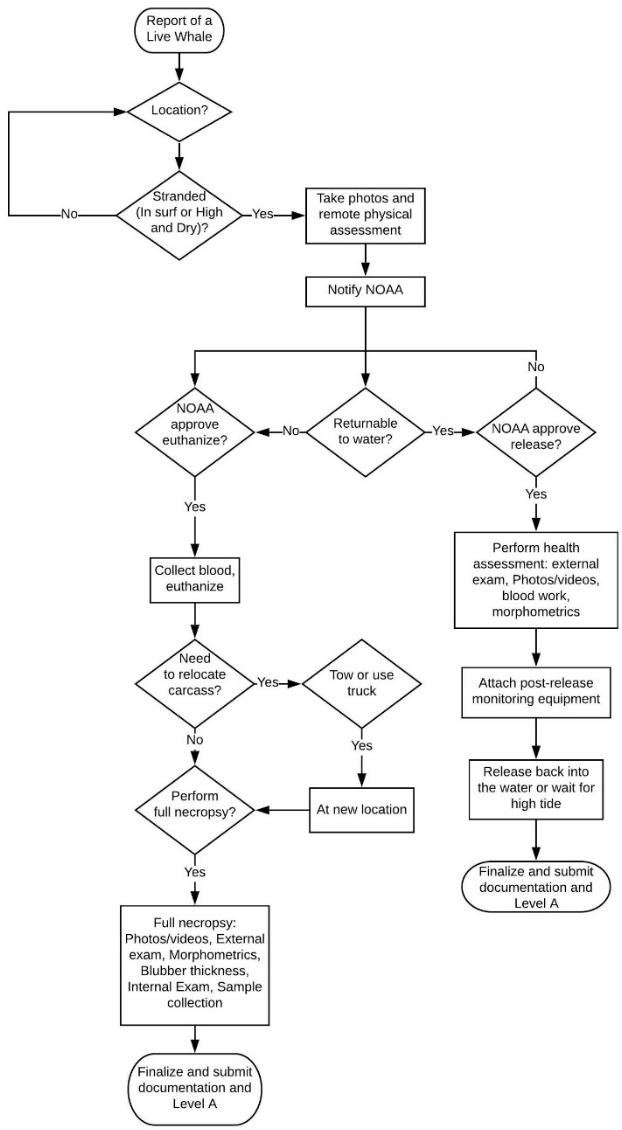
4.4.1 Decision Trees and Triage Criteria for Response

A stranded live whale is generally an emergency situation. However, there are scenarios where it is not safe for personnel to approach the whale (*e.g.,* in high surf, remote location) therefore, the decision of whether (or not) to intervene is made by NMFS, after discussions between multiple parties – the local Stranding Network or response organizations that have "boots on the ground" that are responsible for response, the NMFS RSC, the MMHSRP at OPR HQ, and other parties that may have jurisdiction (*e.g.*, tribes, NPS, state, etc.). Ideally, these consultations also include marine mammal veterinarian(s) and experts in the biology and life history of the affected species. The decision to intervene is made by NMFS after taking into consideration the following minimum questions (others questions may be developed) that help evaluate the benefits and risks based upon the specific situation:

- What field observations have been reported and how recently have they been reported?
- What is the health status of the individual?
- Is there a medical diagnosis?
- What are the potential causes of the animals' observed condition?
- What is the estimated or known life history (*e.g.*, sex, age, size)? Is it a known individual?
- What is the conservation status/reproductive potential?
- Are there safety and logistical concerns for intervention (for the responders and/or animals)?
- What resources are available and is an intervention logistically feasible?

- What potential risks are there for conspecifics or other species?
- Is there a contingency plan in place if intervention is not successful (*i.e.,* if the animal dies in the course of intervention, if the intervention is unsuccessful, or if the animal requires rehabilitation)?
- What are the environmental conditions (*i.e.,* tidal cycle, are there protected/sensitive habitats that should be avoided, etc.)?

Below is a decision tree that can help when deciding the appropriate action for a stranded (in surf or high and dry) response:



4.4.2 Specific Training and Qualifications (including CI letters)

Endangered or threatened large cetacean stranding responses are conducted under a MMPA/ESA permit that is issued to the MMHSRP. In very particular circumstances for non-ESA listed species, a response can be conducted under a SA (by the SA holder after consultation with the Regional Stranding Coordinator) or by a government employee acting under MMPA Section 109(h). Therefore, only responders who have been authorized by NMFS and who have the training, experience, equipment, and support needed should attempt stranded large cetacean interventions. Authorized response efforts may also rely on partners at tribal, local, state and federal agencies (including law enforcement agencies and the USCG), non-governmental organizations, fishermen, and other groups to assist with some responses.

The Stranding Network members are trained or have experience in proper techniques for assessment, supportive care, euthanasia and/or refloating of large whales. Training workshops have been offered to members of the Stranding Network. Additionally, opportunities for apprenticeships or assistant roles to gain the necessary hands on expertise can be arranged. Specific training issues or requirements may exist for certain activities (*e.g.*, in-water captures, euthanasia) and are more appropriate to address at regional or state levels by working with your RSC.

The Large Whale Response Network is made up of individuals who have been evaluated on their qualifications and past experience, and for ESA responses may be issued a CI letter under the MMPA/ESA permit for responding to large whale scenarios, especially for necropsy of certain ESA whales such as North Atlantic right whales. Tables 15 and 16 provide more details on team member roles and qualifications. A CI remains authorized to respond to large whales as long as their CI letter is valid (which is typically the five-year life of the MMPA/ESA permit, with some exceptions). These CIs are expected to coordinate to the extent possible with the NMFS RSCs and the MMHSRP. All response actions are reviewed after the event with the participating responders and MMHSRP staff.

Table 15: Suggested number of personnel and roles required for a typical large whale at sea severely injured or ill first response effort.

Team member roles	Number of personnel required
Incident Commander (IC)	1
Safety Officer (SO)	1
Security/Crowd Control	Variable
Sample Collector	1

Data Collector/Photographer	1-2
Veterinary Staff/Trained Biologists	1-3
Animal Husbandry Team	1-4
Communications Person	1
Optional – UAS Operator (see UAS; Section 6)	1

Table 16: Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, IC and SO; 2º documentation and data collection).

Team Member Role	Role Description	Role Qualifications
Incident Commander (IC)	The IC is responsible for the overall operation, including the performance of the response, and does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the event and objectively ensure that the response is safe for responders, the public, and animals. In some small cetacean responses, the IC may be combined with the SO position.	Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations. Must have the authority to carry out operations.
Safety Officer (SO)	The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed.	Experience in previous live whale or live cetacean responses, ability to continually watch over all personnel involved, communicate with the team to adjust strategy or call off the effort as necessary, and watch for hazards. Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.
Security/Crowd Control	The IC should ensure that the proper authorities in the area have been notified of the response and, if possible, the area is closed to public access during the response.	Knowledge of proper authorities to notify.
Sample Collector	The sample collection technician is responsible for assisting the veterinarian/biologist in collecting any animal samples during the response.	A veterinary technician or personnel trained in veterinary sample collection.
Data Collector	The data collector is essential in recording all aspects of the data for the response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying	Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.

	number, all marks are recorded, and all samples are properly recorded and labeled.	
Photographer or Videographer	This person is responsible for operating still or video photography to document the response. This person may also serve as the data collector.	Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and video including dorsal fin pictures, and ability to post-process photos/video after the capture.
Veterinary Staff/Trained Biologists	The licensed experienced veterinarian, veterinary technician or trained biologist is responsible for the health and monitoring of the live whale and for euthanasia activities if performed. All sedation and euthanasia should be conducted under supervision (direct or indirect) of a licensed veterinarian.	A licensed Doctor of Veterinary Medicine (DVM) or equivalent, veterinary technician or trained biologist who is experienced in cetacean medicine and euthanasia.
Animal Husbandry Team	The animal husbandry team members are responsible for monitoring the live stranded animal and providing palliative care (*e.g.*, shade, water, etc.) to ensure the comfort of the whale on the beach.	Responders must be trained by experienced personnel in working with stranded marine mammals on the beach, monitoring, etc. Advancement requires hands-on experience under the direct supervision of experienced response staff. This handling experience may occur in a captive display or rehabilitation hospital setting or research field setting. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
Communications Person	The Communications Officer or dedicated person is responsible for communicating information about the response to the public and media. For high profile cases or cases conducted under the permit, messages should be coordinated and cleared with NMFS.	Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.
Optional – UAS Operator (see UAS; Section 6)	If permitted to operate a UAS during the response, the UAS operator must have no other duties. The operator/pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the response or causing disturbance to the target or other animals.	A certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous small cetacean field operations. More detail on UAS use is addressed in Section 6.

4.4.3 Data Collection Protocols

Data collection is typically performed by qualified individuals and depending on the level of response and capacities may determine the amount of data collected. Monitoring the animal(s) is essential. Obtaining good photographs and/or video of the animal can help identify individual animals and in assessing their condition. Recording the animal(s) behavior when observed is helpful to aid in the assessment and in determining the best course of action. For any large whale response, at minimum, field information necessary for completion of NOAA's Level A form must be collected. This will include the assignation of a unique identifier (Field ID#, per Regional Stranding Network protocols). Level A forms may be completed electronically via direct entry in the National Stranding Database.

Photo logs are a record of each photo taken, which helps to identify the photographer and date/time taken. During data collection, photos should be taken with a label with ID, date, species, log number, and have a size scale. With all the data collected, a report should be finalized with the photos documented, complete recording of all pertinent findings, and all samples collected.

See Sections 5.1.3 and 5.2.3 for more details of data collection if the whale is euthanized.

4.4.4 Available Tools and Techniques

4.4.4.1.1 Photography including Photogrammetry (UAS or Other)

Digital cameras and Go Pros are used during a stranding response. Most photographic evidence is in digital format and it is necessary to designate cameras and photo cards to the event. A placard that includes identifiers, such as stranding number and pathology accession numbers, date, and a scale should appear in the photos. It is a good practice to begin each case with a photo placard labeled "start" and the time, and end the photographic series for a case with a placard labeled "end" and the time. It is critical that photos remain unaltered and sequential. While photos may be reviewed on the camera to ensure that necessary parts of the image were captured and are in focus, do not delete any photos on the camera (even if they do not provide useful evidence).

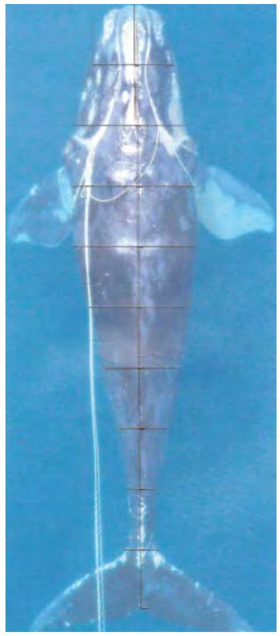


Figure 3: Example of aerial photography. This image was marked for length-to-width ratio analysis to access likely body weight prior to dosing with sedatives for disentanglement efforts (Hunt *et al.* 2013).

4.4.4.1.2 *Remote Physical Assessment (including respiration rate and behavior)*

Each case/event should be assessed through physical, behavioral, and environmental observations. These observations and data will improve better decision-making and adaptive management of the situation to determine the appropriate course of action for that particular individual and situation (refer to the Mass Stranding Best Practices for information on groups of animals). Careful planning and adaptive management will also provide important information that can be used to inform decision making for future cases. Lessons learned from each situation through thorough debriefing also is critical to inform tools and techniques. A standardized health assessment form *may* be available, depending on the region and taxa. If so, it should capture all necessary information. Generally, small cetacean health assessment and monitoring forms can be used to capture essential data. If there is no form available then the questions below should be determined (Cape Cod Stranding Network 2008) in order to more generally assess the whales status and condition and inform decisions. In the future, regional health assessment forms, if not already available, may be developed.

- Determine the species involved and use identification characteristics and catalogs for the species or stock to determine if this is a known individual. The identification characteristics for the species may include the size, coloration, rostrum and callosities, fluke, pectoral fin, and dorsal fin. Is this a known individual? If so, what do we know about the individual, behavior and normal habitat?

- Measure total length, estimate the age class, and calculate weight (using weight charts)
- Note the body condition. If able to determine, is there an indentation behind the cranium (peanut head)? Are ribs and/or scapula visible? Is the animal concave or convex in the epaxial region on a longitudinal view? Are there any skin lesions or wounds?
- If possible, count respirations (number of respirations per minute), note respiratory effort, is there any respiratory exudate, odor, abnormal sound? Stranded whale respirtory rates may range from one to four per minute (depending on size, age, stress and shock, and health) (IFAW pers comm 2020).
- Are there any other animals in the area? How many?
- Take photos and/or video to document injuries, disease or behavioral changes.

Following remote observations, it is critical to share the information and have a discussion with a group of experts (*e.g.*, marine mammal veterinarians, biologists with experience with a given species, etc.). This is possible when the case is not immediately life threatening and the animal's behavior/sighting history is somewhat predictable such that the animal can be relocated for future interventions. In an emergency case (*e.g.*, an animal is in imminent danger of death, such as an anchored animal), immediate intervention (following approval from NMFS) may be warranted.

4.4.4.1.3 Physical Examination

After an initial remote assessment, if the behavior of the whale permits it, a safe closer approach can be attempted for a more thorough physical examination. Care should be taken to remain cranial to the peduncle of the animal at all times. In animals with long and mobile pectoral flippers, responders must be mindful of their position relative to these appendages. Human safety is of the utmost importance when conducting this assessment. Additional PPE, such as helmets, may be necessary to protect responders working closely to the whale. A spotter should monitor both the veterinarian/biologist as they conduct their assessment and the whale in order to ensure their safety.

The whale's reflexes can be tested to evaluate for level of consciousness and potential evidence of neurological dysfunction. The palpebral reflex can be tested by palpating on the skin just cranial and caudal to the eye, the animal should blink in response. The animal should follow the responder with its eyes if it is alert and responsive. Horizontal nystagmus (a pendulous, unconscious swinging of the eye back and forth) has been noted in numerous stranded large whales.The etiology of this finding is not known, possible causes include neurological dysfunction (either pre-existing or due to the stranding), electrolyte imbalance or other causes. The whale's lips and blowhole should retract in response to manipulation.

In large animals, lung and heart sounds may be difficult to detect with a stethoscope, but depending on the animal's position, heart beat can occasionally be observed just caudal to the axilla or sternally between the pectoral flippers. In certain cases, EKG/ECG can also be used to better evaluate the heart rate. Visual observation of respiration rate, character, and depth, as well as blow odor can also be evaluated. The physical examination can also aid in evaluation of injuries or wounds if present.

4.4.4.1.4 Blood Work

Following the general examination and when feasible, getting blood results as soon as possible will help determine the health of the animal and the next steps. If there is time and the animal's condition permits, blood samples should be drawn for blood work and banking. In large whales it is almost always too dangerous to attempt to draw blood from the flukes or caudal peduncle vessels. Alternatively vascular access can be achieved in a much safer manner via dorsal fin vessels or in the pectoral flipper between the radius and ulna (IFAW pers comm 2020). In the field, blood can be evaluated in real-time using an I-Stat or other portable patient-side blood machine. Blood can also be collected for baseline blood work that can include a complete blood count (CBC) and standard serum chemistry tests, these samples will usually be processed after the animal is off the beach (*e.g.*, released, in rehabilitation or euthanized). For more details on blood collection (including necessary supplies) and normal blood values for marine mammal species refer to Gulland *et al.* 2018.

Standard Blood Tests include:

- I-Stat Blood: Depending upon the cartridge type, blood can be collected to evaluate hematocrit, glucose, lactate and other parameters that can be useful to evaluate an animal's status on the beach. Two to three milliliters of whole blood in a heparinized syringe or blood tube.
- Complete Blood Cell (CBC): A standard CBC will include the following - White cell blood count, red cell blood count, hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), mean corpuscular hemoglobin (MCH), a differential cell count, platelet and reticulocyte counts. One full lavender-top tube (EDTA) (one or three milliliters) is taken and refrigerated until analysis.

- Chemistry Profile: Standard serum chemistry profiles will/should include albumin, alkaline phosphatase, bicarbonate, bilirubin (total and direct), BUN, calcium, chloride, cholesterol, CK, creatinine, globulin, glucose, phosphorus, potassium, total protein, sodium, AST (SGOT), ALT (SGPT), GGT, and ratios of albumin:globulin, BUN:creatinine, and sodium:potassium. Blood should be placed in a serum separator tube or red top tube, allowed to clot, centrifuged within two hours of collection, and refrigerated prior to analysis. Excess serum can be saved and banked (frozen) at the rehabilitation facility.

4.4.4.2 *Medical Intervention Strategies*

4.4.4.2.1 Palliative Care

If a cetacean is stranded in tide or high and dry, it is important to provide palliative care while assessments and decisions are being made for next steps. When exposed to sunlight, it is important to keep the skin protected by providing overhead shade with a tarp or umbrella, light colored sheets placed directly on the animal, or applying zinc oxide to the exposed skin. Since cetaceans cannot thermoregulate efficiently out of water, it is essential for responders to constantly monitor their temperature and thermoregulate for the animal by using water buckets to prevent the whale from overheating if warm, or blankets to protect the animal from cold air temperature. Basic monitoring should be conducted on heart rate, respirations, and other behavioral conditions.

4.4.4.2.2 Sedation/analgesia

In beached whales, sedation has been used to reduce resistance during procedures to limit the risk to responders (Moore *et al.* 2010) or used prior to administering euthanasia. Below are Tables 17 and 18 outlining drug combinations for use in live stranded whales that may be released and sedation drugs to be used prior to euthanasia.

Table 17: Large whale sedative dosage for whales that might be released (Moore *et al.* 2010, Moore *et al.* 2012)

Sedation Drug	**Dosage**

Midazolam (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Midazolam (regular conc.)	0.1 mg/kg x 10,000 kg = 1000mg = 200 ml of 5mg/ml solution
Butorphanol (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution
Butorphanol (regular conc.)	0.1 mg/kg x 10,000 kg = 1000 mg =100 ml of 10mg/ml solution
Reversal Drug	**Dosage**
Naltrexone (compounded conc.)	0.1 mg/kg x 10,000 kg = 1000 mg = 20 ml of 50mg/ml solution

Table 18: Large whale sedative dosage prior to euthanasia (IFAW based on Harms *et al.* 2014)

Sedation and Euthanasia Drugs Option 1 – Smaller Whales that can be removed for proper carcass disposal	**Dosage**
Midazolam (compounded conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 10 ml of 50mg/ml solution
Midazolam (regular conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 100 ml of 5mg/ml solution
Butorphanol (compounded conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 10 ml of 50mg/ml solution
Butorphanol (regular conc.)	0.2 mg/kg x 2,500 kg = 500 mg = 50 ml of 10mg/ml solution
Acepromazine	0.2 mg/kg x 2,500 kg = 500 mg = 50 ml of 10mg/ml solution
Xylazine	1-3 mg/kg x 2,500 kg = 2,500-7,500 mg = 25-75 ml of 100mg/ml solution
Pentobarbital	87 mg/kg x 2,500 kg = 217,500 mg = 558 ml of 390mg/ml solution
Sedation and Euthanasia Drugs Option 2 – Larger Whales (any IM injection sites should excised after euthanasia if the carcass is to remain in place)	**Dosage**
Midazolam (compounded conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 40 ml of 50mg/ml solution
Midazolam (regular conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 400 ml of 5mg/ml solution
Butorphanol (compounded conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 40 ml of 50mg/ml solution
Butorphanol (regular conc.)	0.2 mg/kg x 10,000 kg = 2,000 mg = 200 ml of 10mg/ml solution
Acepromazine	0.2 mg/kg x 10,000 kg = 2,000 mg = 200 ml of 10mg/ml solution

Xylazine	1-3 mg/kg x 10,000 kg = 10,000-30,000 mg = 100-300 ml of 100mg/ml solution
Potassium chloride (KCL saturated soln ~300mg/ml.)	100 mg/kg x 10,000 kg = 1,000,000 mg= 3,333 ml of 300mg/ml solution

Protocol for sedation prior to euthanasia in large baleen whales (IFAW based on Harms *et al*. 2014):

Option 1: For smaller baleen whales (subadult minkes, humpback calves), sedation & sodium pentobarbital. This may be utilized if the carcass can be disposed of properly to minimize secondary poisoning and environmental contamination.

Sedation and traditional pentobarbital euthanasia:

- Midazolam +/- Butorphanol 0.2 mg/kg IV/IM
- Wait 10-20 min, then acepromazine 0.2 mg/kg IV/IM
- Wait 20+ min, then Xylazine 1-3 mg/kg IV (IM)
- Wait 5 min (until sedation apparent) then sodium pentobarbital 1ml/10 lbs (87mg/kg) IV

Option 2: For larger baleen whales. If leaving a carcass *in situ* after using this option, all IM injection sites should be excised and disposed of properly.

Sedation and intra-cardiac KCL chloride:

- Midazolam +/- Butorphanol 0.2 mg/kg IV/IM
- Wait 10-20 min, then acepromazine 0.2 mg/kg IV/IM
- Wait 20+ min, then Xylazine 1-3 mg/kg IV (IM)
- Wait 5 min – assess sedation level, if not unconscious repeat dosing as needed
- Once the whale is unresponsive (no palpebral reflex, no menace response, no jaw tone, no blowhole tone, no flipper tone, no nociception/pain), inject 100 mg/kg supersaturated KCL solution via appropriate length intracardiac needle.

4.4.4.2.3 Medications

Depending on the scenario, stranded cetaceans are typically not given antibiotics, analgesics, or other drug therapy due to most animals being euthanized. For NMFS-approved releasable animals, antibiotics, analgesics, and/or other drug therapy could be considered on a case-by-case basis. Antibiotic or other drug therapy will only be approved for the Stranding Network to administer depending on the scenario and if the treatment could likely improve the condition of the whale after release. Typically, long-acting antibiotics, such as ceftiofur or cefovecin, are administered by needle and syringe. Antibiotics can be used to treat live whales with concerning lacerations to help prevent septicemia; however, with an animal already stranded it may be the best course of action and most humane to euthanize instead. Additionally, IV fluids can be administered to stranded large whales to treat dehydration and/or shock that developed during stranding. Large volumes of fluids are needed for clinical effect (IFAW pers comm 2020).

4.4.4.2.4 Euthanasia

Qualified veterinarians may recommend that euthanasia is the most humane option for the whale based on the condition or age of the animal, the circumstances, and available resources. If a stranded large whale is in overall poor condition (*e.g.*, emaciated, malnourished, severe internal or external injuries, dependent calf with no adult present) and/or remains onshore after 1-2 tidal cycles euthanasia will be considered. The weight of a large whale onshore can result in pressure necrosis on the underlying muscles and their lungs can collapse when a whale is not supported by water. Even if a whale was able to free itself during a subsequent incoming tide it would not likely survive the stranding following an extended period out of the water. Qualified veterinarians may recommend that euthanasia is the most humane option for the whale based on the condition of the animal, the circumstances, and available resources. Euthanasia will be discussed on a case by case basis and the decision will be made by the NMFS RSC in consultation with the local Stranding Network group, attending veterinarian, and MMHSRP. If a decision is made to euthanize a large whale, the procedure will be conducted by qualified personnel under the authorization of the SA or MMHSRP permit.

Many options of euthanasia have been considered but have significant limitations and concerns.

- **Pentobarbital:** High secondary poisoning potential, environmental concerns, high aquatic persistence, and proper carcass disposal needed (*e.g.,* incineration, rendering)
- **Ballistics:** Not currently recommended for large cetaceans over 4-8 meters (AVMA 2020)
- **Explosives:** Requires specialized training, limitation of access to explosives, lack of public acceptance, not authorized in the U.S.
- **Exsanguination:** Considered inhumane unless performed on heavily sedated, unconscious, or moribund animals (AVMA 2020)
- **Potassium Chloride (KCL) Method:** Currently the preferred method for euthanasia of large whales in the U.S. when carcasses need to be buried or remain in place. The KCL method has proven successful in several cases with little risk of secondary poisoning for scavengers, the

ability to use various carcass disposal methods, and a fairly reasonable cost (approximately $1000 per case)

For more information on marine mammal euthanasia procedures refer to PEIS Marine Mammal Euthanasia in Chapter 4, as well as the following cetacean papers: Barco *et al.* 2016; Moore 2010, and Harms *et al.* 2018.

4.4.4.3 *Tagging and Marking*

For a stranded (in surf or high and dry) response, only animals that are approved by NMFS for release back into the open ocean will be evaluated for tagging and marking. The decision on which technique(s) to use for tracking a live stranded cetacean for post-release monitoring will generally be made on a case-by-case basis. Gathering data on the survival of large whales that have been released after a live stranding is an essential part of the intervention. Without the data on post-release outcomes, one cannot assess the value of the overall response, nor evaluate the combined suite of protocols employed. If the stranded animal is approved by NMFS as releasable, the whale should be marked or be affixed with a NMFS approved tag to facilitate re-sightings or quick identification if the cetacean should re-strand (Ziccardi *et al.* 2015). The tools available for monitoring post-release outcomes range from the re-sighting of natural or applied markings, to VHF/satellite tag tracking.

Natural Markings are typically used for identification. Some species have specific criteria for identification and some also have catalogs so that if matched to a known individual more information about the animal is possible. These include pigmentation patterns on the fluke or body, callosity shape and size, dorsal fin shape and notches, or other skin marking depending on the species involved. It is important to acquire a comprehensive series of species-relevant images of all such marks before release to enable future recognition.

Applied marks are those artificial markings applied by the Stranding Network responders during the intervention and release. They may be very temporary, such as cattle paint stick markings that last only a few days. Short-term marks could include plastic cattle ear tags or notching in the dorsal fin (for those species with a dorsal fin), that can last for many months to years.

An electronic tag, with options including VHF (radio) and satellite, is another type of applied mark. Tag attachment options include suction cup tags, single pin attachments in the trailing edge of the dorsal fin (for those species with a dorsal fin), or LIMPET tags.

All these types of monitoring can be used in tandem, so photos of natural markings can be coupled with applied marks or tags to increase the likelihood of re-sighting whales at multiple time periods (*i.e.,* short-term and long-term) to assess post-release outcomes. See Table 4 for the pros and challenges of each tagging/marking type. For more specific details on tagging and marking, refer to the Report of the Joint US Office of Naval Research, International Whaling Commission and US National Oceanic and Atmospheric Administration Workshop on Cetacean Tag Development, Tag Follow-up and Tagging Best Practices.

Table 4: Pros and challenges of each tagging/marking type

Natural Markings	
Pros	• Natural markings tend to persist after healing and have more lasting value, especially where the individual's markings are archived from stranding event images • Many areas have Photo-ID catalogs for various whale species or population • Re-sights may occur over many years, allowing for long-term information on the success of the intervention
Challenges	• The whale appearing in an area where photo-id or re-sights may occur for recognizing applied or natural marks • Belonging to a species that has an existing photo-id catalog that can be used for matching • Appropriate photos being collected during the stranding event to match with the photo-id catalog (*i.e.,* fluke photos of humpback whales may be difficult to obtain when they are on a beach) • Communication between researchers with photo-id catalogs and the Stranding Network responders may be challenging, particularly over large geographic distances (multi-country ranges of most migratory large whales) • Data on re-sights may not occur in the short term (days/weeks/months), leading to uncertainty • Lack of re-sight data may not necessarily mean the intervention wasn't successful – the fate of the whale remains unknown
Applied Markings	
Pros	• Easy to apply (paint sticks require no training, cattle ear tags or fin notching minimal and should be familiar to most Stranding Network responders) • Inexpensive and readily available (on hand with many/most Stranding Network responders) • Minimal impact or added stress to the whale
Challenges	• Re-sight information depends upon high level of effort (especially boat-based, but could be shore-based) to identify free-swimming whale ("success")
Electronic Tags	
Pros	• Allow for longer term tracking (days/weeks/months) • Allow for targeted tracking over a large geographic area, with the tag aiding in the ability to locate and re-sight the free-swimming animal (radio or satellite) • Allow for remote tracking (satellite)

Challenges	• An appropriate tag available with a trained applicator • A suitable permit to tag in hand (tagging can be conducted under the national MMHSRP permit with pre-approval) • Funding for the tag acquisition or replacement • Time to focus on the tagging plan while rescue process is ongoing • Potential for added impact or stress to the whale

4.4.4.4 *Physical Intervention*

Moving large whales has serious safety risks for the whale and for the Stranding Network responders involved. Trying to pull or push a large whale from the beach can also be very resource intensive as specialized equipment is required, which may or may not be readily available within the critical 24-36 hours after the stranding. Towing live whales by the tail can result in seriously injuring or dislocating the tail, causing paralysis and is therefore considered inhumane. Below are some options to possibly move live whales once approval has been received from NMFS to attempt to release a whale.

4.4.4.4.1 Floats

For a whale that is deemed releasable, there are multiple methods that might be used to try to assist the animal off the beach. Floats are one technique that may be used in a stranded response to help produce only a small amount of lift to achieve clearance from the bottom and allow the whale to be moved. A pontoon system is getting a stretcher around the whale and the pontoon floats outside of the stretcher to be able to lift the whale slightly in order to move. Inflated mat/bags can also be used. The bag has an excavation bar in front that clears a path for the bag as it goes. Once the bag is in place, it is inflated with air and the sand collapses under the bag and the whale becomes neutrally buoyant for the bag to be pulled to move the whale. Currently pontoon systems are weight limited with the largest whale that can be moved being a juvenile killer whale or animal weighing approximately 4,500 lbs (2000 kg).

It is possible to work with tow boat companies to provide equipment and capabilities to assist in moving a stranded whale back in the open ocean, however to date the methods described below have not been used with a live whale. Some tow boat companies provide service in salvaging boats and have experience moving large stranded objects. Companies such as Tow Boat US, have tubular float bags (8-ton lift capacity) and pillow-shaped float bags (possibly work in pairs) (Figure 6) that have potential in assisting in this situation although to date these have not been tested on a live whale. Two tubular float bags could be pulled snugly on either side of the whale with multiple broad straps (at least three) underneath the whale partially to support the whale and partially to hold the bags close providing direct support (also restrain pectoral fins close to the body). It is also possible to use the floats to support the whale while removing sand/sediment underneath. To be more tolerant of the procedure, it is suggested to possibly sedate the whale to increase human and animal safety. Pre-planning and previous practice using a dead whale or other surrogate would be required before this option could be used.

Figure 6: Picture of the tubular float bags and pillow-shaped float bags

4.4.4.4.2 Harness

Creating a harness to put around the pectoral flippers to pull the animal forward or better position the animal onshore could be good option but still has multiple complications; changing the position of the whale onshore is difficult, the harness needs to be safely released so the animal is not entangled, and this quick release harness is under development and will need to undergo testing before being utilized on the beach. Most importantly, this method should only be considered for an animal in good overall condition and when post-release monitoring is available to determine the success of the response efforts. If a harness is not available, it is possible to make one out of some dyneema or other aramid/HMPE and floats (Figure 7). Other lines, such as vectran, spectra, polysteel, could work with varying limitations (*e.g.*, UV resistance, abrasion resistance, elastic modulus, etc.). Again, any harness must be tested out on a dead whale or surrogate object prior to use in a live whale to determine if the quick release and other equipment will work as designed.

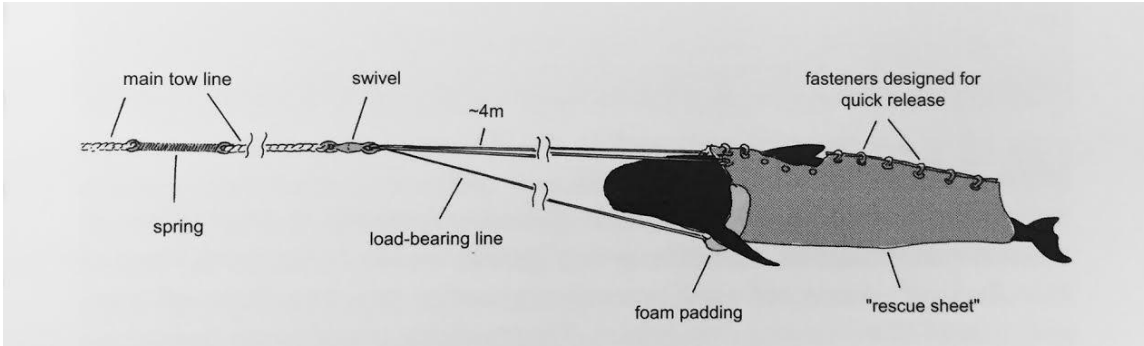


Figure 7: A method for towing utilizing a "rescue sheet" with quick release fasteners, a swivel between lines from a sling and main tow-line to reduce twisting, and a spring in the main tow-line to dampen speed surges.

4.4.4.4.3 Dredging

Dredging to remove sediment or sand around a stranded whale has not been tried very often due to resource limitations and potential environmental impacts/approval process. Dredging would require availability of an appropriate vessel as well as the necessary authorization to be given quickly in an emergency situation, within 24 hours if possible. Dredging to help one animal can also result in significant unintended environmental consequences and may negatively impact other species in the area. Anecdotally, previous attempts to dredge the area around a whale have ended with the whale rolling into the dredged "hole" and then, unable to right itself to breathe, drowning.

4.4.4.5 *Necropsy (Including data collection and sampling)*

If an animal is euthanized then the necropsy is extremely important; it provides valuable insight into the health of these animals and the data collected may help animals in the future. Once the animal is at the necropsy site, the necropsy will begin with 1) photos and videos, 2) human interaction evaluation (if applicable), 3) morphometrics, 4) blubber thickness, and 5) internal examination, 6) and a completed necropsy report (see example in Appendix E).

1) **<u>Photo and videos</u>:** Make another careful assessment of the external condition, noting swellings, scars, lacerations, contusions and other lesions. If abnormalities are found, take as many photos as needed to document. Work with the dedicated photographer team member to make sure all needed photos are obtained and help direct the photographers in any additional photos wanting to document. Some species require specific images; for example, a right whale needs images of all callosities, scars, flukes, and flippers; and humpbacks require ventral fluke images. Ensure

images are taken of all aspects that will assist with photo-identification of the individual as well as record the standard suite of measurements (Pugliares-Bonner *et al.* 2007).

2) **Human interaction evaluation:** The carcass should be examined for evidence of human interaction (*e.g.*, watercraft wounds/scars/vessel strike, entanglement marks or scars, entanglement gear, etc.). When examining for evidence, any suspect evidence should be fully documented (*i.e.,* photos) and the area sampled for histology if possible. A Human Interaction form should also be filled out if there is evidence or suspected evidence. Propeller wound measurements should be collected when feasible, but require adequate training.
3) **Morphometrics:** Depending on the location of the carcass, it may be hard to measure total length of the animal. If in a tide, some of the carcass may be underwater so a reasonable "estimate" will have to be obtained. Significant injuries (*e.g.*, large propeller wounds) may also deform the carcass and require estimation of total length. If the carcass is high and dry, the total length can be measured by laying the tape along the carcass in addition to other body measurements.
4) **Blubber thickness:** If the carcass is fresh and not bloated, at minimum measure blubber thickness at the front of the dorsal fin dorsally, midline and ventrally. For right whales (*Eubalaena*) and whales without dorsal fin blubber thickness, it should be determined which side of the animal has the most complete blubber and then should be measured at 9 different landmarks (ear, angle of mount, eye, blowhole, flipper insertion, umbilicus, genital slit, anus, and fluke notch to anus) along the length of the whale, measured around the animal's girth (McLellan *et al.* 2004).
5) **Internal examination:** Report all areas of hemorrhage, edema, swelling and abscessation. Look for focal changes in color pattern and texture of organs. If the carcass is fresh to moderately decomposed take histology samples of identifiable as well as suspect tissues. Proceed logically through the carcass using a gross necropsy report form as a prompt to ensure all organ systems are examined (Pugliares-Bonner *et al.* 2007). Whenever possible, right whale necropsies should follow the protocol and use the datasheets outlined in McLellan *et al.* 2004.
6) **Necropsy report:** Refer to Section 5.2.3. Also for examples for more specific necropsy protocols specific to right whales (*Eubalaena*), refer to the Right Whale Necropsy Protocol report by McLellan *et al.* 2004.

4.4.4.6 *Disposal (depends of euthanasia method)*

There are a lot of considerations (*e.g.*, available resources, location, land ownership, cause of death) when determining options for disposal. If the animal has a cause of death other than euthanasia, it allows for more options due to eliminating the concern for secondary poisoning to scavengers due to use of barbituates. If the whale is euthanized via a barbiturate (*e.g.*, pentobarbital), the carcass needs to be disposed of in a responsible manner (*e.g.*, rendering, incineration) that removes the risk of secondary poisoning to scavengers from the environment. Certain chemical euthanasia methods, such as saturated KCL solutions in conjunction with heavy sedation, have a low risk of secondary poisoning for scavengers and can be used when leave in place methods of disposal are used (AVMA 2020, Harms *et al.* 2014, Barco *et al.* 2016). For more information, refer to the Marine Mammal Carcass Disposal Best Practices.

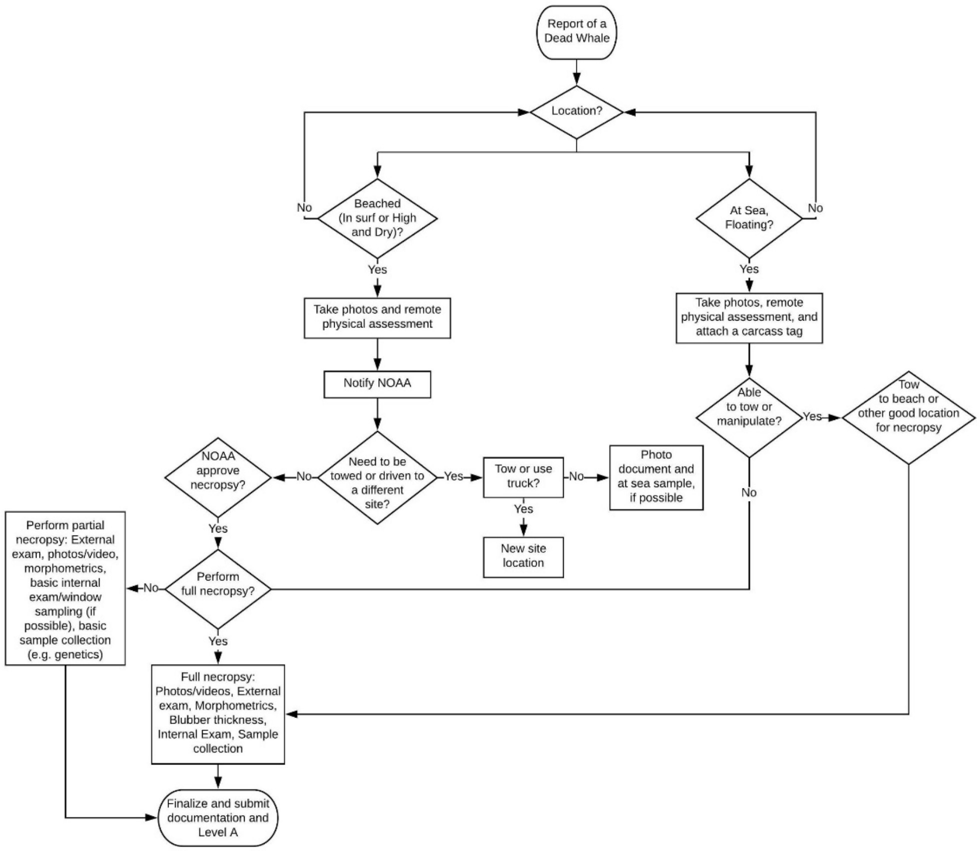
5. Dead Large Whale Emergency Response

5.1 At Sea, Floating

5.1.1 Decision Trees and Triage Criteria for Response

Logistical planning begins with the first report of the carcass. Whenever possible, the reporting vessel should stay with the carcass until a response vessel (tagging and/or towing) arrives on scene. It is important to keep details of every sighting, report, and location to help track the carcass and be able to respond. Depending upon species, location and carcass condition not all at sea whales will be responded to or will land on shore. Certain species (*e.g.,* right whales) may be prioritized for assessment, documentation, at-sea sampling, satellite tagging and/or towing operations. A printed map of the initial location and recent sighting with weather predictions for the following few days should be on hand until the carcass is finally recovered. For certain species (*e.g.,* right whales) NMFS may request a drift model from USCG or NMFS Office of Response and Restoration. Also aerial assets (*e.g.,* USCG, NOAA or private planes) may be used to help re-sight the carcass, if aerial assets are used it is best to also launch a small boat at the same time so the plane can direct the small boat to the whale for at sea assessment (including assessment for towing), photo documentation (photographs, UW video, UAS, etc.), at-sea sampling if needed, and tagging if a carcass tag is available. Once recovered, a necropsy can be performed. See Section 5.2.6 for necropsy details and for necropsy protocols specific to right whales (*Eubalaena*), refer to the Right Whale Necropsy Protocol report by McLellan *et al.* 2004. If a carcass is unable to be recovered, a Level A form still needs to be submitted.

Below is a decision tree that can help when deciding the appropriate action for a carcass at sea response:



5.1.2 Specific Training and Qualifications (including CI letters, NTL)

Endangered or threatened large cetacean stranding responses are conducted under a MMPA/ESA permit that is issued to the MMHSRP. In very particular circumstances for non-ESA listed species, a response can be conducted under a SA (by the SA holder after consultation with the Regional Stranding Coordinator) or by a government employee acting under MMPA Section 109(h). Therefore, only responders who have been authorized by NMFS and who have the training, experience, equipment, and support needed should attempt large cetacean interventions. Authorized response efforts may also rely on partners at tribal, local, state and federal agencies (including law enforcement agencies and the USCG), non-governmental organizations, fishermen, and other groups to assist with some responses.

The Stranding Network members are trained or have experience in proper techniques for safe capture, restraint, and necropsy of various marine mammal species. Training workshops have been offered to members of the Stranding Network. Additionally, opportunities for apprenticeships or assistant roles to gain the necessary hands on expertise can be arranged. Specific training issues or requirements may exist for certain activities (*e.g.*, watercraft wound analysis) and are more appropriate to address at regional or state levels by working with your RSC.

The Large Whale Response Network is made up of individuals who have been evaluated on their qualifications and past experience, and for ESA responses may be issued a CI letter under the MMPA/ESA permit for responding to large whale scenarios, especially for necropsy of certain ESA whales such as North Atlantic right whales. Tables 19 and 20 provide more details on team member roles and qualifications. A CI remains authorized to respond to large whales as long as their CI letter is valid (which is typically the five-year life of the MMPA/ESA permit, with some exceptions). These CIs are expected to coordinate to the extent possible with the NMFS RSC's Large Whale Coordinators and the MMHSRP. All response actions are reviewed after the event with the participating responders and MMHSRP staff.

NTL is a NMFS approved, qualified and experienced team leader who is responsible for all aspects of the necropsy. This includes managing the necropsy team, assigning tasks during necropsy and being responsible for the gross and final necropsy report. A NTL must have experience with a number of large whale necropsies, facility with HI forensics, and approval from NMFS in order to be qualified. Cross-training responders is important in gaining experience to become a NTL. Specific NTL duties may include: conducting and assigning tasks during the necropsy; ensuring NMFS necropsy protocols are followed; sample collection; gear collection; photo-documentation; writing the draft and final gross necropsy report (and reviewing the case report for right whales); and sample dissemination and tracking, including following chain of custody procedures, if applicable. NTLs that regularly necropsy ESA large whales will also be CIs under the NMFS MMHSRP MMPA/ESA Permit. A NTL must have experience with a number of large whale necropsies and approval from NMFS in order to be qualified. The NTL reports to the Operation Safety Chief. For specifics on how to become a NTL see Appendix F.

Technical Specialists report to the NTL and are people with specialized skills or knowledge (*e.g.*, trained biologists, veterinarians or pathologists). These Specialist roles can include the Cutter(s) who assists the NTL and is responsible for examining the carcass and organs, collecting samples, and dismembering the carcass; Sample Coordinator who is responsible for sample tracking and recording during the event; the Photographer who is responsible for taking photographs of the carcass, lesions, unusual markings, or injuries for the veterinary assessment team; and the Data Recorder is responsible for recording all information related to gross observations noted during the necropsy, morphometrics, and filling out any associated datasheets.

Table 19: Suggested number of personnel required for an at sea, dead whale response.

Team member roles	Number of personnel required
Incident Commander (IC)	1
Safety Officer (SO)	1
Vessel Operator(s)	1-2
Crew (vessel dependent)	1-3 (roles can be shared with other roles)
Sample Collector (if needed)	1
Data Collector/Photographer	1-2
Aerial Operations	1-3
Security/Crowd Control	Variable
Necropsy Team Lead (if carcass towed to shore for necropsy)	1-2
Technical Specialists Necropsy Staff (*e.g.*, cutters, photographer, data collector, sample coordinator, etc.)	Variable, 2-30 (depending upon location, carcass condition, whale species, etc.)
Tagger (if needed)	1
Communications Officer (optional)	1
Optional – UAS Operator (see UAS; Section 6)	1

Table 20: Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.*, documentation and data collection).

Team Member Role	Role Description	Role Qualifications
Incident Commander (IC)	The IC is responsible for the overall operation, including the performance of the response, and does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the event and objectively ensure that the response is safe for responders, the public, and animals. In some large whale responses, the IC may be combined with the Operations Section Chief position.	Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations. Must have the authority to carry out operations.
Safety Officer (SO)	The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed.	Experience in dead whale responses, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, waves, other

		animals). Willingness to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.
Vessel Operator(s)/Crew	For responses to dead floating whales, the vessel operators are an essential component to a successful operation. The vessel operators are responsible for ensuring that the vessels are in the proper placement to relocate and document the floating carcass, that the vessel can be safely maneuvered around animal(s) in the water, and that the vessel can be safely handled in all types of weather and sea state conditions such as currents, tides, kelp, wind, etc. Vessel operators should be experienced with floating animal approaches, photo documentation of carcasses, carcass tagging, rigging for towing and towing, if needed.	USCG boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with large whale carcasses around the boat. Experience driving vessels around large whales. Experience maneuvering in tight spaces, rigging and towing, and the ability to remain calm under pressure.
Sample Collector	The sample collector is responsible for collecting any animal samples during the at sea response. This may include skin or blubber samples.	A person trained in sample collection for large whales or cetaceans.
Data Collector	The data collector is essential in recording all aspects of large whale carcass data for the response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all marks or other identifiers are recorded, and all samples are properly recorded and labeled.	Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.
Photographer or Videographer	This person is responsible for operating still or video photography to document the floating carcass, including underwater go pros. This person may also serve as the data collector.	Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and video including head or fluke photos for identification, and ability to post-process photos/video after the capture.
Aerial Operations	Aerial operations may be used in certain responses to locate the carcass and lead the documentation vessel to the carcass. Aerial operations would consist of photo documentation of the carcass and relaying carcass location to the ground and vessel crews. Depending upon the operation one to two persons are needed along with a pilot to photo document the carcass. Sometimes other aerial	Experience with flight operations, aerial search grids, taking aerial photographs, and communicating with ground and vessel crews.

	assets are used (*e.g.,* USCG) and therefore aerial operations may consist of communication with the outside parties and discussion of search/flight plans for relocation the carcass. Aerial operations should coordinate with the IC about obtaining appropriate drift models for creation of the search grid.	
Security/Crowd Control	The IC should ensure that the proper authorities in the area have been notified of the response and, if possible, the area is closed to public access during the response. For floating responses, crowd control may be conducted by local marine law enforcement, USCG, etc.	Knowledge of proper authorities to notify and coordination with law enforcement assets.
Necropsy Team Lead (NTL)	If the floating carcass is towed to shore for necropsy then a NTL is needed to conduct the necropsy. The NTL is a NMFS approved, qualified and experienced team leader who is responsible for all aspects of the necropsy. This includes managing the necropsy team, assigning tasks during necropsy and being responsible for the gross and final necropsy report. Specific NTL duties may include: conducting and assigning tasks during the necropsy; ensuring NMFS necropsy protocols are followed; sample collection; gear collection; photo-documentation; writing the draft and final gross necropsy report (and reviewing the case report for right whales); and sample dissemination and tracking, including following chain of custody procedures, if applicable.	A NTL must have experience with a number of large whale necropsies and approval from NMFS in order to be qualified. The necropsy team leader reports to the Operations Section Chief. NTLs that regularly necropsy ESA large whales will also be co-investigators under the NMFS MMHSRP MMPA/ESA Permit. For specifics on how to become a NTL see Appendix F.
Technical Specialist Necropsy-Cutter	This person is responsible assisting the NTL and is responsible for examining the carcass and organs, collecting samples, and dismembering the carcass.	Experience conducting marine mammal necropsies. Knowledge of cetacean anatomy and necropsy techniques.
Technical Specialist Necropsy-Photographer	This person is responsible for operating still or video photography to document the necropsy, specifically taking photographs of the carcass, lesions, unusual markings, or injuries for the necropsy team.	Experience using photographic equipment and experience documenting cetacean necropsies. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and video including head and flukes for identification, lesions, injuries, and ability to post-process photos/video after the capture.

Technical Specialist Necropsy-Data Collector	This person is responsible for recording all information related to gross observations noted during the necropsy, morphometrics, and filling out any associated datasheets.	Experience collecting data for marine mammal necropsies. Experience with large whale necropsy data forms.
Technical Specialist Necropsy-Sample Coordinator	This person is responsible for sample processing, tracking and recording during the event.	Experience collecting samples at marine mammal necropsies. Experience with sample data collection forms and procedures.
Tagger	The carcass tagger is responsible for attaching a carcass tag to the floating whale if one will be used.	A person who is experienced working on small boats, handling line and rigging, and can attach the tag to the carcass (*i.e.,* to tail or flipper). Attachment may require cutting into the flipper, so knowledge of whale anatomy or necropsy is encouraged.
Communications Person (Optional)	The communications officer is responsible for communicating information about large whale response to the public and media. For high profile cases or cases conducted under the permit, messages should be coordinated and cleared with NMFS.	Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.
Optional – UAS Operator (see UAS; Section 6)	If permitted to operate a UAS during the large whale response, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the response or causing disturbance to the target or other animals.	A certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous small cetacean field operations

5.1.3 Data Collection Protocols and Documentation

Data collection is typically performed by qualified individuals and depending on the level of response and capacities may determine the amount of data collected. It is important to document the event with recording the location and time of each sighting. Monitoring the animal(s) is essential. Obtaining good photographs and/or video of the animal can help identify individual animals and in assessing the level of decomposition. At minimum, field information necessary for completion of NOAA's Level A form must be collected. This will include the assignation of a unique identifier (Field ID#, per Regional Stranding Network protocols). Level A forms may be completed electronically via direct entry in the National

Stranding Database. A Human Interaction form should also be filled out if there is evidence or suspected evidence.

Conduct a complete (as possible) external examination before handling or moving the carcass. This will help to differentiate existing marks and possible human interaction from the marks resulting from the towing, landing, and transporting of the carcass as well as the degree of scavenging and level of decomposition (Pugliares-Bonner *et al.* 2007). When examining for evidence, any suspect evidence should be fully documented (*i.e.,* photos) and the area sampled for histology if possible. Propeller wound measurements should be collected when feasible, but require adequate training.

If assessing and/or sampling the carcass at sea, collecting morphometrics can be challenging and may have to be estimated measurements. Sometimes the measuring tape can be pinned on the carcass in the blubber to hold it in place. Other times the carcass can be measured by the length of the vessel. For sampling, sometimes skin or blubber can be sampled safely at sea. For turbulent sea state, no assessment may be safely possible beyond photo documentation. During these times and if the equipment is available, it may be possible to use UAS for photos and an underwater pole cam video to help with the external exam. For data collection, the goal is to try and obtain as much data as possible from the carcass as safely as possible. Human safety comes first.

A necropsy report should be completed if partial or complete necropsies are performed. See Appendix E for an example of a large whale necropsy form. If fishing gear is present, gear should be collected, documented on the Level A and Human Interaction Form, stored in a centralized location or sent to a gear repository. and documented using Chain-of-Custody forms if transferred. Check with your RSC and local OLE Officer to determine how gear will be stored.These forms start in the field and when samples are transferred signatures are required by both parties, the original form must remain with the animal/sample. Photo logs are a record of each photograph taken, which helps to identify the photographer and date/time taken. During necropsies, photographs should be taken with a label with ID, date, species, log number, and have a size scale (see examples in Appendix D). With all the data collected, a report should be finalized with the photographs documented, complete recording of all pertinent findings, and all samples collected.

5.1.4 Tagging and Marking

With a carcass at sea that will be left or to be sunk, it is important to document any natural markings the carcass has. These markings can be used to determine the individual carcass if there is a photo-identification catalog for that species or if it happens to beach or is reported again. Natural markings include pigmentation patterns on the fluke or body, callosity shape and size, dorsal fin shape and notches, or other skin marking depending on the species. It is important to acquire a comprehensive series of species-relevant images of all such marks before release to enable recognition later. Applied marks, such as cattle paint sticks, can also be used and will only last a few days. These marks are applied by the Network responders before disposal/release. If there are no natural markings, it is possible to attach a short-term mark, which may include plastic cattle ear tags in the dorsal fin (for those species with a dorsal fin) or notching of the dorsal fin or other body parts. All of these types of markings and tags can be used in tandem, if necessary, so photographs of natural markings can be coupled with applied marks or tags to increase the likelihood of identifying whale carcasses if they happen to beach or are re-sighted if they drift or don't sink.

In certain cases (*e.g.,* for towing) reusable GPS carcass tags/buoys can be attached to the floating dead whale via rigging around the tail or through a flipper. The tags link to software that provide a latitude and longitude position for tracking, relocating for towing or data for use in drift modeling. The tags are solar powered, reusable and can be recovered and used on multiple carcasses.

5.1.5 Sampling

Sampling of the carcass even just limited sampling of skin for genetics is important and can help with identification for certain species as well as determination of sex if that is not able to be assessed visually. Partial or full necropsies are extremely important; they can provide valuable insight into the health of these animals and the data collected may help animals in the future. A necropsy sample inventory list is helpful during the necropsy to ensure that all the samples are collected and stored appropriately. A sample inventory list can be found in Appendix E. It is important to understand the priority of samples to be collected based upon carcass condition, primary rule-outs and time available for sampling (Table 21). When in doubt, collect it, and unnecessary samples can be disposed of at a later time (Pugliares-Bonner *et al.* 2007).

Table 21: Example of sample analysis collected per decomposition code (Pugliares-Bonner *et al.* 2007)

Code 2: **Fresh Carcass**	Histology, cytology, pathogens (swabs or tissue), parasitology, contaminants, biotoxins, life history, genetics
Code 3: **Moderate Decomposition**	Histology (limited), pathogens (swabs or tissues), parasitology, contaminants, biotoxins, life history, genetics

Code 4: Advanced Decomposition	Histology (limited), biotoxins, life history, genetics
Code 5: Mummified/Skeletal Remains	Life history, genetics

In some cases, it has been possible to obtain internal samples from free-floating large whale carcasses when there is minimal sea state. If possible, secure lines around the flipper and tail stock to secure the vessel alongside the whale. If attaching lines is not possible, two persons each with a whale hook on either end of the vessel (bow and stern) can hold the whale and vessel together if the vessel is small (Pugliares-Bonner *et al.* 2007). Since most carcasses present ventral side up, samples may be obtained from the colon, and small intestine in addition to skin, muscle, and blubber. The number one importance in sampling a whale carcass at sea is **safety**. It is not safe to collect samples by standing on top of the carcass, in a small inflatable boat, or when sharks are around the carcass. Fortunately, there are some technologies that help to obtain some sample collection without risking safety. GoPros have been used to record video while sampling and by using it (or another type underwater video camera) on a pole to be able to record the animal's external condition that cannot be visible via boat. They can also document underwater entanglements and injuries. UAS have also been used to take pictures or video of the carcass.

5.1.6 Carcass Recovery

For a carcass floating at sea, it is best to be prepared for different scenarios. Depending on the level of decomposition, it may not be feasible to tow the carcass to a more suitable necropsy location and limited sampling or only photo-documentation can be performed at sea. Shark scavenging of the peduncle can result in relatively fresh carcasses not being easily towable. Thorough at-sea examination can help determine that. Where distance offshore, cost, carcass condition or other factors preclude towing a large whale carcass to shore for examination, there is some benefit to the limited examination that can be undertaken at sea in certain situations (Pugliares-Bonner *et al.* 2007). After the documentation and/or limited sampling at-sea and depending on the situation, the carcass may be left at sea or sunk. If a carcass can be towed to shore, then the necropsy can be performed at the determined site which will also allow for planning different disposal method options.

5.1.6.1 *Necropsy Site Location*

It may be necessary to transport the carcass from sea to a more suitable necropsy location (if applicable). Often, on both state, federal, and privately owned properties, there needs to be coordination with the land owners/authorities in facilitating the necropsy and disposal (Pugliares-Bonner *et al.* 2007). Additionally, when choosing a landing site, protected/sensitive habitats such as seagrass, oyster reefs, and coral reefs should be accounted for and avoided. Transporting the carcass to a large marina, state, or federal site (*e.g.*, State Sanitation District, Army Corps, USCG, etc.) that have travel-lifts, boat-lifts or heavy equipment can be an easy way to be able to load a carcass on a transport truck (preferably a large dump-trailer, if possible) if needed to transport to a new site. Carcasses can also be towed directly to an approved beach location for landing and an examination on shore with beach burial or transport off the beach post-necropsy. Again, coordination with the beach owner is necessary to receive approval for landing of the carcass.

5.1.6.2 *Towing*

If the carcass is in a good enough condition, in certain cases the carcass can be towed to a more suitable area for necropsy. It is important to evaluate the condition of the carcass, select the appropriate equipment (*e.g.*, vessel), assess environmental conditions (including high tide), distance to shore, appropriate landing site, disposal plan, etc.

When towing, the vessel should be significantly longer in length than the whale. A towing bridle makes hooking up to a carcass much easier (Figure 8). Using a boathook, push the float ball (a) under the narrowest part of the tail (b) until it floats up the other side of the whale. Pass the float and line it is attached to through the eye splice on the opposite end of the heavy line (c). Cinch it tight. Use the short rope tail (d) on that splice to tie the splice to the heavy line that passes through it to ensure that the bridle does not slip off the whale when no tension is applied. Use the smaller line with the float (a) attached to catch the line when hooking up a tow line to the larger rope. Alternatively, a sinking line with a weight attached can be thrown over the upstream side of the peduncle, the whale will then drift in to this line making it stream out below and behind the moving carcass, allowing one to catch the line with a boathook and draw it up to encircle the peduncle. (Pugliares-Bonner *et al.* 2007). A short tail bridle (*e.g.*, lifting strap) can also be used and will not come off when the line is slacked (*e.g.*, maneuvering in a surf zone). Sometimes the tail is damaged and the whale cannot be towed by the tail, depending upon the vessel size smaller carcasses may be able to be towed alongside the vessel to shore.

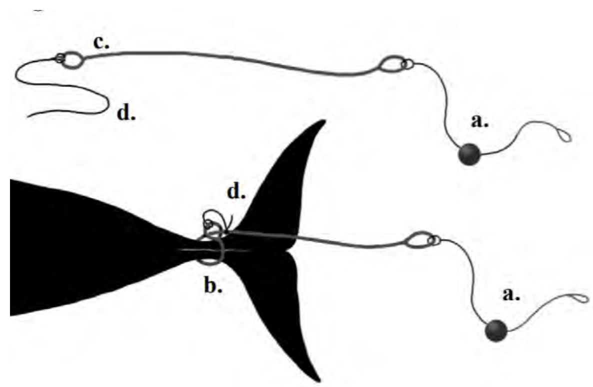


Figure 8: Drawing by Scott Landry, Provincetown Center for Coastal studies

Towing Vessel Capabilities – For short tows (less than two miles) in calm condition (beaufort less than three) small boats (19-22 feet) with outboard power (75-150 horsepower) are adequate to move carcasses to shore. Animals may be secured around the peduncle for towing and towed tail first at slow speed (less than three knots). For longer tows or sea surface conditions of beaufort 3+, larger vessels are recommended. For long tows (greater than ten miles) vessels such as tugs or work boats with deck equipment (winches, frames, cranes) with lifting capacity on the order of twenty tons and main propulsion horsepower of 700+ are suggested. For large vessels conducting long tows, the whale can be secured by the peduncle and lifted alongside of the vessel so that the majority of the flukes are lifted from the water to reduce drag. The ends of the flukes may be docked (cut off) to reduce the amount of lift necessary to clear the flukes above the surface. With vessels of sufficient size and horsepower towing in the tail up configuration can be accomplished at speeds approaching six knots.

5.1.6.3 *Carcass Landing*

Carcass landing is where the floating whale eventually drifts and lands on the beach. However, there are times when a floating carcass will be towed to a suitable landing site. At the landing site, it is necessary to have the appropriate equipment/resources in order to haul the carcass onto land, which depends on the nature of the site and the size of the whale. Additionally, there is often a need for a secondary vessel (*e.g.*, small boat, jet ski, kayak) that can bring the tow rope from the tow vessel to shore for attachment to the heavy equipment to land the carcass (Figure 9). A lightweight float line with a buoy can also be attached to the towline and thrown into the surf to be carried to shore, where the towline can be pulled in. Heavy straps, ropes, chains or cables of 90-ton breaking strength are critical for dragging the carcass. Depending on the situation, different characteristics may be important (*e.g.*, floating vs. sinking line, abrasion resistance, elastic modulus, etc.). The safety margin (working strength) for rigging is usually calculated as

⅓ or ⅕ of its breaking strength. Dragging an object up a slope (*e.g.*, beach or boat ramp) can exert as much as half the full weight of the object, depending on the slope angle. Extreme care must be used when selecting the strength (*e.g.*, breaking vs working strength) and material composition (*e.g.*, HMPE vs nylon vs steel cable) of the rigging being used. Any connectors (*e.g.*, metal shackles) being used to connect lines should have capacities that exceed the lines being used. Line dampeners should always be placed at both ends of the line if the breaking strength is approached or exceeded, or the condition of the rigging is in question. Whenever possible, use rigging that does not require knots that weaken the rigging (*e.g.*, bury-tuck eye splices, soft shackles, etc.). If the necropsy site is on a dock or paved area or if the site is away from the landing area requiring transport, a crane or boat hoist (travel-lift) is a good option for moving the carcass (depending on size) onto the dock or into the transport truck (Pugliares-Bonner *et al.* 2007). While not always optimal, with adequate anchoring a carcass towed into shore can be anchored just offshore or to the beach to ensure it is not lost while additional logistics are arranged, next daybreak, or weather window is waited for. Note that anchoring a carcass in nearshore waters may require certain measures to avoid navigational hazards (*e.g.*, rigging with lights/strobes and radar reflecting panels). When the carcass is very large and heavy or landing equipment is insufficient to completely extract the carcass from the water, the incoming tide can be used as a mechanical advantage to drag the carcass up the beach and anchor it before the tide recedes. This provides a tidal cycle window for an examination. High tide can also be used as a mechanical advantage to tow a whale off of a beach, when relocation is necessary.

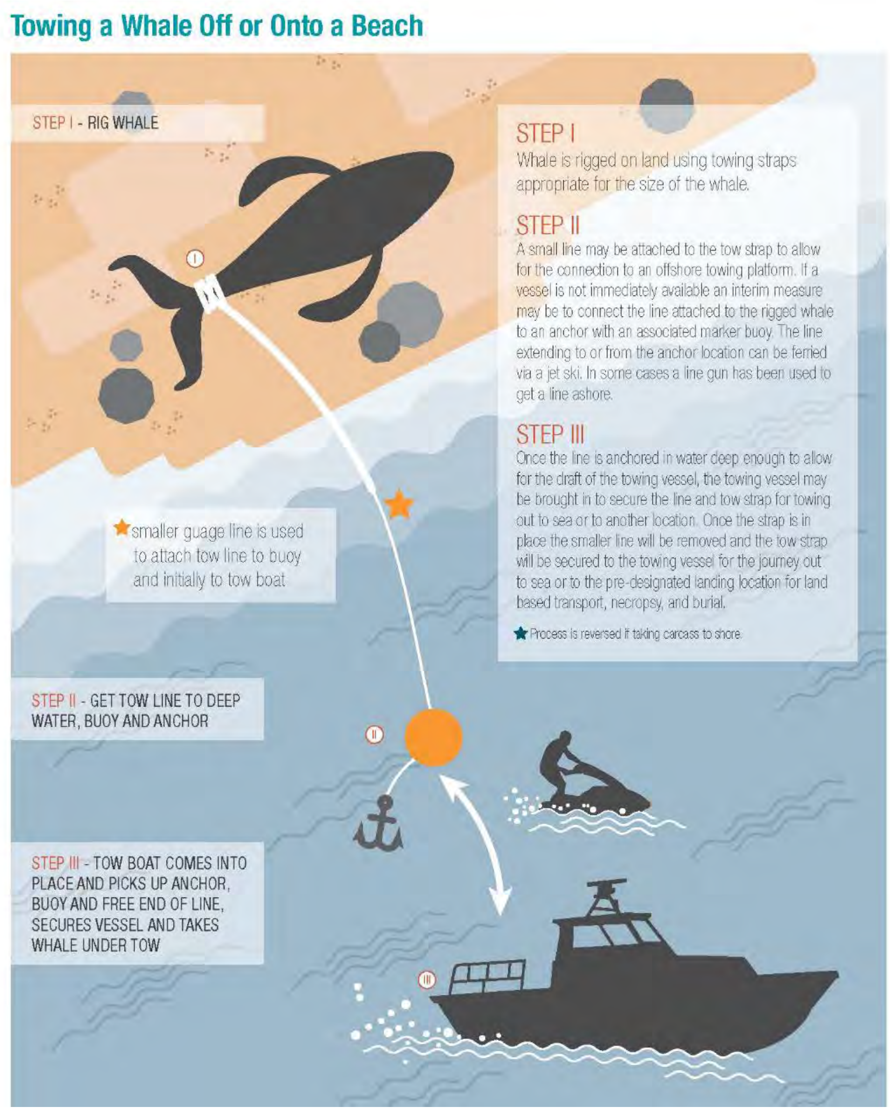


Figure 9: Towing a whale off or onto a beach

5.1.7 Disposal (If not recovered)

For details on specific carcass disposal methods please refer to the Marine Mammal Carcass Disposal Best Practices.

5.1.7.1 *Remain in Place*

The Remain in Place method is the most basic disposal method for at-sea carcasses, especially those that cannot be towed in due to decomposition state, lack of landing sites or lack of funds for towing. Since this method requires leaving the carcass floating at sea to where it may float for a while but will eventually sink, it is recommended that the body cavity of the animal is pierced. This will aid sinking, as the carcass can off-gas more easily. Accelerating the sinking will help prevent the carcass from re-stranding. This method allows marine mammal carcasses to remain in the environment and contribute the nutrients contained within the animal to the environment. Care must be taken to ensure that the carcass will not be pushed back onshore by winds and currents. This is to prevent the carcass from re-stranding, and also to reduce the possibility of human-shark interactions, as floating carcasses have been known to attract sharks (Fallows *et al.* 2013).

5.1.7.2 *Sink*

With the carcass floating at sea, it is possible to dispose of it by sinking. This method has a benefit that the location where the carcass is sunk can be chosen and therefore controlled, which can maximize its benefits to the environment.

When selecting a site to sink a carcass, you must ensure that the carcass is submerged in deep enough water that it does not become a hazard to navigation. The USCG may have restrictions on where a carcass can be sunk, and they should be consulted when planning to sink a carcass. Release at sea methods generally require authorization from the EPA since this agency regulates ocean disposal of marine mammals. The EPA has issued a general permit under the MPRSA to authorize the transport and disposal of marine mammal carcasses in ocean waters under specified conditions. More information on the EPA process can be found here: https://www.epa.gov/ocean-dumping/ocean-disposal-marine-mammal-carcasses.

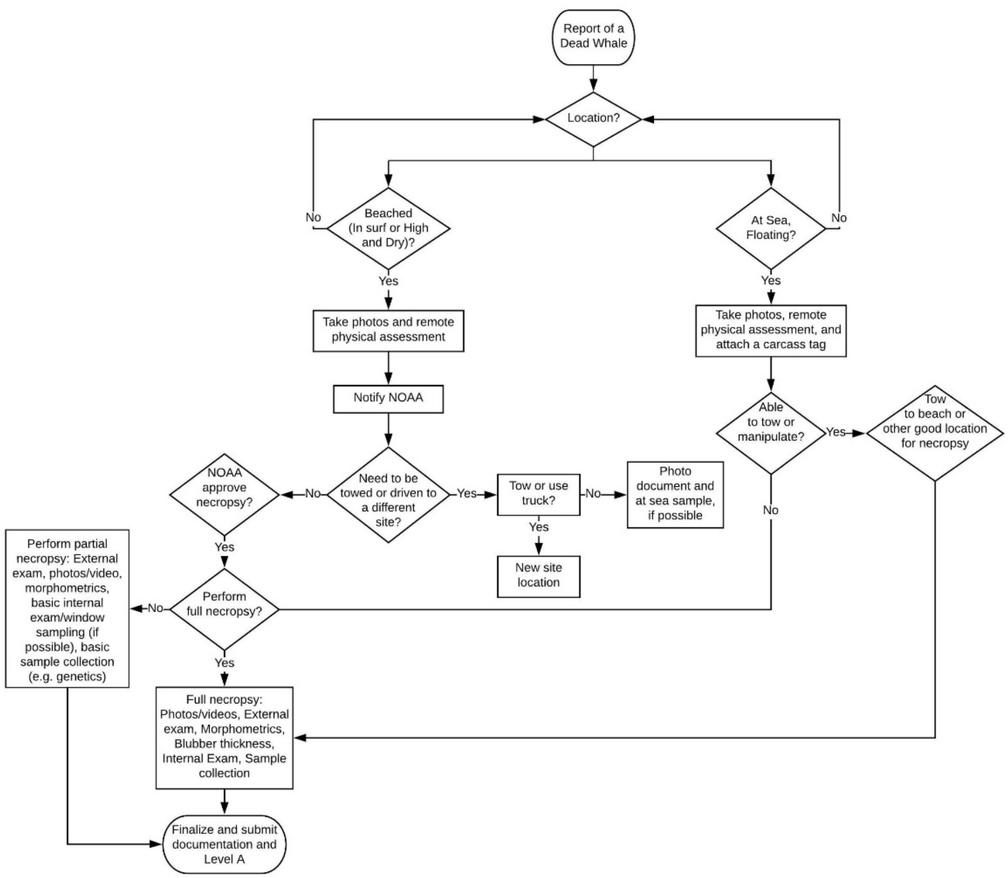
When sinking a carcass a responder will need to decide how the carcass will be weighted down. Even when the body cavity is pierced to allow for more efficient off-gassing, without weights, the carcass could float for some time. Therefore, weights need to be used to hold down the carcass on the seafloor until it is more decomposed. A wide range of weights can be used to ensure the carcass does not refloat, including chains and concrete blocks. If possible, materials that will slowly degrade when submerged in the marine environment, such as zinc or iron should be used as weights. Information on the types of items that can be used for sinking carcasses can be found here: https://www.epa.gov/ocean-dumping/ocean-disposal-marine-mammal-carcasses#What_type. The whale carcass will only need to be weighed down for a limited amount of time, so using weights that do not break down over time will become marine debris once the whale carcass has decomposed.

5.2 Beached/In the Surf or High and Dry

5.2.1 Decision Trees and Triage Criteria for Response

Logistical planning begins with the first report of the carcass. It is important to keep details of every sighting, report, and location to help track the carcass and be able to respond. A printed map of the carcass location with weather predictions for the following few days will be helpful when developing a plan. Plans need to be made for, documentation, transport (if applicable), necropsy, sampling, disposal, resources (*e.g.*, heavy equipment and experienced team members), and for the media. See Section 5.2.6 for necropsy details and for more specific necropsy protocols specific to right whales (*Eubalaena*), refer to the Right Whale Necropsy Protocol report by McLellan *et al.* 2004. If a carcass is unable to be assessed (*i.e.,* beached in a remote location), a Level A form still needs to be submitted.

Below is a decision tree that can help when deciding the appropriate action for a dead large whale beach response:



5.2.2 Specific Training and Qualifications (including CI letters, NTL)

Endangered or threatened large cetacean stranding responses are conducted under a MMPA/ESA permit that is issued to the MMHSRP. Most large ESA cetacean responses are conducted under a MMPA/ESA permit that is issued to the MMHSRP. In very particular circumstances for non-ESA listed species, a response can be conducted under a SA (by the SA holder after consultation with the Regional Stranding Coordinator) or by a government employee acting under MMPA Section 109(h). Therefore, only responders who have been authorized by NMFS and who have the training, experience, equipment, and support needed should attempt large cetacean interventions. Authorized response efforts may also rely on partners at tribal, local, state and federal agencies (including law enforcement agencies and the USCG), non-governmental organizations, fishermen, and other groups to assist with some responses.

The Stranding Network members are trained or have experience in proper techniques for safe capture, restrain, and necropsy of various marine mammal species. Training workshops have been offered to members of the Stranding Network. Additionally, opportunities for apprenticeships or assistant roles to gain the necessary hands on expertise can be arranged. Specific training issues or requirements may exist for certain activities (*e.g.*, watercraft wound analysis) and are more appropriate to address at regional or state levels by working with your RSC.

The Large Whale Response Network is made up of individuals who have been evaluated on their qualifications and past experience, and for ESA responses may be issued a CI letter under the MMPA/ESA permit for responding to large whale scenarios, especially for necropsy of certain ESA whales such as North Atlantic right whales. Tables 22 and 23 provide more details on team member roles and qualifications. A CI remains authorized to respond to large whales as long as their CI letter is valid (which is typically the five-year life of the MMPA/ESA permit, with some exceptions). These CIs are expected to coordinate to the extent possible with the NMFS RSC's Large Whale Coordinators and the MMHSRP. However, given the uncertain communication abilities at sea, and the need for quick decision-making, CIs are empowered to use their best judgment and act independently if the situation requires it. All response actions are reviewed after the event with the participating responders, RSC and MMHSRP staff.

NTL is a NMFS approved, qualified and experienced team leader who is responsible for all aspects of the necropsy. This includes managing the necropsy team, assigning tasks during necropsy and being responsible for the gross and final necropsy report. A NTL must have experience with a number of large whale necropsies, facility with HI forensics, and approval from NMFS in order to be qualified. Cross-training responders is important in gaining experience to become a NTL. Specific NTL duties may include: conducting and assigning tasks during the necropsy; ensuring NMFS necropsy protocols are followed; sample collection; gear collection; photo-documentation; writing the draft and final gross necropsy report (and reviewing the case report for right whales); and sample dissemination and tracking, including following chain of custody procedures, if applicable. NTLs that regularly necropsy ESA large whales will also be CIs under the NMFS MMHSRP MMPA/ESA Permit. A NTL must have experience with a number of large whale necropsies and approval from NMFS in order to be qualified. The NTL reports to the Operation Chief Safety. For specifics on how to become a NTL see Appendix F.

Technical Specialists report to the NTL and are people with specialized skills or knowledge (*e.g.*, trained biologists, veterinarians or pathologists). These Specialist roles can include the Cutter(s) who assists the NTL and is responsible for examining the carcass and organs, collecting samples, and dismembering the carcass; Sample Coordinator who is responsible for sample tracking and recording during the event; the Photographer who is responsible for taking photographs of the carcass, lesions, unusual markings, or injuries for the veterinary assessment team; and the Data Recorder is responsible for recording all information related to gross observations noted during the necropsy, morphometrics, and filling out any associated datasheets.

Table 22: Suggested number of personnel required for a beached, dead whale response.

Incident Commander (IC)	1
Safety Officer (SO)	1
Security/Crowd Control	Variable
Necropsy Team Lead	1-3
Technical Specialists Necropsy Staff (*e.g.*, cutters, photographer, data collector, sample coordinator, heavy equipment supervisor, etc.)	Variable, 2-30 (depending upon location, carcass condition, whale species, etc.)
Communications Officer (optional)	1
Optional – UAS Operator (see UAS; Section 6)	1

Table 23: Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.,* documentation and data collection).

Team Member Role	Role Description	Role Qualifications

Incident Commander (IC)	The IC is responsible for the overall operation, including the performance of the response, and does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the event and objectively ensure that the response is safe for responders, the public, and animals. In some large whale responses, the IC may be combined with the Operations Section Chief position.	Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations. Must have the authority to carry out operations.
Safety Officer (SO)	The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed.	Experience in dead whale responses, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.,* waves, other animals). Willingness to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.
Security/Crowd Control	The IC should ensure that the proper authorities in the area have been notified of the response and, if possible, the area is closed to public access during the response. For beached responses, crowd control may be conducted by local law enforcement, etc.	Knowledge of proper authorities to notify and coordination with law enforcement assets.
Necropsy Team Lead (NTL)	The NTL is a NMFS approved, qualified and experienced team leader who is responsible for all aspects of the necropsy. This includes managing the necropsy team, assigning tasks during necropsy and being responsible for the gross and final necropsy report. Specific NTL duties may include: conducting and assigning tasks during the necropsy; ensuring NMFS necropsy protocols are followed; sample collection; gear collection; photo-documentation; writing the draft and final gross necropsy report (and reviewing the case report for right whales); and sample dissemination and tracking, including following chain of custody procedures, if applicable	A NTL must have experience with a number of large whale necropsies and approval from NMFS in order to be qualified. The necropsy team leader reports to the Operations Section Chief. NTLs that regularly necropsy ESA large whales will also be co-investigators under the NMFS MMHSRP MMPA/ESA Permit. For specifics on how to become a NTL see Appendix F.
Technical Specialist Necropsy-Cutter	This person is responsible assisting the NTL and is responsible for examining the carcass and organs, collecting samples, and dismembering the carcass.	Experience conducting marine mammal necropsies. Knowledge of cetacean anatomy and necropsy techniques.

Technical Specialist Necropsy-Photographer	This person is responsible for operating still or video photography to document the necropsy, specifically taking photographs of the carcass, lesions, unusual markings, or injuries for the necropsy team.	Experience using photographic equipment and experience documenting cetacean necropsies. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and video including head and flukes for identification, lesions, injuries, and ability to post-process photos/video after the capture.
Technical Specialist Necropsy-Data Collector	This person is responsible for recording all information related to gross observations noted during the necropsy, morphometrics, and filling out any associated datasheets.	Experience collecting data for marine mammal necropsies. Experience with large whale necropsy data forms.
Technical Specialist Necropsy-Sample Coordinator	This person is responsible for sample processing, tracking and recording during the event.	Experience collecting samples at marine mammal necropsies. Experience with sample data collection forms and procedures.
Technical Specialist Necropsy-Heavy Equipment	If heavy equipment is used then this person is responsible for overseeing the operation of heavy equipment used for landing and necropsying the large whale. This role may be filled by the incident commander or NTL for certain responses.	Experience guiding heavy equipment, understanding of rigging, and risks associated with heavy equipment. Good communication skills for working with heavy equipment operator and NTL. Knowledge of how the equipment operates, how rigging may change under different loads, and troubleshooting.
Communications Person (Optional)	The communications officer is responsible for communicating information about large whale response to the public and media. For high profile cases or cases conducted under the permit, messages should be coordinated and cleared with NMFS.	Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.
Optional – UAS Operator (see UAS; Section 6)	If permitted to operate a UAS during the large whale response, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the response or causing disturbance to the target or other animals.	A certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous small cetacean field operations

5.2.3 Data Collection Protocols and Documentation

Data collection is typically performed by qualified individuals and depending on the level of response and capacities may determine the amount of data collected. It is important to document the event with recording the location and time. Obtaining good photographs and/or video of the animal can help identify individual animals and can allow for more post-necropsy assessments. For situations such as a carcass in a remote area, at minimum, field information necessary for completion of NOAA's Level A form must be collected. This will include the assignation of a unique identifier (Field ID#, per Regional Stranding Network protocols). Level A forms may be completed electronically via direct entry into the National Stranding Database. A Human Interaction form should also be filled out if there is evidence or suspected evidence.

Conduct a complete (as possible) external examination before handling or moving the carcass. This will help to differentiate existing marks and possible human interaction from the marks resulting from the towing, landing, and transporting of the carcass as well as the degree of scavenging and level of decomposition (Pugliares-Bonner *et al.* 2007). When examining for evidence, any suspect evidence should be fully documented (*i.e.,* photos) and the area sampled for histology if possible. Propeller wound measurements should be collected when feasible, but require adequate training.

A necropsy report should be completed if partial or complete necropsies are performed. See Appendix E for an example of a large whale necropsy form. If fishing gear is present, gear should be collected, documented on the Level A and Human Interaction Form, stored in a centralized location or sent to a gear repository and documented using Chain-of-Custody forms if transferred. Check with your RSC and local OLE Officer to determine how gear will be stored. These forms start in the field and when samples are transferred signatures are required by both parties, the original form must remain with the animal/sample. Photo logs are a record of each photograph taken, which helps to identify the photographer and date/time taken. During necropsies, photographs should be taken with a label with ID, date, species, log number, and have a size scale (see examples in Appendix D). With all the data collected, a report should be finalized with the photographs documented, complete recording of all pertinent findings, and all samples collected.

5.2.4 Necropsy Site Location Determination

Most dead large whale cases can be necropsied on-site where the carcass washed ashore. However, depending on where a carcass washes ashore, there are times the carcass needs to be moved due to being in an unsuitable location (*e.g.*, rocky, highly public beach, bad current, tides, etc.) for a necropsy and disposal. The carcass will have to be towed to a new location or can be transported using a flatbed truck, if reasonable. A majority of the time both state, federal, and privately owned properties, the land owners/authorities are eager to remove the carcass and are very cooperative in facilitating the necropsy and disposal (Pugliares-Bonner *et al.* 2007). However, when moving carcasses, avoid traversing and/or damaging protected/sensitive habitats (*e.g.*, seagrass, coral reefs, and oyster reefs). The biggest issue when determining necropsy site location is also thinking about the disposal options.

5.2.4.1 *At Stranding Site*

The stranding site of where the whale washes up needs to be evaluated for particular logistics and so it can help decide whether or not the carcass should be relocated. The site needs to be determined if it is a safe place to perform necropsy. A few questions to think about when determining:

- Can the site be easily accessed from land?
- Is it easy to get equipment or personnel to the site?
- Are the conditions at the site safe for people?

If all these questions are answered yes, then the response plan will continue to be carried out at the current site. If any of these are answered no, the response needs to be evaluated for relocating the carcass to a more suitable location.

5.2.4.2 *Relocating Carcass*

For information relating to relocating a carcass, refer to Section 5.1.6.2 for towing or Section 5.1.6.3 for carcass landing.

5.2.6 Necropsy (Including data collection and sampling)

The necropsy is extremely important; it provides valuable insight into the health of these animals and the data collected may help animals in the future. Once the animal is at the necropsy site, the necropsy will begin with 1) photos and videos, 2) human interaction evaluation (if applicable), 3) morphometrics, 4) blubber thickness, and 5) internal examination, 6) and a completed necropsy report.

1) **Photo and videos:** Make another careful assessment of the external condition, noting swellings, scars, lacerations, contusions and other lesions. If abnormalities are found, take as many photos as needed to document. Work with the dedicated photographer team member to make sure all

needed photos are obtained and help direct the photographers in any additional photos wanting to document. Some species require specific images; for example, a right whale needs images of all callosities, scars, flukes, and flippers; and humpbacks require ventral fluke images. Ensure images are taken of all aspects that will assist with photo-identification of the individual as well as record the standard suite of measurements (Pugliares-Bonner *et al.* 2007).

2) **Human interaction evaluation:** The carcass should be examined for evidence of human interaction (*e.g.*, watercraft wounds/scars/vessel strike, entanglement marks or scars, entanglement gear, etc.). When examining for evidence, any suspect evidence should be fully documented (*i.e.,* photos and measurements) and the area sampled for histology if possible. A Human Interaction form should also be filled out if there is evidence or suspected evidence, and is required for all fresh dead and moderately decomposed animals (codes 2 and 3). Propeller wound measurements should be collected when feasible, but require adequate training.

3) **Morphometrics:** Depending on the location of the carcass, it may be hard to measure total length of the animal. If in a tide, some of the carcass may be underwater so a reasonable "estimate" will have to be obtained. If the carcass is high and dry, the total length can be measured by laying the tape along the carcass in addition to other body measurements.

4) **Blubber thickness:** If the carcass is fresh and not bloated, at minimum measure blubber thickness at the front of the dorsal fin dorsally, midline and ventrally. For right whales (*Eubalaena*) and whales without dorsal fin blubber thickness, it should be determined which side of the animal has the most complete blubber and then should be measured at 9 different landmarks (ear, angle of mount, eye, blowhole, flipper insertion, umbilicus, genital slit, anus, and fluke notch to anus) along the length of the whale, measured around the animal's girth (McLellan *et al.* 2004).

5) **Internal examination:** Report all areas of hemorrhage, edema, swelling and abscessation. Look for focal changes in color pattern and texture of organs. If the carcass is fresh to moderately decomposed take histology samples of identifiable as well as suspect tissues. Proceed logically through the carcass using a gross necropsy report form as a prompt to ensure all organ systems are examined (Pugliares-Bonner *et al.* 2007). Whenever possible, right whale necropsies should follow the protocol and use the datasheets outlined in McLellan *et al.* 2004.

6) **Necropsy report:** Refer to Section 5.2.3. Also for examples for more specific necropsy protocols specific to right whales (*Eubalaena*), refer to the Right Whale Necropsy Protocol report by McLellan *et al.* 2004.

5.2.7 Disposal (depends of euthanasia method)

Depending on the cause of death of the whale determines the options for disposal. If the animal has a cause of death other than euthanasia, it allows for more options due to eliminating the concern for secondary poisioning to scavengers from barbituate drugs. If the whale is euthanized via barbiturates (*e.g.*, pentobarbital), the carcass needs to be disposed of in a responsible manner (*e.g.*, rendering, incineration) that removes the risk of secondary poisoning to scavengers. Certain chemical euthanasia methods, such as saturated KCL solutions in conjunction with heavy sedation, have a low risk of secondary poisioning for scavengers and can be used when remain in place methods of disposal are used (AVMA 2020, Harms *et al.* 2014, Barco *et al.* 2016). For details on specific carcass disposal methods please refer to the Marine Mammal Carcass Disposal Best Practices.

6. Future Needs

6.1 Research

Emergency response-related research is an important aspect of the MMHSRP, as the program continues to work towards improving current rescue, response, assessment, and surveillance activities. Specifically for large whale responses, research into more effective herding or hazing techniques, improved remote administration of medications techniques, as well as propeller wound analysis for large whales is needed. Additionally, collecting real-time data by utilizing carcass tags on floating dead whales could help to improve both drift and hind-case models.

6.2 Tool/Technique Development

Tool development and training projects, such as UAS testing, typically only affect a small number of animals and allow the MMHSRP to test and train responders on a range of new and improved emergency response tools. Other examples of technologies and/or methods that may be tested in these small-scale projects could include improved remote drug delivery devices and drug dosages, and disentanglement, tagging, or deterrents technologies. Watercraft wound analysis tools and techniques are essential to develop as human interaction increases. It is useful to have techniques to help determine watercraft impact information for both live and dead whales to provide guidance on management strategies into ESA and MMPA actions, refine activities implemented for species recovery, identifying threats, and assessing effectiveness of implemented recovery actions Additionally, testing of refloating technologies on dead stranded whales or other surrogates could be useful to determine what techniques may be used in future cases that are candidates for refloating, etc. Contact the MMHSRP for more specific details and requirements for tool/technique development.

6.3 Training

Increased training in current hazing and herding techniques would be beneficial for groups dealing with out of habitat large whales. Once developed, training in remote sedation techniques could be useful for certain areas that deal with difficult entanglements (*e.g.*, mouth). Continued training in large whale euthanasia techniques (including landmarks, equipment and drug dosages) is needed to expand veterinarians and trained biologists in this technique. This could be through virtual training, workshops or "hands-on" during necropsy events. Continued training in large whale necropsy techniques (including limited and full as well as with or without heavy equipment) is needed to increase capacity and train the next generation of necropsy team leaders. This could be through virtual training, workshops or "hands-on" during necropsy events. Consistent wound analysis training is needed to increase the Network's knowledge gap and capacity on performing accurate analysis. This could be through virtual training along with required "hands-on" training during necropsy events and/or workshops.

7. Acknowledgements

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9. Appendix A: Example Incident Action Plan (IAP)

Incident Briefing (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated:
Any whale		Date: *06/25/20* Time: *12:00*

4. Map/Sketch (include sketch, showing the total area of operations, the incident site/area, impacted and threatened areas, overflight results, trajectories, impacted shorelines, or other graphics depicting situational status and resource assignment):

5. Situation Summary (for briefings or transfer of command):

6. Prepared by:	Position Title:	Signature:
ICS 201, Page 3	Date/Time:	

Incident Briefing (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated:
Any whale		Date: *06/25/20* Time: *12:00*

7. Current and Planned Objectives:
1. Ensure the safety of the public and responders in accordance with established protocols;
2. Deploy resources to document the animal location, condition and attach bouy to motior movement.
3. Secure landing location to conduct necropsy and the required equipment to tow animal to landing site.
4. Compile a team to reciveven the animal at the landing site, secure it to land and collect initial Level A data.
5. Once animal is secured conduct necropsy and dispose of animal in accordance with established protocols.
6. Provide timely and accurate information and updates to agencies involved, the public and media.

8. Current and Planned Actions, Strategies, and Tactics:

Time:	Actions:
	Notify local stranding network partner, carcass documentation, id landing site, establish ICS structure and positions
	Coordinate with local assets to confirm location, document animal, attach buoy and tow animal to landing site
	Deploy team to receive tha animal being towed and begin initial examination
	Deploy Necropsy NTL and team to conduct necropsy in accordance with accepted protocols.
	Develop a media/outreach strategy to provide updates and information to media and the public

6. Prepared by: *Rob DiGiovanni* Position Title: *IC* Signature: ______

ICS 201, Page 3 Date/Time: ______

Incident Briefing (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated:
Any whale		Date: *06/25/20* Time: *12:00*

9. Current Organization (fill in additional organization as appropriate)**:**

Incident Commander(s)

Liaison Officer

Safety Officer

Public Information Officer
NOAA PIO

Planning Section Chief

Operations Section Chief

Finance/Administration Section Chief

Logistics Section Chief

Aerial Survey Group

Necropsy group

On Water Recovery Group

Land Recovery Group

Division or Group

Division or Group

6. Prepared by: *Rob DiGiovanni*	Position Title: *IC*	Signature:
ICS 201, Page 3	Date/Time:	

Incident Briefing (ICS 201)

1. Incident Name:	2. Incident Number:	3. Date/Time Initiated:
Any whale		Date: *06/25/20* Time: *******

10. Resources Summary:

Resource	Resource Identifier	Date/Time Ordered	ETA	Arrived	Notes (location/assignment/status)
Incident Commander	IC	06/25/2020 0800	1300	☐	
Operation section	OCS	06/25/2020 0800	1300	☐	
Logistic section chief	LSC	06/25/2020 0800	1300	☐	
Public info officer	PIO	06/25/2020 0800	1300	☐	
Liaison officer	LO	06/25/2020 0800	1300	☐	
Safety officer	SO	06/25/2020 0800	1300	☐	
Plannig section chief	PSC	06/25/2020 0800	1300	☐	
Aerial Survey team				☐	
On water recovery team				☐	
Land recovery team				☐	
NTL				☐	
Necropsy team				☐	
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6. Prepared by:	*Rob DiGiovanni*	Position Title: *IC*	Signature:
ICS 201, Page 3		Date/Time:	

10. Appendix B: Example Large Whale Supportive Care Equipment List

Item	# per kit
Action Packer	1
Sheets	4 to 6
Towels	4
Zinc Oxide	2
5-gallon Buckets	4
Collapsible Shovel	1
Helmets	2
Welders	2
Life Vest	2
Nitrile Powder Free Gloves (med and large)	2
Eye Protection	2
Hand Sanitizer (large bottle)	1
Sample jar for parasites/skin biopsy	4
Sample tubes (fecal sample)	5
Sterile petri dish - blow sample	Pack of 5
Paint Stick	2
Pump sprayer	1
16x20 tarp (in lieu of tent)	2
Measuring Tape 100 ft	1
Small Ruler (wounds)	1

Stakes (perimeter)	1 pack of 12
Rebar stake and rope	2
Carabiners	2
Mallet	1
Sharpie	2
Monitoring sheet	5
Reflex testing instructions and data sheet	5
Laminated ID card with scale (write in rain)	2
Dry erase marker	2
Protocol	1

11. Appendix C: Example Free Swimming Whale Assessment and Monitoring Datasheet

Marine Mammal Rescue and Research
Free-swimming Whale Assessment and Monitoring Datasheet

IFAW

Whale ID: ________________ IFAW#: ________________ **Date:** __________________________ **Location:** _
____

Response Vessel:________ **Examiner:** _______________ **Recorder:** ________**_Other Responders on Vessel:**_________
_____**UAV used?** Y N

Species: *M. novaengliae* *E. glacialis* *B. physalus* *B. acutorostrata* *B. borealis* **Estimated Length:**______ft
Age Class: C J SA A CBD

Est. Str. Length: ___________**(ft)** (**Method:** compared to vessel / photogrammetry / other) **Est. Weight:** ______________
(kg) **Sex:** F M CBD

Body Condition: 1 (emaciated) 2 (thin) 3 (slightly thin) 4 (mesomorphic) 5 (robust) **BCS Notes:**
____

Skin Condition: Excellent Good Fair Poor N/E **Cyamid Coverage:** mild moderate severe N/E
Cyamid color:____________

Wound Location (if present): Head Mouth Flipper (R L) Body Peduncle Flukes **star locations with associated wounds and describe below*

Wound Description:
____

Initial Time on An [ ] [ ] **Animal:**

Time of Surfacing or Activity/ Procedure (HH:MM:SS)	**Resps / Surfacing**	**Resp Rate /5 minutes**	**Respiratory Quality**	**Response to Vessel** (evasive (E) / approachable (A) / No Response NR)	**Swim Direction** (with respect to vessel)	**Swim Speed** (est. in knots or – fast, moderate, slow, stopped)	**Time of Dive** (HH:MM:SS)	**Comments / Activity / Procedure** **Whale activity:** At surface (S)/ just below surface (SS)/at depth (D), floating (F)/ logging (L) /actively swimming (AS) / slowly swimming (SS), feeding (FE), socializing (SZ), fluke slapping (FS), pec slapping (PS). **Procedures:** close vessel approach (CA), UAV flying, other

Time of Surfacing or Activity/ Procedure (HH:MM:SS)	**Resps / Surfacing**	**Resp Rate /5 minutes**	**Respiratory Quality**	**Response to Vessel** (evasive (E) / approachable (A) / No Response NR)	**Swim Direction** (with respect to vessel)	**Swim Speed** (est. in knots or – fast, moderate, slow, stopped)	**Time of Dive** (HH:MM:SS)	**Activity / Procedure Notes** Whale activity: At surface (S)/ just below surface (SS)/at depth (D), floating (F)/ logging (L) /actively swimming (AS) / slowly swimming (SS), feeding (FE), socializing (SZ), fluke slapping (FS), pec slapping (PS). Procedures: close vessel approach (CA), UAV flying, other.

12. Appendix D: Examples of Photo and Ruler Sheet

Photo and ruler sheets/labels are used when taking photographs. When using these, it is important to make sure it is properly calibrated before printing for use. For larger structures and/or animals, especially in the field, Example 2 sheet is not useful when photographing due to lack of visibility of the tiny lines. A proper photo scale, similar to Example 1, with large black and white bars should be used on anything other than close-ups or macro photography.

Example 1:

Example 2:

Revised May 15, 2014

Photo Identifier:

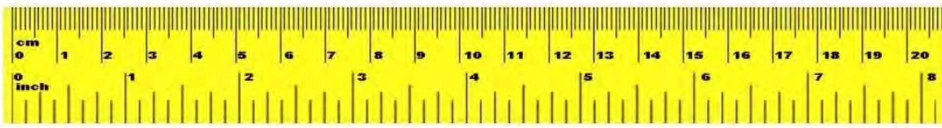
(Please cut this tool out and use it as a scale and identifier for photographs you take)

Animal ID#(s): **Sex:** **Age class:**

Stranding Location:

Necropsy date:

Prosector:



13. Appendix E: Example Large Whale Necropsy and Sample List Datasheet

This is an example datasheet for large whale necropsies. Within the datasheet it includes a sample collection list. The list is an example and will depend upon species, UME, etc. as different samples may need to be collected.

LARGE WHALE NECROPSY FORM Examination Date & Time:
TMMC Field ID #: Initial Observation Date:
Other ID No.s: Form Completed By:
Common Name: Exam Participants:
Scientific Name: Location :
Age Class: Sex: Lat and Long (DD):
State of Decomp: Total Length (cm):

*** Photographs: *Include lateral views of dorsal ridge (both sides) and fluke edges for photo ID.*

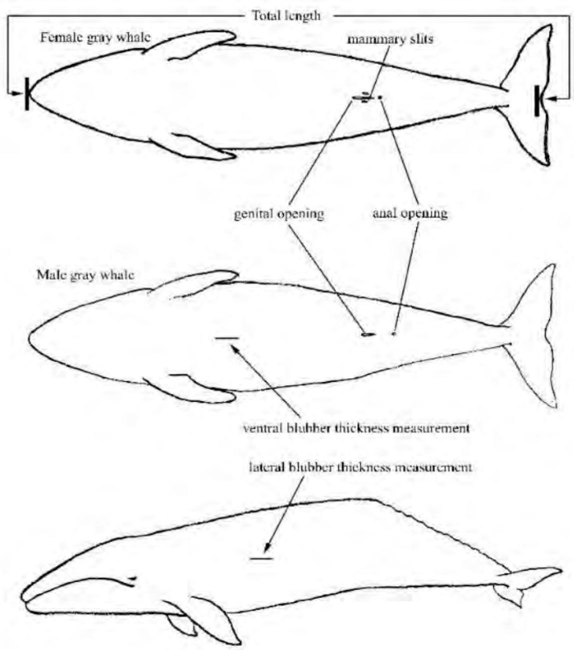
*** Check dorsum for potential tag sites, if any, photograph and sample for histology: No tags observed
History prior to necropsy:
External Nutritional Condition: (*Describe nuchal crest, scapula/ spine visibility; photo lat & rostral views)*

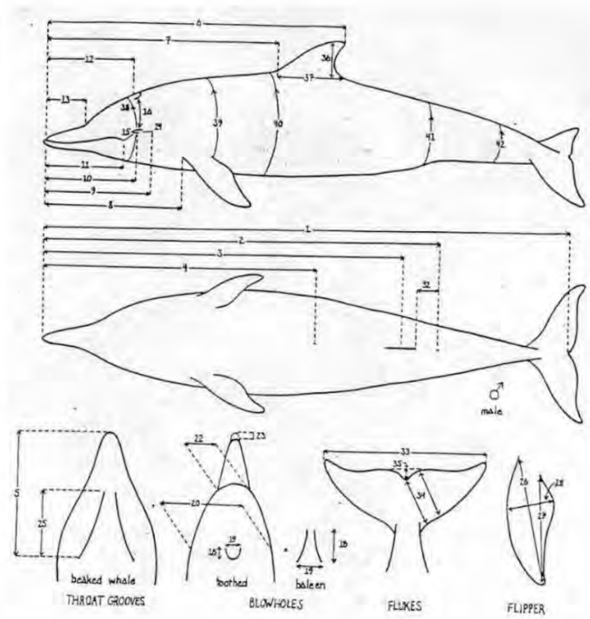
Any unusual smell noted?
External wounds: (*Describe, draw, photo & collect labeled histo samples).* **Signs of HI?**

Musculoskeletal system:
Respiratory System:
Gastrointestinal system:
Liver:
Circulatory system:
Urinary system:
Reproductive tract:
Distribution of internal fat: (*Describe and photograph)*
Subcutaneous: Mesenteric:
Omental: Perirenal:
Other: N
Stomach contents: (*weight, texture, color, smell*):
Intestinal contents (*texture, smell*):
Parasites External:
Internal:

Preliminary cause of death:

Topography	Morphology	Etiology





MEASUREMENTS (specify units:_______)

1. Total length			26. Flipper length, anterior		
2. Snout to anus			27. Flipper length, posterior		
3. Snout to genital slit.			28. Flipper width, maximum		
4. Snout to umbilicus			29. Mammary slit length	R	L
8. Snout to flipper			Number of mammary slits.	R	L
9. Snout to ear			Slit length:	Genital	Anal
10. Snout to eye.			32. Perineal length (males)		
11. Snout to gape			33. Fluke width		
12. Snout to blowholes.			34. Fluke depth at	lobe	notch
14.Eye to ear			38. Girth at eye		
15. Eye to gape			39. Girth at axilla... (half)		
16 Eye to blowhole edge (L/R)	L	R	40. Maximum girth..(half).		
18. Blowhole	length	width	41. Girth at anus.....(half)..		
19. Diameter ear opening			42. Girth midway anus to notch.		
20. Head diameter at eyes			43.Height midway anus to notch		
21. Length of eye opening			44. Thickness midway anus to notch		
22. Rostral width at melon apex			Blubber thickness at axilla:		
			Dorsal	Lateral	Ventral

Histology Samples: (*bold if taken*)

Lung	Stomachs	Kidney	Thyroid	Gonad	Liver
Trachea	Duodenum	Ureter	Eye	Ileum	Lymph node:
Heart	Muscle	Urethra	Vagina	Cervix	Thymus
Aorta	Fat: _______	Urinary Bladder	Uterus	Tonsil	Tongue
Pulmonary artery	Blubber	Mammary Gland	Colon	Pancreas	Prepuce/ Penis
Esophagus	Brain	Spinal cord	Skin		

Sample	**Storage**	**# Samples needed**	**# Samples collected**	**Project**
Tongue ulcer, lymph node, lung, or any abnormal tissue (paired with histo)	Whirlpak, -80º C	1 each		Infectious Archive
Liver	4 cm^3 in whirlpak, -80º C	2		Infectious Archive
Kidney	4 cm^3 in whirlpak, -80º C	2		Infectious Archive
Urine	Cryovial, -80º C	2		Biotoxin concentration
Feces	Cryovial, -80º C	2		Biotoxin concentration
Stomach contents	Cryovial, -80º C	2		Biotoxin concentration
Aqueous humor	Cryovial, -80	1		Infectious Archive
Skin/ muscle	DMSO, -20	1		SWFSC: cetacean genetics
Skin	Whirlpak, -80º C	2		Archive
Blubber 5cm x 5cm x full thickness with skin (Collect from lat & dorsal measurement site. Trim off dorsal/right, cranial corner to mark orientation)	Whirlpak, -80º C	2		Infectious Archive
Blubber 5cm x 5cm x full thickness with skin (Collect from lat & dorsal measurement site. Trim off dorsal/right, cranial corner to mark orientation)	Teflon, -20º C	2		Toxicology
Pelvic Bones Bulla	Ziploc, -20º C	2 1		CAS: museum
Ear plug, Bulla, large plate of baleen down to the gumline and 50 grams of blubber (try to get epidermis to muscle interface or aliquot from mid layer) **get anything you can**	Ziploc, -80º C	1 each		Trumble: Life history
Whole Eye	Formalin	1		Murphy:UCD:Sclera thickness
Lens	Whirlpak	1		TMMC: Aging
Parasites	Any, in salt water in bag: Transfer to 70% ethanol	Any		Williams: NMLC: parasitic disease
Baleen, longest plate	Trash bag, -20º C	1		Jacobsen: HSU:mysticete physiology
Baleen Plates Humpback	Trash bag -20º C	5		Pierson:SF Whaletours: Education
Baleen Plates Blue Whale	Trash bag -20º C	5		Pierson:SF Whaletours: Education
Mandible	Trash bag -20º C	1		Pierson:SF Whaletours: Education
Pennella	Any Species (see protocol), -20º C	1-2		Alps: CICRU: Pennella biology

Throat Groves (see protocol)	Trash bag	Any		Will Gough
Stomach contents	Vials provided	1 kg per gut region		Matthew Savoca
Blubber/skin	Whirl pac	10 grams		Matthew Savoca
Small rib	Trashbag	1 each		Lauren Rust
Blubber, liver, lung, gonads	Ziplock	1 each		Godard: Texas Tech: mysticete hormones

*** CHECK CURRENT REQUESTS: HARD PARTS AND APPROVED TISSUE SAMPLES – RECORD ON BACK OF FORM

14. Appendix F: Large Whale Necropsy Team Leader Duties, Categories, and Qualifications

Introduction

The Large Whale Necropsy Team Leader (NTL) is NMFS approved and responsible for all aspects of the large whale necropsy including conducting the necropsy; ensuring NMFS necropsy protocols are followed; collecting samples and recording data; photo-documenting the animal; and writing the gross necropsy report (and reviewing case reports for right whales and other whales, as needed). For non-ESA large whales (*e.g.,* gray whales, humpback whales), the NTL may be someone designated by the Regional Stranding Coordinator (RSC) with the skill to lead and conduct the necropsy (the individual must be familiar with identification of signs of human interaction) and write the gross necropsy report. For ESA species, and especially for North Atlantic right whales, the NTLs will be determined and appointed, according to the criteria below, by the Regional Stranding Coordinator (RSC) and Marine Mammal Health and Stranding Response Program (MMHSRP) Headquarters Team along with input from existing ESA species NTLs. All ESA large whale responses should be conducted under the MMHSRP MMPA/ESA Permit and NTLs that conduct ESA necropsies on a regular basis should be covered with a co-investigator letter under the MMHSRP MMPA/ESA permit. These co-investigator letters are issued by the MMHSRP Headquarters Team. During a response the NTL reports to the Operations Section Chief under the ICS structure.

NTL Levels

1) Apprentice NTL
2) Non-ESA Species NTL
3) ESA Species NTL

1. Apprentice NTL

The Apprentice NTL assists a Non-ESA NTL or ESA NTL during a large whale stranding response and necropsy. During the necropsy, the Apprentice NTL may be a cutter, sample collector, data recorder, photographer, or perform other duties as assigned.

<u>Pre-requisite Experience & Knowledge:</u>

- The candidate must regularly lead or have led small cetacean/marine mammal necropsies (10-20 per year, or more than fifty total) and be familiar with the protocols for identifying signs of human interaction.
- All candidates for the Apprentice NTL should be knowledgeable in large whale ecology and cetacean anatomy, including the skeletal system, central nervous system, reproductive systems, major vessels, and lymph nodes.
- In areas that use heavy equipment, the Apprentice NTL should have a basic working knowledge of large equipment and especially the safe operating loads of many differing types of line, chain and wire rope.

Physical Requirements and Time Commitment:

- Apprentice NTLs must recognize that large whale necropsies are physically strenuous and may result in exposure to zoonotic agents. Because immune compromised individuals have higher susceptibility to zoonotic diseases, it is required that all candidates for Apprentice NTL be physically fit and in good health.
- The Apprentice NTL must be familiar with necropsy safety precautions and personal protective equipment, and have access to gear for extreme weather conditions.
- The Apprentice NTL must be affiliated with a National Stranding Network organization. This qualification can be waived with recommendations from Stranding Network organizations or RSC (*e.g.,* local veterinarian, whale biologist).
- The Apprentice NTL must be familiar with, and willing to work with and follow NMFS sampling protocols. The candidate must also be willing to work in conjunction with, respect the authority of, and assist local Stranding Network organizations.
- The Apprentice NTL must have an interest in becoming a NTL and have previously attended at least three large whale necropsies/stranding events.
- The Apprentice NTL must be available to attend up to three large whale necropsies per year, with 24 to 48 hours' notice, and write necropsy reports for cetaceans/marine mammals that they have necropsied.
- The Apprentice NTL must acknowledge that NTL responsibilities are very time consuming and can extend for a considerable time after the necropsy is finished. Therefore, the Apprentice NTL must have approval from his/her institution for such a time commitment.

Advancement to Non-ESA NTL:

- Apprentice NTLs may be advanced to becoming a Non-ESA NTL after meeting the criteria outlined below, being recommended by a Non-ESA or ESA NTL to NMFS, and after subsequent approval by the NMFS RSC and MMHSRP Headquarters Staff.

2. Non-ESA NTL

For non-ESA large whale (*e.g.,* gray whales, humpback whales) responses, the Non-ESA NTL oversees all aspects of the necropsy and data collection, including: conducting and assigning tasks during the necropsy; ensuring NMFS necropsy protocols are followed; sample collection; gear collection (if applicable); photo-documentation; writing the draft and final gross necropsy report and case report; and sample dissemination and tracking, including following chain of custody procedures, if applicable.

- The Non-ESA NTL reports to the Operations Section Chief or the Incident Commander if there is no Operations Section Chief.
- The Non-ESA NTL oversees technical specialists (*i.e.,* personnel with specialized skills or knowledge, such as veterinarians or pathologists, cutters, the sample coordinator, photographers, and data recorder).
- In areas that use heavy equipment (*e.g.*, certain areas along the Atlantic coast), the Non-ESA NTL also uses and/or directs operators of heavy machinery in order to coordinate the cutting and disarticulation of the carcass with the sample collection.
- Non-ESA NTLs may lead necropsies on all species of large whales except for ESA species. Occasionally NMFS may request a Non-ESA NTL to lead an ESA species necropsy, especially if the area is remote or the carcass condition is advanced.

<u>Pre-requisite Experience & Knowledge</u>:

- The Non-ESA NTL must have all of the qualifications listed for an Apprentice NTL.
- The Non-ESA NTL must have assisted during at least ten large whale necropsies/stranding events, including writing reports and sample dissemination (to the satisfaction of NMFS, other NTLs, and contracted pathologists).
- The Non-ESA NTL must have been an Apprentice NTL with a Non-ESA NTL or ESA NTL during at least two of those large whale necropsies.
- The Non-ESA NTL must demonstrate proficiency with protocols for identifying signs of human interaction, including identifying signs of fishery interaction, signs of vessel strike, and proficiency at measuring propeller wounds.

- In areas where heavy equipment is normally used (*e.g.*, certain areas along the Atlantic coast), a Non-ESA NTL must have worked with heavy equipment during at least three stranding events and directed heavy equipment use during at least one stranding event.

Willingness to Train:

- Non-ESA NTL will be asked to train Apprentice NTLs.
- NMFS Regional personnel, in collaboration with current NTLs, will identify interested, potential apprentice NTLs and provide training opportunities for these individuals at large whale necropsies.

Advancement to ESA NTL:

- Non-ESA NTLs may advance to an ESA NTL after meeting the criteria outlined below, recommendation and review by other ESA NTLs, and after subsequent approval by the NMFS RSC and MMHSRP Headquarters Staff.

3. ESA NTL

ESA NTLs have the same roles and responsibilities as Non-ESA NTLs, but may also perform this role during responses to ESA whales (*e.g.*, Bryde's, Fin, etc.), including North Atlantic right whale stranding responses.

Pre-requisite Experience & Knowledge:

- The ESA NTL must be a current Non-ESA NTL, and must have led at least twenty-five large whale necropsies on multiple species in multiple environmental conditions.
- If the ESA NTL works on the east coast or plans to necropsy North Atlantic right whales, they should also have experience assisting with or leading at least seven North Atlantic right whale necropsies. These seven necropsies can be part of the twenty-five necropsies listed above.
- The ESA NTL must also have written necropsy reports and coordinated sample dissemination (to the satisfaction of recommending ESA NTLs, NMFS, and contracted pathologists).

Willingness to Train:

- ESA NTLs will be asked to train Apprentice NTLs and Non-ESA NTLs.

15. Appendix G: Live Large Whale Strandings Q& A

West Coast Region
2019-2020

Q: Why do whales strand?
Large whales may strand alive for a number of reasons, including complex topographic and oceanographic conditions, contaminants, weather conditions, natural toxins such as domoic acid or saxitoxin poisoning, disease, emaciation or malnourishment, and human caused injuries. Each case is different and the West Coast Marine Mammal Stranding Network responds to all large whale cases to better understand what factors may have contributed to the stranding.

Q: Are whale populations healthy on the West Coast of the United States?
After 45 years of protection under the Marine Mammal Protection Act many whale populations are recovering and are reaching healthy population levels. Gray whales are common along the West Coast and were removed from the endangered species list in 1994. Six species of whales found along the West Coast are currently listed under the Endangered Species Act including the Blue whale, Fin whale, Humpback whale (some distinct population segments have been recently delisted), Northern Pacific Right Whale, Sei whale and the Southern Resident Killer whale.

Q: How common is it for a large whale to strand alive?
In the past 12 years (2006-2017) 100 large whales stranded alive in the United States. Of these only twelve were returned to the sea, seven of which were self-released and only one Stranding Network response can be confirmed as a successful rescue due to post-release monitoring with a telemetry tag. A majority of these animals died onshore due to underlying health concerns and the negative gravitational effects from being on the beach. In 2019, the West Coast Marine Mammal Stranding Network humanely euthanized two Humpback whales after they did not self- release after multiple tidal cycles and after health assessments were performed.

Q: Can large whales be saved when they strand?
Every large whale stranding event is unique and poses different challenges. Human safety is put first in every case when considering how to respond. When a whale strands onshore a primary concern is that gravitational effects (increased pressure from being out of the water) can lead to respiratory and circulatory collapse (Geraci & Lounsbury 2005). The animal can also experience severe skin blistering, live animal scavenging, hyperthermia, distress and serious injury. The West Coast Marine Mammal Stranding Network has used several supportive care methods to address some of these concerns during past live whale strandings, such as using sheets, water buckets and sprayers to keep whales wet and cool while waiting for the tide to rise or when considering other options, including euthanasia. There may be instances when the whale cannot be safely accessed by the response team so monitoring the whales' condition from a distance may be required.

Q: What are the limitations to responding to a live large whale stranding?
Some of the challenges and limitations include; logistics particularly for remote locations, environmental conditions such as weather and wave conditions, animal size and behavior, public interest and busy locations, resource limitations, and disposal of the carcass if the animal expires. Many considerations and risks need to be evaluated to guide a response such as the welfare of the animal, personnel safety, and the availability of trained and licensed individuals.

Q: Why can't a whale be pulled off of the beach?
Moving large whales has serious safety risks for the whale and for the Network responders involved. Trying to pull or push a large whale from the beach can also be very resource intensive as specialized equipment is required, which may or may not be readily available within the critical 24-36 hours after the stranding. Towing live whales by the tail can result in seriously injuring or dislocating the tail, causing paralysis and is therefore considered inhumane. While there are YouTube videos of "successful" whale re-floating which generally involve putting a rope or cable around the peduncle/tail of the animal and pulling it off the beach/sandbar with a boat, based on input from veterinarians and discussions by the International Whaling Commission this action is likely to cause pain and physical harm to the animal. It can injure tail muscles reducing the ability of the whale to swim, feed, and avoid predators. In the worst case scenario this process could break the spinal cord which would then paralyze the animal. Creating a harness to put around the pectoral flippers to pull the animal forward or better position the animal onshore would be a physiologically better alternative but this method still has multiple complications; changing the position of the whale onshore is difficult, the harness needs to be safely released so the animal is not entangled, and this quick release harness is under development and will need to undergo testing before being utilized on the beach. Most importantly, this method should only be considered for an animal in good overall condition and when post-release monitoring is available to determine the success of the response efforts.

Q: Can the area around the animal be dredged so it can swim away?
Dredging to remove sediment or sand around a stranded whale has not been tried very often due to resource limitations and potential environmental impacts/approval process. Dredging would require availability of an appropriate vessel as well as the necessary authorization to be given quickly in an emergency situation, within 24 hours if possible. Dredging to help one animal can also result in significant unintended environmental consequences and may negatively impact other species in the area. Anecdotally, previous attempts to dredge the area around a whale have ended with the whale rolling into the dredged "hole" and then, unable to right itself to breathe, it drowned.

Q: When does the Network consider euthanasia?
If a stranded large whale is in overall poor condition (emaciated, malnourished, severe internal or external injuries, dependent calf with no adult present) and remains onshore after 1-2 tidal cycles euthanasia will be considered. This will be discussed on a case by case basis and the decision is made by the NOAA Regional Stranding Coordinator in consultation with the local Network group, attending veterinarian, and Marine Mammal Health and Stranding Response Program (MMHSRP) staff. This does not mean that euthanasia will be considered in every case, in some areas the location and limited resources may prevent us from intervening safely or considering euthanasia. The weight of a large whale onshore can result in pressure necrosis on the underlying muscles and their lungs can collapse when a whale is not supported by water. Even if a whale was able to free itself during a subsequent incoming tide it would not likely survive the stranding following an extended period out of the water. Qualified veterinarians may recommend that euthanasia is the most humane option for the whale based on the condition of the animal, the circumstances, and available resources. If a decision is made to euthanize a large whale, the procedure will be conducted by qualified personnel under the authorization of the MMHSRP permit.

Q: What means of euthanasia are available for large whales?
Many options for humanely euthanizing animals have been considered in order to weigh risks with animal welfare concerns. Currently the preferred method for euthanasia of large whales is through a dose of potassium chloride (KCl). This has been used successfully in several cases with little toxicity risk to other animals that may scavenge the carcass after euthanasia allowing for natural carcass disposal, and at a fairly

reasonable cost for resource limited Networks. This method involves deep sedation so the animal is fully unconscious or 'asleep' before administering the potassium chloride. The location and condition of the animal in shallow water or if fully dry stranded may impact the ability of a Network veterinarian to safely approach the whale to administer the solution.

Q: Will the whale be in pain? Will the whale react? How long will it take?
The whale is first given a high dose of a strong sedative and an analgesic (painkiller) before being given the dose of potassium chloride to stop the heart. The initial doses are given with long, skinny needles that do not cause much pain, similar to a vaccine shot. The potassium chloride is then delivered through a large intracardiac needle that reaches the heart. As part of that process, the veterinarian needs to get backflow from the needle to make sure it is in the right place. This process may cause the whale to bleed at the injection site, which can look much worse when a relatively small amount of blood mixes with water. The whale may react by gaping its mouth or by raising the pectoral flippers or flukes which is known as the "last swim". This may be difficult to witness but if euthanasia is being administered, qualified veterinarians have determined it is the most humane option for the whale. The time of death varies for each case; sedation to death can range from 48 minutes to 2 hours and 18 minutes. From the time the potassium chloride is administered to death ranges from 4 minutes to 10 minutes. The potassium chloride works by inhibiting the ability of the heart muscles to contract and effectively stops the heart when administered.

Q: What are the options for responding to a free swimming large whale that has an injury, unusual behavior, or is debilitated?
There are very few options for treating a free swimming large whale. Many times treatment with medication such as antibiotics cannot address the underlying reason of why the animal is debilitated or injured. The West Coast Marine Mammal Stranding Network can consider administering antibiotics on a case by case basis if the treatment could lead to the improved condition of the whale. Large free swimming whales cannot be humanely euthanized at sea, the tools to do so safely simply do not exist at this point in time.

Q: What can be learned from live large whale strandings?
Every year there are thousands of reports of stranded marine mammals (this includes whales, dolphins, porpoises, seals and sea lions) throughout the West Coast Region. Each case can hold important information about the species which can contribute to scientific research or public education. The West Coast Marine Mammal Stranding Network conducts necropsies on large whales that have stranded to better understand the cause of death by collecting a range of samples for analysis. The analysis of these samples may take weeks or even months, but as results become available we can share those results with members of the public or the media if requested. The necropsy is extremely important; it provides valuable insight into the health of these animals and the data collected may help animals in the future.
For more information on major findings from research related to stranded animals on the West Coast, please visit:
http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/stranding_network_publications.html

Q: What is the West Coast Marine Mammal Stranding Network?
The National Oceanic and Atmospheric Administration (NOAA) West Coast Marine Mammal Stranding Network was established in the early 1990's under the Marine Mammal Protection Act (MMPA). Members of the network respond to marine mammal stranding events along the California, Oregon, and Washington coasts and is part of a nationwide network. To learn more about the West Coast Marine Mammal Stranding

Network:
http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/stranding_network.html

Q: How are the Network responders authorized?
The network is composed of cooperating scientific investigators and institutions, volunteer networks and individuals. Other organizations also involved are wildlife and fisheries agencies and state and federal law enforcement. Each group is authorized by NOAA Fisheries to respond to marine mammal strandings within a specific geographic response area through a Stranding Agreement or Stranding Rehabilitation Agreement. The Marine Mammal Protection Act authorizes local or State government officials to respond in the normal course of their duties under 50 CFR 216.22.

Q: What role does NOAA play?
NOAA's Marine Mammal Health and Stranding Response Program was formalized by the 1992 Amendments to the Marine Mammal Protection Act and NOAA's National Marine Fisheries Service was designated as the lead agency to coordinate related activities. Each Region (Alaska, Pacific Islands, West Coast, Southeast, and Greater Atlantic) has a Regional Stranding Coordinator that oversees the Network responders. For contact information for your Regional Stranding Coordinator please visit: http://www.nmfs.noaa.gov/pr/health/coordinators.html

Appendix XVII

NMFS Standards for Rehabilitation Facilities

Executive Summary

The goal of this document is to set MINIMUM facility, husbandry, and veterinary standards for rehabilitating marine mammals (cetaceans and pinnipeds, excluding walrus) under the jurisdiction of the National Marine Fisheries Service (NMFS) in the United States. Likewise some of the standards put forth in this document are based on the U.S. Department of Agriculture, Animal and Plant Health Inspection Service's Animal Welfare Act regulations which define minimum standards for permanent managed care marine mammals. However, there are differences between the two documents in that NMFS Rehabilitation Standards were developed for temporary care of ill or injured marine mammals.

STANDARDS FOR REHABILITATION FACILITIES - TABLE OF CONTENTS

1 Introduction

As part of the National Marine Fisheries Service (NMFS) Stranding Agreements, NMFS will require that all rehabilitation facilities for ceteaceans and pinnipeds, excluding walrus, meet the MINIMUM STANDARDS presented in this document. The goal of this document is to set MINIMUM facility, husbandry, and veterinary standards for rehabilitating marine mammals in order to meet the prescribed NMFS and FWS Standards for Release. Likewise some of the standards put forth in this document are based on the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) Animal Welfare Act (AWA) regulations which define minimum standards for permanent managed care marine mammals. However, there are differences between the two documents in that NMFS standards were developed for temporary care of ill or injured marine mammals. RECOMMENDED STANDARDS are included in some sections, and consist of facility design and operational suggestions for optimizing the rehabilitation. Meeting or exceeding the RECOMMENDED STANDARDS may be considered a goal to strive towards when upgrading existing, or designing new facilities or protocols.

It is the intent of NMFS to provide a reasonable process for facilities to be upgraded to meet the MINIMUM STANDARDS set forth in this document. Substandard facilities may be improved using funds that may be available through the John H. Prescott Rescue Assistance Grant Program (Prescott Grant). Likewise Prescott Grant funds may also be used to improve facilities that meet MINIMUM STANDARDS with the goal to achieve or exceed the RECOMMENDED STANDARDS. Health and safety practices are highly stressed in this document. NMFS expects all personnel and volunteers will be trained to the highest level of responsibility they are assigned. Rehabilitation facilities are encouraged to comply with Occupational Safety and Health Administration regulations.

Newly constructed facilities must meet the MINIMUM STANDARDS and must be inspected by NMFS prior to admitting patients. Certain facilities (*e.g.,* Short-term Holding and Emergency Temporary Holding Facilities) do not need to meet all the MINIMUM STANDARDS, please see Sections 6 and 7 for details on these exemptions.

1.1 Purpose

The purpose of rehabilitation is to provide humane care for ill or injured marine mammals and to optimize releasing the animals back to the wild. As mandated by Title IV Section 402 (a) of the Marine Mammal Protection Act (MMPA), NMFS has developed guidance and criteria for release based on optimizing the chances for survival and minimizing the risk to wild populations (NMFS and FWS Standards for Release). These rehabilitation facility standards have been developed to achieve the goals set forth by the NMFS and FWS Standards for Release.

This document is organized with the main section (Section 2) that provides standards for any marine mammal rehabilitation facility, regardless of taxa, that works with NMFS trust species (*i.e.,* all cetaceans and pinnipeds except for walrus). Subsequent sections provide taxa-specific differences for cetaceans (Section 3) and pinnipeds (Section 4), as well as standards for those facilities that are providing rehabilitation for Endangered Species Act listed marine mammals (Section 5). The last two sections include exemptions from the MINIMUM STANDARDS for facilities that engage in short-term holding (Section 6), and emergency temporary holding (Section 7). Also included is Appendix A, which is a checklist with each of the MINIMUM STANDARDS for use of facilities in preparation for Facility Inspections, which will be conducted by NMFS on a regular or as needed basis (in-person or virtually).

The following reports may be requested annually by NMFS as required under the NMFS Stranding Agreement or as a part of the Facility Inspections:

- Standard Operating Procedure (SOP) reviews;
- Health and Safety Plan reviews;
- National Oceanic and Atmospheric Administration (NOAA) Form 89864, Office of Management and Budget (OMB) #0648-0178 (Level A Data; Marine Mammal Rehabilitation Disposition Report; Human Interaction Form);
- Case records/summaries for any rehabilitation performed at a facility, including narrative descriptions of the cases as well as spreadsheets of treatments, blood values, etc.

1.2Acknowledgements

These Rehabilitation Standards have been revised from 2009 Standards originally written by Laurie Gage of the USDA Animal and Plant Health Inspection Service Animal Care. We want to thank Dr. Gage for her contributions to the Rehabilitation Standards and Inspection Program over the years. We would also like to thank the many people who contributed information and review of these Standards.

2 Standards for All Rehabilitation Facilities

2.1 Facilities, Housing, and Space

2.1.1 Pool and Pen Construction and Design

Pools can be any shape and should be structurally sound, maintained in good repair, protect animals from injury, contain animals within the facility, and restrict entrance of unwanted animals.

MINIMUM STANDARDS

2.1.1.1 Pools and pens must be constructed of durable, non-toxic, non-corrodible material.
2.1.1.2 Pools and pens must offer ease of cleaning.
2.1.1.3 Pools and pens must offer ease of handling the animals.
2.1.1.4 If netting is used as pen construction material, it must be small enough gauge to prevent entanglement.

FOR SEA PEN LAGOON/BAY FACILITIES ONLY (SP):

2.1.1.5 (SP). Facilities must maintain effective barrier fences extending above the high tide water level, or other appropriate measures, on all sides.
2.1.1.6 (SP). Nets must be sufficiently rigid to prevent entanglement by mammals or fish.
2.1.1.7 (SP). Sea pens must have a second set of perimeter nets at least 10 m from the net pen to prevent direct contact between animals inside the pen in rehabilitation with wild marine mammals.
2.1.1.8 (SP). Sea pens must be located more than 1 km from any major outflow of storm drains or sewage treatment plants. Note: This distance may need to be greater when considering flow direction or current from these outflows.
2.1.1.9 (SP). Sea pens must be placed more than 500m downstream from water intake pipes that bring water into facilities housing marine mammals.
2.1.1.10 (SP). Quarantine sea pens must be placed so that tidal action or underwater currents will not permit water flow between quarantine pens and sea pens housing animals that are further along in rehabilitation or healthy (captive) marine mammals.

2.1.2 Shelter, Shade, and Temperature

Rehabilitation facilities located where there is inclement weather need to provide shelter to rehabilitating animals that may be exposed to extreme heat or cold. Animals held in indoor facilities should be provided with appropriate light and dark photoperiods which mimic actual seasonal conditions.

MINIMUM STANDARDS

2.1.2.1 Means must be available to control the air temperature to facilitate recovery, protecting rehabilitating animals from extremes of heat and cold and preventing discomfort.
2.1.2.2 Holds water temperatures within the normal seasonal habitat temperature range for the species under rehabilitation, unless otherwise authorized by the attending veterinarian in writing.

FOR OUTDOOR FACILITIES (OR THE PORTION OF POOLS/PENS THAT ARE OUTDOORS):

2.1.2.3 Shade structures or shelters must be available to animals to aid thermoregulation on those days when local climatic conditions could compromise the health of the animal.
2.1.2.4 Shade structures (when used) must be large enough to provide shade to at least 25% of the area of the pool/pen at all times of day.

FOR INDOOR FACILITIES (OR THE PORTION OF POOLS/PENS THAT ARE INDOORS):

2.1.2.5 Lighting in indoor facilities should be appropriate for the species and should illuminate the pen/pool during daylight hours.

2.1.2.6 Means must be available to ensure sufficient air turnover to prevent discomfort, reduce potential for transmission of disease, prevent build-up of heat or chemical fumes, and provide a method for bringing fresh air into the facility.

2.1.2.7 There must be sufficient vents or openings to allow movement of air throughout the facility.

RECOMMENDED

- Full spectrum lights or a natural source of lighting for animals housed indoors.
- Removable or adjustable shade structures over pools and pens that are easily cleaned and that provide more natural sunlight to animals that are less active.
- Permanent shade structures over pools and pens for animals that are more active (pre-prelease)
- Shade structures, where necessary, shall be large enough to provide shade to at least 50% of the minimum horizontal dimension (MHD) surface area determined for the species held in the pool. MHD is defined as 7.3 meters (24 feet) or two times the actual length of the largest species housed in the pool, whichever is greater.

2.1.3 Housekeeping

MINIMUM STANDARDS

2.1.3.1 Areas surrounding rehabilitation pools and pens (including decks and walkways) must be kept clean and in good repair.

2.1.3.2 Support buildings and grounds must be kept clean and in good repair.

2.1.3.3 All enclosures must have no sharp projections, edges, or loose objects which may cause trauma or injury to the marine mammals in rehabilitation.

2.1.3.4 Objects introduced as environmental enrichment must be too large to swallow, made of nonporous and cleanable material, frequently disinfected, and not an entanglement hazard.

2.1.3.5 All drains and overflows must have screened covers.

2.1.3.6 Pens and pools must have no holes or gaps larger than ½ the size of the head diameter of the smallest animal housed within.

2.1.4 Pest Control

MINIMUM STANDARDS

2.1.4.1 The facility must maintain a safe and effective program for the control of insects, reptilian, avian, and mammalian pests.

2.1.4.2 Insecticides or other chemical agents for pest control must not be applied in an enclosure housing marine mammals or in a food preparation area, except as authorized in writing by the attending veterinarian.

2.1.4.3 If insecticides or other chemical agents for pest control are applied, all appropriate measures must be taken to prevent direct contact (airborne, waterborne, or solid surface) between the animals and the chemical.

2.1.4.4 Insecticides or other chemical agents for pest control must be stored in properly labeled containers and separated from food preparation and animal feed areas.

2.1.4.5 Post MSDS “right to know” documents for personnel utilizing insecticides/pesticides, or cleaning, water quality, and animal treatment chemicals and drugs.

2.1.5 Sanitation

MINIMUM STANDARDS

2.1.5.1 Animal and food waste must be removed at least once per day from the rehabilitation enclosure areas outside the pool, and more frequently when necessary to prevent contamination.

2.1.5.2 Animal and food particulate waste must be removed from pools at least once per day, and more frequently as necessary to maintain water quality and prevent contamination.

2.1.5.3 Trash and debris must be removed from pens and pools as soon as it is noticed to preclude ingestion or other harm to the animals.

2.1.5.4 Pools and pens must be cleaned and disinfected between patients or patient cohorts (Note: Effective filtration systems provide adequate disinfection for pools).

2.1.5.5 Ensures appropriate disinfectants are mixed to recommended dilutions and are utilized to clean pens, equipment, utensils, and feed receptacles and to place in foot baths. These disinfectants should have both bactericidal and virucidal qualities (https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html).

2.1.5.6 Measures must be taken to prevent animals from coming into direct contact with disinfectants from spray, cleaning hoses, aerosols, or any other method of delivery.

2.1.5.7 Rotates disinfectants on a regular basis to prevent bacterial resistance.

2.1.5.8 Chemical agents for cleaning and sanitizing must be stored in properly labeled containers and located away from food preparation and animal feed areas.

RECOMMENDED

- Coat all pool and haul-out surfaces with a non-porous, non-toxic, non-degradable cleanable material that is able to be disinfected.

2.1.6 Facility Security

MINIMUM STANDARDS

2.1.6.1 The rehabilitation facility must be secured from public access.

2.1.6.2 There must be no opportunities for direct public contact with animals in rehabilitation.

2.1.6.3 Facilities with outdoor enclosures (including net pens) must have a complete perimeter fence of an adequate height and construction to keep out people, domestic animals, wildlife, and pests.

RECOMMENDED

- 24-hour monitoring (may be virtual via cameras and/or alarms) is maintained when animals are present.

2.2 Water Quality

2.2.1 Water Source and Disposal

MINIMUM STANDARDS

2.2.1.1 Fresh water must be available to clean and wash down pens and surrounding areas (e.g., decks and walkways).

2.2.1.2 Wastewater must be discharged in accordance with state and local regulations.

2.2.1.3 Any required documentation (e.g. permits) for wastewater discharge must be maintained and provided to NMFS upon request.

2.2.1.4 Effluent from pens must not be near the water intake.

2.2.2 Water Quality Testing

MINIMUM STANDARDS

FOR ALL SYSTEMS (DUMP AND FILL, CLOSED, SEMI-OPEN, AND OPEN):

2.2.2.1 Clean the rehabilitation pools and pens as often as necessary to maintain proper water quality.
2.2.2.2 Test temperature in all pools at least daily, or whenever heating or cooling water.
2.2.2.3 If chlorine or bromine is used, test chlorine or bromine level in all pools daily.
2.2.2.4 If chlorine is used, maintain total chlorine below 1.5 ppm, where combined chlorine does not exceed 50% total chlorine.
2.2.2.5 If used, other chemical additives should be measured daily and shall not be added in a manner that could cause harm or discomfort to the animals.
2.2.2.6 Record daily measurements that are taken (e.g. temperature, chlorine levels, ozone levels, pH, salinity, etc.).

FOR DUMP AND FILL SYSTEMS ONLY:

2.2.2.7 Drains water from pools daily or as often as necessary to keep the pool water quality within acceptable limits.

FOR CLOSED, SEMI-OPEN OR OPEN SYSTEMS ONLY:

2.2.2.8 Test pH in all pools daily.
2.2.2.9 Maintain pH between 6.5 and 8.5.
2.2.2.10 If ozone is used, measure ozone levels daily.
2.2.2.11 If ozone is used, maintain ozone levels below 0.02 mg/liter.
2.2.2.12 If salt water is used, maintain salinity levels above 24 parts per thousand (ppt) unless a written veterinary plan calls for lower salinity levels, or if the animals are housed in sea pens near their resident range.
2.2.2.13 Measures and records coliform growth in all pools weekly.
2.2.2.14 Total coliform counts do not exceed 500 per 100 ml or a most probable number (MPN) of 1000 coliform bacteria per 100 ml water. Or fecal coliform counts do not exceed 400 per 100 ml.
2.2.2.15 If a single coliform test exceeds the limit, 2 additional tests should be performed within 48 hours and the results averaged OR the pool may be completely or partially refilled and tested again within a week. The results of tests should be recorded.
2.2.2.16 Has separate filtration and water flow systems for pools in quarantine/isolation areas.

FOR CLOSED AND SEMI-OPEN SYSTEMS ONLY:

2.2.2.17 Have a minimum of 2 complete water changes per day to maintain sufficient turnover of water through the filtration system.
2.2.2.18 Water is regularly filtered through appropriate filters (e.g. sand and gravel) to remove particulate matter, and disinfectants (e.g. chlorine, ozone, UV, etc.) are available to be added to eliminate pathogens.

FOR OPEN WATER SEA PENS ONLY:

2.2.2.19 The pen must have a method for moving water (e.g., paddles, pumps, spray devices) that is able to aerate and move water if there is insufficient flow of tides or current through the enclosure with an equivalent of two water changes per day.

2.3 Isolation/Quarantine

2.3.1 General Isolation and Quarantine

MINIMUM STANDARDS

2.3.1.1 All new animals should be admitted into a separate pool, pen or cage that can be isolated with the use of dividers, tarps, or via physical space from other animals. Animals that are admitted in the same 24 hour period may be housed together as a group or cohort.

2.3.1.2 Sufficient space or solid barriers between animal enclosures should be provided to prevent direct contact, including wash down or splash moving from one pool to another, to reduce the possibility of water or airborne disease transmission.

2.3.1.3 Animal care personnel must thoroughly clean and disinfect buckets, hoses, scales, transport equipment, and cleaning equipment to prevent transmission of pathogens via fomites if equipment is used by multiple animals/pens.

2.3.1.4 Foot baths must be placed at the entry and exit to animal areas, and used by all personnel whenever entering or exiting these areas.

2.3.1.5 Foot baths should be changed at least daily.

2.3.1.6 All personnel interacting with animals should use personal protective equipment [e.g. protective clothing (slickers, coveralls, etc.), closed toed shoes, gloves, eye protection and/or face masks].

2.3.1.7 Foot baths, glove baths, and/or other methods should be used to disinfect clothing, wet suits, or exposure suits and footwear between handling animals within the quarantine/isolation area and outside of the quarantine/isolation area.

2.3.1.8 Each animal must be individually identified with a mark or tag upon admission. Note: This may be a temporary mark or tag such as a shave mark or grease pen, but must be sufficient to distinguish between individuals.

2.3.2 Prevention of Disease Transmission

MINIMUM STANDARDS

2.3.2.1 Personal pets must be prohibited from entering the facility and facility grounds, remaining outside the perimeter fence at all times.

2.3.2.2 Personnel in contact with animals in rehabilitation must change contaminated clothing and/or disinfect all equipment prior to leaving the rehabilitation premises.

2.3.2.3 Provide eye flushing stations as used with hazardous materials (HAZMAT) or normal saline bottles to irrigate the eye.

2.3.2.4 Personnel with open wounds should not interact with animals carrying potentially infectious diseases.

2.3.2.5 Train personnel how to recognize symptoms and prevent contracting zoonotic disease.

2.3.2.6 A written health and safety plan(s) is available to all personnel that includes protocols for safely handling all species and sizes of marine mammals cared for at the facility, a list of potential zoonotic diseases, and includes protocols for managing bite wounds.

2.3.3 Biosecurity for Facilities with Species other than Marine Mammals on Site

This includes zoos/aquaria, rehabilitation facilities of other wildlife, etc.

MINIMUM STANDARDS

2.3.3.1 Traffic flow patterns must be established so that personnel working with marine mammals in rehabilitation do not inadvertently travel into other animal areas and vice versa.

2.3.3.2 Established decontamination protocols must be followed before personnel working with marine mammals in rehabilitation enter areas housing other animals.

2.3.3.3 Restrooms, showers, changing rooms, etc. should be established for personnel working with marine mammals in rehabilitation separate from those working with other animals.

2.3.3.4 Food containers (buckets, tubs, tanks, feeding implements, etc.) taken into pools and pens for animals in rehabilitation must be dedicated to stranded animal use and marked or otherwise identified.

2.3.3.5 Food for animals in rehabilitation may be prepared in a central/combined kitchen and then taken into the rehabilitation area. However, containers must be thoroughly disinfected before returning to the shared area.

2.3.4 Evaluation Requirements Prior to Placing Marine Mammals Together

MINIMUM STANDARDS

2.3.4.1 Each animal must have an evaluation by trained personnel that is notated in its medical record before moving animals between pools/pens.

2.3.4.2 Prior to moving an animal out of the intake (isolation/quarantine) area, an evaluation should be conducted, unless waived by veterinary personnel.

2.3.4.3 Prior to moving an animal out of the intake (isolation/quarantine) area, a complete blood count (CBC)/blood chemistries, and other appropriate tests should be obtained, unless waived by the attending veterinarian.

2.3.4.4 Personnel conducting evaluations and making decisions regarding animal pen placement must be familiar with current NMFS recommendations on diseases of concern (e.g., avian influenza, leptospirosis, morbillivirus, etc.) and emerging diseases.

2.3.5 Outbreak Prevention and Control

MINIMUM STANDARDS

2.3.5.1 The facility must have a detailed infection control and outbreak plan that details how infectious disease transmission will be mitigated or contained.

2.3.5.2 The infection control and outbreak plan must address zoonotic pathogens including both airborne and non-airborne pathogens.

2.3.5.3 During an outbreak of an infectious disease, personal protective equipment, equipment, and tools strictly dedicated to the quarantine areas must be used.

2.3.5.4 If the animals are part of a declared Unusual Mortality Event (UME), screening for disease must be in direct coordination with NMFS and the UME investigative team.

2.3.5.5 Personnel must be trained to follow appropriate quarantine protocols.

2.4 Nutrition

2.4.1 Feeding and Diets

MINIMUM STANDARDS

2.4.1.1 Diet composition and frequency must be reviewed by a nutritionist, attending veterinarian, or the animal care supervisor and must be formulated with consideration for age, species, condition, and size of the marine mammals being fed.

2.4.1.2 Animals should be fed a minimum of twice per day, unless directed otherwise in writing by the attending veterinarian.

2.4.1.3 Personnel must be trained to recognize good and bad fish and other seafood (e.g. squid, invertebrates) quality.

2.4.1.4 Animals must receive sufficient vitamin and/or salt supplementation, approved in writing by the attending veterinarian. Note: Veterinary approval could be included as part of a general feeding protocol for the facility.

2.4.1.5 Feeding must only be conducted by qualified, trained personnel.

2.4.1.6 Feeding of rehabilitation animals by members of the public is **strictly** prohibited.

2.4.2 Food Storage, Thawing, and Preparation

"Food items" are defined as fish, invertebrates, and other animal products for consumption by marine mammals in rehabilitation.

MINIMUM STANDARDS

2.4.2.1 Frozen food items must be stored in freezers which are maintained at a maximum temperature of 0°F (-18°C).

2.4.2.2 Food freezers must only contain food items for animal consumption. Human food or frozen specimens must not be placed in the fish freezer.

2.4.2.3 All boxes of food items must be labeled with the date of delivery and must be used within one year of delivery date.

2.4.2.4 Frozen food should be rotated in the freezer so oldest food is fed first.

2.4.2.5 Food items must not be allowed to sit in direct sunlight.

2.4.2.6 Food items should be thawed in the coldest water available.

2.4.2.7 All food items must be fed to the marine mammals within 24 hours of complete thawing

2.4.2.8 All thawed food should be refrigerated.

2.4.2.9 The thawed food items must maintain a cold temperature through feeding and not allowed to reach room temperature. Food items may be iced or refrigerated for a reasonable time before feeding (exact time will vary depending on ambient temperature)

2.4.2.10 Prepared formula/gruel must be fed immediately or refrigerated and fed within 24 hours of preparation.

2.4.2.11 Once heated to an appropriate temperature for a feed, formula/gruel must be discarded if it is not consumed within one hour

2.4.2.12 Food containers (e.g., buckets, tubs, bottles, tanks), utensils (e.g., knives, cutting boards), and any other equipment used for holding, thawing, or preparing food must be cleaned with detergent and hot water after each feeding, and sanitized at least once per day.

2.4.2.13 Kitchens and other food preparation and handling areas must be cleaned after every use and sanitized at least once per week (https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html).

2.5 Veterinary Medical Care

2.5.1 Veterinary Program and Staffing

MINIMUM STANDARDS

2.5.1.1 Veterinary care for the animals must conform with any State Veterinary Practice Act or other laws governing veterinary medicine which applies to the state in which the facility is located.

2.5.1.2 Personnel caring for animals are sufficiently trained to assist with veterinary procedures under the direction of the attending veterinarian and the rehabilitation facility maintains at least one Animal Care Supervisor who is responsible for overseeing prescribed treatments, maintaining hospital equipment, and controlling drug supplies.

2.5.1.3 The Animal Care Supervisor is adequately trained to deal with emergencies until the veterinarian arrives, be able to direct the restraint of the animals, be responsible for administration of post-surgical care, and be skilled in maintaining appropriate medical records. The Animal Care Supervisor communicates frequently and directly with the attending veterinarian to ensure that there is a timely transfer of accurate information about medical issues.

2.5.1.4 The attending veterinarian or the Animal Care Supervisor must review and initial the standard operating procedures of the facility annually (e.g. euthanasia protocol, health and safety plan, etc.), and whenever the documents are changed or updated.

2.5.2 Attending Veterinarian

The "attending veterinarian" is the veterinarian for the facility who assumes responsibility for diagnosis, treatment, and medical clearance for release or transport of marine mammals in rehabilitation (50 CFR 216.27).

MINIMUM STANDARDS

2.5.2.1 The attending veterinarian must provide a schedule of veterinary care that includes visual and physical examinations of all of the marine mammals in rehabilitation, and a periodic visual inspection of the facilities.

2.5.2.2 The attending veterinarian must review animal records for all animals (in person or electronically).

2.5.2.3 The attending veterinarian must be able to write and submit timely transport and disposition (e.g. release, non-releasable) recommendations for marine mammals in rehabilitation.

2.5.2.4 The attending veterinarian must be available to answer questions on a 24-hour basis via phone/text/or e-mail.

2.5.2.5 The attending veterinarian must be available to visit the facility on an emergency basis.

2.5.2.6 The attending veterinarian must have prior experience working with marine mammals or be in regular consultation with an experienced marine mammal veterinarian and have access to a list of other expert veterinarians to contact when assistance is needed.

2.5.2.7 The attending veterinarian must have an active state veterinary license in the United States

2.5.2.8 The attending veterinarian must have the skills to draw blood from and give injections to the species most commonly encountered at the rehabilitation center.

2.5.2.9 The attending veterinarian must identify and provide contact information for backup veterinarians available during any absences.

2.5.2.10 The attending veterinarian must have the appropriate registrations and licenses to obtain the necessary medications for the animals treated at the rehabilitation facility.

2.5.2.11 The attending veterinarian must be able to conduct a full post-mortem examination on any species of marine mammal treated at the facility.

2.5.2.12 The attending veterinarian must be knowledgeable of and able to perform marine mammal euthanasia.

2.5.2.13 The attending veterinarian must be knowledgeable about species-specific pharmacology

2.5.2.14 The attending veterinarian must consult with NMFS when the time in rehabilitation of any individual animal will exceed 6 months.

2.5.2.15 The attending veterinarian must be knowledgeable of marine mammal zoonotic diseases.

2.6 Diagnostic Testing

2.6.1 Diagnostic Tests

All diagnostic testing standards may be waived at the discretion of the attending veterinarian; however, such waivers and the rationale must be written in the animal's medical records.

MINIMUM STANDARDS

2.6.1.1 Animals shall have a minimum of two blood samples drawn for complete blood count (CBC) with differential and serum chemistry – one taken upon or shortly after admission and one taken prior to release (see NMFS and FWS Standards for Release). Note: If duration of rehabilitation is shorter than a week, one blood work-up may suffice at the attending veterinarian's discretion and must be documented in the medical record and release request (if applicable).

2.6.1.2 Fecal test for parasites may be run upon admission of each animal, at the discretion of the attending veterinarian.

2.6.1.3 Serology may be performed for each animal as necessary for release determinations based upon direction of the NMFS Regional or National Stranding Coordinator and the Marine Mammal Health and Stranding Response Program or the attending veterinarian.

2.6.1.4 The NMFS Regional Stranding Coordinator shall be notified as soon as possible following detection/confirmation of any disease of concern (e.g., emerging, reportable or zoonotic disease that could be a potential hazard for public or animal health).

2.6.2 Pre-Release Testing and Requirements

MINIMUM STANDARDS

2.6.2.1 All requirements in the NMFS and FWS Standards for Release must be followed for each animal, including pre-release complete blood count/chemistry.

2.6.2.2 Documentation that the pre-release checklist was reviewed must be included in the animal's medical records, particularly if the requirement for pre-release notification and authorization has been waived by the NMFS Region.

2.6.2.3 For cetaceans and ESA pinnipeds, live fish tests should be conducted prior to release if feasible.

2.6.2.4 Prior to release, each animal must be marked or tagged using a NMFS approved tag in such a way as to facilitate monitoring of marine mammals released to the wild.

2.7 Necropsy and Euthanasia

2.7.1 Necropsy

MINIMUM STANDARDS

2.7.1.1 The attending veterinarian or trained personnel may perform a necropsy on every animal that dies within 24 hours of death, if feasible. If necropsy is to be performed at a later date (ideally no longer than 72 hours postmortem), the carcass should be stored appropriately to delay tissue decomposition including freezing.

2.7.1.2 Histopathology may be performed on select tissues from each animal that dies, at the discretion of the attending veterinarian.

2.7.1.3 For animals that die of an apparent infectious disease process, a complete set of all major tissues should be evaluated by histopathology, if feasible.

2.7.1.4 Carcass disposal must be handled in a manner consistent with local and state regulations.

2.7.2 Euthanasia Protocols

MINIMUM STANDARDS

2.7.2.1 The facility must have a written euthanasia protocol signed and reviewed by the attending veterinarian annually.

2.7.2.2 A list of all persons authorized to administer euthanasia must be included in the euthanasia protocol, signed by the attending veterinarian, and reviewed (and updated if needed) annually.

2.7.2.3 Euthanasia shall be performed in a way to minimize distress in the animal.

2.7.2.4 All persons administering euthanasia must be knowledgeable and trained to perform the procedures.

2.7.3 Euthanasia Drugs

MINIMUM STANDARDS

2.7.3.1 Drug Enforcement Administration (DEA) laws and regulations and State Veterinary Practice Acts should be followed when using controlled drugs including storage, inventory, and record keeping.

2.7.3.2 Appropriate drugs for euthanasia, in quantities appropriate for the largest species admitted to the facility, shall be maintained in stock on site or will be provided as needed by a licensed veterinarian with a current DEA license.

2.8 Record Keeping and Retention

2.8.1 Record Keeping

Create and update individual medical records for each animal that enters rehabilitation.

MINIMUM STANDARDS

Medical records must contain at a minimum:

2.8.1.1 An accurate description of the animal, individual identification (e.g. marks, tag number), date and location of stranding, sex, and findings of human interaction.

2.8.1.2 Weight records, including weight at stranding, weekly weights for underweight animals if feasible, and weight taken within two weeks of release/placement.

2.8.1.3 Other measurements, including at a minimum length and girth at stranding, and within two weeks of release/placement.

2.8.1.4 Any medication or treatments administered to the animal.

2.8.1.5 The results of any blood work or other diagnostic tests.

2.8.1.6 Documentation of animal movement between pens.

2.8.1.7 Feed records should record the actual, not estimated, individual daily consumption by food type by weighing food before and after feeding. Note: If non-critical animals are housed in groups and are broadcast-fed, daily individual food consumption may be estimated.

2.8.1.8 Medical records include Subjective, Objective, Assessment, and Plan (SOAP)-based medical assessment of each patient, or at minimum include clinical findings, diagnoses and treatment plans for each patient.

2.8.1.9 Complete and submit the Marine Mammal Stranding Report – Level A, Marine Mammal Rehabilitation Disposition, and Human Interaction Forms (NOAA Form 89-864; OMB Control No.0648-0178) within 30 days of the stranding and disposition events.

2.8.2 Record Retention

MINIMUM STANDARDS

2.8.2.1 Maintain medical and husbandry records in an accessible format for a minimum of 15 years.
2.8.2.2 Maintain up to date water quality and water additives records for a minimum of two years.
2.8.2.3 Maintain life support system maintenance records for a minimum of one year.
2.8.2.4 Ensure all records are available for NMFS review upon request.

2.9 Contingency Plans

2.9.1 Contingency Plans

Each facility must have and periodically review and update written contingency plans for personnel, facilities, and animals for each of the following situations:

MINIMUM STANDARDS

2.9.1.1 "Acts of God" which may include floods, earthquakes, hurricane, tsunami, wild fire, global pandemics, or other unpredictable natural disasters known to occur in the region where the facility is located.
2.9.1.2 Inclement weather, including large storms.
2.9.1.3 Construction in the vicinity of the rehabilitation pools.
2.9.1.4 Power outages, addressing maintenance of food items and life support systems.
2.9.1.5 Water shortages, including obtaining and disposing of adequate amounts of water during peak periods of animal use, and back-up water sources if primary source is limited or unavailable.
2.9.1.6 The facility must have a written plan for maximum capacity during periods of increased strandings (Unusual Mortality Event, El Nino, etc.).

2.10 Viewing

2.10.1 Viewing

[Reserved]

2.10.1.1 Has a variance or waiver from NMFS to allow public viewing of non-ESA marine mammals undergoing rehabilitation.

RECOMMENDED

- Only remote public viewing or distance viewing is allowed and only when there is no possible impact of the public viewing on the animals being rehabilitated.

3 Standards for Cetacean Rehabilitation Facilities

All facilities rehabilitating cetaceans must meet all MINIMUM STANDARDS identified in Section 2, in addition to the MINIMUM STANDARDS in this Section.

3.1 Requirements for Cetaceans in Critical Care

Animals in critical care include ill, injured, neonatal, or other cetaceans that cannot swim normally.

3.1.1 Critical Care Standards

MINIMUM STANDARDS

3.1.1.1 For animals that cannot swim unsupported, support must be provided via flotation devices, a suspended stretcher system, constant human support, a shallow resting shelf, sloping beach, or other system.

3.1.1.2 Animals that need support must be appropriately monitored.

3.1.1.3 Animals that cannot swim or dive must have a water spray or method to keep their skin moist.

3.1.1.4 Sufficient shade structures or shelters must be provided to animals if they are unable to swim, dive, or thermoregulate.

3.1.1.5 Means must be available to control the water temperature (either heating or cooling) for critical care animals.

3.1.1.6 Pool diameter and depth for critical care cetaceans can be less than that described in Section 2, and is at the discretion of the attending veterinarian.

3.2 Requirements for Cetacean Pools and Pens

These standards apply to animals that are no longer in critical care and are swimming independently.

3.2.1 Pool Size, Depth and Shade

"Pool" includes both man-made structures as well as open sea/bay/net pens.

MINIMUM STANDARDS

3.2.1.1 Pools must be available to all cetaceans in rehabilitation.

3.2.1.2 All pools must be deep enough for animal(s) to float and submerge.

3.2.1.3 Pool depth must equal one half the body length of the cetacean or 0.9 m (3 ft), whichever is greater.

3.2.1.4 Pools shall have a minimum horizontal dimension (MHD) of 7.3 meters (24 feet) or two times the actual length of the largest animal in the pool, whichever is greater.

3.2.1.5 Shade structures, where necessary, are large enough to provide shade to at least 50% of the MHD surface area determined for the species held in the pool. MHD is defined as 7.3 meters (24 feet) or two times the actual length of the largest species housed in the pool, whichever is greater.

3.2.2 Number of Cetaceans per Pool

MINIMUM STANDARDS

3.2.2.1 The pool should provide enough space for each animal to swim, dive, and maintain an individual distance of one body length from any other cetaceans in the pool at the same time.

3.2.2.2 The facility shall have a written plan for maximum capacities for each pool, which may be species or size dependent.

3.2.3 Extended Rehabilitation

Extended rehabilitation is defined as longer than 6 months.

MINIMUM STANDARDS

3.2.3.1 Animals housed longer than 6 months must be provided with pools at least 1.5 meters (5 feet) deep and must meet the USDA, APHIS AWA MHD standards

3.2.3.2 Exceptions to pool measurements or the USDA standards for cetaceans in extended rehabilitation must be discussed with NMFS by the attending veterinarian and must be documented with a signed statement in the animal's medical records.

3.3 Water Quality

3.3.1 Salt Water

MINIMUM STANDARDS

3.3.1.1 Salt water must be readily available to fill pools housing rehabilitating cetaceans except at the direction of the attending veterinarian, which must be documented in the animal's medical records.

3.3.1.2 Salinity should be tested in each pool daily and maintained between 24-35 ppt, unless the written veterinary plan calls for a different salinity.

3.3.2 Water Temperature

MINIMUM STANDARDS

3.3.2.1 The facility should have the ability to heat and cool the water.

3.3.2.2 The water temperature should be maintained within the normal wild seasonal temperature range for the species in rehabilitation except at the direction of the attending veterinarian, which must be documented in the animal's medical records.

3.4Staffing Levels

3.4.1 Staffing Level for Cetaceans

MINIMUM STANDARDS

3.4.1.1 For each critical care cetacean weighing less than 250 kg, there should be a minimum of 2 personnel qualified to handle cetaceans, with additional personnel required for larger animals as determined by veterinary and/or husbandry personnel.

3.4.1.2 For every 4 cetaceans not in critical care but still being monitored, provide a minimum of 2 personnel qualified to handle cetaceans for the time period appropriate for monitoring (may be 24-hour).

3.4.1.3 For every 5 cetaceans that are pre-release (eating regularly and independently, not requiring handling), provide a minimum of one person qualified to handle cetaceans during regular operation hours.

3.4.1.4 Personnel is available on a 24-hour basis for critical animal care.

3.5 Diagnostic Testing

3.5.1 Diagnostic Tests

MINIMUM STANDARDS

3.5.1.1 Animals should be tested for hearing abilities early in rehabilitation and prior to consideration for release, when feasible.

3.5.1.2 Evaluation of pregnancy in adult females should be conducted early in rehabilitation, either via serum progesterone and estrogen levels or through ultrasonic examination.

4 Standards for Pinniped Rehabilitation Facilities

All facilities rehabilitating pinnipeds, excluding walrus, must meet all MINIMUM STANDARDS identified in Section 2, in addition to the MINIMUM STANDARDS in this Section.

4.1 Requirements for Pinnipeds in Critical Care

Animals in critical care include ill, injured, neonatal, or other pinnipeds that cannot swim normally or should not be in the water.

4.1.1 Critical Care Standards

MINIMUM STANDARDS

4.1.1.1 Critical care pinnipeds may be held without water access at the discretion of the attending veterinarian, but this should be documented in the animal's medical record.

4.1.1.2 Provides platforms in dry resting areas allowing critical or debilitated animals an alternative to laying on concrete or other hard/cold surfaces.

4.1.1.3 Pool size and depth, as well as amount of dry resting area (DRA) for critical care pinnipeds is at the discretion of the attending veterinarian, but this should be documented in the animal's medical record.

4.1.1.4 Means must be available to control the water temperature (heating or cooling) for critical care animals that need access to water.

4.1.1.5 Radiant heating devices or waterproof heating pads are utilized when ambient temperatures fall below the comfort level of the animal, which will be determined by the species, age, medical condition, and body condition of the animal.

4.1.1.6 Animals are able to move away from point source heaters. If animals are too debilitated to move, temperature of heaters cannot exceed the safe range of 60-80°F at skin surface or animals are monitored every 2 hours.

4.1.1.7 If ambient air temperatures reach > 80° F (26.6° C), shade must be provided to pinnipeds that cannot swim or do not have access to a pool. Water spray or another method for wetting the animal must also be provided.

4.1.1.8 Large fans or "swamp coolers" are available to move air across animals with no access to pools when ambient temperatures reach over 85°F (29.4°C).

4.1.2 Pinniped Pup Specific Care Standards

Guidance for pinniped pups less than a year old.

MINIMUM STANDARDS

4.1.2.1 Houses pups individually or with similar aged conspecifics depending upon veterinary discretion.

4.1.2.2 For phocids <1 week of age or otariids < 3 weeks of age, house with 24/7 supervised access to shallow water (< 0.5 meters deep) pools. If 24/7 supervision is not possible, restrict access to water during non-supervised periods. 24/7 supervision may stop when animals demonstrate ability to swim and haul out without assistance.

4.1.2.3 Access to raised platforms in dry resting areas for pups of all ages, at the discretion of the veterinarian.

4.1.2.4 Platforms are low enough for easy access yet high enough to allow the floor to dry under platform.

4.1.2.5 Platforms are made of material with a sealed cleanable surface and designed to allow for waste to pass through.

4.2 Requirements for Pinniped Pools and Pens

These standards apply to animals that are no longer critical care and are swimming independently.

4.2.1 Pool Access

MINIMUM STANDARDS

4.2.1.1 Pools are available for all non-critical care pinnipeds undergoing rehabilitation.

4.2.2 Pool Size and Depth

MINIMUM STANDARDS

4.2.2.1 Pools shall be at least 0.76 m (2.5 feet) deep.
4.2.2.2 Pools shall be deep enough for each animal maintained within to completely submerge.
4.2.2.3 Pools shall be large enough in diameter to allow each animal housed therein to swim.

4.2.3 Dry Resting Area

MINIMUM STANDARDS

4.2.3.1 For one non-critical pinniped, the pen must have a dry resting area (DRA) equivalent to 1.2 x (length of the animal)^2.
4.2.3.2 For two non-critical pinnipeds sharing a pen, the pen must have a DRA equivalent to 1.5 x (length of the longest animal)^2.
4.2.3.3 For three or more non-critical pinnipeds sharing a pen, the pen must have a DRA equivalent to 1.5 x (length of the longest animal)^2, and in addition, enough space for the animals to lay with at least one body length separation, to turn around completely, and to move at least two body lengths in one direction.
4.2.3.4 If the facility has the potential and the willingness to admit adult male pinnipeds, it must have a written contingency plan (including appropriately sized pools and pens) for management of these cases.

4.2.4 Extended Rehabilitation

Extended rehabilitation is defined as longer than 6 months.

MINIMUM STANDARDS

4.2.4.1 If a pinniped is kept for longer than 6 months but less than a year, the facility should meet USDA APHIS AWA standards. However, the actual length of each animal may be used for the dry resting area calculation rather than the adult length.
4.2.4.2 If a pinniped is kept for longer than 1 year, holding space must meet USDA APHIS AWA standards.

4.3 Staffing Levels

4.3.1 Staffing Level for Pinnipeds

MINIMUM STANDARDS

4.3.1.1 Provides a minimum of three qualified trained rehabilitation personnel on site for the first 25 pinnipeds housed at the facility, and two more trained rehabilitation personnel for every additional 25 pinnipeds. More staffing is available for dependent pups.
4.3.1.2 Personnel is available on a 24-hour basis for critical animal care.

5 Standards for Endangered Species Act Marine Mammal Rehabilitation Facilities

All facilities rehabilitating Endangered Species Act (ESA) marine mammals must meet all MINIMUM STANDARDS identified in Section 2, 3 and 4 if applicable, in addition to the MINIMUM STANDARDS in this Section.

The rehabilitation of NMFS ESA marine mammals was outlined in NMFS procedural directive 02-308-01 issued in 2012 and these requirements are now incorporated in the below standards. Additionally, all ESA marine mammals in rehabilitation are held under the NMFS Marine Mammal Health and Stranding Response Program's (MMHSRP) NMFS ESA/Marine Mammal Protection Act (MMPA) Permit and there are additional authorizations and reporting requirements needed for the Permit.

5.1 Requirements for ESA Pools and Pens

5.1.1 Pool and Pens

MINIMUM STANDARDS

5.1.1.1 The facility has dedicated space to house ESA marine mammals individually if needed.

5.1.1.2 The facility can provide an appropriate social environment with adequate room for more than one animal of a social species if needed or appropriate as deemed by the attending veterinarian.

5.2 Veterinary Medical Care

5.2.1 Attending Veterinarian

The "attending veterinarian" is the veterinarian for the facility who assumes responsibility for diagnosis, treatment, and medical clearance for release or transport of marine mammals in rehabilitation (50 CFR 216.27).

MINIMUM STANDARDS

5.2.1.1 The attending veterinarian and animal care staff must have prior experience working with marine mammals, experiencing working with ESA marine mammals, and will consult experts with specific expertise as needed.

5.2.1.2 Veterinary medical care is provided as needed and available 7 days a week.

5.2.1.3 The attending veterinarian must be on-site for a minimum of 20 hrs per week if an ESA marine mammal is in critical condition and requiring intensive care.

5.2.1.4 A maintenance care designation for ESA marine mammals that are stable and no longer need intensive care may be requested by the attending veterinarian to the MMHSRP headquarters staff by completing in writing a Maintenance Care Medical Summary (a template can be quested from NMFS). If approved, the attending veterinarian must be on-site at least one day a month for animals in maintenance care.

5.2.1.5 The attending veterinarian must be available to answer questions on a 24-hour basis via phone/text/or e-mail.

5.2.1.6 The attending veterinarian must be available to visit the facility on an emergency basis.

5.2.1.7 The attending veterinarian must request prior authorization from the MMHSRP headquarters staff for major medical procedures, including when sedating or anesthetizing an ESA marine mammal.

5.2.1.8 Procedures conducted on an ESA marine mammals must be under the direct supervision of professional staff and the attending veterinarian.

5.2.1.9 The attending veterinarian is available and actively consults with MMHSRP headquarters staff and consulting veterinarian.

5.2.1.10 The attending veterinarian should discuss recommended treatments with MMHSRP headquarters staff and consulting veterinarian.

5.2.1.11 The attending veterinarian and animal care staff should promptly implement activities requested by the MMHSRP headquarters staff and consulting veterinarian.

5.3 Necropsy and Euthanasia

5.3.1 Necropsy

MINIMUM STANDARDS

5.3.1.1 The attending veterinarian or trained personnel must perform a necropsy on every ESA marine mammal that dies within 24-48 hours of death.

5.3.1.2 Histopathology must be performed on select tissues from each ESA marine mammal that dies.

5.3.2 Euthanasia Authorization

MINIMUM STANDARDS

5.3.2.1 The attending veterinarian or staff must request permission from the NMFS Regional Stranding Coordinator and MMHSRP Program headquarter staff prior to euthanizing any ESA marine mammal.

5.4 Pre-Release Requirements

5.4.1 Pre-Release Approvals

Under the NMFS MMPA/ESA permit MMHSRP headquarters staff is required to approve release determinations for rehabilitated ESA marine mammals.

MINIMUM STANDARDS

5.4.1.1 The attending veterinarian must consult with the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff regarding the recommendation for release and the release plan for ESA-listed species.

5.4.1.2 The attending veterinarian must submit a Medical Summary Release Request and Release Plan (a template can be requested from NMFS) at least a week in advance of the release date to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff for approval.

5.5 Record Keeping and Notification

5.5.1 Record Keeping and Notification

MINIMUM STANDARDS

5.5.1.1 Within 24 hours of admission to rehabilitation, an accurate description of the animal, including any mark/tag number if present, date and location of stranding, sex, and findings of human interaction should be transmitted to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff.

5.5.1.2 An individual Medical Summary for each ESA marine mammal must be submitted within a week of entering rehabilitation. The medical summary should include current bloodwork. Medical summaries must be transmitted to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff. A Medical Summary template may be requested from NMFS.

5.5.2 Permit Authorization

MINIMUM STANDARDS

5.5.2.1 Facilities that regularly maintain ESA marine mammals for short-term holding or long-term rehabilitation must have a Co-investigator letter issued under the MMHSRP NMFS ESA/MMPA Permit.

5.5.3 Permit Reporting

MINIMUM STANDARDS

5.5.3.1 All requested information including animal disposition, samples collected, etc. must be submitted to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff annually in accordance with the NMFS ESA/MMPA permit reporting period.

5.6 Viewing

5.6.1 ESA Viewing

MINIMUM STANDARDS

5.6.1.1 No direct public viewing of ESA marine mammals is allowed.

5.6.1.2 Indirect public viewing of ESA marine mammals is allowed via remote cameras or one-way glass or clear glass that is above the animal’s line of sight.

6 Standards for Short-Term Holding Facilities

Short term holding is defined as less than 96 hours. Facilities that hold marine mammals for this time are subject to all of the above MINIMUM STANDARDS in Sections 2, 3, 4 and 5 if applicable, with the following exemptions:

6.1 Exemptions from Facilities, Housing and Space Standards (2.1)

6.1.1.1 The number of animals housed in each pool/pen can exceed the standard for long-term rehabilitation. However, the facility must have a written plan for maximum capacity, outlining the following:

- Number of animals per pool/pen by species, age class;
- How to determine cohorts when the facility is at maximum capacity; and
- How to handle the need for increased transports.

6.2 Exemptions from Water Quality Standards (2.2)

If pools are available:
6.2.1.1 A daily test for pH is not required
6.2.1.2 A daily test for salinity is not required
6.2.1.3 Either fresh or salt water may be used.

6.3 Exemptions from Nutrition Standards (2.4)

6.3.1.1 Vitamin or salt supplementation is not required.

6.4 Exemptions from Veterinary Medical Care Standards (2.5)

6.4.1.1 A physical exam may be conducted by any trained personnel.
6.4.1.2 An attending veterinarian is not required on site for animal examination, but must be available by phone 24/7 to respond to updates or questions from trained personnel.

6.5 Exemptions from Diagnostic Testing Standards (2.6)

6.5.1.1 No completed blood count/blood chemistry test is required.
6.5.1.2 No additional diagnostic testing is required.
6.5.1.3 Live fish tests are not required prior to release.

6.6 Exemptions from Record Keeping and Retention (2.8)

6.6.1.1 No girth, length, or weight is required to be taken or recorded, although estimated measurements are encouraged.

6.7 Exemptions from Cetacean-Specific Standards (3)

6.7.1.1 The diameter and the pool depth is at the discretion of the attending veterinarian, so long as the animal can float and submerge.
6.7.1.2 On a case by case basis in an emergency situation, cetaceans may be maintained in fresh water for no more than 96 hrs with the prior authorization and review of the holding and transport plan by the RSC. This plan should include how the cetacean will be immediately transferred to a salt water environment if the cetacean develops any bloodwork abnormalities or skin lesions. Cetaceans in fresh water should receive oral salt supplementation as well as monitoring of electrolyte balance and other blood parameters via daily bloodwork.

6.7.1.3 Hearing and pregnancy testing is not required prior to release.

6.8 Exemptions from Pinniped-Specific Standards (4)

6.8.1.1 The diameter and the pool depth and dry resting area is at the discretion of the attending veterinarian, so long as the animal can float and submerge and enough dry resting area to lay down and turn around.
6.8.1.2 Non-critical care pinnipeds may be maintained in a dry pen with no access to a pool.

6.9 Exemptions from ESA-Specific Standards (5)

6.9.1.1 The diameter and the pool depth and dry resting area is at the discretion of the attending veterinarian, so long as the animal can float and submerge and enough dry resting area to lay down and turn around.
6.9.1.2 ESA marine mammals do not need to be housed individually.
6.9.1.3 At the request of the Regional Stranding Coordinator and/or MMHSRP headquarter staff, a short-term holding facility that may not meet minimum rehabilitation standards for ESA species long-term rehabilitation can serve as a temporary stabilization location prior to transferring the animal to a long-term rehabilitation facility. The facility must comply with all requests and recommendations for stabilization care from NMFS or consulting veterinary/wildlife experts. The short-term holding facility needs to be pre-approved by the Regional Stranding Coordinator and/or MMHSRP headquarters staff prior to holding an animal for temporary stabilization.
6.9.1.4 On a case-by case basis, ESA species may be held in a short-term holding facility for >96 hrs prior to transfer to a long-term rehabilitation facility, after notification and with agreement from NMFS (at a minimum, MMHSRP headquarters staff and the Regional Stranding Coordinator), the short-term holding facility, and the long-term rehabilitation facility receiving the animal.

7 Standards for Emergency Temporary Holding Facilities

Emergency Temporary Holding Facilities are defined as those facilities that are temporary in nature (*e.g.,* tents, pop-up pools, etc.), are designed to respond to emergency situations (*e.g.,* oil spills, infectious disease outbreaks, UMEs, etc.), and will only exist during the duration of the emergency (*e.g.,* hours, days, weeks to months). These facilities may practice both short-term (<96hrs) and long-term care (>96hrs). Emergency Temporary Holding Facilities must be inspected by NMFS (in-person or virtual) prior to operation.

Facilities that hold marine mammals for this purpose are subject to all of the above MINIMUM STANDARDS in Section 2, 3, 4 and 5 if applicable, with the following exemptions:

7.1 Exemptions from Facilities, Housing and Space Standards (2.1)

7.1.1.1 The number of animals housed in each pool/pen can exceed the standard for long-term rehabilitation**.** However, the facility must have a written plan for maximum capacity, outlining the following:

- Number of animals per pool/pen by species, age class;
- How to determine cohorts when the facility is at maximum capacity; and
- How to handle the need for increased transports.

7.2 Exemptions from Water Quality Standards (2.2)

7.2.1.1 A daily test for pH is not required
7.2.1.2 A daily test for salinity is not required
7.2.1.3 Either fresh or salt water may be used.

7.3 Exemptions from Nutrition Standards (2.4)

7.3.1.1 Vitamin or salt supplementation is not required if animals are housed for less than 96 hours.

7.4 Exemptions from Veterinary Medical Care Standards (2.5)

7.4.1.1 A physical exam may be conducted by any trained personnel.
7.4.1.2 An attending veterinarian is not required on site for animal examination, but must be available by phone 24/7 to respond to updates or questions from trained personnel.

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7.5 Exemptions from Diagnostic Testing Standards (2.6)

7.5.1.1 No complete blood count/blood chemistry test is required if animals are housed for less than 96 hours.
7.5.1.2 Live fish tests are not required prior to release if animals are housed for less than 96 hours.

7.6 Exemptions from Record Keeping and Retention (2.8)

7.6.1.1 No girth, length, or weight is required to be taken or recorded for animals housed less than 96 hours, although estimated measurements are encouraged.

7.7 Exemptions from Cetacean-Specific Standards (Section 3)

7.7.1.1 The diameter and the pool depth is at the discretion of the attending veterinarian, so long as the animal can float and submerge.
7.7.1.2 On a case by case basis in an emergency situation, cetaceans may be maintained in fresh water for no more than 96 hrs with the prior authorization and review of the holding and transport plan by the RSC. This plan should include how the cetacean will be immediately transferred to a salt

water environment if the cetacean develops any bloodwork abnormalities or skin lesions. Cetaceans in fresh water should receive oral salt supplementation as well as monitoring of electrolyte balance and other blood parameters via daily bloodwork.

7.7.1.3 Hearing and pregnancy testing is not required prior to release if animals are housed for less than 96 hours.

7.8 Exemptions from Pinniped-Specific Standards (4)

7.8.1.1 The diameter and the pool depth and dry resting area is at the discretion of the attending veterinarian, so long as the animal can float and submerge and has enough dry resting area to lay down and turn around.

7.8.1.2 A non-critical pinniped may be maintained in a dry pen with no access to a temporary pool for up to two weeks.

7.9 Exemptions from ESA-Specific Standards (5)

7.9.1.1 The diameter and the pool depth and dry resting area is at the discretion of the attending veterinarian, so long as the animal can float and submerge and enough dry resting area to lay down and turn around.

7.9.1.2 ESA marine mammals do not need to be housed individually.

7.9.1.3 At the request of the Regional Stranding Coordinator and/or MMHSRP headquarter staff, a short-term emergency temporary holding facility that may not meet minimum rehabilitation standards for ESA species long-term rehabilitation can serve as a temporary stabilization location prior to transferring the animal to a long-term rehabilitation facility. The facility must comply with all requests and recommendations for stabilization care from NMFS or consulting veterinary/wildlife experts. The short-term emergency holding facility needs to be approved by the Regional Stranding Coordinator and/or MMHSRP headquarters staff prior to holding an animal for temporary stabilization.

7.9.1.4 On a case-by case basis, ESA species may be held in a short-term emergency temporary holding facility for >96 hrs prior to transfer to a long-term rehabilitation facility, after notification and with agreement from NMFS (at a minimum, MMHSRP headquarters staff and the Regional Stranding Coordinator), the short-term temporary holding facility, and the long-term rehabilitation facility receiving the animal.

7.9.1.5 On a case-by case basis, ESA species may be held in a long-term emergency temporary holding facility for long-term rehabilitation, after notification and with agreement from NMFS (at a minimum, MMHSRP headquarters staff and the Regional Stranding Coordinator).

Appendix A: NMFS/MMHSRP Rehabilitation Facility Inspection Checklist

NMFS/MMHSRP Rehabilitation Facility Inspection Program

Checklist for Inspection

Name of Facility: ____

Date of Inspection: ____

Facility Representative(s): ____

Inspector(s): ____

CI = Compliance   NCI = Non-Compliance

	CI	NCI	STANDARD	COMMENTS
2	**STANDARDS FOR ALL REHABILITATION FACLITIES**			
2.1	**FACILITIES, HOUSING, AND SPACE**			
2.1.1	**Pool and Pen Construction and Design**			
	MINIMUM STANDARD			
2.1.1.1			Pools and pens must be constructed of durable, non-toxic, non-corrodible material.	
2.1.1.2			Pools and pens must offer ease of cleaning.	
2.1.1.3			Pools and pens must offer ease of handling the animals.	
2.1.1.4			If netting is used as pen construction material, it must be small enough gauge to prevent entanglement.	
FOR SEA PEN LAGOON/BAY FACILITIES ONLY (SP):				
2.1.1.5 (SP)			Facilities must maintain effective barrier fences extending above the high tide water level, or other appropriate measures, on all sides.	

2.1.1.6 (SP)			Nets must be sufficiently rigid to prevent entanglement by mammals or fish.	
2.1.1.7 (SP)			Sea pens must have a second set of perimeter nets at least 10 m from the net pen to prevent direct contact between animals inside the pen in rehabilitation with wild marine mammals.	
2.1.1.8 (SP)			Sea pens must be located more than 1 km from any major outflow of storm drains or sewage treatment plants. NOTE: this distance may need to be greater when considering flow direction or current from these outflows.	
2.1.1.9 (SP)			Sea pens must be placed more than 500m downstream from water intake pipes that bring water into facilities housing marine mammals.	
2.1.1.10 (SP)			Quarantine sea pens must be placed so that tidal action or underwater currents will not permit water flow between quarantine pens and sea pens housing animals that are further along in rehabilitation or healthy (captive) marine mammals.	
2.1.2	**Shelter, Shading, and Temperature**			
	MINIMUM STANDARD			
2.1.2.1			Means must be available to control the air temperature to facilitate recovery, protecting rehabilitating animals from extremes of heat and cold and preventing discomfort.	
2.1.2.2			Holds water temperatures within the normal seasonal habitat temperature range for the species under rehabilitation, unless otherwise authorized by the attending veterinarian in writing.	
FOR OUTDOOR FACILITIES (OR THE PORTION OF POOLS/PENS THAT ARE OUTDOORS)				
2.1.2.3			Shade structures or shelters must be available to animals to aid thermoregulation on those days when local climatic conditions could compromise the health of the animal.	
2.1.2.4			Shade structures (when used) must be large enough to provide shade to at least 25% of the area of the pool/pen at all times of day.	
FOR INDOOR FACILITIES (OR THE PORTION OF POOLS/PENS THAT ARE INDOORS)				
2.1.2.5			Lighting in indoor facilities should be appropriate for the species and should illuminate the pen/pool during daylight hours.	
2.1.2.6			Means must be available to ensure sufficient air turnover to prevent discomfort, reduce potential for transmission of disease, prevent build-up of heat or chemical fumes, and provide a method for bringing fresh air into the facility.	
2.1.2.7			There must be sufficient vents or openings to allow movement of air throughout the facility.	

2.1.3	**Housekeeping**			
	MINIMUM STANDARD			
2.1.3.1			Areas surrounding rehabilitation pools and pens (including decks and walkways) must be kept clean and in good repair.	
2.1.3.2			Support buildings and grounds must be kept clean and in good repair.	
2.1.3.3			All enclosures must have no sharp projections, edges, or loose objects which may cause trauma or injury to the marine mammals in rehabilitation.	
2.1.3.4			Objects introduced as environmental enrichment must be too large to swallow, made of nonporous and cleanable material, frequently disinfected, and not an entanglement hazard.	
2.1.3.5			All drains and overflows must have screened covers.	
2.1.3.6			2.1.3.6 Pens and pools must have no holes or gaps larger than ½ the size of the head diameter of the smallest animal housed within.	
2.1.4	**Pest Control**			
	MINIMUM STANDARD			
2.1.4.1			The facility must maintain a safe and effective program for the control of insects, reptilian, avian, and mammalian pests.	
2.1.4.2			Insecticides or other chemical agents for pest control must not be applied in an enclosure housing marine mammals or in a food preparation area, except as authorized in writing by the attending veterinarian.	
2.1.4.3			If insecticides or other chemical agents for pest control are applied, all appropriate measures must be taken to prevent direct contact (airborne, waterborne, or solid surface) between the animals and the chemical.	
2.1.4.4			Insecticides or other chemical agents for pest control must be stored in properly labeled containers and separated from food preparation and animal feed areas.	
2.1.4.5			Post MSDS "right to know" documents for personnel utilizing insecticides/pesticides, or cleaning, water quality, and animal treatment chemicals and drugs.	
2.1.5	**Sanitation**			
	MINIMUM STANDARD			

2.1.5.1			Animal and food waste must be removed at least once per day from the rehabilitation enclosure areas outside the pool, and more frequently when necessary to prevent contamination.	
2.1.5.2			Animal and food particulate waste must be removed from pools at least once per day, and more frequently as necessary to maintain water quality and prevent contamination.	
2.1.5.3			Trash and debris must be removed from pens and pools as soon as it is noticed to preclude ingestion or other harm to the animals.	
2.1.5.4			Pools and pens must be cleaned and disinfected between patients or patient cohorts (Note: effective filtration systems provide adequate disinfection for pools).	
2.1.5.5			Ensures appropriate disinfectants are mixed to recommended dilutions and are utilized to clean pens, equipment, utensils, and feed receptacles and to place in foot baths. These disinfectants have both bactericidal and virucidal qualities (https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html).	
2.1.5.6			Measures must be taken to prevent animals from coming into direct contact with disinfectants from spray, cleaning hoses, aerosols, or any other method of delivery.	
2.1.5.7			Rotates disinfectants on a regular basis to prevent bacterial resistance.	
2.1.5.8			Chemical agents for cleaning and sanitizing must be stored in properly labeled containers and located away from food preparation and animal feed areas.	
2.1.6	**Facility Security**			
	MINIMUM STANDARD			
2.1.6.1			The rehabilitation facility must be secured from public access.	
2.1.6.2			There must be no opportunities for direct public contact with animals in rehabilitation.	
2.1.6.3			Facilities with outdoor enclosures (including net pens) must have a complete perimeter fence of an adequate height and construction to keep out people, domestic animals, wildlife, and pests.	
2.2	**WATER QUALITY**			
2.2.1	**Water Source and Disposal**			
	MINIMUM STANDARD			
2.2.1.1			Fresh water must be available to clean and wash down pens and surrounding areas (e.g., decks and walkways).	
2.2.1.2			Wastewater must be discharged in accordance with state and local regulations.	

2.2.1.3			Any required documentation (e.g. permits) for wastewater discharge must be maintained and provided to NMFS upon request.	
2.2.1.4			Effluent from pens must not be near the water intake.	
2.2.2	**Water Quality Testing**			
	MINIMUM STANDARD			
FOR ALL SYSTEMS (DUMP AND FILL, CLOSED, SEMI-OPEN, and OPEN)				
2.2.2.1			Clean the rehabilitation pools and pens as often as necessary to maintain proper water quality.	
2.2.2.2			Test temperature in all pools at least daily, or whenever heating or cooling water.	
2.2.2.3			If chlorine or bromine is used, test chlorine or bromine level in all pools daily.	
2.2.2.4			If chlorine is used, maintain total chlorine below 1.5 ppm, where combined chlorine does not exceed 50% total chlorine.	
2.2.2.5			If used, other chemical additives should be measured daily and shall not be added in a manner that could cause harm or discomfort to the animals.	
2.2.2.6			Record daily measurements that are taken (e.g. temperature, chlorine levels, ozone levels, pH, salinity, etc.)	
FOR DUMP AND FILL SYSTEMS ONLY				
2.2.2.7			Drains water from pools daily or as often as necessary to keep the pool water quality within acceptable limits.	
FOR CLOSED, SEMI-OPEN or OPEN SYSTEMS ONLY				
2.2.2.8			Test pH in all pools daily.	
2.2.2.9			Maintain pH between 6.5 and 8.5.	
2.2.2.10			If ozone is used, measure ozone levels daily.	
2.2.2.11			If ozone is used, maintain ozone levels below 0.02 mg/liter.	
2.2.2.12			If salt water is used, maintain salinity levels above 24 parts per thousand (ppt) unless a written veterinary plan calls for lower salinity levels, or if the animals are housed in sea pens near their resident range.	
2.2.2.13			Measures and records coliform growth in all pools weekly.	
2.2.2.14			Total coliform counts do not exceed 500 per 100 ml or a most probable number (MPN) of 1000 coliform bacteria per 100 ml water. Or fecal coliform counts do not to exceed 400 per 100 ml.	

2.2.2.15			If a single coliform test exceeds the limit, 2 additional tests should be performed within 48 hours and the results averaged OR the pool may be completely or partially refilled and tested again within a week. The results of tests should be recorded.	
2.2.2.16			Has separate filtration and water flow systems for pools in quarantine/isolation areas.	
FOR CLOSED AND SEMI-OPEN SYSTEMS ONLY				
2.2.2.17			Have a minimum of 2 complete water changes per day to maintain sufficient turnover of water through the filtration system.	
2.2.2.18			Water is regularly filtered through appropriate filters (e.g. sand and gravel) to remove particulate matter, and disinfectants (e.g. chlorine, ozone, UV, etc.) are available to be added to eliminate pathogens.	
FOR OPEN WATER SEA PENS ONLY				
2.2.2.19			The pen must have a method for moving water (e.g., paddles, pumps, spray devices) that is able to aerate and move water if there is insufficient flow of tides or current through the enclosure with an equivalent of two water changes per day.	
2.3	**ISOLATION/QUARANTINE**			
2.3.1	**General Isolation and Quarantine**			
	MINIMUM STANDARD			
2.3.1.1			All new animals should be admitted into a separate pool, pen or cage that can be isolated with the use of dividers, tarps, or via physical space from other animals. Animals that are admitted in the same 24 hour period may be housed together as a group or cohort.	
2.3.1.2			Sufficient space or solid barriers between animal enclosures should be provided to prevent direct contact, including wash down or splash moving from one pool to another, to reduce the possibility of water or airborne disease transmission.	
2.3.1.3			Animal care personnel must thoroughly clean and disinfect buckets, hoses, scales, transport equipment, and cleaning equipment to prevent transmission of pathogens via fomites if equipment is used by multiple animals/pens.	
2.3.1.4			Foot baths must be placed at the entry and exit to animal areas, and used by all personnel whenever entering or exiting these areas.	
2.3.1.5			Foot baths should be changed at least daily.	

2.3.1.6			All personnel interacting with animals should use personal protective equipment [e.g. protective clothing (slickers, coveralls, etc.), closed toed shoes, gloves, eye protection and/or face masks].	
2.3.1.7			Foot baths, glove baths, and/or other methods should be used to disinfect clothing, wet suits, or exposure suits and footwear between handling animals within the quarantine/isolation area and outside of the quarantine/isolation area.	
2.3.1.8			Each animal must be individually identified with a mark or tag upon admission. Note: this may be a temporary mark or tag such as a shave mark or grease pen, but must be sufficient to distinguish between individuals.	
2.3.2	**Prevention of Disease Transmission**			
	MINIMUM STANDARD			
2.3.2.1			Personal pets must be prohibited from entering the facility and facility grounds, remaining outside the perimeter fence at all times.	
2.3.2.2			Personnel in contact with animals in rehabilitation must change contaminated clothing and/or disinfect all equipment prior to leaving the rehabilitation premises.	
2.3.2.3			Provide eye flushing stations as used with hazardous materials (HAZMAT) or normal saline bottles to irrigate the eye.	
2.3.2.4			Personnel with open wounds should not interact with animals carrying potentially infectious diseases.	
2.3.2.5			Train personnel how to recognize symptoms and prevent contracting zoonotic disease.	
2.3.2.6			A written health and safety plan(s) is available to all personnel that includes protocols for safely handling all species and sizes of marine mammals cared for at the facility, a list of potential zoonotic diseases, and includes protocols for managing bite wounds.	
2.3.3	**Biosecurity for Facilities with Species other than Marine Mammals on Site**			
	MINIMUM STANDARD			
2.3.3.1			Traffic flow patterns must be established so that personnel working with marine mammals in rehabilitation do not inadvertently travel into other animal areas and vice versa.	
2.3.3.2			Established decontamination protocols must be followed before personnel working with marine mammals in rehabilitation enter areas housing other animals.	

2.3.3.3			Restrooms, showers, changing rooms, etc. should be established for personnel working with marine mammals in rehabilitation separate from those working with other animals.	
2.3.3.4			Food containers (buckets, tubs, tanks, feeding implements, etc.) taken into pools and pens for animals in rehabilitation must be dedicated to stranded animal use and marked or otherwise identified.	
2.3.3.5			Food for animals in rehabilitation may be prepared in a central/combined kitchen and then taken into the rehabilitation area. However, containers must be thoroughly disinfected before returning to the shared area.	
2.3.4	**Evaluation Requirements Prior to Placing Marine Mammals Together**			
	MINIMUM STANDARD			
2.3.4.1			Each animal must have an evaluation by trained personnel that is notated in its medical record before moving animals between pools/pens.	
2.3.4.2			Prior to moving an animal out of the intake (isolation/quarantine) area, an evaluation should be conducted, unless waived by veterinary personnel.	
2.3.4.3			Prior to moving an animal out of the intake (isolation/quarantine) area, a complete blood count (CBC)/blood chemistries, and other appropriate tests should be obtained, unless waived by the attending veterinarian.	
2.3.4.4			Personnel conducting evaluations and making decisions regarding animal pen placement must be familiar with current NMFS recommendations on diseases of concern (e.g., avian influenza, leptospirosis, morbillivirus, etc.) and emerging diseases.	
2.3.5	**Outbreak Prevention and Control**			
	MINIMUM STANDARD			
2.3.5.1			The facility must have a detailed infection control and outbreak plan that details how infectious disease transmission will be mitigated or contained.	
2.3.5.2			The infection control and outbreak plan must address zoonotic pathogens including both airborne and non-airborne pathogens.	
2.3.5.3			During an outbreak of an infectious disease, personal protective equipment, equipment, and tools strictly dedicated to the quarantine areas must be used.	
2.3.5.4			If the animals are part of a declared Unusual Mortality Event, screening for disease must be in direct coordination with NMFS and the UME investigative team.	

2.3.5.5			Personnel must be trained to follow appropriate quarantine protocols.	
2.4	**NUTRITION**			
2.4.1	**Feeding and Diets**			
	MINIMUM STANDARD			
2.4.1.1			Diet composition and frequency must be reviewed by a nutritionist, attending veterinarian, or the animal care supervisor and must be formulated with consideration for age, species, condition, and size of the marine mammals being fed.	
2.4.1.2			Animals should be fed a minimum of twice per day, unless directed otherwise in writing by the attending veterinarian.	
2.4.1.3			Personnel must be trained to recognize good and bad fish and other seafood (e.g. squid, invertebrate) quality.	
2.4.1.4			Animals must receive sufficient vitamin and/or salt supplementation, approved in writing by the attending veterinarian. NOTE: Veterinary approval could be included as part of a general feeding protocol for the facility.	
2.4.1.5			Feeding must only be conducted by qualified, trained personnel.	
2.4.1.6			Feeding of rehabilitation animals by members of the public is **strictly** prohibited.	
2.4.2	**Food Storage, Thawing, and Preparation**			
	MINIMUM STANDARD			
2.4.2.1			Frozen food items must be stored in freezers which are maintained at a maximum temperature of 0°F (-18°C).	
2.4.2.2			Food freezers must only contain food items for animal consumption. Human food or frozen specimens must not be placed in the fish freezer.	
2.4.2.3			All boxes of food items must be labeled with date of delivery and must be used within one year of delivery date.	
2.4.2.4			Frozen food should be rotated in the freezer so oldest food is fed first.	
2.4.2.5			Food items must not be allowed to sit in direct sunlight.	
2.4.2.6			Food items should be thawed in the coldest water available.	
2.4.2.7			All food items must be fed to the marine mammals within 24 hours of complete thawing.	
2.4.2.8			All thawed food should be refrigerated.	

2.4.2.9			The thawed food items must maintain a cold temperature through feeding and not allowed to reach room temperature. Food items may be iced or refrigerated for a reasonable time before feeding (exact time will vary depending on ambient temperature).	
2.4.2.10			Prepared formula/gruel must be fed immediately or refrigerated and fed within 24 hours of preparation.	
2.4.2.11			Once heated to an appropriate temperature for a feed, formula/gruel must be discarded if it is not consumed within one hour.	
2.4.2.12			Food containers (e.g., buckets, tubs, bottles, tanks), utensils (e.g., knives, cutting boards), and any other equipment used for holding, thawing, or preparing food must be cleaned with detergent and hot water after each feeding, and sanitized at least once per day.	
2.4.2.13			Kitchens and other food preparation and handling areas must be cleaned after every use and sanitized at least once per week (https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html).	
2.5	**VETERINARY MEDICAL CARE**			
2.5.1	**Veterinary Program and Staffing**			
	MINIMUM STANDARD			
2.5.1.1			Veterinary care for the animals must conform with any State Veterinary Practice Act or other laws governing veterinary medicine which applies to the state in which the facility is located.	
2.5.1.2			Personnel caring for animals are sufficiently trained to assist with veterinary procedures under the direction of the attending veterinarian and the rehabilitation facility maintains at least one Animal Care Supervisor who is responsible for overseeing prescribed treatments, maintaining hospital equipment, and controlling drug supplies.	
2.5.1.3			The Animal Care Supervisor is adequately trained to deal with emergencies until the veterinarian arrives, be able to direct the restraint of the animals, be responsible for administration of post-surgical care, and be skilled in maintaining appropriate medical records. The Animal Care Supervisor communicates frequently and directly with the attending veterinarian to ensure that there is a timely transfer of accurate information about medical issues.	

2.5.1.4			The attending veterinarian or the Animal Care Supervisor must review and initial the standard operating procedures of the facility annually (e.g. euthanasia protocol, health and safety plan), and whenever the documents are changed or updated.	
2.5.2	**Attending Veterinarian**			
	MINIMUM STANDARD			
2.5.2.1			The attending veterinarian must provide a schedule of veterinary care that includes visual and physical examinations of all of the marine mammals in rehabilitation, and a periodic visual inspection of the facilities.	
2.5.2.2			The attending veterinarian must review animal records for all animals (in person or electronically).	
2.5.2.3			The attending veterinarian must be able to write and submit timely transport and disposition (e.g. release, non-releasable) recommendations for marine mammals in rehabilitation.	
2.5.2.4			The attending veterinarian must be available to answer questions on a 24-hour basis via phone/text/or e-mail.	
2.5.2.5			The attending veterinarian must be available to visit the facility on an emergency basis.	
2.5.2.6			The attending veterinarian must have prior experience working with marine mammals or be in regular consultation with an experienced marine mammal veterinarian and have access to a list of other expert veterinarians to contact when assistance is needed.	
2.5.2.7			The attending veterinarian must have an active state veterinary license in the United States	
2.5.2.8			The attending veterinarian must have the skills to draw blood from and give injections to the species most commonly encountered at the rehabilitation center.	
2.5.2.9			The attending veterinarian must identify and provide contact information for backup veterinarians available during any absences.	
2.5.2.10			The attending veterinarian must have the appropriate registrations and licenses to obtain the necessary medications for the animals treated at the rehabilitation facility.	
2.5.2.11			The attending veterinarian must be able to conduct a full post-mortem examination on any species of marine mammal treated at the facility.	
2.5.2.12			The attending veterinarian must be knowledgeable of and able to perform marine mammal euthanasia.	
2.5.2.13			The attending veterinarian must be knowledgeable about species-specific pharmacology.	

2.5.2.14			The attending veterinarian must consult with NMFS when the time in rehabilitation of any individual animal will exceed 6 months.	
2.5.2.15			The attending veterinarian must be knowledgeable of marine mammal zoonotic diseases.	
2.6	**DIAGNOSTIC TESTING**			
2.6.1	**Diagnostic Tests**			
	MINIMUM STANDARD			
2.6.1.1			Animals shall have a minimum of two blood samples drawn for complete blood count (CBC) with differential and serum chemistry – one taken upon or shortly after admission and one taken prior to release (see NMFS and FWS Standards for Release). NOTE: If duration of rehabilitation is shorter than a week, one blood work-up may suffice at the attending veterinarian's discretion and must be documented in the medical record and release request (if applicable).	
2.6.1.2			Fecal test for parasites may be run upon admission of each animal, at the discretion of the attending veterinarian.	
2.6.1.3			Serology may be performed for each animal as necessary for release determinations based upon direction of the NMFS Regional or National Stranding Coordinator and the MMHSRP or the attending veterinarian.	
2.6.1.4			The NMFS Regional Stranding Coordinator shall be notified as soon as possible following detection/confirmation of any disease of concern (e.g., emerging, reportable or zoonotic disease that could be a potential hazard for public or animal health).	
2.6.2	**Pre-Release Testing and Requirements**			
	MINIMUM STANDARD			
2.6.2.1			All requirements in the NMFS and FWS Standards for Release must be followed for each animal, including pre-release complete blood count/chemistry.	
2.6.2.2			Documentation that the pre-release checklist was reviewed must be included in the animal's medical records, particularly if the requirement for pre-release notification and authorization has been waived by the NMFS Region.	
2.6.2.3			At minimum for cetaceans and ESA pinnipeds, live fish tests should be conducted prior to release if feasible. Live fish tests is encouraged for other taxa/species as feasible.	
2.6.2.4			Prior to release, each animal must be marked or tagged using a NMFS approved tag in such a way as to facilitate monitoring of marine mammals released to the wild.	

2.7	**NECROPSY AND EUTHANASIA**			
2.7.1	**Necropsy**			
	MINIMUM STANDARD			
2.7.1.1			The attending veterinarian or trained personnel may perform a necropsy on every animal that dies within 24 hours of death, if feasible. If necropsy is to be performed at a later date (ideally no longer than 72 hours postmortem), the carcass should be stored appropriately to delay tissue decomposition including freezing.	
2.7.1.2			Histopathology may be performed on select tissues from each animal that dies, at the discretion of the attending veterinarian.	
2.7.1.3			For animals that die of an apparent infectious disease process, a complete set of all major tissues should be evaluated by histopathology, if feasible.	
2.7.1.4			Carcass disposal must be handled in a manner consistent with local and state regulations.	
2.7.2	**Euthanasia Protocols**			
	MINIMUM STANDARD			
2.7.2.1			The facility must have a written euthanasia protocol signed and reviewed by the attending veterinarian annually.	
2.7.2.2			A list of all persons authorized to administer euthanasia must be included in the euthanasia protocol, signed by the attending veterinarian, and reviewed (and updated if needed) annually.	
2.7.2.3			Euthanasia shall be performed in a way to minimize distress in the animal.	
2.7.2.4			All persons administering euthanasia must be knowledgeable and trained to perform the procedures.	
2.7.3	**Euthanasia Drugs**			
	MINIMUM STANDARD			
2.7.3.1			Drug Enforcement Administration (DEA) laws and regulations and State Veterinary Practice Acts must be followed when using controlled drugs including storage, inventory, and record keeping.	
2.7.3.2			Appropriate drugs for euthanasia, in quantities appropriate for the largest species admitted to the facility, shall be maintained in stock on site or will be provided as needed by a licensed veterinarian with a current DEA license.	
2.8	**RECORD KEEPING AND RETENTION**			
2.8.1	**Record Keeping**			

	MINIMUM STANDARD			
			Medical records must contain at a minimum:	
2.8.1.1			An accurate description of the animal, individual identification (e.g. marks, tag number), date and location of stranding, sex, and findings of human interaction.	
2.8.1.2			Weight records, including weight at stranding, weekly weights for underweight animals if feasible, and weight taken within two weeks of release/placement.	
2.8.1.3			Other measurements, including at a minimum length and girth at stranding, and within two weeks of release/placement.	
2.8.1.4			Any medication or treatments administered to the animal.	
2.8.1.5			The results of any blood work or other diagnostic tests.	
2.8.1.6			Documentation of animal movement between pens.	
2.8.1.7			Feed records should record the actual, not estimated, individual daily consumption by food type by weighing food before and after feeding. NOTE: if non-critical animals are housed in groups and are broadcast-fed, daily individual food consumption may be estimated.	
2.8.1.8			Medical records include Subjective, Objective, Assessment, and Plan (SOAP)-based medical assessment of each patient, or at minimum include clinical findings, diagnoses and treatment plans for each patient.	
2.8.1.9			Complete and submit the Marine Mammal Stranding Report – Level A, Marine Mammal Rehabilitation Disposition, and Human Interaction Forms (NOAA Form 89-864; OMB Control No.0648-0178) within 30 days of the stranding and disposition events.	
2.8.2	**Record Retention**			
	MINIMUM STANDARD			
2.8.2.1			Maintain medical and husbandry records in an accessible format for a minimum of 15 years	
2.8.2.2			Maintain up to date water quality and water additives records for a minimum of two years.	
2.8.2.3			Maintain life support system maintenance records for a minimum of one year.	
2.8.2.4			Ensure all records are available for NMFS review upon request.	
2.9	**CONTINGENCY PLANS**			
2.9.1	**Contingency Plans**			
	MINIMUM STANDARD			

			Each facility must have and periodically review and update written contingency plans for personnel, facilities, and animals for each of the following situations:	
2.9.1.1			"Acts of God" which may include floods, earthquakes, hurricane, tsunami, wild fire, global pandemics, or other unpredictable natural disasters known to occur in the region where the facility is located.	
2.9.1.2			Inclement weather, including large storms.	
2.9.1.3			Construction in the vicinity of the rehabilitation pools.	
2.9.1.4			Power outages, addressing maintenance of food items and life support systems.	
2.9.1.5			Water shortages, including obtaining and disposing of adequate amounts of water during peak periods of animal use, and back-up water sources if primary source is limited or unavailable.	
2.9.1.6			The facility must have a written plan for maximum capacity during periods of increased strandings (Unusual Mortality Event, El Nino, etc.).	
2.10	**VIEWING**			
2.10.1	**Viewing**			
	MINIMUM STANDARD			
2.10.1.1			Has a variance or waiver from NMFS to allow public viewing of non-ESA marine mammals undergoing rehabilitation.	
3	**STANDARDS FOR CETACEAN REHABILITATION FACLITIES**			
			All facilities rehabilitating cetaceans must meet all MINIMUM STANDARDS identified in Section 2, in addition to the MINIMUM STANDARDS in this Section.	
3.1	**REQUIREMENTS FOR CETACEANS IN CRITICAL CARE**			
3.1.1	**Critical Care Standards**			
	MINIMUM STANDARD			
			Animals in critical care include ill, injured, neonatal, or other cetaceans that cannot swim normally.	
3.1.1.1			For animals that cannot swim unsupported, support must be provided via flotation devices, a suspended stretcher system, constant human support, a shallow resting shelf, sloping beach, or other system.	
3.1.1.2			Animals that need support must be appropriately monitored.	
3.1.1.3			Animals that cannot swim or dive must have a water spray or method to keep their skin moist.	

3.1.1.4			Sufficient shade structures or shelters must be provided to animals if they are unable to swim, dive, or thermoregulate.	
3.1.1.5			Means must be available to control the water temperature (either heating or cooling) for critical care animals.	
3.1.1.6			Pool diameter and depth for critical care cetaceans can be less than that described in Section 2, and is at the discretion of the attending veterinarian.	
3.2	**REQUIREMENTS FOR CETACEAN POOLS AND PENS**			
			These standards apply to animals that are no longer in critical care and are swimming independently.	
3.2.1	**Pool Size, Depth and Shade**			
	MINIMUM STANDARD			
3.2.1.1			Pools must be available to all cetaceans in rehabilitation.	
3.2.1.2			All pools must be deep enough for animal(s) to float and submerge.	
3.2.1.3			Pool depth must equal one half the body length of the cetacean or 0.9 m (3 ft), whichever is greater.	
3.2.1.4			Pools shall have a minimum horizontal dimension (MHD) of 7.3 meters (24 feet) or two times the actual length of the largest animal in the pool, whichever is greater.	
3.2.1.5			Shade structures, where necessary, are large enough to provide shade to at least 50% of the MHD surface area determined for the species held in the pool. MHD is defined as 7.3 meters (24 feet) or two times the actual length of the largest species housed in the pool, whichever is greater.	
3.2.2	**Number of Cetaceans per Pool**			
	MINIMUM STANDARD			
3.2.2.1			The pool should provide enough space for each animal to swim, dive, and maintain an individual distance of one body length from any other cetaceans in the pool at the same time.	
3.2.2.2			The facility shall have a written plan for maximum capacities for each pool, which may be species or size dependent.	
3.2.3	**Extended Rehabilitation**			
	MINIMUM STANDARD			

3.2.3.1			Animals housed longer than 6 months must be provided with pools at least 1.5 meters (5 feet) deep and must meet the USDA, APHIS AWA minimum horizontal dimension (MHD) standards	
3.2.3.2			Exceptions to pool measurements or the USDA standards for cetaceans in extended rehabilitation must be discussed with NMFS by the attending veterinarian and must be documented with a signed statement in the animal's medical records.	
3.3	**WATER QUALITY**			
3.3.1	**Salt Water**			
	MINIMUM STANDARD			
3.3.1.1			Salt water must be readily available to fill pools housing rehabilitating cetaceans except at the direction of the attending veterinarian, which must be documented with a signed statement in the animal's medical records.	
3.3.1.2			Salinity should be tested in each pool daily and maintained between 24-35 ppt, unless the written veterinary plan calls for a different salinity.	
3.3.2	**Water Temperature**			
	MINIMUM STANDARD			
3.3.2.1			The facility should have the ability to heat and cool the water.	
3.3.2.2			The water temperature should be maintained within the normal wild seasonal temperature range for the species in rehabilitation except at the direction of the attending veterinarian, which must be documented with a signed statement in the animal's medical records.	
3.4	**STAFFING LEVELS**			
3.4.1	**Staffing Level for Cetaceans**			
	MINIMUM STANDARD			
3.4.1.1			For each critical care cetacean weighing less than 250 kg, there should be a minimum of 2 personnel qualified to handle cetaceans, with additional personnel required for larger animals as determined by veterinary and/or husbandry personnel.	
3.4.1.2			For every 4 cetaceans not in critical care but still being monitored, provide a minimum of 2 personnel qualified to handle cetaceans for the time period appropriate for monitoring (may be 24-hour).	

3.4.1.3			For every 5 cetaceans that are pre-release (eating regularly and independently, not requiring handling), provide a minimum of one person qualified to handle cetaceans during regular operation hours.	
3.4.1.4			Personnel is available on a 24-hour basis for critical animal care.	
3.5	**DIAGNOSTIC TESTING**			
3.5.1	**Diagnostic Tests**			
	MINIMUM STANDARD			
3.5.1.1			Animals should be tested for hearing abilities early in rehabilitation and prior to consideration for release, when feasible.	
3.5.1.2			Evaluation of pregnancy in adult females should be conducted early in rehabilitation, either via of serum progesterone and estrogen levels or through ultrasonic examination.	
4	**STANDARDS FOR PINNIPED REHABILITATION FACLITIES**			
			All facilities rehabilitating pinnipeds, excluding walrus, must meet all MINIMUM STANDARDS identified in Section 2, in addition to the MINIMUM STANDARDS in this Section.	
4.1	**REQUIREMENTS FOR PINNIPEDS IN CRITICAL CARE**			
4.1.1	**Critical Care Standards**			
	MINIMUM STANDARD			
			Animals in critical care include ill, injured, neonatal, or other pinnipeds that cannot swim normally or should not be in the water.	
4.1.1.1			Critical care pinnipeds may be held without water access at the discretion of the attending veterinarian, but this should be documented in the animal's medical record.	
4.1.1.2			Provides platforms in dry resting areas allowing critical or debilitated animals an alternative to laying on concrete or other hard/cold surfaces.	
4.1.1.3			Pool size and depth, as well as amount of dry resting area (DRA) for critical care pinnipeds is at the discretion of the attending veterinarian, but this should be documented in the animal's medical record.	
4.1.1.4			Means must be available to control the water temperature (heating or cooling) for critical care animals that need access to water.	

4.1.1.5			Radiant heating devices or waterproof heating pads are utilized when ambient temperatures fall below the comfort level of the animal, which will be determined by the species, age, medical condition, and body condition of the animal.	
4.1.1.6			Animals are able to move away from point source heaters. If animals are too debilitated to move, temperature of heaters cannot exceed the safe range of 60-80°F at skin surface or animals are monitored every 2 hours.	
4.1.1.7			If ambient air temperatures reach > 80° F (26.6° C), shade must be provided to pinnipeds that cannot swim or do not have access to a pool. Water spray or another method for wetting the animal must also be provided.	
4.1.1.8			Large fans or "swamp coolers" are available to move air across animals with no access to pools when ambient temperatures reach over 85°F (29.4°C).	
4.1.2	**Pinniped Pup Specific Care Standards**			
	MINIMUM STANDARD			
			Guidance for pinniped pups less than a year old:	
4.1.2.1			Houses pups individually or with similar age conspecifics depending upon veterinary discretion	
4.1.2.2			For phocids <1 week of age or otariids < 3 weeks of age, house with 24/7 supervised access to shallow water (< 0.5 meters deep) pools. If 24/7 supervision is not possible, restrict access to water during non-supervised periods. 24/7 supervision may stop when animals demonstrate ability to swim and haul out without assistance.	
4.1.2.3			Access to raised platforms in dry resting areas for pups of all ages at the discretion of the veterinarian.	
4.1.2.4			Platforms are low enough for easy access yet high enough to allow the floor to dry under platform.	
4.1.2.5			Platforms are made of material with a sealed cleanable surface and designed to allow for waste to pass through.	
4.2	**REQUIREMENTS FOR PINNIPED POOLS AND PENS**			
			These standards apply to animals that are no longer critical care and are swimming independently.	
4.2.1	**Pool Access**			
	MINIMUM STANDARD			
4.2.1.1			Pools are available for all non-critical care pinnipeds undergoing rehabilitation.	

4.2.2	**Pool Size and Depth**			
	MINIMUM STANDARD			
4.2.2.1			Pools shall be at least 0.76 m (2.5 feet) deep.	
4.2.2.2			Pools shall be deep enough for each animal maintained within to completely submerge.	
4.2.2.3			Pools shall be large enough in diameter to allow each animal housed therein to swim.	
4.2.3	**Dry Resting Area**			
	MINIMUM STANDARD			
4.2.3.1			For one non-critical pinniped, the pen must have a DRA equivalent to 1.2 x (length of the animal)^2.	
4.2.3.2			For two non-critical pinnipeds sharing a pen, the pen must have a DRA equivalent to 1.5 x (length of the longest animal)^2.	
4.2.3.3			For three or more non-critical pinnipeds sharing a pen, the pen must have a DRA equivalent to 1.5 x (length of the longest animal)^2, and in addition, enough space for the animals to lay with at least one body length separation, to turn around completely, and to move at least two body lengths in one direction.	
4.2.3.4			If the facility has the potential and the willingness to admit adult male pinnipeds, it must have a written contingency plan (including appropriately sized pools and pens) for management of these cases.	
4.2.4	**Extended Rehabilitation**			
	MINIMUM STANDARD			
4.2.4.1			If a pinniped is kept for longer than 6 months but less than a year, the facility should meet USDA APHIS Animal Welfare Act standards. However, the actual length of each animal may be used for the dry resting area calculation rather than the adult length.	
4.2.4.2			If a pinniped is kept for longer than 1 year, holding space must meet USDA APHIS Animal Welfare Act standards.	
4.3	**STAFFING LEVELS**			
4.3.1	**Staffing Level for Pinnipeds**			
	MINIMUM STANDARD			

4.3.1.1			Provides a minimum of three qualified trained rehabilitation personnel on site for the first 25 pinnipeds housed at the facility, and two more trained rehabilitation personnel for every additional 25 pinnipeds. More staffing is available for dependent pups.	
4.3.1.2			Personnel is available on a 24-hour basis for critical animal care.	
5	**STANDARDS FOR ENDANGERED SPECIES ACT MARINE MAMMAL REHABILITATION FACLITIES**			
			All facilities rehabilitating Endangered Species Act (ESA) marine mammals must meet all MINIMUM STANDARDS identified in Section 2, 3 and 4 if applicable, in addition to the MINIMUM STANDARDS in this Section.	
5.1	**REQUIREMENTS FOR ESA POOLS AND PENS**			
5.1.1	**Pool and Pens**			
	MINIMUM STANDARD			
5.1.1.1			The facility has dedicated space to house ESA marine mammals individually if needed.	
5.1.1.2			The facility can provide an appropriate social environment with adequate room for more than one animal of a social species if needed or appropriate as deemed by the attending veterinarian.	
5.2	**VETERINARY MEDICAL CARE**			
5.2.1	**Attending Veterinarian**			
	MINIMUM STANDARD			
5.2.1.1			The attending veterinarian and animal care staff must have prior experience working with marine mammals, experiencing working with ESA marine mammals, and will consult experts with specific expertise as needed.	
5.2.1.2			Veterinary medical care is provided as needed and available 7 days a week.	
5.2.1.3			The attending veterinarian must be on-site for a minimum of 20 hrs per week if an ESA marine mammal is in critical condition and requiring intensive care.	
5.2.1.4			A maintenance care designation for ESA marine mammals that are stable and no longer need intensive care may be requested by the attending veterinarian to the MMHSRP headquarters staff by completing in writing a Maintenance Care Medical Summary (a template can be requested from NMFS). If approved, the attending veterinarian must be on-site at least one day a month for animals in maintenance care.	

5.2.1.5			The attending veterinarian must be available to answer questions on a 24-hour basis via phone/text/or e-mail.	
5.2.1.6			The attending veterinarian must be available to visit the facility on an emergency basis.	
5.2.1.7			The attending veterinarian must request prior authorization from the MMHSRP headquarters staff for major medical procedures, including when sedating or anesthetizing an ESA marine mammal.	
5.2.1.8			Procedures conducted on an ESA marine mammals must be under the direct supervision of professional staff and the attending veterinarian.	
5.2.1.9			The attending veterinarian is available and actively consults with MMHSRP headquarters staff and consulting veterinarian.	
5.2.1.10			The attending veterinarian should discuss recommended treatments with MMHSRP headquarters staff and consulting veterinarian.	
5.2.1.11			The attending veterinarian and animal care staff should promptly implement activities requested by the MMHSRP headquarters staff and consulting veterinarian.	
5.3	**NECROPSY AND EUTHANASIA**			
5.3.1	**Necropsy**			
	MINIMUM STANDARD			
5.3.1.1			The attending veterinarian or trained personnel must perform a necropsy on every ESA marine mammal that dies within 24-48 hours of death.	
5.3.1.2			Histopathology must be performed on select tissues from each ESA marine mammal that dies.	
5.3.2	**Euthanasia Authorization**			
	MINIMUM STANDARD			
5.3.2.1			The attending veterinarian or staff must request permission from the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff prior to euthanizing any ESA marine mammal.	
5.4	**PRE-RELEASE REQUIREMENTS**			
5.4.1	**Pre-Release Approvals**			
	MINIMUM STANDARD			
5.4.1.1			The attending veterinarian must consult with the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff regarding the recommendation for release and the release plan for ESA-listed species.	

5.4.1.2			The attending veterinarian must submit a Medical Summary Release Request and Release Plan (a template can be requested from NMFS) at least a week in advance of the release date to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff for approval.	
5.5	**RECORD KEEPING AND NOTIFICATION**			
5.5.1	**Record Keeping and Notification**			
	MINIMUM STANDARD			
5.5.1.1			Within 24 hours of admission to rehabilitation, an accurate description of the animal, including any mark/tag number if present, date and location of stranding, sex, and findings of human interaction should be transmitted to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff.	
5.5.1.2			An individual Medical Summary for each ESA marine mammal must be submitted within a week of entering rehabilitation. The medical summary should include current bloodwork. Medical summaries must be transmitted to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff. A Medical Summary template may be requested from NMFS.	
5.5.2	**Permit Authorization**			
	MINIMUM STANDARD			
5.5.2.1			Facilities that regularly maintain ESA marine mammals for short-term holding or long-term rehabilitation must have a Co-investigator letter issued under the MMHSRP NMFS ESA/MMPA Permit.	
5.5.3	**Permit Reporting**			
	MINIMUM STANDARD			
5.5.3.1			All requested information including animal disposition, samples collected, etc. must be submitted to the NMFS Regional Stranding Coordinator and MMHSRP headquarters staff annually in accordance with the NMFS ESA/MMPA permit reporting period.	
5.6	**VIEWING**			
5.6.1	**ESA Viewing**			
	MINIMUM STANDARD			
5.6.1.1			No direct public viewing of ESA marine mammals is allowed.	
5.6.1.2			Indirect public viewing of ESA marine mammals is allowed via remote cameras or one-way glass or clear glass that is above the animal's line of sight.	

Appendix XVIII

Dwarf and Pygmy Sperm Whale (*Kogia Spp.*) Best Practices

Executive Summary

These Dwarf and Pygmy Sperm Whale Best Practices highlight general procedures specific to responding to live and dead *Kogia* spp. Based upon findings from a previous *Kogia* workshop held in the Southeast United States (U.S.) there are common diseases syndromes (*e.g.*, cardiomyopathy) in dwarf and pygmy sperm whales that make rehabilitation of certain age classes of these species extremely difficult. These Best Practices outline the appropriate field response to live dwarf and pygmy sperm whale strandings as well as suggestions for appropriate sampling of euthanized or dead stranded whales.

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1. Introduction

1.1 Background

In 1992, the Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the Marine Mammal Protection Act (MMPA). The MMHSRP serves as the centralized coordination agency for marine mammal stranding response efforts in the United States (U.S.). The MMHSRP works to standardize regional network operations and define national stranding response policy.

Nationally, strandings of dwarf (*Kogia sima*) and pygmy sperm whales (*Kogia breviceps*) are relatively rare (Table 1; nationally an average rate of 40 per year), but they are the second most commonly stranded marine mammal in the southeast region of the U.S. (U.S. Atlantic coast from Florida through North Carolina, Gulf of Mexico, Puerto Rico, and the U.S. Virgin Islands) and where they commonly live strand. Dwarf and pygmy sperm whales are rarely seen during aerial or ship-based surveys due to their deep-sea habitat and avoidance behavior towards vessels (Baird, 2005). In addition, unlike dolphins and porpoises that spend much of their time at the surface, dwarf and pygmy sperm whales have short surfacing periods and small dorsal fins, making it difficult to identify and differentiate between the two species at sea (Chivers *et al.* 2005; Waring *et al.* 2007). Because dwarf and pygmy sperm whales are difficult to differentiate at sea, or even during a stranding event, the two species are often grouped together for management purposes. The pattern of the "false gill slit" pigmentation pattern (Appendix A) is one of the ways that can help differentiate between the two but often can only be viewed up close such as during a stranding event (Keenan-Bateman, 2016). The U.S. Marine Mammal Stock Assessment Reports (SARs) provide a best estimate of abundance for the California, Oregon and Washington *Kogia* stock of 4,111 (SAR 2016), no estimate is available for Hawaiian *Kogia* stock (SAR 2013), Atlantic *Kogia* stock of 3,785 (SAR 2016) animals and 186 (SAR 2012) animals for the northern Gulf of Mexico stock. Dwarf and pygmy sperm whales are not listed as endangered or threatened species, nor are they currently managed as strategic stocks under the Marine Mammal Protection Act (MMPA) due to human caused mortality. Despite this, their significant level of strandings along the East Coast and in the Gulf of Mexico (annually, 37 animals) creates a need for additional information on dwarf and pygmy sperm whale life history, abundance, distribution, and causes of morbidity and mortality.

In 2009, NMFS held a Dwarf and Pygmy Sperm Whale Workshop focusing on these two species in the Southeast region, especially live stranded animals. The Workshop had five main goals:

1. To evaluate the current state of knowledge regarding *Kogia* health, disease, and population parameters;
2. To understand *Kogia* illness/strandings, with a focus on health/disease issues and population impacts;
3. Provide guidance to the Stranding Network for standardized tissue/data collection and distribution, and for beach decisions regarding live *Kogia* strandings;
4. To develop a research strategy for looking at causes of morbidity and mortality in *Kogia*, especially cardiomyopathy; and
5. Develop common case definitions with images and descriptions for each of the cardiomyopathic conditions, a common sampling regime, and analytical protocols.

Sections of these Best Practices present summary and updated data from that 2009 Workshop.

1.2 Legislation Pertinent to Cetaceans

There is a key piece of legislation that governs interactions with marine mammals in the U.S. that apply to dwarf and pygmy sperm whales.

> <u>Marine Mammal Protection Act (MMPA)</u>: The MMPA, signed into law in 1972, prohibits the "take" of sea otters, seals, sea lions, walruses, whales, dolphins, and porpoises, which includes harassing or disturbing these animals, as well as harming or killing, unless such take is specifically exempted in the statute or authorized. The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS has jurisdiction over cetacean and pinniped species (with the exception of walrus), and USFWS has jurisdiction over walrus, polar bear, sea otters, and manatees. The 1992 amendments to the MMPA included Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health of marine mammals and health trends of marine mammal populations through the collection of stranding data.

1.3 Management Needs

In recent years, there has been a philosophical shift in management practices towards ecosystem-based management, which considers various resources and species as interrelating parts of systems rather than as individual components to be managed separately. The general lack of knowledge available for dwarf and pygmy sperm whales provides multiple management challenges and the concerns resulting in several key management questions. Generally, these questions can be grouped under three categories: 1) population and stock assessment, 2) life history and health, and 3) strandings.

Kogia species are grouped together and divided into the following stocks for management purposes: California, Oregon and Washington; Hawaiian; Western North Atlantic; and Gulf of Mexico. To adequately manage *Kogia* spp., their abundance, and geographic distribution is needed, as well as whether their distribution has changed over time. Additional morphological, genetic, and/or behavioral data is also needed to provide further information on stock delineation. In addition, information is needed about their mortality rates and whether their populations are decreasing, stable, or increasing. Finally, managers need to know the age structure of the population and whether there is other structure to the populations that must be taken into consideration with management strategies.

Little is known about the life history of *Kogia* spp. and the causes of their mortality. Stock assessment reports assume a population growth rate of no more than 4% (Waring *et al.* 2007). Based on this growth rate, stranding numbers would suggest that at least some stocks might be declining. As a result, managers need to understand the stressors affecting *Kogia* spp. and leading to their stranding and mortality.

1.4 Intended Uses of Best Practices

NMFS and the Marine Mammal Stranding Network (the Stranding Network) have developed protocols and procedures for responding to live marine mammals that are stranded or otherwise in distress to ensure the health, welfare, and safety of both the human responders and animals. These protocols balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, the reader should consult references such as Marine Mammals Ashore (Geraci *et al.* 2005) and the CRC Handbook of Marine Mammal Medicine (Gulland *et al.* 2018).

These Dwarf and Pygmy Sperm Whale Best Practices (Best Practices) highlight general procedures specific to responding to live and dead *Kogia* spp. Based upon findings from the 2009 *Kogia* workshop there are common diseases (*e.g.*, cardiomyopathy) in dwarf and pygmy sperm whales that make rehabilitation of certain age classes of these species extremely difficult. These Best Practices outline the appropriate field response to live dwarf and pygmy sperm whale strandings as well as suggestions for appropriate sampling of euthanized or dead stranded whales.

These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual and does not by itself qualify the reader for any actions or authorizations. These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a "living document," and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

1.5 Funding

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for eligible members of the Stranding Network through an annual competitive grant process. These grants support the rescue and rehabilitation of stranded marine mammals (including small cetaceans), data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are competitive and limited and there is not enough funding to cover all costs of the Stranding Network, individual Stranding Network members must support many of the costs for normal operations.

2. Population Status and Historical Data from Previous Strandings

2.1 Population Status and Trends

2.1.1 *Kogia* species stock assessment, habitat use, and status - summary by Lance Garrison

Under the MMPA, NMFS is required to develop annual stock assessment reports that include adequate evaluations of stock structure, estimates of abundance, and quantification of human-induced mortality. This includes recent (less than 5 years old) estimates of abundance that are both accurate and precise. There are significant challenges in the assessment of *Kogia* species status that limit the ability to develop adequate stock assessments. First, it is not possible to differentiate between the two species when they are encountered at sea. As a result, mortality and abundance estimates cannot be derived for each species. In the NMFS stock assessment reports, this is reflected by separate reports for the two species; however, the information contained in those reports is nearly identical. The *Kogia* assessments are separated into California, Oregon and Washington and Hawaiian stocks on the west coast and the Gulf of Mexico and Western North Atlantic stocks on the east coast; however, these divisions are an assumed one and do not reflect the results of a targeted study of population structure.

Developing accurate and precise abundance estimates is made difficult by the low encounter rate of *Kogia* during assessment surveys, their long dive times with short surface intervals, and the difficulty in seeing them during less than optimal sighting conditions. As a result, available abundance estimates for California, Oregon and Washington, Hawaiian, Gulf of Mexico and Atlantic stocks are both highly variable and negatively biased. The current best estimate of abundance of *Kogia* in the California, Oregon and Washington Pacific ocean is 4111 (Coefficient of Variation [CV]=1.12); for the Hawaiian Pacific ocean has insufficient data; for the Atlantic is 3785 (CV= 0.47) based on surveys conducted between Florida and the Gulf of Maine during the summer of 2016; and for the Gulf of Mexico is 186 (CV=1.04) based upon surveys conducted during the summer of 2009.

Habitat studies based upon historical sightings (Figure 3) in the Gulf of Mexico indicate that *Kogia* are more frequently encountered in deep oceanic waters near areas with a high occurrence of surface frontal zones and increased concentrations of zooplankton. This suggests that they aggregate in areas where mesoscale physical processes tend to concentrate their prey such as the edges of loop current eddies in the Gulf of Mexico. Interactions between *Kogia* and commercial fisheries are apparently rare. There was one documented interaction with the east coast pelagic longline fishery that occurred in 2000. Based on this one interaction, Western North Atlantic *Kogia* were considered strategic stocks for several years. However, since there have been no additional observed interactions, the stocks currently are not strategic. For the pacific region, historical sightings (Figure 4) have been rare; therefore, data is insufficient to identify habitat or delineate possible stock boundaries for that area.

Considerable research effort will be required to improve the assessment of *Kogia* stocks. Stock structure studies are currently underway from stranded animals that should allow evaluation of population structure within and between the western North Atlantic and Gulf of Mexico. However, extensive targeted survey effort will be required to improve abundance estimates and understanding of habitat use. In addition, tagging studies will be required to both evaluate dive/surface times and to distinguish potential differences in habitat preferences between the species. Developing adequate assessments for *Kogia* will require significant additional resources.

2.1.2 National Pygmy and Dwarf Sperm Whale Stranding Trends

The stranding data nationally for 2006-2018 from the NMFS National Marine Mammal Health and Stranding Response Database were analyzed. Dwarf and pygmy sperm whales strand nationally at an average rate of 40 per year (Figure 1; Table 1). Of this number 20 per year (Figure 2) on average strand alive. Nationally the age breakdown for these species is predominantly adults and calves.

From 2006 to 2018, 3,039 cetaceans live-stranded in the U.S. Of these, the largest percentage (23%) were bottlenose dolphins (*Tursiops truncatus*), followed by short-finned pilot whales (*Globicephala macrorhynchus*) (21%), and *Kogia* species-including unidentified *Kogia* (10%). The majority of live-stranded *Kogia* (80%) were either euthanized or died at the stranding site or during transport. In contrast, only 38.5% of bottlenose dolphins were either euthanized or died at the stranding site or during transport. From 2006-2018, ~3% of live-stranded *Kogia* (nine individuals) were admitted to rehabilitation facilities. However, all *Kogia* either died or had to be euthanized during rehabilitation. In contrast, from 2006 through 2018, ~10% of live-stranded bottlenose dolphins were admitted to rehabilitation facilities. Of those bottlenose dolphins, approximately two-thirds survived rehabilitation and were either released or deemed non-releasable and retained in permanent captivity (generally dependent calves).

2.1.3 East Coast *Kogia* species stranding trends - workshop summary by Jenny Litz, Gina Rappucci, and Dan Odell

Stranding data for 1990-2018 from the NMFS National Marine Mammal Health and Stranding Response Database and the NMFS Southeast Regional Marine Mammal Stranding Database were analyzed. *Kogia*, particularly *Kogia breviceps*, are the second most commonly stranded cetacean species along the east coast U.S. with an average of 37 strandings per year (Table 2). One of the most striking characteristics of *Kogia* strandings is the proportion that strand alive. Over 58% of *Kogia*s are alive when they strand, compared to less than 13% of all cetacean species. *Kogia* strandings have been reported along the entire U.S. east coast, the Gulf of Mexico, and even the Caribbean (Puerto Rico and the U.S. Virgin Islands). However, the highest number of *Kogia* strandings per mile of coastline occurs along the Atlantic coast between North Carolina and Florida. Unusually, the majority of *Kogia* strandings are adults. The majority of calves that do strand are dependent calves that strand in close association with an adult female.

For the majority of states, approximately 36% or more of the *Kogia* strandings were *K. breviceps*. Specific stranding data by state found that strandings of *K. breviceps* were the most common with the *K. breviceps* vs *K. sima v*s unidentified *Kogia sp.* stranding proportions respectively as follows: North Carolina (60%, 33%, 7%), the Florida Gulf Coast (51%, 39%, 10%), Louisiana (50%, 33%, 17%), and Texas (55%, 26%, 19%). While the total number of strandings for *Kogia* varies by year, it also varies by state and year. Seasonal patterns of strandings were not apparent in the data, with the exception of calves. Calf strandings of both species were higher in the summer (Jun – Aug) and fall (Sept – Nov) than the winter (Dec - Feb) and spring (Mar - May).

From 2006 through 2018, 1,285 cetaceans 716 marine mammals live-stranded in the Southeast Region of the US. Of these, the largest percentage (46%) were bottlenose dolphins (*Tursiops truncatus*), followed by *Kogia* species (20%). Interestingly, over 50% of *Kogia* were alive when they stranded, compared to less than 20% of all cetacean species. The majority of live-stranded *Kogia* (83%) were either euthanized or died at the stranding site or during transport. In contrast, only 37% of bottlenose dolphins were either euthanized or died at the stranding site or during transport. From 2002 through 2007, 13% of live-stranded *Kogia* (18 individuals) were admitted to rehabilitation facilities. In general, *Kogia* calves tended to survive longer in rehabilitation than older animals (Figure 5). However, all *Kogia* either died or had to be euthanized during rehabilitation. In contrast, from 2002 through 2007, 21% of live-stranded bottlenose dolphins were admitted to rehabilitation facilities. Of those bottlenose dolphins, approximately two-thirds survived rehabilitation and were either released or deemed non-releasable and retained in permanent captivity (generally dependent calves).

2.2 Historical Findings from Previous Rehabilitation Cases

Previous *Kogia* spp. rehabilitation efforts have predominantly failed mainly due to adult stranded animals that exhibit what has been classified as cardiomyopathy based upon gross and histological findings. In addition, the diet composition of *Kogia* is not understood and the diets provided in rehabilitation have been unsuccessful especially for calves. Only one pygmy sperm whale has ever been successfully rehabilitated and released, a sub-adult whale that stranded in New York. It was unclear if the release was actually successful based upon post-release tracking (Wells *et al.* 2013, Scott *et al.* 2001).

2.2.1 Cardiomyopathy

In the stranding data, many animals had some form of myocardial degeneration (MCD) or cardiomyopathy (CMP). Harbor Branch Oceanographic Institute (HBOI) at Florida Atlantic University (FAU) has begun investigating the histopathological characteristics as well as biochemical markers of MCD and CMP from stranded *K. breviceps*. A heart dissection manual, by Hensley *et al.* 2005, was published by HBOI in order to standardize specimen sampling. Subsequent clinicopathological pilot studies have focused on the relationship of various factors including serum chemistry parameters, hematological parameters, cardiac troponins, glucocorticoids, catecholamines, and different nutritional parameters (*i.e.*, selenium, thiamine, carnitine) in CMP and MCD in *Kogia*. The results of these preliminary studies indicated some potential trends, but due to small sample size and lack of availability of samples for both diseased and healthy animals, it is difficult to interpret this data or make any inference to CMP/MCD, and the *Kogia* population. Recommendations for further study include:

- Increased animal and sample sizes;
- Functional studies including cardiac ultrasound, 5-lead electrocardiogram (EKG) on live whales are needed; and
- Sample banking for future analyses and defining baselines in stranded individuals.

2.2.2 Domoic acid and *Kogia* cardiomyopathy

Evidence of cardiac disease is frequently found in stranded adult *Kogia*. Other disease categories resulting in significant population morbidity and mortality are scarcely represented in stranding records to account for any sizable impact on the population. Many questions need to be answered to determine both the etiology and pathogenesis of CMP including a thorough investigation of mortality records (pathology reports). Domoic acid (DA) is one area of research into a potential cause of CMP that can be addressed without samples from healthy animals, as well as in determining the level of population exposure. However, interpreting the presence of DA in relation to exposure time, the pharmacokinetics and route of exposure in the *Kogia* is difficult. Fire *et al.* (2009) found that 59% of dwarf and pygmy sperm whales tested between 1997-2008 were positive for DA exposure.

2.2.3 Gastrointestinal Issues - summary by Charles Manire

Pygmy and dwarf sperm whales are regularly found stranded, however, there have been few animals that have been kept alive for more than a week or two. These stranded animals are usually either cow-calf pairs (recently post-partum with a severely emaciated cow and a relatively healthy calf) or individual adults (in poor condition). In an effort to expand the knowledge regarding maintaining these species alive in rehabilitation, the Dolphin and Whale Hospital at Mote Marine Laboratory in Sarasota, Florida has attempted to raise calves and rehabilitate adults. In the process, much information was gained regarding digestive limitations and gastrointestinal disorders that affect both species, as well as refined medical and husbandry techniques that have allowed the calves to be kept alive for up to 21 months.

Between 1994 and 2003, a total of ten pygmy sperm whales (five adults, one juvenile, and four calves) and three dwarf sperm whales (an adult, juvenile, and calf) were brought in alive to the Dolphin and Whale Hospital. The adults arrived in fair to very poor body condition and were kept alive from a few hours to a maximum of 40 days. All adults were ultimately found to have electrolyte imbalance, gastrointestinal issues, and/or cardiomyopathy. In contrast to the arrival condition of the adults, the calves generally arrived in fair to good body condition and were kept alive for 3-21 months.

The issues that caused the most problems, eventually becoming insurmountable, were those related to the gastrointestinal tract. Anatomically and physiologically, the gastrointestinal tract of the *Kogia* spp. is unique among marine mammals. First, the contents of the entire intestinal tract appear normally to be liquid. When there is any form to the contents, this is evidence of constipation. Unfortunately, drugs normally used to control constipation in other mammals, seem to have very little effect on the *Kogia* intestine. In our experience, enemas, stool softeners, saline cathartics, and most other drugs used to treat constipation have little or no effect on *Kogia*s. Keeping fluid intake high, usually through regular stomach tubing, seems to be the only preventative that has much effect. The effects of constipation on these mammals can be devastating, including sequelae such as intestinal volvulus, intestinal rupture, intestinal blockage, and impaction. One of these sequelae has been the ultimate cause of death of each of the *Kogia* calves that underwent rehabilitation at the Dolphin and Whale Hospital. Recent experience with pygmy killer whales has shown a similar set of problems, possibly related to inability to digest the food items being fed. With the *Kogia*, most of the intestinal problems were obvious when they were being fed solid squid, possibly also relating to an inability to digest the food.

3. Dwarf and Pygmy Sperm Whale Stranding Response

3.1 Authorization and Training

Marine mammal stranding responders need to be authorized to respond under both of the MMPA and the Endangered Species Act (ESA). The Stranding Network consists of approximately 100 organizations that have applied for and received an authorization, called a Stranding Agreement (SA). The SA is issued under Section 112(c) of the MMPA and allows the take of marine mammals that are stranded for response and rehabilitation. For non-ESA species, a response can be conducted under a SA or by a government employee acting under MMPA Section 109(h). Therefore, only responders who have been authorized by NMFS and who have the training, experience, equipment, and support needed should attempt cetacean interventions. Authorized response efforts may also rely on partners at tribal, local, state and federal agencies (including law enforcement agencies and the USCG), non-governmental organizations, fishermen, and other groups to assist with some responses.

Stranding Network members are trained or have experience in proper techniques for safe response to various stranded marine mammal species, as well as experience in species identification (due to the different *Kogia* spp. being difficult to identify). Historically training workshops have been offered to members of the Stranding Network. It would be beneficial for future training to also include other federal, state, local and tribal partners who may be the first responders, especially for live stranded whales. Specific training issues or requirements may exist for certain activities (*e.g.*, rehabilitation) and are more appropriate to address at regional or state levels by working with your Regional Stranding Coordinator (RSC).

3.2 Decisions on the Beach

When responding to live-stranded marine mammals, decisions need to be made on the beach that are based on the most humane course of action for the animal, it’s likelihood of survival, and the investment of available resources. Public safety should also be considered when responding to live-stranded marine mammals, especially if the public are trying to render first aid to the animal.

As stranding statistics and previous rehabilitation efforts reveal, *Kogia* are not well suited for captive environments and have rarely survived in captivity long-term. Because little is known about the nutritional needs for these species, those animals that do survive in rehabilitation for an extended period tend to develop digestive complications. These digestive issues have been the main roadblock to the survival of *Kogia* calves in rehabilitation. However, even if these nutritional constraints were overcome, placement of dependent calves or other non-releasable rehabilitated *Kogia* would be an issue, as there are no other *Kogia* alive in public display. In addition, most adult *Kogia* are in some stage of the degenerative disease process of cardiomyopathy, decreasing their chance for long-term survival. There is also limited information available on the biology of *Kogia*, which can complicate rehabilitation efforts, but which also provides the opportunity to learn from these animals.

Given the poor prognosis for survival of *Kogia* in rehabilitation, current NMFS guidance recommends euthanasia for most live-stranded dwarf and pygmy sperm whales. **Euthanasia is the recommended option when dealing with live stranded *Kogia*s** for the following reasons:

- Many rehabilitation facilities in the Southeastern U.S. no longer accept live-stranded *Kogia* because of the difficulties of caring for these animals in rehabilitation. There are two main issues as to why rehabilitation for these species has always failed:
    - Little is known about the life history and nutritional requirements; and
    - For more than half of documented pygmy sperm whale strandings, signs of cardiomyopathy have been documented.
- The rehabilitation needs are costly, and the success rate of rehabilitated animals is poor.
- Additionally, attempts to rehabilitate dependent *Kogia* calves will not be considered. Rehabilitated, nutritionally dependent cetacean calves are considered non-releasable by NMFS, because they do not possess the necessary skills to survive in the wild.

However, in certain cases (*e.g.*, sub-adults) rehabilitation may be approved by NMFS on a case-by-case basis if the *Kogia* Stranding Network Plan is in place (see below).

3.2.1 *Kogia* Stranding Rehabilitation Network Plan

If rehabilitation is to be considered, NMFS requires each Stranding Network to have a plan in place ahead of time for dealing with live-stranded *Kogia*. This includes understanding the samples that need to be collected, the appropriate team in place, rehabilitation facilities to call for pre-approval, and understanding the NMFS requirements/guidelines. This plan should be developed with and submitted to the NMFS RSC for review and approval. Rehabilitation, per 50 CFR 216.3, is defined as treatment of beached and stranded marine mammals taken under section 109(h)(1) of the MMPA or imported under section 109(h)(2) of the MMPA, with the intent of restoring the marine mammal's health and, if necessary, behavioral patterns. The purpose of an authorized marine mammal rehabilitation care facility is to provide treatment for a period of time with a goal of releasing the animal back to the wild.

The *Kogia* rehabilitation plan would also include, but not limited to, answers to the following questions:

- If a facility intends to accept *Kogia* for rehabilitation, then what is their plan if an animal is deemed non-releasable?
- How will you determine whether an animal may be a good candidate for rehabilitation (*e.g.,* subadult, health status, etc.)?
- What kind of health assessment tools could and should be used on the beach to make those decisions?
- What can be learned from these animals if they were to be brought into rehabilitation, and do you have a science developed to address those questions?
- Although animal welfare takes priority over research objectives, research priorities should be identified, and plans made for *Kogia* in rehabilitation.

In addition, public awareness and communication needs to be included as part of this plan. NMFS can provide outreach products to distribute during a living-stranding event. These outreach products would provide information on *Kogia*, their health issues, difficulties with their rehabilitation, and euthanasia.

3.2.2 Facility Pre-Approval

For *Kogia* species to be further assessed or rehabilitated, the facility must have an existing SA for cetacean rehabilitation, be pre-approved by NMFS, and the animal to be rehabilitated must be a sub-adult. To receive approval, these facilities would need to have a plan for caring for and maintaining the *Kogia*, adequate resources, a post-release monitoring plan, and a long-term plan for placement of the animal if it were deemed non-releasable. It is emphasized that *Kogia* should not be rehabilitated, or even triaged, in pop-up pools, as *Kogia* have been known to collapse them. Facilities must also be willing to perform the following tests upon admission to rehabilitation, when the animal arrives onsite: i-STAT, physical exam, complete blood count, blood chemistry, cardiac ultrasound and ECG testing. Diagnostic tests should be completed within a two-week time period, after which time a decision must be made to either euthanize the animal or continue rehabilitation.

3.2.3 Case Management Plan

If a veterinarian should determine a pygmy or dwarf sperm whale is a suitable candidate for rehabilitation and release, then a case management plan must be submitted to the NMFS RSC within 48 hours of admission. The case management plan will include preliminary diagnostic findings, such as blood results, a medical assessment, husbandry procedures, and a future diagnostic plan. Additionally, the plan should detail the facilities' plan as previously outlined, if the animal is deemed non-releasable, as well as what knowledge can be gained regarding the rehabilitation of *Kogia*s, what tools can be developed, and what other research questions the facility would focus on, and why.

3.3 Sample Collection

In all pre- and post-mortem cases of stranded *Kogia*s, it is important to collect samples (Appendix B) to further our knowledge of these animals. As we learn more about the species, protocols for diagnostics, sampling, handling samples, and prioritization of samples will be further fine-tuned. At minimum, basic samples should be collected which include, but are not limited to, weight (if available), morphometrics, photographs, skin and blubber biopsies, fecal and gastric samples, and blood samples from live whales, and full histopathology and biotoxin samples from dead whales. Recent research has identified new data on parasites as well as gut microbiomes in *Kogia*; therefore, parasite and fecal collection is encouraged during necropsy (Keenan-Bateman *et al.* 2018, Denison *et al.* 2020).

4. Conclusion

There are many unanswered questions regarding stranded dwarf and pygmy sperm whales. Rehabilitation has proven extremely challenging and to date has been largely unsuccessful. This is due to the lack of knowledge of their basic biology, their inability to digest foods commonly fed to captive marine mammals, and the prevalence of cardiomyopathy in adult animals. **<u>It is recommended in general to euthanize all live-stranded *Kogia* until more is learned about the species.</u>**

5. Acknowledgements

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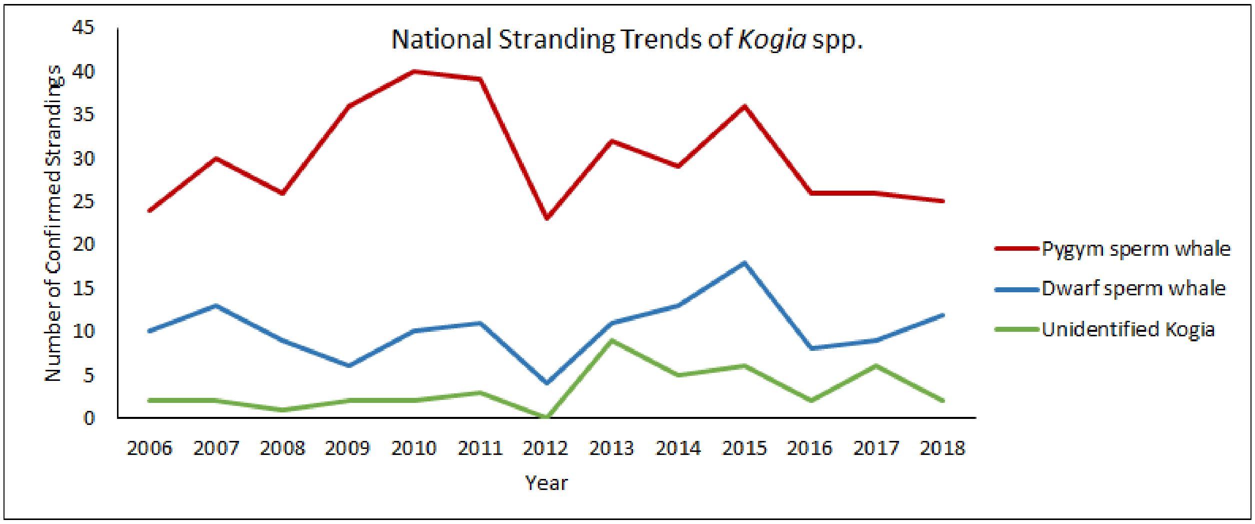
6. Tables and Figures

Figure 1.

National Stranding Trends of *Kogia* spp. Strandings from 2006-2018



Southeast Stranding Trends of *Kogia* spp. Strandings from 2006-2018

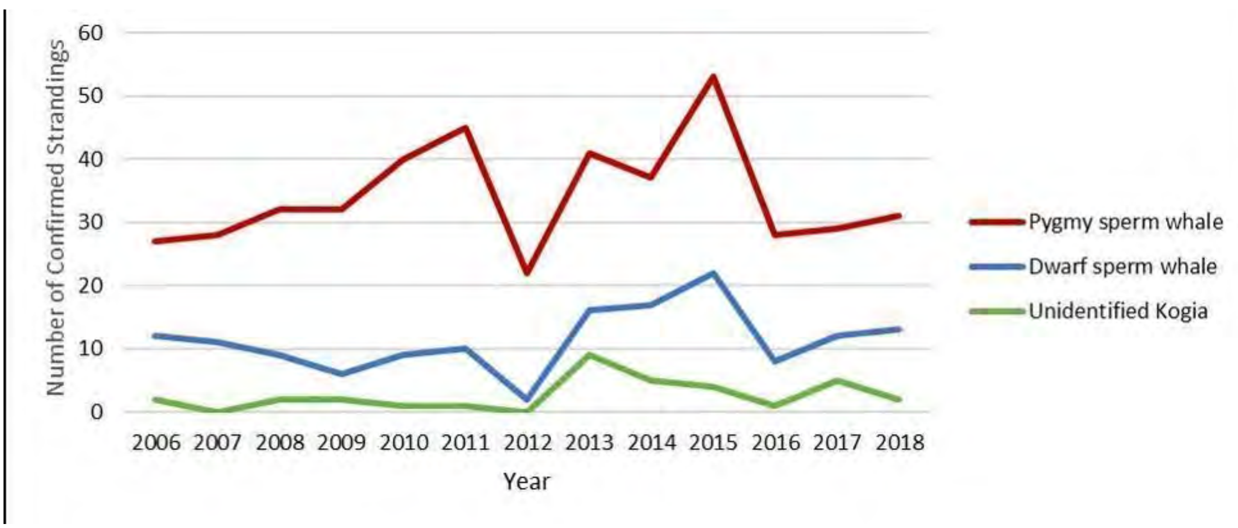
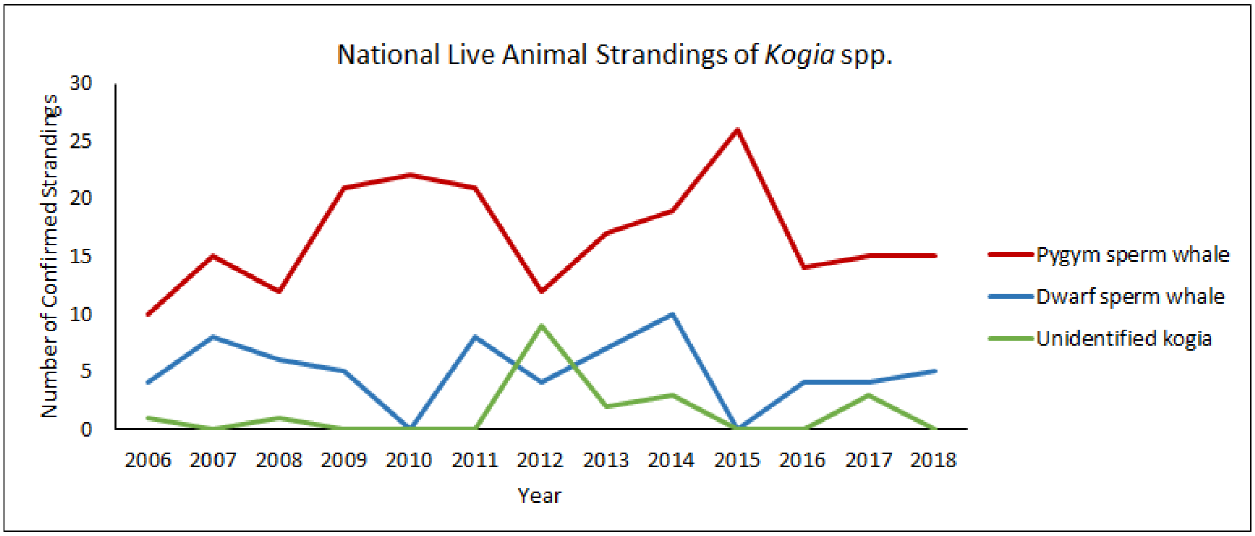


Figure 2:

National Live Stranding Trends of *Kogia* spp. Strandings from 2006-2018



Southeast Live Stranding Trends *Kogia* spp. Strandings from 2006-2018

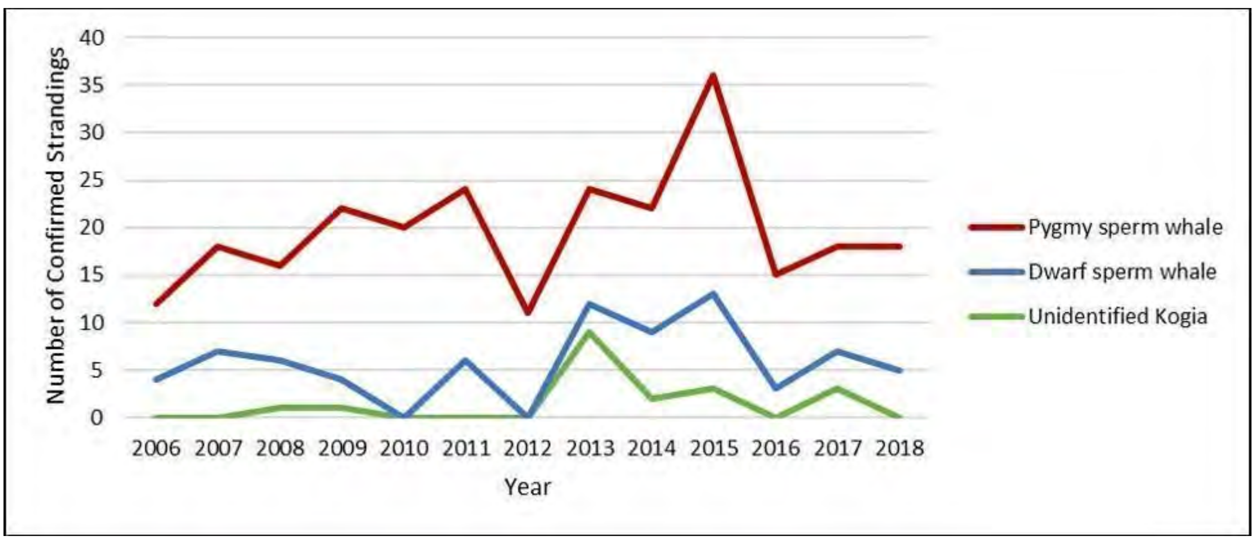
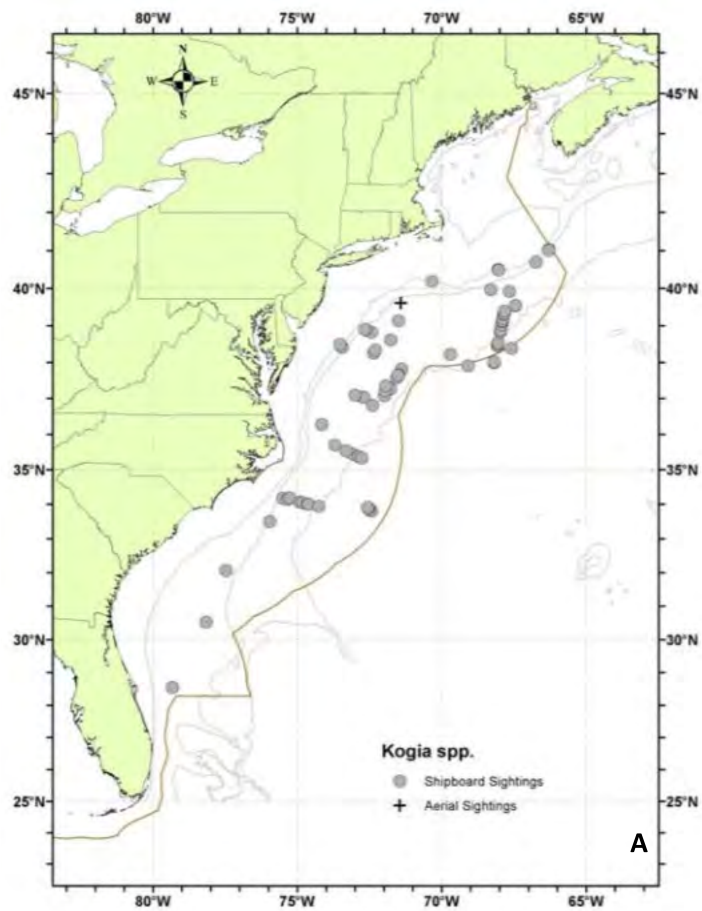


Figure 3. *Kogia* spp. sightings, A) 2004 and 2011 surveys in the Atlantic, and B) 1996-2001, 2003, 2004, and 2009 surveys in the Gulf of Mexico.



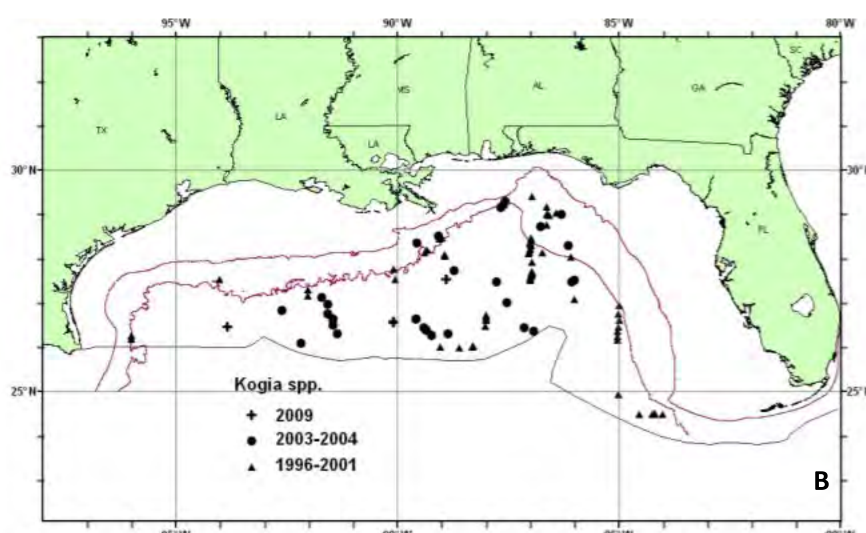
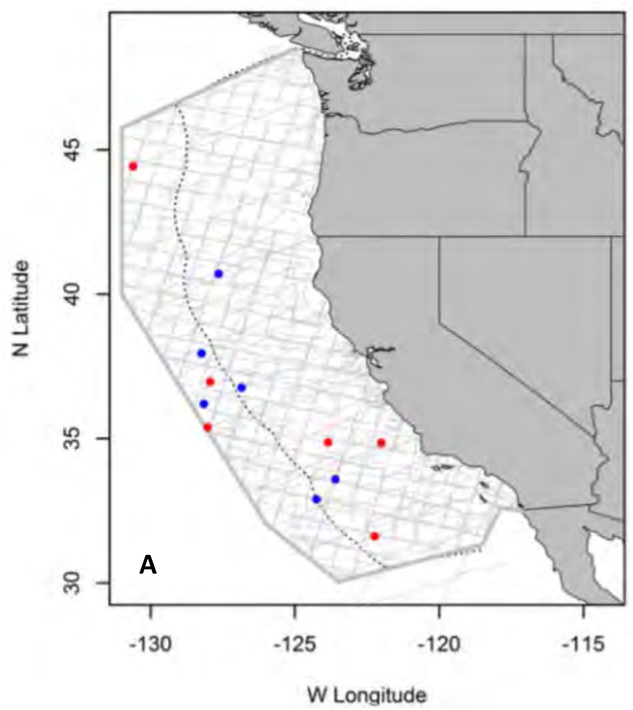


Figure 4. *Kogia* spp. sightings, A) 1994-2014 surveys off California, Oregon, and Washington, B) Dwarf sperm whale 2002 and 2012 surveys surrounding the Hawaiian Islands, and C) Pygmy sperm whales 2002 and 2010 surveys surrounding the Hawaiian Islands.



B

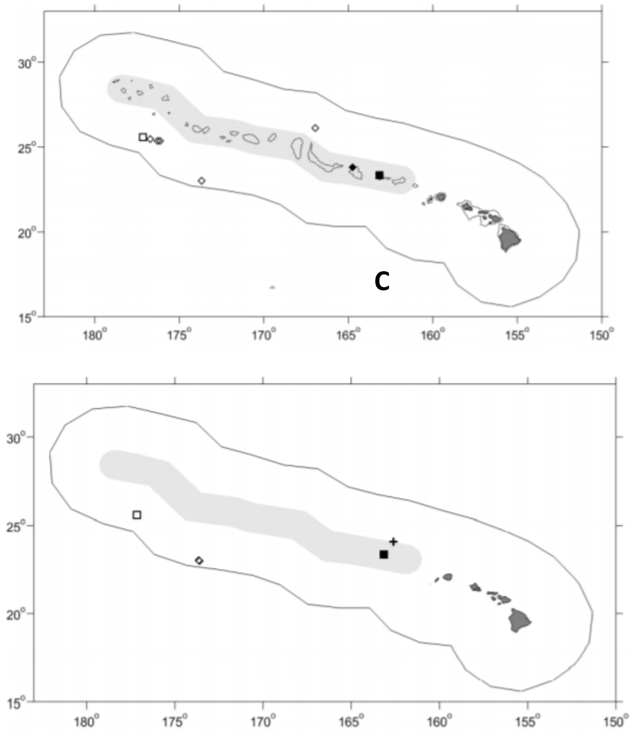
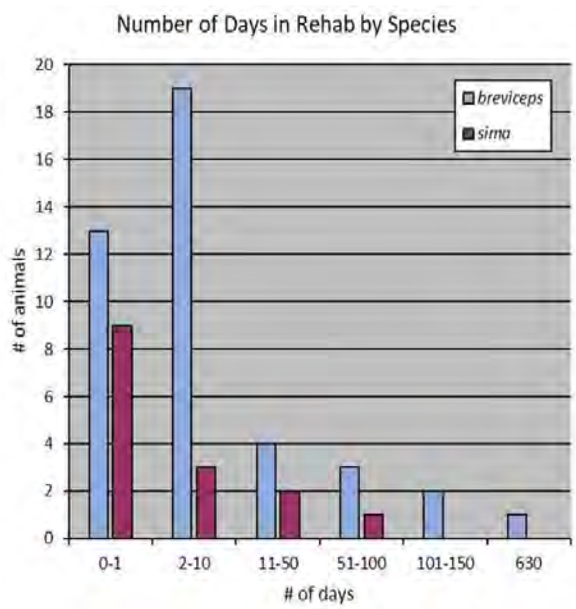


Figure 5. Number of days *Kogia* spp. survived in rehabilitation by species and age class between 1995 and 2007.



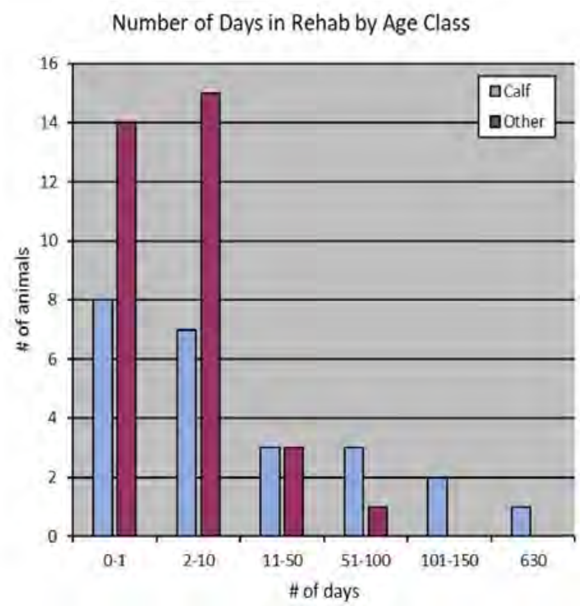


Table 1: National average *Kogia* strandings from 2006-2018.

National Average Strandings 2006-2018	
Dwarf	10.31 (+/-3.47)
Pygmy	30.15 (+/-5.89)
Unidentified *Kogia*	3.50 (+/-2.43)

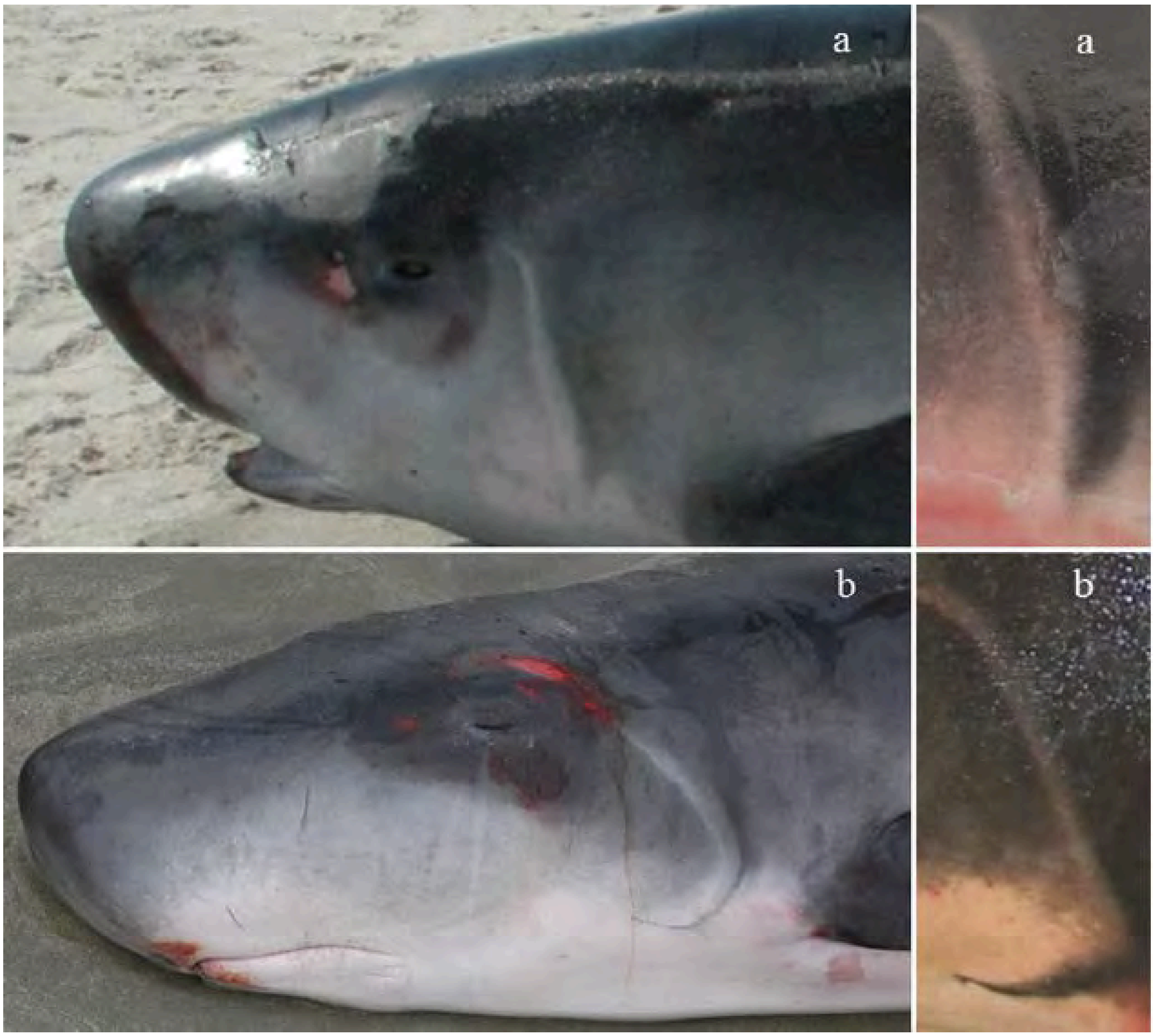
Table 2: The average number of *Kogia* spp. strandings per year along the east coast of the U.S. by species and geographic region.

Average East Coast Strandings 1990 – 2018			
	All *Kogia*	K. breviceps	K. sima
Atlantic	30	22	6
Gulf*	7	4	2
Puerto Rico and the US Virgin Islands	<1	<1	<1

*Includes Florida Keys

7. Appendix A: Species Identification, "False gill slit" pigmentation pattern (Keenan-Bateman, 2016)

Species-specific differences in the "false gill slit" pigmentation pattern among (a) *Kogia* sima and (b) K. breviceps.



8. Appendix B: Necropsy Sample List

GoMEX Sample Collection Checklist 2018

____ Level A
Field # ______________
____ Human Interaction form developed by CCSN and VAQS
____ Morphometrics (code 1 - early 3)

Biotoxins:
Code 2 & early 3
Freeze -20, 5 ml or 10g:
____ Liver
____ Feces
____ Urine
____ Stomach contents/ gastrointestinal contents

Contaminants, POPs:
Code 2, adult & sub-adult males
Freeze -80 preferred, -20
Foil, dull side in
____ Blubber

Viral (code 2 & early 3):
Cryovial, freeze at -80
____ Lung
____ Lung lympn node
____ Brain
____ Spinal cord
____ Blowhole swab
____ Rectal swab

Life History (code 2 & early 3):
Freeze, -20:
____ Teeth for aging
____ Teeth for stable isotopes
____ Skin/muscle for stable isotopes
In DMSO or frozen:
____ Skin (genetics)
Photographs
____ Dorsal fin for photo-ID
Reproductive Data
____ Testes measurements, see below
____ Ovaries measurements, see below
☐ Pregnant?
____ Length of fetus
____ # CL ____ # CA

Brucella (code 2 & early 3):
5 ml cyrovial, Freeze at -80
____ Joint lesion (swab or abscess tissue)
____ Lung
____ Brain (cerebellum inc. meninges)
____ Spinal cord
____ CSF

Live animals:
Life history
____ Dorsal fin for photo-ID
____ Skin biopsy in DMSO **or**
____ Blood in EDTA vacutainer (-80)
Chemistry/Hematology
____ 1-3 ml purple top K_3EDTA
____ 6-10 ml red/gray tiger top SST tubes
____ 1 green top sodium heparin tube
____ 2 blood smears
Pathogen
____ Blowhole Swab (-80)
____ 1 ml Whole Blood (-80)
____ 1 ml Serum (-80)

Special Case: Freshwater Exposure
Live Animal, Code 1
____ Plasma for renin (-80)
____ Urinalysis, dipstick
____ Urine, specific gravity
____ Remaining urine for chemistry (-80)
____ Water salinity at site
Brown/orange material or skin lesions?
____ Photos of lesions with measurement scale
____ Skin scraping (glass slide)
____ Skin lesion in formalin
____ Skin lesion cryovial (-80)
____ *Skin lesion VTM (-80) if avaiable*
____ *Skin lesion RNA Later (-80) if available*
Code 2
____ Serum from congealed blood (-80)
____ CSF (-80)
Code 2 & early 3 (see full histology list)
____ Water salinity at site
____ Urinalysis, dipstick
____ Urine, specific gravity
____ Remaining urine for chemistry (-80)
____ Vitreous (eye) (-80)
Brown/orange material or skin lesions?
____ Skin scraping (glass slide)
____ Skin lesion wedge w/ blubber (-20)
____ Photos of lesions with measurement scale

Histology (code 2 & early 3):
**Priority samples
10% neutral buffered formalin, 10:1 formalin:tissue ratio
Samples fixed in formalin should be no more than 1 cm thick

____ Blubber
____ Skin and any skin lesions
____ Muscle (specify location)
____ Eye (L/R)
____ **Lung
____ **Trachea
____ **Heart (all 4 chambers)
____ Aorta
____ Pulmonary Artery
____ Thymus
____ **Thyroid
____ **Laryngeal Assoc. Lymph. Tissue
____ Pharynx
____ Tongue
____ Esophagus
____ **Liver
____ Stomach (all chambers)
____ Pancreas
____ **Spleen
____ Small Intestine (proximal, mid, distal)
____ Colon

____ **Kidney
____ **Adrenal Gland
____ Urinary bladder
____ Gonads
____ Mammary Gland
____ **Uterus/Uterine horn
____ Vagina & Cervix
____ Prostate & Penis
____ Spinal Cord (specify location)
____ **Brain (cerebrum, cerebellum,stem,pituitary)

Lymph nodes/ additional histo (list tissue):
**Thoracic ____________
**Abdominal/Genital ____________
____
____
____
____
____
____

Field # _______________

Additional Samples Collected:

	Tissue	Preservative	Analysis/Comments

Reproductive Measurements

circle one: Ovaries / Testes

_____ Right Length
_____ Right Width
_____ Right Diameter
_____ Left Length
_____ Left Width
_____ Left Diameter

Appendix XIX

NATIONAL MARINE FISHERIES SERVICE (NMFS) CRITERIA FOR DISENTANGLEMENT ROLES AND TRAINING LEVELS

Levels of Participation in the Disentanglement Network – Definitions

Roles	Levels
First Responder	1-5
Primary First Responders	3-5
Primary Disentanglers	4-5

First Responder is a general term that is used to describe anyone in the Network with any level of training who may respond to an entanglement report under Network protocols and authorization. At a minimum they will voluntarily attempt to standby with an entangled whale and, depending on training, experience, authorization and equipment available, may also assess and perhaps tag the whale. Individuals with higher Network ratings (Levels 3-5) may act as **Primary First Responders** in local areas. Primary First Responders direct efforts locally and, under certain conditions and authorization, may attempt disentanglements during first response. These individuals have rapid access to vessels and specialized equipment. Additionally, Primary First Responders are on call full- time or at least during those times when there is a high likelihood of an entanglement report in their area of responsibility.

A First Responder's anticipated range of tasks is generally dependent on their classification in the Network. Classifications to various levels are determined on an individual basis and are based on a number of factors including, but not limited to the following:

- Preexisting experience and skills
- Willingness and commitment to build experience and improve skills
- Training
- Opportunity and available resources
- Location
- Commitment to being “on-call”
- Commitment to respond as needed

Primary Disentanglers are individuals who can perform all of the responsibilities of a first responder, but who also meet the criteria used by NMFS for selecting individuals who may undertake the very dangerous activity of disentangling (i.e. attaching to, stopping and cutting a whale free). Primary Disentanglers must have the experience, training, support and proper equipment at the time of the event to conduct a full disentanglement with a high likelihood of success. Primary Disentanglers are those rated at Level 4-5 in the Disentanglement Network. A summary of the various levels of certification follows.

DISENTANGLEMENT NETWORK CERTIFICATION

LEVEL 1

Targeted Individuals: Professional mariners (*i.e.* fishermen, naturalists, Marine Patrol Officers) Boating experience and/or experience around whales is highly suggested (*i.e.* professional fishing, field biology, marine law enforcement, whale watching, etc.)

Responsibilities

Level 1 activities: report, standby, and assess (within experience)

- Rapidly alert Disentanglement Network of first-hand and/or second-hand knowledge of local entanglements
- Depending on experience, stand by an entangled whale until backup arrives, and/or
- Communicate with crew on the vessel that is directly standing by the entangled whale and offer to replace the stand by vessel until additional backup or the response team arrives (if needed and within experience)

Criteria for certification

- Completed Level 1 classroom training, or
- Viewed Provincetown Center for Coastal Studies (PCCS) Training Video and demonstrated equivalent knowledge and experience (submit resume)

LEVEL 2

Targeted Individuals: Professional mariners (*i.e.* fishermen, naturalists, Marine Patrol Officers). There is a higher expectation of commitment and participation from Level 2 responders.

Responsibilities

<u>Level 2 activities</u>: report, stand by, and assess at a higher level (within experience)

- Provide a thorough assessment of the nature of the entanglement and the species, condition and behavior of the whale
- Provide local knowledge, transportation, and assistance to Primary First Responders, as needed, on a voluntary basis
- Be on call, as available, to assist in planned disentanglement operations on telemetry tagged whales

Criteria for certification

Level 1 certification in addition to the following:

- Completed Level 2 on-water training, or
- Viewed PCCS Training Video and demonstrated equivalent knowledge and experience (submit resume)

LEVEL 3

Targeted Individuals: Whale researchers and naturalists, fishermen, natural resource agency personnel, Marine Patrol Officers.

Responsibilities

<u>Level 3 activities</u>- report, stand by, assess, document and attach a telemetry buoy. Other activities may include:

- Be on call 24 hours and should respond if conditions allow
- Initiate and maintain preparedness with local fishing industry, Coast Guard, and other resources
- Prepare local disentanglement action plan
- Provide entanglement assessment, documentation and recommendations to Primary
- Disentanglers during events
- Attach telemetry equipment to entangling gear if needed and authorized
- May be asked (depending on experience) to disentangle a minor entanglement with potential to adversely affect any whale other than right whales under the supervision/authorization of

Level 4 or 5 network members. Authorization and supervision may be given over the phone or radio depending on the circumstances and level of experience.

Criteria for certification

Level 1 and 2 certification and experience in the following elements:

- Large whale species identification and behavior, and the ability to safely follow a free swimming, entangled whale
- Boat handling and safety including basic seamanship, driving, and close approaches to whales
- Line handling and safety including knowledge of knots, handling lines under pressure, and an understanding of how working lines behave
- Follows instructions and response plans

Note: Each candidate will be evaluated for each element and any deficiencies must be supplemented with adequate training and/or experience.

Additionally, all Level 3 responders must have:

- Basic Level 3 training, or
- Advanced Level 3 training - an apprenticeship with PCCS

LEVEL 4

Targeted Individuals: Whale researchers and naturalists, fishermen, natural resource agency personnel, Marine Patrol Officers.

Responsibilities

Level 4 activities-

- Report, stand by, assess, document, attach a telemetry buoy, consult on an action plan and disentangle all large whales except right whales
- Report, stand by, assess, document and attach a telemetry buoy to right whales
- On a case by case basis and after consultation (see commitment to consult under Level 5 below), certain cuts on known entangled right whales may be permitted at level 4 ***if the proposed action is first approved by level 5 disentanglers and NMFS***

Please Note: Entangled whale behavior varies considerably by species. However, Level 4 Disentanglers should routinely be able to attempt disentanglement of all large whales other than right whales.

Criteria for certification

Basic or Advanced Level 3 Certification and:

- Direct experience in a supervised (by PCCS/Network coordinators or NMFS) large whale disentanglement, documentation of that experience, and a positive evaluation from NMFS using information provided by PCCS/Network Coordinators and any hard documentation (*i.e.* video)
- When possible, commitment to consultation as detailed in Level 5 below

LEVEL 5

Targeted Individuals: Level 4 Responders

Responsibilities

Level 5 activities - report, stand by, assess, document, attach a telemetry buoy, consult on an action plan and disentangle all large whales including right whales.

Please Note: Right whales are aggressive and therefore generally the most difficult whales to disentangle. North Atlantic right whales are among the most critically endangered large whales in the world. Certification at this level is highly selective and specialized.

Criteria for certification

Level 4 certification and:

- Experience w/ right whale behavior and/or includes a person on the team directly involved in the whale disentanglement (in the boat with the whale) that is experienced in right whale behavior
- Documented participation in a right whale disentanglement and/or NMFS/PCCS review of video of participation in a right whale disentanglement that followed NMFS protocol
- Commitment to Consultation to include:

- Immediate Consultation: when possible, use satellite/cell phones to bring in additional ideas/experience from other level 5s and level 4s (and vets and behaviorists if appropriate) while on scene with an entangled right whale
- Action Plan Development: For a tagged right whale, consultation required with NMFS, level 5s and 4s, veterinarians, behaviorists, etc.

Rationale for consultation: First assessments and strategies almost invariably change with more discussion or information. Consultation will likely help to increase human safety and critical choices regarding risks to whale health must be made with the best available information.

Appendix XX

Large Whale Entanglement Response Best Practices

Drafted for NOAA's Marine Mammal Health and Stranding Response Program

September 2020

J. Straley/ NOAA MMHSRP permit # 932-1489

Executive Summary

Entanglement in, and ingestion of, actively-fished gear, marine debris, and non-fishery-related gear, is a global problem affecting many marine species, including large whales. It has been estimated that hundreds of thousands of cetaceans die each year as a result of entanglements worldwide, representing a significant anthropogenic threat. Entanglement for large whales can result in serious injury and mortality. Entanglement also impacts fisheries and poses risks to responders that might attempt to free the animals. Responding to an entangled large whale is a challenging and dangerous undertaking. The likely mobility of the animal, unfavorable weather and sea-state conditions, lack of experienced and trained responders, along with support and resources (*e.g.,* vessels, equipment), the animal's large size, and its stressed and unpredictable nature, compound the challenges and safety concerns surrounding large whale entanglement response. People have been seriously injured and killed. This document provides Best Practices guidance towards safe and effective large whale entanglement response. It represents a set of proven currently used protocols and techniques, along with associated tools and technology, to safely free some (not all), large whales from life-threatening entanglements. However, the risk reduction in these Best Practices goes beyond that of animal welfare and human safety concerns represented by disentanglement efforts, and also considers the broader effort of gathering valuable information - "entanglement response", that may ultimately mitigate the threat (and risks) of entanglement for large whales. Therefore, it includes necessary preparation and planning, as well as risk assessment and mitigation for animal and human safety, and the criteria and authorizations that need to be followed. The principal resources of large whale entanglement response are the trained, well-equipped, and experienced responders. Human safety is paramount. It is for risk reduction that all large whale entanglement response efforts in the United States involving close approach are authorized, overseen, and permitted, under NOAA Fisheries' Office of Protected Resources and their Marine Mammal Health and Stranding Response Program (MMHSRP).

Although this document includes known/existing Best Practices, responders should never stop striving for innovative and new methods to increase the safety and success of an entanglement response. These protocols are meant as overall Best Practices and should not limit advances in techniques for improving animal welfare or increasing the safety, efficiency, or effectiveness of the response.

Objectives

The objectives of this document are to provide Best Practice principles and guidelines, to identify the hazards and risks associated with large whale entanglement response, and to safely and effectively mount warranted and authorized response efforts to large whales with life-threatening entanglements under NOAA's Marine Mammal Health and Stranding Response Program. The objectives of large whale entanglement response are to first, safely free some whales from life-threatening entanglements. Secondly, increase awareness and appropriate stewardship, thus minimizing the potential risks of response to members of the well-meaning public, as well as for trained, authorized responders. Finally, and most importantly, gain valuable information towards preventing entanglements and minimizing their impacts. The latter, if successful, has the advantage of reducing the overall risk posed by large whale entanglements.

Dedication and Recognition

This document is **dedicated** to the memory of Joe Howlett of Campobello Island, Canada. Joe was a fisherman and conservationist. He was also an experienced, dedicated and passionate member of the Campobello Entanglement Response team who on July 10, 2017, tragically died while attempting to disentangle a North Atlantic right whale in the Gulf of St. Lawrence. This unfortunate incident should remain a reminder to all those that are a part of large whale entanglement response efforts worldwide, of the risks involved, and is an important motivation for these Best Practices in order to prevent similar tragedies in the future.

As such this document also **recognizes** the risks and efforts of all who have been and are presently part of the global large whale entanglement response effort. Their dedication, and in many cases initiation, is to be acknowledged. Organized entanglement responses were begun by Jon Lien in Newfoundland, Canada, in the late 1970s, Dr. Charles "Stormy" Mayo and David Mattila in the Northeast region of the U.S. in the 1980s, and by others from other regions around the globe (esp. Australia, Canada, New Zealand and South Africa as it relates to early efforts). Much of the content within these Best Practices originates from their early response efforts and others since then, and similar best practices and risk assessment documents. One example that compiles the experience of those across the globe is the IWC international consensus Principles and Guidelines for large whale entanglement response (see Appendix C), a document based upon the overarching principles developed by international experts and endorsed by the 89 countries of the IWC, including the United States.

Disclaimer

The Best Practices principles and guidelines outlined in this document are primarily meant for use by authorized responders and managers, as well as, members of federal and state agencies, non-governmental organizations (NGOs), researchers, industries (fisheries, tour), and others from the on-water community that might provide authorized large whale entanglement response support under NOAA's Marine Mammal Health and Stranding Response Program (MMHSRP). They do not represent a manual for the general public on how to disentangle a large whale. As well-intentioned as the public might be, the disentanglement of a large whale is extremely challenging and dangerous. Only trained, experienced, and well-equipped personnel, working under the MMHSRP, should attempt to disentangle large whales.

While the goals of these Best Practices are to minimize the risks from the threat and its associated response, large whale entanglement response is inherently complex, unpredictable, and potentially a dangerous endeavor. Following these Best Practices does not guarantee the safety of responders, an animal's successful release, nor the timely and successful garnering of information towards reducing the threat and its impacts.

The National Marine Fisheries Service's (NMFS) Office of Protected Resources (OPR), the authors, and other contributors, do not warrant that the information in this document is free from errors or omissions, nor do they accept any form of liability for any actions taken as a result of these guidelines and principles. While there are criteria and principles outlined that are required (*i.e.*, obligatory) as part of the MMHSRP's authorized response efforts, there is <u>no obligation</u> to initiate, or to be a part of those efforts. All responsibility is upon the responder to undertake safe activities using their best judgment. Again, this is not an instruction manual.

The content presented in this document, in part, attempts to compile the cumulative experience of knowledgeable responders, and similar Best Practices and risk assessment documents provided by other networks. However, the NMFS' OPR, the authors, and other contributors do not take responsibility for the opinions or actions of others arising from the use of content within this document. In addition, these Best Practices represent a living document, intended to evolve as new information and experience is gained.

1. Introduction

○ 1.1 Background

Entanglement in and ingestion of actively-fished gear, marine debris, and non-fishery-related gear is a global problem affecting many marine species, including large whales (Laist 1996a; Gall & Thompson 2015). Entanglement is considered a significant anthropogenic source of large whale injury and mortality (Lien et al. 1989; Robbins and Mattila 2004; Kraus 1990, Knowlton & Kraus 2001, Johnson et al. 2005, 2007; Kraus et al. 2005, 2016; Glass et al. 2010; Pace et al. 2014). Worldwide mortality of cetaceans from fisheries by-catch, the unintended catch or entanglement of non-targeted species, has been estimated to be in the hundreds of thousands annually (Read et al. 2006; Read et al. 2013).

Entangled humpback whale off Alaska (A. Jensen/ NOAA AKPRD/ MMHSRP permit # 923-1489)

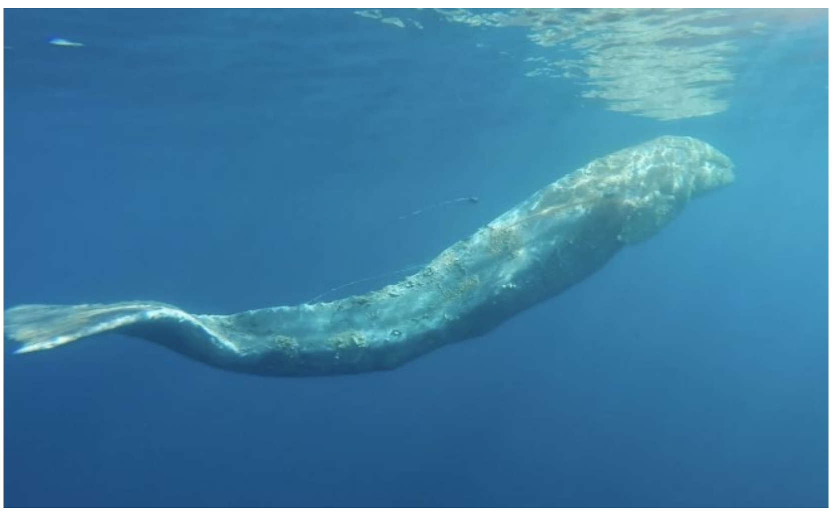
Large whales entangled in gear are impacted at both the individual and population level. Individual impacts include physical trauma resulting from wounds (Lyman & Mattila 2010), weakening of the immune system (Hunt et al. 2006; Rolland et al. 2017) and infections (Knowlton & Kraus, 2001;

Entangled North Atlantic right whale in poor condition (NOAA NEFSC/ MMHSRP permit # 18786)

Cassoff et al. 2011; Moore et al. 2013). Entanglement can also hinder a whale's mobility, impacting feeding (Clapham, Young & Brownell 1999; Coughran 2004), and increasing energy expenditures from dragging gear (Moore et al. 2013; van der Hoop et al. 2014), which in turn can affect the animal's condition, including emaciation (Cassoff et al. 2011; Moore & van der Hoop 2012). Restricted mobility may result in drowning (Moore et al. 2013), and can contribute to other threats, such as whale-vessel collisions (Laist et al. 2001). Any of these can result in death (Cassoff et al. 2011; Clapham, Young, and Brownell 1999; Moore et al. 2013). Other associated impacts include behavioral, such as disruptions to nursing (Kotet et al. 2009) and an increase in predatory attacks (Mazzuca et al. 1998; Moore et al. 2013). Impacts to individuals raise animal welfare concerns, as they are considered a source of pain and suffering (Moore & van der Hoop 2012). Population-level impacts resulting from mortalities may decrease population size (Caswell et al., 1999). Entanglement may reduce recruitment through reduced calving rates (van der Hoop, Corkeron & Moore 2016; Rolland et al. 2016), reduced calf fitness and survivorship, and higher incidence of juvenile entanglement (Lien 1994; Mazzuca et al. 1998; Robbins 2011; Knowlton et al. 2012). In some populations, entanglements may be a major depressing factor, affecting their ability to recover, as is the case with the critically endangered North Atlantic right whale (Kraus et al. 2005; Knowlton et al. 2001; Caswell 1999; NMFS 2005, van der Hoop et al. 2012).

Large whale entanglements also pose risks and impacts to fishermen, and the fishing and aquaculture industries. The risks include: injury and loss of life from dealing with a whale in their gear; loss of equipment (including their vessel), the catch, and time, all equating to money; increased regulations; and bad public perception *(i.e.*, all fishermen are bad; fishing is bad).

Between 2007 and 2016, an average of 69 large whales were confirmed entangled in US waters annually (NOAA 2018). However, reporting underestimates the magnitude of the threat as many animals will not be observed for various reasons, including: the expansiveness and observational challenges (*e.g.,* effort, conditions) of the world's oceans, and animals can carry all or parts of the gear over broad expanses and over time (*i.e.,* across ocean basins and away from effort). The cryptic nature of gear, as well as the fact that the animals spend much of their time submerged, gear being shed (*i.e.,* self-released), and animals falling victim to the entanglement (*i.e.*, dying with the carcass sinking), translates to an decreased probability of the animal being observed. In addition, the sources of reports are not typically dedicated and directed in nature, but opportunistic. Sources of reporting can be from on-water, aerial and land-based sources and can include governmental and military patrols, research and monitoring efforts (*e.g.,* observer programs), tour industry, fishermen, and the general public.



Entangled gray whale calf (NOAA PRD-WCR/ MMHSRP permit # 932-1905)

While all species of large whales have been reported entangled within U.S. waters and/or by U.S. sources, the most commonly reported are minke whales (*Balaenoptera acutorostrata*), humpback whales (*Megaptera novaeangliae*), gray whales (*Eschrichtius robustus*), and North Atlantic right whales (*Eubalaena glacialis*; NOAA 2020). Right whales are of considerable concern, (Moore et al. 2006; Rolland et al. 2016) due to their critically Endangered status, and the impacts entanglement has had and continues to have on the species (NMFS 2017).

Scar analysis studies of wounds resulting from recent and non-lethal entanglements, indicate that the rate of entanglement for many large whale populations is much higher than sighting reports and known disentanglement efforts would suggest. Data from scar studies performed on humpback whales in the North Atlantic indicate that only 7% of the humpback whales that get entangled on an annual basis are ever observed, and thus reported (Mattila & Robbins 2003). Analysis of scarring in North Atlantic right whales indicated that 84.7% may have been recently entangled (Knowlton et al. 2018). Scar studies for humpback whales in the Gulf of Maine and parts of Southeast Alaska suggest non-lethal entanglement rates of around 50% (Robbins & Mattila 2001, 2004; Neilson et al. 2009; Robbins 2009, 2011). Scar rates for humpback whales in Hawaii over the last eight years have averaged 21% (Lyman and Finn 2020). Entanglement scar analysis has been done on a variety of other species, including, bowhead whales (George et al. 2017), gray whales (Bradford et al. 2009), and minke whales (Northridge et al. 2010). Scar analysis also illustrates that many animals given time will release the gear on their own. This has response implications, as an animal that is assessed as likely self-releasing, will likely not warrant a response. However, scar analysis, like reporting, does not give us the complete picture of the threat, as some animals will fall victim to the entanglement or otherwise never be observed. Humpback whales in the Gulf of Maine have been shown to have had an estimated mortality from entanglements of approximately 4%, and for every one animal observed and reported dead, nine others likely fell victim (Robbins et al., 2009).

Line-scarred humpback whale (Chad Kruzic)

In addition, long-term sighting histories, and knowledge of entanglement outcomes and inferences from annual entanglement wound analysis, suggest annual mortality rates for some species and populations could be significantly impacting growth rates, and therefore hindering the recovery of some populations (*e.g.,* North Atlantic and North Pacific right whales).

Large whales have been recorded entangled in just about anything and everything found in the world's oceans (*i.e.,* actively-fished gear; marine debris, constituting lost or abandoned fishing gear; and non-fishery-related gear). The sources of these entanglements are extensive and diverse. However, a majority of the known gear entangling whales is believed to be actively-fished gear (Meÿer et al. 2011). Many types of fishing gear (*e.g.,* gillnets, longlines, and pot/trap lines) are known to cause entanglements (Baird et al. 2002; Johnson et al. 2005; Read et al. 2006; Song et al. 2010; Benjamins et al. 2012). Gear entangling the animals will vary over regions and time based on fisheries and their seasonality, along with the animals' distribution and abundance changes. Much of this gear however is fixed, that is, it is set and left for a period of time (Johnson et al. 2005). The identification of the gear - the source of the entanglement, poses many challenges and biases, including the identifiable nature of the gear and the different impacts it might pose. As an example, Bering Sea crab pot gear contains robust, long-lasting surface buoy systems that generally equate to the gear being more identifiable for a greater length of time. This gear may also pose differential risks represented by the higher risk posed by the greater breaking strengths compared to the potentially lower risks from the larger diameter lines providing some chafe protection to the animal.

Humpback whale entangled in marine debris off Hawai'i (NOAA HIHWNMS/ MMHSRP permit # 932-1489)

As far as why large whales get entangled, it is likely due to a number of possibilities. In some cases, the entanglement may be from intentional contact/interaction, representing attempts to depredate the catch, playing with the gear, and/or use of the gear (*e.g.,* rubbing on it to remove parasites). The animal is aware of the contact with the gear, and possibly attracted to it. In other cases, the contact with the gear is unintentional (*i.e.,* they have stumbled into it). Examples include: inattention during feeding, breeding, or other behaviors; inability to detect the gear due to its cryptic nature (*e.g.,* a gillnet); environmental characteristics (*e.g.,* water clarity, time of day); and the novelty of the gear (*e.g.,* the inexperience of younger animals, a new fishery opening). Whether the initial contact with the gear is intentional or not, the entanglement itself is unintentional and can have serious consequences.

Entanglement threat is very dynamic, as changes in the gear, the animals' distribution and fishing effort influence the rate and impact of entanglement. However, recent environmental changes may further reflect the dynamic nature of entanglement threat by providing new and different habitat, and even greater changes in fishing effort, that will further affect large whale entanglements, and associated reporting (Lyman et al., 2019). Continued monitoring and investigation is needed to understand, and thereby potentially mitigate, what is a continually evolving threat - a moving target.

Due to their large size, the impact of entanglement for whales is typically not immediate. As such, and in many cases, there is time to potentially free the animal. Animals have been known to remain entangled for months and even years (Moore et al. 2006). However, responding to an entangled large whale is a challenging and dangerous undertaking due to the inaccessibility and likely mobility of the animal, weather and sea state conditions, availability of resources, the size of the animal, the fact that the animal likely doesn't realize responders are there to help it, and the paucity of cases that warrant response providing little opportunity for responders to gain hands-on experience. People have been seriously injured and killed during large whale disentanglement efforts. However, there is a great deal of value in responding to an entangled large whale. While dangerous, the disentanglement of an animal and associated efforts (hence referring to the overall effort as "large whale entanglement response"), may not only free an animal from a life-threatening entanglement and thereby have animal welfare benefits, but contribute towards the broader conservation and risk reduction goals. For instance, entanglement has broader impacts, including to fisheries, and responders that might be tasked to free the animal.

Authorized response team attempting to free an entangled humpback whale off New England (CCS/ NOAA MMHSRP permit # 18786)

Organized entanglement responses were begun by Jon Lien in Newfoundland Canada in the late 1970s, and a number of advances in tools and protocols for working with free-swimming entangled whales were developed by Dr. Charles "Stormy" Mayo and David Mattila at the Center for Coastal Studies in the 1980s (Moore et al., 2018). Other regions around the globe developed large whale entanglement response efforts, and associated tools and procedures; however, much of the large whale entanglement response and response network in the U.S. today has its origins with the Center for Coastal Studies.

Response team frees a humpback whale off the Pacific Northwest (PNWERN/ NOAA MMHSRP permit # 18786-03)

NOAA Fisheries' Office of Protected Resources (NMFS OPR) and their Marine Mammal Health and Stranding Response Program (MMHSRP), built upon these initial regional efforts of partnering with state and federal agencies, non-governmental organizations (NGOs), researchers, the fishing industry, members of the community and many others, to establish a network of trained, experienced, well-equipped responders throughout the U.S. The principal resource of large whale entanglement response is the network of authorized responders. Human safety is paramount. The Network follows protocols and techniques that have been proven over time, and can mitigate the risks posed by the response to an entangled large whale. It is for risk reduction - to humans and animals - that all large whale entanglement response efforts involving close approach are authorized, overseen, and permitted, under NMFS OPR and their MMHSRP.

While the Network's efforts to free large whales from lethal entanglements are authorized and overseen, risks still exist and not every whale will be freed (just as not all the marine debris can be removed from the world's oceans). Thus, the primary goal of the Network is towards prevention. By responding to reports of life-threatening entanglements, authorized network response provides valuable information that guides the effort to prevent entanglement – the ultimate goal. Information gained from large whale entanglement response efforts will help to better understand the threat of large whale entanglement, (*e.g.,* the need for mitigation and the evaluation of implemented mitigating measures) and its associated impacts into the future. Much of the information provided above (*i.e.,* within the Background) has been gained through these efforts.

The Network's response hopefully also reduces risk to the well-intentioned general public that might attempt to free an animal on their own, which, in addition to being dangerous, may be illegal. In most cases, well-meaning rescue attempts fail to completely free the animal, leaving lethal wraps behind that may make the situation worse. In addition, such efforts fail to garner information to reduce the threat and its impacts. Immediate reporting and authorized response is the best way to help the animal and reduce risk to the public.

This document provides Best Practice guidance towards large whale entanglement response. It represents a set of proven and currently used protocols and techniques (*i.e.*, standard operating procedures [SOPs]), along with associated tools and technology, which have proven themselves over time to safely free some large whales from life-threatening entanglements. The risk reduction in these Best Practices goes beyond that of animal welfare and freeing entangled whales, as it also emphasizes reducing risk through increasing awareness and includes the gathering of valuable information that may ultimately mitigate the threat (and risks) of entanglement for large whales.

Response team attempts to cut free entangled humpback whale off Alaska (S.Lewis/ NOAA MMHSRP permit # 932-1905)

Mitigating the threat of large whale entanglements will require a collaborative effort from resource managers, scientists, conservation organizations, industries (fishing, tour, etc.), NGOs, local communities, including indigenous, as well as local, state and federal governments. Accordingly, these Best Practices represent the collaborative efforts of many to pool expertise and knowledge.

○ 1.2 Marine Mammal Health and Stranding Response Program

The Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established in 1992 by Congress, under Title IV of the Marine Mammal Protection Act (MMPA) to protect and preserve marine mammals and their ecosystem. The MMHSRP coordinates emergency response to stranded and/or entangled cetaceans and pinnipeds (excluding walrus)* in the U.S. working with stranding and entanglement networks as well as local, tribal, state, and federal government agencies. The MMHSRP works to standardize regional network operations and define national entanglement and stranding response policy to ensure that all activities performed are safe for both responders and animals. Large whale entanglement response is a permitted activity under the authority of an enhancement permit issued to the MMHSRP.

* Polar bears, walrus, sea otters, and manatees fall under the jurisdiction of the U.S. Fish and Wildlife Service.

https://www.fisheries.noaa.gov/national/marine-life-distress/marine-mammal-health-and-stranding-response-program

- ### 1.3 Legislation Pertinent to Large Whale Entanglement Response

Marine Mammal Protection Act (MMPA): The MMPA, signed into law in 1972, prohibits the "take" of marine mammals. Take, as defined under the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1362). The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS is responsible for the protection and conservation of all cetacean and pinniped species (with the exception of walruses), and their habitat and USFWS oversees the management of walruses, polar bears, sea otters, and manatees, and their habitat. The 1992 amendments to the MMPA included Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health of marine mammals and health trends of marine mammal populations through the collection of stranding data.

Endangered Species Act (ESA): The ESA, enacted in 1973, provides for the conservation of species that are listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on "take" with certain exceptions, which means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (16 U.S.C. § 1531).

In 1992, the **Marine Mammal Health and Stranding Response Program (MMHSRP)**, under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the MMPA. The MMHSRP centrally coordinates marine mammal stranding response efforts in the United States under Title IV of the MMPA as well as a NMFS MMPA/ESA permit. The MMHSRP works to standardize regional network operations and define national stranding response policy.

Trained response team frees entangled gray whale off California (NOAA PRD-WCR/ MMHSRP permit # 18786-02)

Since 1999, large whale disentanglement response, now referred to as “large whale entanglement response,” has been under the MMHSRP as a permitted activity to maintain a safe and effective response to whales in life-threatening entanglements, and further reduce risk through the ultimate goal of prevention - entanglement threat mitigation.

○ 1.4 Best Practices Purpose and Intended Uses

NMFS and the MMHSRP have developed Best Practices for the warranted and authorized response to large whales that are observed with life-threatening entanglements. It is intended to provide best practice guidelines to identify the hazards and risks associated with large whale entanglement response, as to safely and effectively respond to large whales with life-threatening entanglements under NMFS’ MMHSRP. The health, welfare, and safety of both human responders and animals are the top priority for NMFS and the Marine Mammal Stranding and Entanglement Response Networks they oversee.

The Best Practices outlined here focus on the broad nature of large whale entanglement response. They should only be used as guidance towards the response of entangled large whales. Protocols and procedures addressing entanglement and associated response (*e.g.,* entrapment) to small cetaceans and pinnipeds can be found in the NMFS Best Practice Guides for Small Cetacean or Pinniped Entanglement Response. In addition, these Best Practices are meant for trained, experienced and authorized personnel operating under the oversight and authorization of NMFS MMHSRP in their pursuit to mitigate risks of large whale entanglement response in the U.S.

These Best Practices have been compiled from the cumulative experience of many large whale entanglement responders, and from other large whale entanglement response Best Practices and Risk Assessments from around the world (see Acknowledgements). For instance, these U.S. Best Practices are consistent with and strive to expand upon the IWC international consensus Principles and Guidelines for large whale entanglement response (see Appendix C), a document endorsed by 89 countries, including the U.S., and itself compiled from past efforts of similar documents. They represent a suite of proven and currently used protocols and techniques (*i.e.,* SOPs), along with associated tools and technology, to safely pursue freeing some large whales from life-threatening entanglements.

These Best Practices balance the need for standardized procedures, while allowing flexibility to address specific needs of different situations resulting from different species, age class, and condition of the whale; gear type, complexity of the entanglement and its impact to the animal, the environment, weather conditions, resources and support available, as well as unforeseen circumstances. Large whale entanglement response is complex, having many variables. Every case, and thus response, is unique. These guidelines cover the basics and delve into some of the variation (see broad outline under Structure); however, they will likely require continued evaluation by the Network (NMFS and higher-level responders) not only to determine how to respond, but whether or not to respond. Making the decision to not initiate, or to abort a response mission is a viable option.

NOAA Response team frees humpback whale from life-threatening entanglement (HIHWNMS/ NOAA MMHSRP permit # 932-1489)

There is no obligation for authorized individuals or partner organizations to conduct a response (they can always "opt out" at any time and for any reason), but if a response is undertaken, there is an obligation to maintain the safety of all involved.

Additionally, these practices are designed to complement regional guidance to address slight differences and details resulting from regional variation, including species-specific issues (*e.g.,* critically endangered North Atlantic right whales), the remoteness of the environment, and differences in gear types.

Assessment during a response operation is ongoing and the same holds for the SOPs that might define the overall mission. Best Practices have evolved over time with continued (risk) assessment and should continue to do so with increased knowledge and advancements in techniques, changes in protocols, and/or new technology. Managers and responders involved in the MMHSRP's network response to entangled large whales, along with other similar network efforts worldwide, should never stop striving for innovative methods to increase the safety and success of an entanglement response. Advances and changes, however, should be thoroughly assessed and tested in order to mitigate any risks.

○ 1.5 Structure

These Best Practices cover the broader components of large whale entanglement response – not just the disentanglement of an animal. The components addressed within the body of the document include: Incident Command System and how it fits within large whale entanglement response (Section 2.2), required authorizations under the MMHSRP and otherwise (Section 2.3), all-important responder roles and their requirements (Section 2.4), the resources required for safe and effective response (Section 2.5), communication (Section 2.6), the gathering of information (Section 2.7), the value and types of training (Section 2.8), the environmental and weather conditions that are required (Section 2.9), preparation and planning (Section 2.10), the different procedures that make up large whale entanglement response (Section 2.11), risk assessment and mitigation (Section 2.12), and finally the intervention criteria and decision matrices (Section 2.13) that are used to help responders mitigate risk. Some of the broader roles of large whale entanglement response are addressed as First Response, including tethered telemetry tagging (Section 3.0); cutting a whale free - Disentanglement (Section 4.0); the use of sedation (Section 5.0); UAS (Unmanned Aircraft Systems) use (Section 6.0); and after-action mitigation – including debriefs and investigation (Section 7). Another way to look at the structure of the document is that it addresses what are generally considered the five steps of risk assessment. Figure 1 illustrates the cyclical nature of the five steps resulting from the continuous nature of risk assessment.

Figure 1: Five steps of risk assessment

The five steps are:

1. **Identifying the risk factors**, which is covered in Section 2.12, but also within the Risk and Mitigation sections for each of the broad roles.
2. **Who and what can be harmed**, also covered in Section 2.12 and respective broad roles.
3. **Evaluating the risk and mitigation**, addressed within Section 2.13, and again, within the broad roles.
4. **Record the finding and implement (mitigation measures)**, which in many ways, the entire document addresses, but specific examples lie in Sections 2.12, 3.10, 4.10, 5.10, and 6.10.
5. **Monitor and review**, which is literally the take-home message towards mitigating large whale entanglement threat, and completes the circle.

Other components such as outreach and awareness, reporting and associated vetting, decision matrices and establishing an Incident Action Plan, risk assessment/GARs (Green-Amber-Red checklists), different monitoring techniques and tools, and specific resource requirements (*e.g.,* specialty tools) are also covered and/or as provided examples in the appendices. This document also addresses funding (Section 8), conclusions (Section 9), acknowledgements (Section 11), literature cited (Section 12), and appendices (Section 13). The appendices include associated forms and examples of report forms, datasheets, checklists, criteria, and more, that have been used during entanglement response efforts throughout the country.

Some of the specific topics/techniques addressed are:

- Required and recommended safety gear (*e.g.,* PFDs, helmets, gloves, safety knives)
- Use of different vessel types and the roles of those vessels (*e.g.,* large vs small)
- Recommended skill sets and experience, as well as, established criteria and roles of responders
- Risk factors (*i.e.*, hazards), risk assessment and decision matrices
- Using physical restraint or not (*e.g.,* kegging, cutting-on-the-fly, and sedation)
- Use of different knives under different circumstances (*e.g.,* pole-mounted flying vs fixed)
- Use of knives for different gear types (*e.g.,* ropes vs nets vs cables)
- Use of technology (*e.g.,* telemetry, UAS, POV cameras)
- Debriefs and follow-up (*e.g.,* debrief reports and gear investigation)

2. Planning for Large Whale Entanglement Response

○ 2.1 Outreach and Education

In its broadest sense, large whale entanglement response efforts under the MMHSRP start with outreach and education - it is the foundation of the effort. Increasing awareness and promoting stewardship helps reduce entanglement threat, increase reporting and associated information, and promote public safety (*i.e.*, outlining what roles the public can play). Promoting stewardship and working together with the public, industry, and stakeholders - the community, is instrumental towards mitigating entanglement in large whales. In many cases when there is no awareness, there are no reports, but as soon as people know of the issue, what can be done, the value of information towards reducing the threat, and the hotline number(s) to call to report entangled whales, reports suddenly occur. Large whale entanglement response is very much based on reporting effort.

Below is an example of a rack-style reporting card used along the U.S. West Coast, that provides the regional Hotline number to report an entangled whale, or otherwise distressed marine mammal, and a list of information needed (*i.e.,* a checklist; Figure 2). This allows the Network to confirm the report, make an initial assessment, and if conditions and resources allow, perhaps make an authorized response - to make informed decisions. Reporting is also valuable in locating entangled whales, as they end up being large needles in an even larger haystack - the world's oceans. Immediately reporting an entangled whale, as opposed to trying to free it on one's own, is the best way for the public (or otherwise untrained and inexperienced persons) to help the animal.

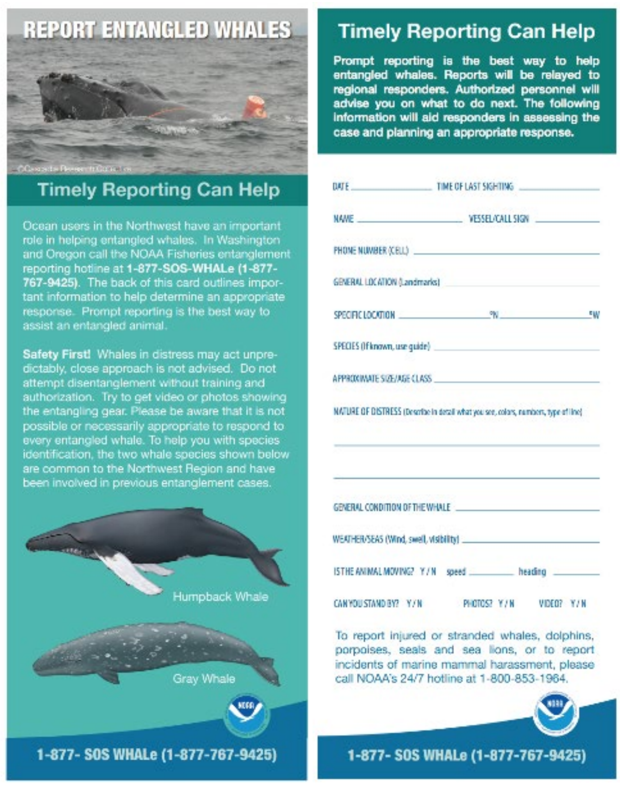


Figure 2: U.S. West Coast large whale entanglement response reporting rack card

For a list of all regional Hotline numbers in order to report entangled or injured marine mammals throughout the U.S., please see https://www.fisheries.noaa.gov/report. It is important to enlist the community, especially the on-water community, to safely and legally, locate, report, and garner information on the threat of entanglement to large whales.

○ 2.2 Incident Command System

Response to large whales entangled in gear can be challenging and complex, and often involves multiple organizations and agencies. Variables such as closely approaching a large, unpredictable animal that is under stress and likely in discomfort, the complexity of the entanglement, the availability of resources, the experience of the response team, the environment and weather, all pose challenges and significant risks to the animals and responders. In order to plan, coordinate, and minimize risks, large whale entanglement response under NMFS MMHSRP's oversight and authorization adheres to the Incident Command System (ICS).

ICS is a standardized and structured approach to establish common processes for planning and managing a response. It enables a coordinated effort among all responders, and allows for the integration of equipment, personnel, procedures, and communications among responders. ICS is based on decades of lessons learned, and helps to minimize risks to responders and animals. It also increases the achievement of response objectives, and provides for the efficient use of resources. ICS uses standard terminology and common terms to ensure understanding and coordination among all responders. It establishes roles based on training and experience, chain of command, and ensures integrated communications, accountability, and organizational structure. As such, ICS's structured and disciplined management system is applied to numerous operational components of large whale entanglement response and is featured heavily in these Best Practices.

Teams free an entangled humpback whale off the West Coast (WET/ NOAA MMHSRP permit # 18786)

ICS has a modular structure that can be expanded or contracted depending on the size and complexity of the operation. By using ICS, each team member knows their exact role in the response, the response plan, and any mitigation measures, should an emergency arise during the response. An **Incident Action Plan (IAP)** documents these incident goals and objectives, disseminates information about the response, and is revised on a regular basis to maintain consistent, up-to-date guidance. These Best Practices outline many of the components of large whale entanglement response that are part of ICS and can be part of an IAP.

ICS is typically divided into four components or primary roles:

Incident command falls under the **Incident Commander (IC)**, who is responsible for the overall management and the performance of the response operation. While usually found onsite with the response team, the IC does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the response. Generally speaking, for a large whale entanglement response effort, the IC will be the highest-level or most experienced Co-Investigator (under the MMHSRP permit) involved in the response.

NMFS MMHSRP's ICs are established through level designations based on their experience and training (see level designation roles and criteria; Section 13, Appendix B). IC's can also be determined on a case-by-case basis, and are dependent on the assessed risk level (see GAR risk assessment; Section 13, Appendix L) of a particular response. Since large whale entanglement response is a permitted activity under the MMHSRP, level-designated ICs are listed under the permit as co-investigators (CIs), linking the permit and its listed activities to ICS.

Operations falls under the **Operations Officer** (OO) who is responsible for the deployment of resources and control of operations in accordance with the IAP. A good example of an OO would be an experienced captain of the support vessel and/or a Vessel Operations Coordinator associated with the effort.

Planning falls under the **Planning Officer** (PO) who is responsible for supporting the incident by collecting and analyzing incident information, (risk) assessment, outcome predictions, acquisition of personnel and resources, strategies to manage the incident, and preparation of the IAP. A good example of a PO might be a Regional Stranding Coordinator (RSC) or Large Whale Entanglement Response Coordinator (LWERC).

Logistics falls under the **Logistics Officer** (LO) who is responsible for supporting the incident by providing transportation, communications, equipment maintenance, fueling, food and medical services, as well as any other logistical needs. A good example of a LO is an Operations Manager or similar person involved in the effort.

ICS can expand and contract depending on the scale of the emergency, and can even change for a single case if the response gets more or less complex. For a local, single day, simple response effort for an entangled whale (*e.g.,* a basic assessment mission), all of these roles may be filled by just a few experienced people. For a multi-day response happening hundreds of miles offshore, perhaps with a sedation attempt, each role would be a different person and could be subdivided further into discrete areas of responsibility.

For more information about ICS and how to take a free course, see https://training.fema.gov/emiweb/is/icsresource/TrainingMaterials.htm.

○ 2.3 Authorization

Large whale entanglement response and associated research are conducted under the oversight and authority of NMFS' MMHSRP as a permitted activity. The enhancement and research permit is issued to NMFS and their MMHSRP, with Teri Rowles D.V.M., Ph.D., listed as the Principal Investigator. The permit's authority is pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA;16 U.S.C 1374 et seq.); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.); the regulations governing the taking, importing and exporting of endangered and threatened species (50 CFR Parts 222-226); and the Fur Seal Act of 1966 (16 U.S.C. 1151 et seq.).

NMFS, along with appropriate high-level (level 4 or higher) responders, through a standardized and intensive review process, certify individuals as CIs to conduct entanglement response activities under their authorization. This certification (*i.e.*, CI letter) is not a blanket authorization to individual Network members. Therefore, all activities of Network members that may require federal authorization must be done under the continuous permission and supervision of NMFS *(i.e.,* the PI), and personnel listed as CIs under the MMHSRP permit must have otherwise met all criteria of the permit and of the MMHSRP large whale entanglement response program. Permission can be granted on a case-by-case basis as needed during an event. Authorization for disentanglement of ESA-listed species will be limited to appropriately trained and experienced individuals and is designated through different levels of participation as outlined by NMFS in their "NOAA Fisheries Criteria for Disentanglement Roles and Training Levels - May 1, 2003" (see Incident Command and Appendix B). Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury (see pp 34-35 NMFS Serious Injury Procedure for details), and in which the response effort is assessed to represent little to no risk to the responders or animal.

NMFS Office of Protected Resources (OPR), or Regional Stranding, or Large Whale Entanglement Response Coordinators (LWERCs) must be consulted to review risk assessment. An IAP, or direct communications on an action plan, must be provided and approved prior to conducting entanglement response activities (see heightened consultation; Appendix P), euthanasia, or necropsy of an ESA-listed cetacean. If communications cannot be established, response activities can be conducted by a designated level responder at a role one step lower than their designation. For instance, a level 4 responder, who could normally disentangle a humpback whale, and was unable to notify their chain-of-command, would be authorized (all other criteria being met) to tag the whale (a level 3 activity). All procedures requiring sedation or euthanasia must be performed under the supervision of a veterinarian.

Response efforts may also fall under the additional authority of state and federal agencies (*e.g.,* Federal Aviation Administration [FAA] in regard to Unmanned Aircraft Systems [UAS aka aerial drones] activities, reserves and other marine protected areas [MPAs], towards access), the military (*e.g.,* military installations or during exercises), restricted access due to human safety (*e.g.,* unexploded ordinances), and Indigenous waters.

In addition to the authorization provided under the MMHSRP and otherwise, there may be criteria and requirements outlined by a responder's employer. Roles and activities outlined by the responder's employer (*i.e.*, the response effort is written into the job description) may address liability and injury coverage. Lastly, there is the personal decision of whether or not a responder feels comfortable with their individual role or task. Remember, there is no obligation to respond.

○ 2.4 Team Member Roles

Whale rescue is complex, unforgiving work that is dependent on the commitment of trained, well-informed, well equipped, and highly skilled people. Even support roles require a great deal of experience. Tools and techniques change and each entanglement provides new and unique challenges. A responder's anticipated range of tasks (*i.e.*, roles) is based on their experience and associated training, which is broadly classified as a level-designation within the Network. Network level designations are determined on an individual basis through an application process and committee review that includes existing level 4 and 5 responders. Certification is based on a variety and combination of factors including, but not limited to[1]:

- Pre-existing large whale entanglement response experience and skillset

[1] Note, roles can be established on a case-by-case basis independent of a predetermined designation, based on required reporting. This can occur prior to response for review and approval by NMFS leads, and/or high-level responders (*i.e.*, levels 4 or 5).

- Training
- Location (availability)
- Commitment to be on call and respond as needed (availability)
- Associated experience
- Availability of associated resources *(e.g.,* use of an appropriate response vessel, telemetry, tools)
- Willingness and commitment to build experience and improve skills

Below are the general roles and their descriptions, and where applicable their level designations (More detail is provided in Appendix B):

First Responder is a general term that is used to describe anyone in the Network with varying levels of training who may respond to an entanglement report under Network protocols and authorization. At a minimum, they will voluntarily attempt to standby with an entangled whale and, depending on training, experience, authorization and equipment available, may also assess and perhaps tag the whale. Under certain conditions and authorization, First Responders may assist in disentanglement.

The First Response Team's primary mission is rapid on-site response for assessment, documentation, monitoring, and if appropriate, telemetry tagging the whale for relocating the whale later. Since most entangled large whales, when first reported, are not in imminent danger of death, the immediate issue is locating the animal and determining the nature and severity of the emergency. This may require only one or two experienced Network members. If a whale is then determined to require assistance (*e.g.,* has a life-threatening entanglement), a Large Whale Entanglement Response IC and listed CI under NOAA's MMHSRP permit will coordinate with the First Response Team to mount an effort, if resources and conditions allow.

Primary First Responders are generally referred to as individuals with higher Network rank (levels 3 - 5). Primary First Responders participate in and can lead first responder roles as authorized. Level 4 and 5 Primary First Responders generally can lead in disentanglement efforts under certain conditions and authorization, while level 3 Primary First Responders typically assist in disentanglement efforts under the direction of designated level-4 or 5 ICs.

Courtesy of FL-FWC (MMHSRP permit # 932-1489)

<u>Primary Disentanglers</u> are individuals who can perform all of the responsibilities of a primary first responder, but who also meet the criteria used by NMFS for selecting individuals who may undertake the very dangerous activity of disentangling (*i.e.*, attaching to, stopping, and cutting) a large whale. Primary Disentanglers must have the experience, training, support, and proper equipment to conduct a full disentanglement with a high likelihood of success. Primary Disentanglers are those rated at Level 4 or Level 5 in the Network.

Detailed descriptions of team member roles and responsibilities are described in greater detail within each of the entanglement response method sections below. All personnel should be familiar with the MMHSRP permit and the minimum qualifications for each role. In general, roles and responsibilities might include but are not limited to:

1. Incident Commander (IC) – responsible for on-site oversight of the response effort. They are typically the highest level-designated CI under the permit on site;
2. Safety Officer (SO) – can be IC or vessel operator, but valuable to be a dedicated person/role;
3. Vessel operators - helmspersons for both support and approach vessels; typically acts as SO or OO;
4. Vessel crew – assist with the operation of the transit/support vessel; will typically overlap with other roles;
5. Communications Officer – maintains communications with shoreside contacts;
6. Data Manager – responsible for recording and maintaining all data associated with response;
7. Documenters – responsible for the photo-documentation (*e.g.,* still and video) of animal, entanglement and response, as well as monitoring of camera (*i.e.,* POVs, batteries to prevent lapse in camera recording ability);
8. Disentanglers – experienced and generally higher designated personnel responsible for roles associated with cutting the animal free;

9. Biopsy sampler – responsible for obtaining biopsy samples; is trained and experienced in use of sampling equipment (*e.g.,* crossbow and pneumatic gun);
10. Tagger – responsible for setup, deployment and use of telemetry to remotely track the animal;
11. Unmanned Aircraft System (UAS) pilot – experienced, UAS pilot responsible for safe flight of UAS platforms, if not FAA Part 107 Remote Pilot certified, they must have direct oversight by onscene FAA Part 107 Remote Pilot certified Pilot in Command;
12. Pilot in Command (PIC) – experienced, FAA Part 107 Remote Pilot certified pilot and designated person overseeing UAS flights on scene. May also directly pilot the UAS platform(s);
13. Observers – responsible for maintaining lookout for animals during transit, response, and UAS operations;
14. Darter (sedation) – experienced person authorized to administer sedating drugs, and experienced with use of delivery equipment;
15. Mission Commander (MC) – responsible for the safe execution of any UAS operations. Does not have to be on-site;
16. Planning Officer (PO) – responsible for incident support. May or may not be on-site. Typically filled by RSC or LWERC; and
17. Principle Investigator (PI) – responsible for all activities performed under the MMHSRP permit. is typically off-site.

○ 2.5 Resources

Large whale entanglement response is a unique, complex, and potentially dangerous mission. Having the resources (*e.g.,* tools, vessels, Personal Protective Equipment [PPE], and emergency gear) is critical to accomplishing the mission and reducing risks. Like any piece of equipment or tool, they demand upkeep and continued familiarization by those that will use them. Some equipment is unique, having been modified or specially designed for their task, and may require testing and approvals before being used in response efforts. Due to the nature of large whale entanglement response (*i.e.,* not knowing when the call might come in), there is a considerable benefit to strategically locating and maintaining caches of equipment.

Each type of response (*e.g.,* approach for assessment and documentation, tagging, physical constraint – kegging, close approach to assess and cut, and sedation) requires specific equipment. Much of the equipment is outlined in individual sections later in this document. Appendix D contains a sample equipment checklist. Below is a description of the primary equipment and their general uses.

Vessels:

Vessel support represents the most important tool or resource. Vessel(s) provide transit for crew and gear, including a secondary approach vessel, and act as a platform for assessment, documentation, monitoring, tagging, biopsy sampling, UAS operations, and safety support for a secondary close approach vessel (*e.g.,* disentanglement task team). Vessel support requires an experienced and well-qualified helmsperson. The helm position is critical, and must be filled by someone with experience operating around whales and gear. An inexperienced helmsperson can add risk to what is already a high risk operation. The two primary vessels – the response support vessel, and the close approach task vessel, are discussed below.

Support vessels can act as rapid response vessels, and transport crew and gear; they can also act as a platform for assessment, documentation, monitoring, tagging, biopsy sampling, UAS operations, and safety support for a secondary close approach vessel (*e.g.,* disentanglement task team).

However, the primary role of the support vessel, once a secondary task vessel for close approach (to the whale and gear) has been launched, is safety support. Any other roles must coincide with, or not impact, the primary mission of safety support. For instance, UAS operations should be done from an alternative platform once the primary vessel is in its support role. In addition, crew aboard the primary support vessel in safety support roles also need to focus on their roles and not be distracted by other roles. It is extremely important that the support vessel and support crew continue to maintain safety for the approach (task) team or any team at higher risk. Support vessels can, and do take on other roles once relieved of their safety support role.

Support and approach vessels in Hawaii (Kern)

The support vessel needs to be of appropriate size, for seaworthiness and range, and capable of holding gear and personnel. The operational limits (range) need to be defined based on the speed, size and operating range of the vessel, sea conditions, mission load, vessel safety equipment, and distance as to ascertain response time, but more importantly, time to receive advanced medical attention in the event of an emergency.

At least one appropriate support vessel should be used. Additional support vessels may be used; however, only the primary safety support vessel should be in proximity of the animal and approach team. An appropriate distance and position is approximately 70 meters abeam, or off the quarter of the animal/team. Such a distance will reduce stress on the animal, be less likely to get unintentionally involved with the animal or trailing gear, and yet be close enough to quickly lend assistance to the approach vessel/team should it be needed. If additional support vessels are needed for other support roles (*e.g.,* UAS operations), they should remain further off (*e.g.,* 300 m) than the primary safety support vessel. In regard to safety support vessels, more may not be better. In several cases, entangled whales have become more stressed as support vessels encroached upon the animal.

Partner agencies, organizations and the private sector may provide support vessels and safety support roles. Examples include: U.S. Coast Guard, NOAA Office of Law Enforcement, NOAA Science Centers, state agencies, harbormasters, Ocean Safety, fishermen, and researchers. However, vessels still need to be operated by appropriate crew trained and familiar with the mission.

In summary, the primary considerations and criteria of a support vessel are:

- Use of appropriate number of support vessels (minimum of one; there can be too many, especially if encroaching on animal);
- Use of appropriate support vessel (size, range, seaworthiness, speed, safety equipment, uncluttered deck space for operations, etc.);
- Maintain appropriate distance (~ 70 m) and position (off beam or quarter) to animal, trailing entangling gear, and an existing approach vessel to avoid complicating the operation, but at the same time lend assistance should it be needed;
- Maintain communication within and between platforms;
- Use of experienced vessel operator (experience with vessel, maneuvering around animal, and with operation);
- Use of experienced and trained crew in all necessary roles and procedures, and maintaining focus aboard the support vessel; and

- Do not attach or bring into the vessel (other than a bight of line) gear (*e.g.,* line and attached tools) that may still be attached to the animal.

The **approach or task vessel's** primary task is to provide an appropriately sized platform as to hold the approach team, and be manageable, responsive, clean (as in no snag points), have an easily liftable engine, preferably minimal drag, be stable, and easily accommodate line handling and viewing. Typical platforms that make excellent approach vessels are soft-bottom inflatables between 4 and 7 meters (12 – 21 feet) in length. Such platforms typically accommodate closer approach work due to their responsiveness and simple layout.

The approach vessel should be as free of snag points as possible. Gear should be stowed or, if not necessary, removed and stowed on a support vessel. Only the gear that is required for that part of the mission should be in the vessel. The same holds for personnel. All crew, especially the helmsperson, should be very familiar with the vessel and its safe operation. Vessels should be used in training to increase familiarization with the tool. Like the support vessel, the helmsperson role on the approach vessel is critical. It is one of the most important roles.

The smaller, inflatable platforms may also provide a safe means to "tow" behind the animal once a working line is attached or established, allowing grapples to firmly attach to already existing gear (*i.e.*, set the hook), and for assessment of the animal (*e.g.,* its behavior and strength) and nature of the entanglement (*e.g.,* gear movement). Finally, they can act like an additional drag, similar to a "kegging" buoy if kegging constraint is required (see Sections 2.13.5 or 4.9).

When towing behind the whale (*i.e.*, Nantucket sleigh ride), the line attached to the whale is not secured (*i.e.*, tied, belayed, wrapped, etc.) to the vessel, but instead, in the case of an inflatable vessel, is placed over the surface area of the sponson (aka tube) at or near the bow as to use the friction of the material to allow the vessel to be towed. In such cases, the line is not brought into the vessel, but bent over the bow and back over the side of the vessel again. Towing should not be done from larger vessels as the extra drag provides force (*e.g.,* lines under load) and can result in lack of control that is dangerous for the animal and responders.

With the availability of longer pole systems, and other more remote means of working on the animals (*e.g.,* cutting grapples), larger platforms can be safely used as approach vessels. This is especially the case under circumstances in which a closer approach may not be required, and the advantages of the smaller platform are not realized (*e.g.,* no kegging). In some situations, a larger approach platform may be more beneficial, due to increased (yet still acceptable) sea conditions, the value of a higher and more stable platform, better angle of attack, and being otherwise safer (*e.g.,* from a companion animal, mother and calf, sharks, distance from shore).

In many cases the preferred platform may not be available, and the mission may have to be adjusted to match the vessel (tool) and its crew's experience. Vessels are one of the most important tools and, like any tool, the operator needs to know how to use it, or the tool itself will incur additional risk to what is already a high-risk operation.

In summary, the following are the primary considerations and criteria of an approach or task vessel:

- Use of appropriate approach vessel (size, uncluttered deck space for operations, easily liftable engine);
- Appropriate operating range and safety equipment for the location working in;
- Avoid or minimize time within the "danger zone" where probability of contact with animal and/or gear is greatly increased;
- Maintain communication within and between platforms;
- Use of experienced vessel operator (experience with vessel, maneuvering around animal, and with mission);
- Use of experienced and trained crew in all necessary roles and procedures, and maintaining focus aboard the approach vessel; and
- Do not attach or bring into the vessel (other than a bight of gear) gear (*e.g.,* line and attached tools) that may still be attached to the animal.

Aerial support:

While not discussed in any detail, aircraft (fixed-wing and rotary-bladed) may also represent valuable assets to a large whale entanglement response. Aerial assets can be used towards locating, assessing, documenting, monitoring (albeit limited), transport of crew and gear, and medical evacuation. UAS can represent a relatively low-cost means of providing efficient aerial assessment and documentation. If used appropriately (*i.e.*, not incurring additional risks), the use of UASs can also reduce risk by reducing the number of close vessel approaches by personnel. See Section 6 for more details on the use of UAS in large whale entanglement response.

Grabbing tools (grapple/skiff hook):

The most frequently used tool to gain access to the entangled animal, at least initially, is the **grab grapple.** It is used to attach a line to an entangled whale, that is otherwise inaccessible, by attaching to the gear entangling the animal. The grab grapple is a fairly remote tool, being thrown up to approximately 20 meters from the responders' approach vessel. It is used to attach the telemetry package, establish a working line, and attach kegging buoys and sea anchors. It functions by pinching the line between the tine(s) and the shaft, and is typically good for moderate holding times. For more accuracy and longer term holding, the pole-deployed **skiffhook** can be used. Once deployed, a line attached to the carabiner clip provides access. The skiffhook attachment is typically used as a secondary line (*i.e.*, after the grapple has established a line), where certain placement is required, in order to avoid additional trauma to the animal (*e.g.*, additional drag force to a tightly wrapped and traumatized limb), to avoid working with a line under extreme load (*i.e.,* from trailing gear or kegging buoys), and to leapfrog past or avoid gear that should not be handled (*e.g.,* gillnet or longline, or a tool that cannot be cleared). Once these tools are attached, the team should maintain heightened awareness while working directly behind the animal as to avoid having the tools attached to the working line be behind the response team as doing so poses a dangerous entangling situation for the approach team.

Telemetry:

In addition to specially designed tools that provide access, and help to constrain and thus free large, entangled whales, there are satellite transmitters that allow the Network to remotely track and monitor an entangled animal over time. The science is called telemetry, which is an important tool in large whale entanglement response efforts. Telemetry can be used to track and re-locate entangled whales that cannot otherwise be freed during the initial response due to limited resources (*e.g.,* experience of on-site personnel, proper equipment), and/or condition restraints (*e.g.,* weather, sea state, time of day, remoteness of location). Telemetry is also useful in those cases where an effort has been initiated, but terminated early due to sea condition considerations, or the behavior of the animal has made it dangerous for the rescue team, or for the welfare of the animal, to proceed. Telemetry may also prove that an animal has been able to self-release (*i.e.,* rid itself of the gear), by potentially tracking the location of the shed gear. As such, telemetry increases the safety of entanglement response operations, and may assist in its overall success.

The Network presently uses a combination of Argos (polar-orbiting satellites), GPS-based (geo-stationary satellites) and VHF radio transmitters housed in a single cylinder, as its primary telemetry package to track entangled whales for response purposes. The telemetry package is secured within a telemetry buoy (a 14" trawl buoy held within a stainless-steel collar), and attached to the entangling gear. The buoy is ballasted to maintain the transmitter in an upright position, clear of the water, and towed from a bail that allows the buoy to clear itself should it become fouled with debris or kelp.

A lower drag buoy is currently being developed and tested by The Nature Conservancy that also utilizes cutting edge technological hardware to maximize the responder's ability in relocating the tagged, entangled whale. However, in the meantime and in addition to, the Ross timed-release clips can be used to attach the buoys to the entangling gear, providing a predetermined time that the buoy will remain attached. Should a response not be possible, and the telemetry buoy remain attached, the telemetry buoy should detach at a specified point in time. The Ross timed-release clips use predetermined galvanic releases built into the clips, like the loop of a pelican hook, to hold the clip closed until they dissolve and weaken in the saltwater. They can also be used for attaching moderate-sized kegging buoys for longer-term use. However, the clips are not strong enough for the full kegging process. For additional details, see the Ross timed-release user manual in Appendix K).

The development of any new tool or technique presents safety and logistical usage concerns that need to be well thought out and tested. For this reason the MMHSRP permit (as described under "Training and Tool Development" in Appendix 4 of the permit) requires that any newly proposed tool and technique be thoroughly defined and tested prior to approval in a field setting.

In addition to the telemetry buoy and transmitter, telemetry kits include VHF receivers, antennas, and more recently Argos Goniometers. The VHF receiver will initially be used when initiating the tag to ensure a signal is being transmitted and to confirm (*i.e.,* fine-tune) the VHF tag frequency (VHF tag frequencies can drift over time and fine-tuning frequencies can gain miles of receiving range). The remote access of satellite-obtained fixes, along with the line-of-sight, real-time positioning obtained from the VHF receiver and connected antenna, allow for the re-location and monitoring of an entangled whale. Some teams have use of Argos Goniometers that detect the strength of the transmission and the direction towards the platform along with any GPS positions, for real-time, in-the-field relocation of an entangled animal. See Appendix J for sample telemetry instructions.

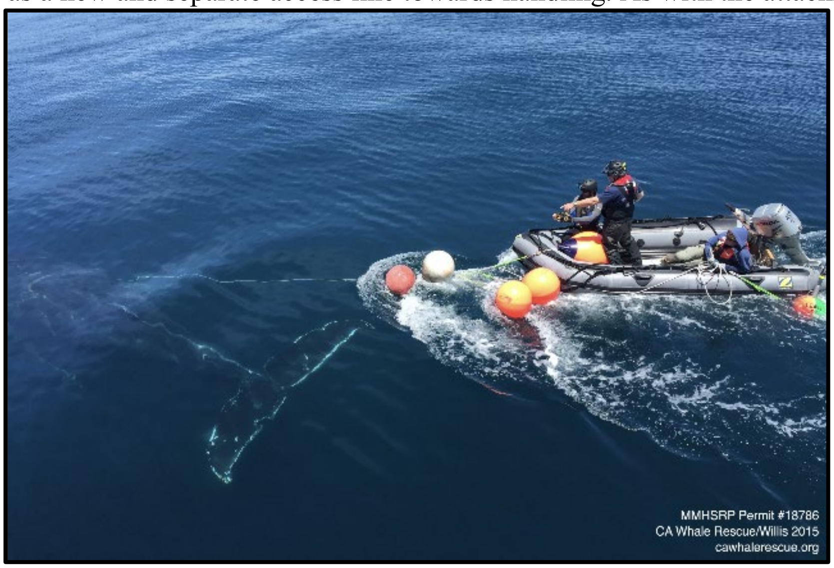
Other types of transmitters, such as penetrating, surface anchoring and suction-cup tags, have and can also be used. Such transmitters and their use may require additional approvals and safeguards.

Poles:

Over the years, poles have become lighter, longer and stronger; they allow the user to maintain a greater distance from the animal to avoid the danger zone. The danger zone is that area around the animal that a responder is at higher risk of being hit by the animal (*i.e.,* within reach of flippers and/or tail), or can become directly or indirectly (*e.g.,* the vessel) entangled in trailing gear. Poles are typically telescoping or come as separate units that can be secured to each other. Pole lengths can vary from 2 to 11 meters (~7 to 35 feet). However, 8.5 meters (28 feet) is typically the maximum that can be handled, with the longer lengths being used from a larger, more stable platform (*i.e.,* primary vessel). The greater pole length in part allows for the use of larger platforms, even though they may be less responsive (*i.e.*, maneuvering and tilting engines out of the water). Poles can range from off-the-shelf general painter's and utility poles, to the more expensive, and higher quality, carbon-fiber poles. Poles may attach to specially designed sockets which are used for deploying flying knives and grapples. Poles can also be used to mount point-of-view (POV) cameras, such as GoPros, to obtain underwater documentation towards assessment, or with a knife to document a cut. When poles are used, helmets should be worn by the person handling the pole, as well as those team members in proximity (*e.g.,* on the bow of the large vessel or within the smaller task vessel). Note: poles become directly connected to and an extension of the animal at the point of tool attachment or when cuts are being made, until such time the tool has cleared or the cut has been made.

Constraining gear (kegging buoys and sea anchors):

In those cases where the entangled animal has a limited surface interval, is fast moving, evasive, or otherwise inaccessible; and/or its movements are unpredictable and potentially aggressive; and otherwise appropriate for the animal (*e.g.,* not causing additional injury or a radical negative response), constraining techniques may be used. Such techniques have the goal of slowing the whale down (but not necessarily stopping it), keeping it at or near the surface, and controlling its movements somewhat (as much as one can control a multi-ton animal). The primary constraining technique is 'kegging,' a modification of an old whaling technique, in which harpoons attached barrels (kegs) were thrown at the whale to add drag and buoyancy in order to slow and keep the whale at the surface. In large whale entanglement response, polyball buoys (typically A3s and A4s) are methodically added to the established working line to create drag and buoyancy forces. Under certain circumstances, a sea anchor, a funnel-like device, may be attached to provide more drag. Sea anchors should have their attachment straps stitched along the entire length of the sea anchor and, for most species, have a meter-wide mouth or less. Right whales and blue whales may require large-mouthed sea anchors. Multiples of both kegging buoys and/or sea anchors, and combinations of the two, can be used. However, they should be added methodically (~ every 20 minutes as a rule), and one at a time, to reduce stress on the animal, and decrease the chances of any unwanted radical response (*e.g.,* thrashing) from the animal that might increase risk for the animal and response team. The key is being patient, and using the number of buoys needed. Be aware of the load forces on the 'loaded' line, and its potential impacts to the animal and the response team. Avoid loading a line that is attached to deeply embedded wraps as they may cause additional trauma and discomfort to the animal and a negative response. Limbs have been amputated from the kegging process. Since loaded lines represent additional risk to the response team, if possible, attach or establish an unloaded line as a new and separate access line towards handling. As with the attachment of the telemetry buoy, the Ross timed-release clips can be used, but note they can only handle so much force. As with the tools themselves, avoid getting between the kegging buoys and/or sea anchor, and the whale, as the loaded line is typically not safe to handle.



Response team "kegs" whale to gain access to the animal and entanglement (CWR/ NOAA MMHSRP permit # 18786)

Cutting tools:

Most of the knives used to free whales are hooked, presenting dull outer surfaces that protect the animal with an inner blade(s), angled to facilitate efficient cuts, while using the mechanical advantage of pulling and/or simple drag and buoyancy forces to make cuts. Most hooked knives are deployed by use of a pole system. Some remain **fixed** (*i.e.*, remain affixed to the pole), while others are meant to be placed and released **(flying),** with a line attached to the knife allowing the team to fall back away from the animal, and provide a more remote and safer means of cutting. In general, fixed knives are more appropriate for entanglements that lie further back on the body (*i.e.*, generally behind the dorsal fin), are less complex, and when the entanglement/animal are more accessible. In this case, overall risks are reduced so that they might allow a responder to remain behind the animal in a safer zone (see zones of response). Flying knives are more appropriate for entanglements that involve the mouth, pectoral flippers and body wraps ahead of the dorsal fin, which are more complex, involving multiple lines or cordages of line, less accessible, and in general, exhibit higher risk as they may place the responder alongside or above the animal for a period of time – the danger zone. However, due in part to the death of Joe Howlett, and the continued effort to reduce risk, as well as the unpredictable nature of large whale entanglement response, the use of flying knives should be prioritized (*i.e.*, a flying knife can be held in position and operated as a fixed knife and released if circumstances dictate). While hooked knives generally work well cutting lines, they tend to bind when attempting to cut finer mesh nets (*e.g.,* gillnets). To maintain contact, provide enough action, and yet not bind the gear, slightly serrated, longer, and minimally curved blades are more appropriate for gillnets. A good example is the **Spyderco "Whale Knife" (aka Coughran blade)**. Pole-deployed knives generally reduce risk by reducing proximity and time near the animal, but also provide some accuracy of knife deployment.

Thrown knives, such as a **cutting grapple** (*i.e.,* a grapple with knife blades incorporated in its tines), decrease proximity to the animal and gear, and thereby decrease risk, but also generally reduce accuracy in deployment. Cutting grapples cannot only be used as a disentanglement tool, but can also be used as a safety tool, for they can be rapidly and remotely deployed to sever an unanticipated and dangerous connection between the whale and the team.

Many specialty knives have been developed and tested over the years. For instance, Scott Landry, from the Provincetown Center for Coastal Studies (PCCS), came up with the idea of using a broadhead arrow deployed from a crossbow (the Turkey Guillotine), to cut otherwise inaccessible lines that might be under tension (*e.g.,* a tight wrap, under load, around the head of a North Atlantic right whale). The knife has been used successfully on three response efforts. Chris Slay, of Coastwise Consulting, developed a pole-deployed, guillotine-type knife towards the use of embedded lines. The "Slay" blade has also been used to successfully free numerous entangled whales.

Documentation gear:

Digital single lens reflex (DSLR) cameras, video cameras, GoPros and other point-of-views (POVs), along with cameras flown from UASs, can be used to document response efforts. DSLRs, video cams or comparable cameras with a variety of lenses accommodate distant and close fields of view, as well as, still and video imagery. POV cameras (*e.g.,* GoPros) mounted on helmets, parts of the vessel, and poles provide different perspectives, are somewhat hands-free, remote, and can accommodate documentation during response efforts (*e.g.,* a helmet cam documenting the attachment of a grapple to trailing gear from the thrower's perspective). If conditions and environment allow, pole-mounted POV cameras and/or housed DSLRs can be placed in the water to provide full-body, entanglement configuration, and gear identity imagery. However, members of the response team should never get in the water to document the animal and entanglement directly. Live-streaming, pole-mounted POVs, in combination with a pole-mounted knife, may aid in making more accurate cuts to entangling gear (*i.e.*, like a surgeon during an operation). The use of UASs or aerial drones provides an aerial view of the animal and entanglement, providing information on the condition of, and impact to, the whale (*e.g.,* photogrammetry and wound analysis), configuration of the gear, and behavior of the animal. If used appropriately, aerial drones can reduce response risk by remotely providing assessment and thus reducing the need for responders to closely approach by vessel in order to assess the whale and entanglement. However, aerial drones can have their own risks and regulations exist for their use (see Section 6 for additional details on aerial drone use in large whale entanglement response). Images and video obtained during a response can be valuable for follow-up assessment and as training tools. As is the case with all documentation gear, it is only useful if fully-charged batteries and memory cards are available. This is a valuable role that the Documenter or Equipment Manager functions in.

Sampling gear:

A biopsy sample or the attachment of a monitoring tag is typically done after the animal has been cut free or the effort otherwise terminated. Biopsy samples are typically obtained with the use of bolts or darts shot from crossbows or air rifles. In addition, tags with a variety of sensors (*e.g.,* depth, location, acoustics, pitch and roll, and/or video feeds) can be attached to the animal to better understand the impact of and behaviors associated with entanglement. Aerial drones can (and are) also used to collect whale exhalant and tissue samples towards genetics, body condition analysis and stress indicators.

Personal protective gear:

The most important resources in large whale entanglement response efforts are the people – the response team. Human safety is paramount and as such personal protective equipment (PPE) is a critical component. Typical PPE includes an appropriate PFD, gloves, helmet, and a safety knife. Additional protective gear might be warranted due to environmental or operational needs (*e.g.,* sedation attempt, infectious environment). While not protective gear, adequate hydration and food are also important to providing protection (*e.g.,* a dehydrated body is prone to injuries).

PFDs will vary depending on role and environment. For colder environments, drysuits, full worksuits or float jackets may be required, while for warmer climes, type III work vests are more appropriate. Beware that large whale response can be strenuous, and overheating is a concern. Remember, if a responder is thrown or falls overboard, that as long as they remain afloat, the support vessel should recover them in short order. However, in all cases the PFD needs to fit well, and if used in the approach vessel where the wearer is likely to be handling gear attached to the animal, should be as free as possible of snag points. Water-activated (only) yoke-style PFDs, should not be used within the smaller approach vessel.

Gloves, like PFDs, should fit well and protect potential line handlers and cutters from rope burns and cuts. To provide dexterity, the glove fingers can be cut off to the second knuckle from the index, third and fourth fingers, and still provide adequate protection. In colder climes, reinforced neoprene or thermal gloves may be needed.

Helmets provide protection and should be worn by any member of the team that approaches the animal and/or is using poles, or are in the proximity of a team member using poles. Remember that pole work represents an extension of the animal for a period of time while a clip is snapped in or a line is cut. Whether a grazing contact from the animal or a wayward pole, a well-fitted, high-quality helmet may save a response member’s life.

Safety knives represent any high-quality knife that can be easily operated with one hand. Their primary purpose is to cut the vessel, a piece of equipment, a teammate or oneself free of any inadvertent gear that might also be attached to the animal. Safety knives should not be used as utility knives but maintained for their specific purpose. Safety knives should be attached on one’s person to be readily available. Recoilers can be used but should be of such a material (*e.g.,* nylon and not stainless steel), so the lanyard itself can be readily cut if necessary.

PPE will vary depending on one’s role and the environment. Proper clothing and footwear, sun protection, and eye protection should be used as necessary. Additional gear such as knee pads and visor add-ons to helmets can be beneficial. In addition to PPE that might help protect a responder, jewelry, loose clothing, and long hair, needs to be removed or otherwise addressed.

○ 2.6 Communication

Clear communication is essential throughout an entanglement response. It is important to maintain clear communication from receiving the report, planning for the response, during the response and after the response. Examples of initial communications are vetting the report with the primary observer, coordinating standby support, providing an initial alert to the response team, and arranging for rapid first response. If the report is confirmed and response is warranted, planning communications involve notifying regional coordinator(s) and getting any required approvals (*e.g.,* providing an initial IAP), arranging resources (*e.g.,* OO; vessel support), coordinating logistics, alerting and coordinating a response team (pre-mission briefs), and giving NOAA media leads a heads-up. During a response, communications need to be maintained among team members (*e.g.,* within and between vessels), between the on-site response team and shoreside and coordinating contacts, and between associated support parties. It is the role of the on-scene Communications Officer to relay information to a shoreside contact who then relays the information to other appropriate parties. Examples of post-response communications involve debrief calls and reports, investigation towards prevention, and dissemination of information, including appropriate and cleared communications with the media (*e.g.,* news outlets, website updates, and social media).

The use of authorized, members-only entanglement response websites provide near real-time alerts of reports, case reviews towards preparation, and a repository of past cases (though they do not represent or replace official databases) and associated resources (*e.g.,* checklists and manuals) towards increasing responders' understanding of and preparedness for large whale entanglement response activities.

Common means of on-water/on-site communications include handheld very high frequency (VHF) marine radios, satellite phones, cell phones, and two-way radios (*e.g.,* walkie talkies). Some applications for phones (*e.g.,* Zello) allow a cell phone to be used as a walkie talkie and send group texts. Some communication equipment is geared towards emergency use, like EPIRBs (Emergency Position Indicating Radio Beacons) and satellite-based communications (*e.g.,* InReach). All communications equipment should be checked and verified to be functioning, and appropriate personnel trained (*i.e.*, familiar) on their use. This is especially important in the event of an emergency.

U.S members-only password-protected websites:

Atlantic Large whale Disentanglement Network:

https://alwdn.org

North Pacific Large Whale Entanglement Response Website:

https://www.whaledisentanglement.org/

Sharing of information with general public - news outlets and social media:

The IC must coordinate with the National LWERC or MMHSRP lead, Regional Stranding/LWERCs, and the NMFS Office of Communications/media leads concerning higher-profile entanglement response events. NMFS Office of Communications and otherwise assigned media leads will take point and coordinate media response/efforts. If responders are contacted by the media for an interview, they should work with the NOAA Office of Public Affairs and/or assigned media leads in responding. Some media (*e.g.,* social media) will need to be approved before posting. All media interviews should be considered "on the record." Media personnel should never be part of the approach or support teams (*i.e.*, aboard support or approach vessels) and are rarely on-site. Always remember that the entanglement response comes first. Responders are NOT required to speak to the news media. See Appendix E , *Media Guidance document created for the West Coast Region*, for more detail on how to work with NMFS on Media.

- ## 2.7 Data Collection

The collection of data is a critical component of large whale entanglement response, as gaining information to reduce the threat, testing existing mitigation measures, and increasing the safety and efficiency of response for humans and the animals, are the primary and ultimate goals. Data collection starts on receiving the entanglement report to confirm and obtain an initial risk assessment (see Appendix F for examples of reporting data forms) and proceeds throughout the effort. Additional data forms and checklists corresponding to different aspects of the response (*e.g.,* obtaining samples, photo-documentation, telemetry, sedation, UAS operations) or dataloggers, are used to garner as much information on and from the effort as possible. Data needs must be well thought out prior to the start of any entanglement response effort.

Data forms geared towards evaluating the animal and entanglement, along with operational risk assessment are typically used in early stages of the response, as they will be used to produce an IAP. Checklists should be developed and used. Checklists are data forms that help evaluate, assess and share the information in hand as to make informed decisions. Floatplans, risk assessment GARs, and decision matrices are all good examples. See Appendices D, F, I, L, M, and T for examples of checklists. Important forms for preparation prior to response may include: applicable permits; reporting forms (Appendix F), Level A and Human Interaction Forms (Appendix A); gear checklists (Appendix D - Gear Checklist); response data forms (Appendix F); response checklists (Appendix I); telemetry instructions (Appendix J); Photo-documentation (Appendix R); biological sampling (Appendix S); UAS use checklist (Appendix T); sedation worksheets (Appendix U - Remote Sedation Worksheet); and media checklist (Appendix E – Media Form). A data manager is typically assigned the role of coordinating and managing the collection of information during a response. All entangling gear should be retained, documented on the Level A and Human Interaction Form, and stored in a centralized location.

The imagery obtained during response is another example of documentation. Not only does it have great value, but it is required under the MMHSRP permit. Documentation helps confirm reports, assist in evaluative and operational assessment during response, and researchers and managers assess the impacts of the entanglement and any mitigation measures. Additionally, its use in outreach and education promotes awareness and stewardship, and its use in debriefs and future training reduces risk.

The documenting vessel should maintain a safe distance and avoid getting in the path of the animal and effort. The best location is typically beside and slightly behind the animal and/or primary approach vessel. If an effort is underway, the documenting vessel should maintain at least 70 meters (75 yards) distance from the animal and approach vessel. If possible/safe, and while maintaining the above, the documenting vessel should work with the vessel helmsperson to have proper lighting and/or to have action in the approach vessel more–or--less face themselves. A good location on the vessel should be selected that allows flexibility, stability, personal safety, and avoids obstructions (*e.g.,* antennas). Documenters must watch themselves and avoid getting caught up so much with documenting the event that they put themselves at risk. Furthermore, documenters are in a role that allows for assessing the overall operation. If they see someone doing something wrong/unsafe, or any risk, they must point it out. Appendix R has documentation instructions. The following represents some of the primary aspects of large whale entanglement response that should be documented:

Animal:

- Identity (species as well as individual)

- Health (emaciated?, cyamids, blisters, color and texture of skin)
- Wounds (location, severity, identity of source)
- Behavior

*Document the entire animal and its behaviors beyond what is outlined above and what might at the time appear associated with the entanglement, as others may be able to glean additional information from the comprehensive documentation.

Association with other animal(s):

- Conspecifics
- Other species (*e.g.,* dolphins)
- Predation threat (*e.g.,* sharks)

The entanglement:

- Gear type (*e.g.,* buoys, configuration of gear, close-ups of line)
- How entangled (*e.g.,* origin, # of wraps, how tight, where it is not entangled)

The rescue operation:

- Initial approach
- Assessment
- Documentation (photograph the other guy taking pictures)
- Establish a working line (*e.g.,* grapple throws)
- Line handling and Nantucket sleigh ride of approach vessel
- Attaching telemetry
- Kegging (attaching as well as towing buoys)
- Use of sea anchor
- Cutting (fixed knife and flying knife cuts)
- Safety (personnel with PFDs and helmets)
- Retrieval of gear
- Team image (*i.e.*, to illustrate that it is a team effort)

Sampling is another category of information. This can represent a biopsy sample of skin and blubber for genetics, health assessment, and stress analysis. Biopsy samples are typically obtained with the use of bolts or darts shot from crossbows or air rifles, and require additional training. In addition, tags with a variety of sensors (*e.g.,* depth, location, acoustics, video feed) can be attached to the animal to better understand the impact of and behaviors associated with entanglement. However, disentanglement operations and safety should be prioritized over any additional sampling. In many cases, the biopsy sample or the attachment of a monitoring tag is done after the animal has been cut free or the disentanglement effort otherwise terminated. The most important sample to obtain from a disentanglement effort, if safe to do so, is the removal and recovery of the entangling gear.

○ 2.8 Training

Responders in Alaska conduct training (D. Gann/ NOAA PRD-AKR)

Training is an important aspect of large whale entanglement response. It provides a better understanding of the complexity and risks when responding to an entangled large whale, and at the same time allows for greater familiarization and strengthening of the skills and tools required of particular roles, and their culmination into a safe and efficient team effort. Trainings also have the added advantage of testing equipment, which, due to the nature of entanglement response, may be infrequently used. Ongoing trainings or refreshers, not only help maintain skill sets and familiarization, but also help responders remain current with any changes in gear, protocols and technology, as well as promoting team communication, coordination and overall team cohesiveness.

Large whale entanglement response trainings involve basic first responder, which provides background on the threat and first responder roles, and more advanced, multi-day classroom, and on-water firsthand examples and simulations, led and supervised by an experienced, higher-level responder(s). Responders are typically trained in proper tools, protocols and techniques of planning and logistics, approaching an entangled animal, assessment and documentation, safely attaching transmitters and other means of monitoring the animal, continuous risk assessment and communications, the on-site decision-making process, cutting the animal free or standing down, collecting valuable animal and entangling gear information, and the debriefs and post event investigation that might further reduce both operational and evaluative risks associated with large whale entanglements and their authorized response (see Appendix H for example of a training agenda).

First responder trainings have also been provided in CD format, and most recently as an online course developed as a partnership between NMFS and The Nature Conservancy (see below for links to the different regional online first responder training courses). Trainings may focus on specific skill sets or roles (*e.g.,* documentation, telemetry, data, sedation), or be required or recommended for specific activities/roles (*e.g.,* firearm awareness for biopsy and sedation roles, UAS piloting for effective entanglement response documentation and assessment). Training should evolve with the experience of the trainee and information gained. The use of life-size models, albeit representing parts of the animal, like a peduncle and/or fluke, will elevate the level of the training and provide more scenario-based training exercises (*e.g.,* close reach vs far, tight wraps vs loose, inaccessible weighted lines vs accessible buoyant lines). Some training focus on general preparedness and emergency response, and may be required depending on their role and regional response protocols (CPR and first aid, ditch training). Training opportunities may also include longer term (*e.g.,* weeks to months) apprenticeships to allow the trainee to immerse themselves, and potentially receive supervised hands-on experience in an actual response, as well as general animal behavior and close approach techniques. Since skill sets need to be maintained, training should be continuous in the form of refreshers. However, much of the training is through supervised, hands-on experience, in actual response efforts, as opportunities might arise, starting in lower-level support roles (*e.g.,* documenter, data person, communications). Training, along with hands-on experience, are major requirements towards receiving level designation within MMHSRP's large whale entanglement response network.

Responders hone their skills during scenario-based response trainings and refreshers (NOAA HIHWNMS)

Level 1-2 online first responder training links:

Pacific Islands online first responder training:
https://pacific-islands-training.whaledisentanglement.org/

Alaska online first responder training:
https://alaska-training.whaledisentanglement.org/

West Coast online first responder training:
https://west-coast-training.whaledisentanglement.org/

East Coast online first responder training:
In development as of 9/2020

Potential responders from around the globe undergo response training as part of CCS' apprenticeship program

Responders in Hawai'i use a fabricated life-size whale tail wrapped in lines to train (NOAA HIHWNMS)

More than anything, whether increasing or maintaining skills and proficiency in a particular role or with a particular piece of equipment, training helps mitigate risks, and should remain a regular component of large whale entanglement response efforts. While these Best Practices provide review and guidance towards large whale entanglement response, they are not meant to replace actual trainings, but to complement them. As such, the contents of these Best Practices do not represent an instruction manual on how to best free an entangled whale.

○ 2.9 Environment and Weather

By its very nature, large whale entanglement response occurs on the ocean with limited protection, sometimes in remote locations, and is easily influenced by weather conditions, which typically pose risks that need to be considered and addressed (*i.e.*, part of an IAP risk assessment).

Consideration of weather forecasts is essential prior to response. Responders should consider wind, precipitation, fog, sea state, and any forecasted or probabilities of changes in weather. Environmental conditions that should be assessed include tides and currents, as well as air and water temperatures. The remoteness of the site is an important consideration, especially as it applies to proximity of a safe port (harborage), and medical attention (facilities). Length of day and time of day (*i.e.*, amount of daylight remaining), are also critical considerations. During the winter, the length of day may limit certain response efforts, especially if compounded by other environmental factors like remoteness and weather considerations. The same holds true for what response actions are possible based on the time of day. For instance, while length of day remaining might not accommodate a full disentanglement effort, it might allow for the assessment and tagging of an animal towards a future response.

In addition, the assessment of weather and other environmental conditions, through forecasting and real-time/on-scene assessment, is a continuous and ongoing process. Considerations for the near-term, and the long-term, may all have bearing on operations. A good example is, once again, the attachment of a transmitter to track the animal towards future efforts. Considerations in the near term would involve being able to mount an effort to assess and potentially tag the animal, while in the longer term, it is about having a weather window to safely mount a follow-up effort. If a hurricane is approaching, it may not be a good idea to tag what is likely a migrating animal (*i.e.,* it may move out of an area of response within the week).

Assessment of environmental conditions may dictate never initiating a response mission, limiting its scope, or otherwise tailoring the mission as conditions might allow (*e.g.,* tagging an entangled whale rather than continuing disentanglement efforts) or aborting a mission that is underway.

Environmental conditions not only influence the decision on when to mount or abort a response mission, but in those cases in which assessment has determined a response is possible, it will have a bearing on what resources are needed. For instance, a midday effort, offshore in a Beaufort 4, may allow an assessment effort, but would likely require a larger vessel to handle the range and sea state conditions (*i.e.*, “As conditions and resources allow”). See Procedures and Mission Complexity (Section 2.11 and in other sections) for more examples and details.

- ## 2.10 Preparation and Planning

Prior to response:

While some large whale entanglement reports might involve long-term standby support, an animal that has been tagged, or an anchored animal allows time to further plan and prepare for a response. In many cases the response to entangled large whales represents being on-call, and if conditions and resources allow, potentially mounting a rapid response. As such, proper planning and preparation is typically that much more critical to mission success and safety. As much as possible, resources, including vessels, response equipment, medical and emergency gear, documentation and communication equipment, and personal response gear (*i.e.,* PPE) need to be maintained, organized and readily available during times in which reports are likely to be received and conditions generally warrant response efforts (*i.e.,* within season). Planning and preparation lays the foundation towards a more efficient and safer response.

Some of the key points that should be addressed at the various stages of pre-report planning and preparation, offsite pre-response planning, on-site pre-response planning, response operations (or standing down), and post-response operations and planning, are:

<u>Pre-report planning and preparation</u>:

- Outreach and education (increase awareness and promote stewardship towards reducing the threat and increasing reporting of entangled whales);
- Equipment readiness/checks (maintained, available, batteries charged, etc.);
- Personnel availability and readiness (roles, contacts, authorizations);
- Trainings (review of roles/procedures and use of equipment);
- Authorizations/permitting; and
- Pre-season briefs (review important and/or new protocols, equipment, procedures)

<u>Response (see Section 2.11 below for general procedures on large whale entanglement response)</u>

<u>Post-response operations and preparation/planning</u>**:**

- Safeguard data collected and pursue/investigate to garner additional information;
- Clean, charge, repack and otherwise prepare gear for next mission (the next call could come in the next day);
- Work with the media coordinator to prepare, authorize, compile and disseminate approved documentation and messages for media (social, network, cable, etc.);
- Perform debrief and compile reports (*e.g.,* update level A); and
- Remedy deficiencies (acquire new gear, repairs, trainings).

Additional details regarding preparation and planning are addressed within specific operations. Examples of response checklists are provided in the appendices.

○ 2.11 Procedure – Mission Complexity

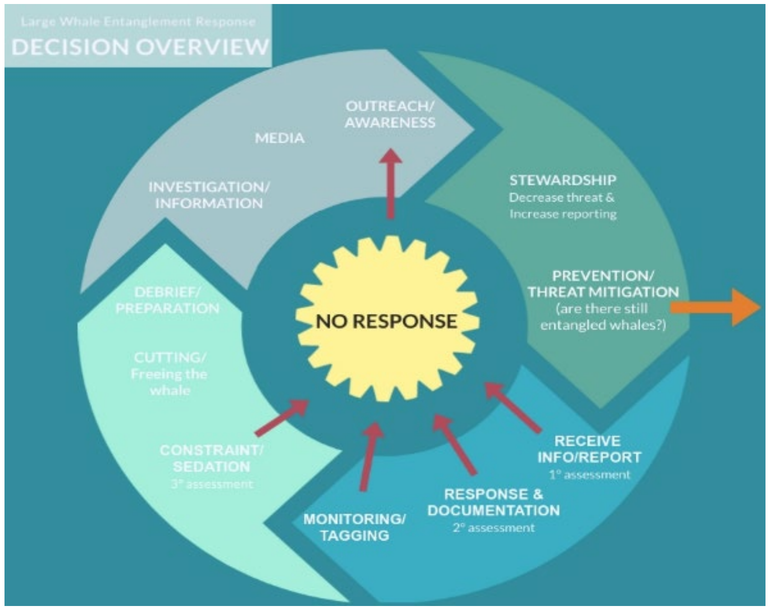


Figure 3: Large whale entanglement response procedure and decision overview

Procedures will vary depending on the type of entanglement response. However, there are certain common themes to any response effort and SOPs that will apply across all types of efforts. While greater details regarding specific procedures are presented in the sections below, the general sequence of events is outlined here:

1. On receiving the report, assessment begins, and will continue throughout the broader response. The first or 1° assessment represents confirming the report, and if confirmed, determining whether the entanglement is life-threatening, or that the animal is otherwise a candidate for response (*i.e.*, evaluative assessment of the animal).
2. Determine if there is appropriate capacity to respond - operational assessment. Do conditions and resources allow?
3. If the above criteria are met, along with any additional reporting and authorization requirements, a response may be mounted. Concurrently, monitoring efforts may have been implemented (*e.g.,* standby support may be requested for an immediate response, a response targeted over days might implement tethered-tag monitoring, and potential longer term response might alert the on-water community to appropriately monitor).
4. Once on scene, 2° assessment and documentation is obtained. Is the animal truly entangled? Is the entanglement indeed life-threatening?

5. If criteria for evaluative and operational assessment are still met, continued response will use 3º assessment and decision matrices to determine what actions can and should be done. Whether to cut on the fly – no constraint, sedate, or constrain the animal? Whether to use a fixed knife or a flying knife? Whether to approach from a smaller and more maneuverable vessel, or a larger, higher, more stable vessel? One very important action is inaction, or aborting an effort or mission due to safety concerns. Many of these actions, their decision processes, risk assessment and mitigating measures are outlined in more detail in later sections.
6. If all criteria are met, then disentanglement of the animal may be carried out (or again, the mission aborted).
7. Whether successful or not, debrief to review lessons learned, remedy deficiencies, and prepare for the next effort.
8. With knowledge gained from response and further investigation, pursue overall risk mitigation (*e.g.,* risk to animals, risk to fishing industry, risk to public, and risk to responders). Share information and findings within the Network and with partners.
9. Sharing appropriate information with the Media as a means to continue outreach and education, completing the cycle until information gained reduces the threat and its associated risks, and entanglement threat is no longer deemed a concern (or leave the cycle of response as depicted in Figure 3).

Note at any point, efforts can be terminated. See Figures 3 and 4 for illustrated depictions of large whale entanglement response primary actions and decision processes.

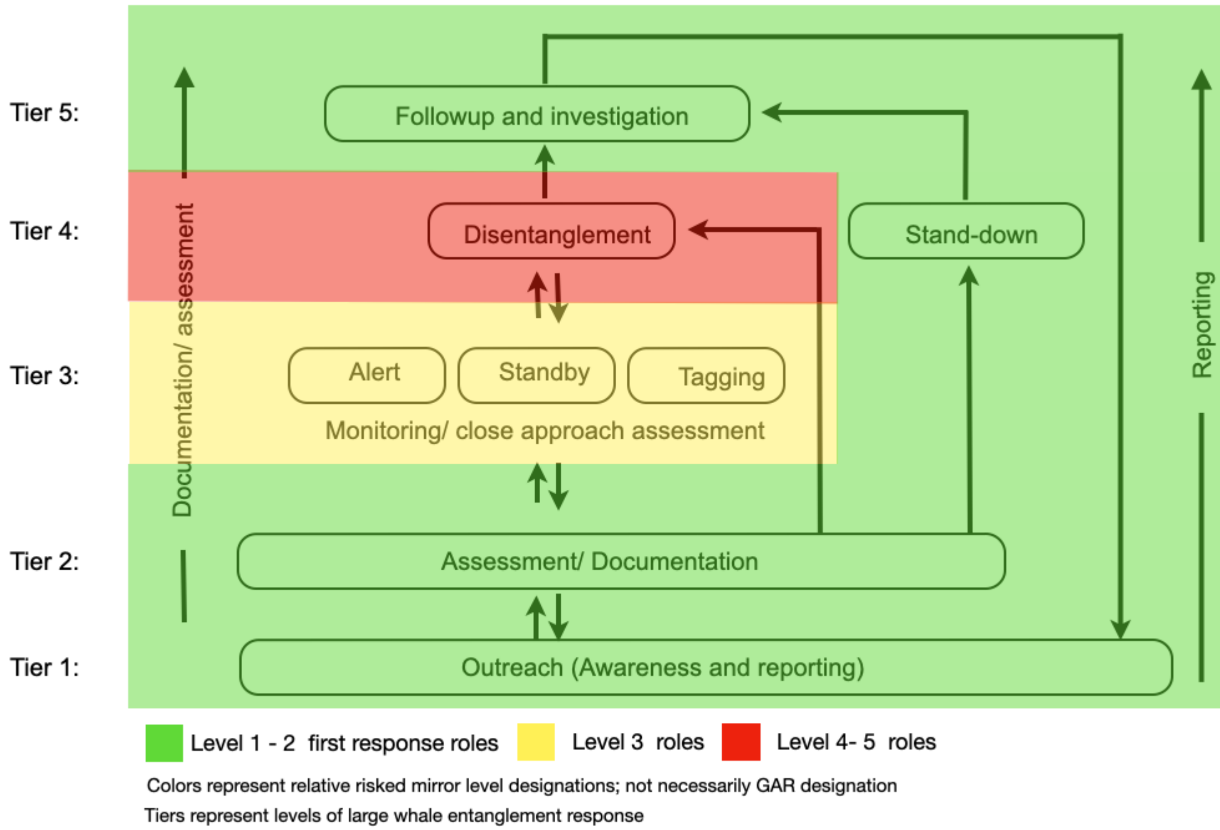


Figure 4: Large whale entanglement response flow diagram

Some details that combine general procedures of large whale entanglement response efforts with that of continued planning:

Pre-response planning:

- Vet (1° assessment) report (is the entanglement confirmed; likely life-threatening?)
- Check availability of rapid response/nearby appropriate first response and/or monitoring
- Check weather and other environmental conditions (*i.e.*, conditions conducive towards response?)
- Availability of response team (authorized IC/CI? alert team; fill roles)
- Acquire gear, including PPE; load response vessel
- Setup and turn on telemetry for initial testing (notify shoreside contact)
- Draft initial IAP and conduct GARs

- Ensure authorizations (*e.g.,* contact NMFS OPR, Regional Stranding and Entanglement Response Coordinators, appropriate agency leads – state and federal, sanctuaries, reserves, parks, etc.)
- Establish shoreside contacts; post floatplans
- Establish initial roles; crew responsibilities (CI, SO, communications, data, telemetry)
- Continued communications with on-site observer, potential monitors, NMFS, and leads
- Conduct safe transit (*e.g.,* appropriate speed, maintain observers, range limits based on load and medical attention)
- Prepare appropriate gear enroute (*e.g.,* cameras, telemetry, safety gear; start collecting data)

Response planning:

- Locate animal and conduct 2º on-site evaluative assessment
- Conduct on-site risk assessment *(i.e.,* operations GAR)
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations, and make a final decision about response
- Update IAP, including establishing roles for any engagement of animal
- Update shoreside contacts on IAP, GAR
- Launch inflatable (*i.e.*, approach vessel) and/or last step equipment readiness
- Conduct safety briefing/review checklists

Response operations:

- Safely and methodically follow prescribed procedures and protocols provided by GARs, decision matrices, authorizations and any on-site supervision (*i.e.,* CI and SO)
- Maintain vigilance and conduct continued risk assessment (personnel, resources, weather, animal). Changes in conditions, resources, and assessment may dictate changes in procedure (*e.g.,* concerns over fatigue may require rotating personnel), including termination (*i.e.*, abort mission)
- Maintain communications throughout (including shoresides)
- Collect data/information (including tissue samples when appropriate and recovery of removed or discarded entangling gear)
- Document all aspects of animal, entanglement and operations
- Abort mission if necessary; no obligation

2.12 Risks and Mitigation

Large whale entanglement threat and its impacts, along with the associated response, are complex and potentially dangerous. In order to mitigate risks of large whale entanglement response to humans and animals, comprehensive entanglement response safety plans, risk assessment documents, and decision matrices should be drafted and implemented. These, along with safety plans and risk assessments specific to partner agencies and organizations (*e.g.,* USCG) that may provide support, are all instrumental towards maintaining a safe and productive response.

Considering the five steps of risk assessment, safety briefings and pre-mission briefs should occur prior to any entanglement response effort to identify the risk factors. In addition, risk analysis and decision matrices to determine who/what might be harmed, along with evaluating the risk factors and possible mitigation, should be completed to guide responders and managers in making safe, informed decisions regarding the authorized response to entangled large whales under NOAA's MMHSRP. Incident Action Plans (IAPs) should be drafted to record the risk factors and their mitigating measures, and implemented within the response. Lastly, monitor and review the mitigating measures, one of the primary goals of this document, as to determine their effectiveness. Good data is needed to make informed decisions towards risk mitigation.

Figure 5: Five Steps of Risk Assessment

Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. Trainings, especially more advanced, scenario-driven simulation trainings, can be an excellent means to identify and mitigate risks. On completion of any response, thorough debriefs or after-action reports should be drafted, outlining risks incurred, lessons learned, and additional mitigating measures that can be applied to the next response and/or shared with others.

The variability in entanglement type, entanglement configuration, animal state and condition, location and conditions, experience and availability of responders and resources, causes risk evaluations to be dependent on circumstances. It is crucial to large whale entanglement response operations that response risk be continuously monitored throughout (in real time) to minimize the likelihood of negative consequences and uphold safe operations. Risk assessment and its mitigation is an ongoing process; it is never complete, as there is always room for improvement. Safety plans, risk assessment documents, and even these Best Practices should be updated continually and frequently (hence the cyclical depiction of the five steps of risk assessment in Figure 5).

However, there is one principal risk factor that always applies to both the animal and the responders - the approach, and resulting proximity, of the entangled whale and responders to each other. This higher risk area is referred to as the "Danger Zone" and represents the area around the animal in which harm to the whale and/or responders is more likely. It is the area in which direct contact can occur to the animal from a vessel or to the responders from an animal's flipper, tail or other part of the body. Contact can also occur indirectly from responders or the approach vessel getting caught in trailing gear entangling the whale. Figure 6 shows the "Danger Zone" around an entangled whale and the other operational zones depending on the plan and the approach vessel's role (*e.g.,* 1º assessment, documentation, and tagging vs monitoring and standby support).

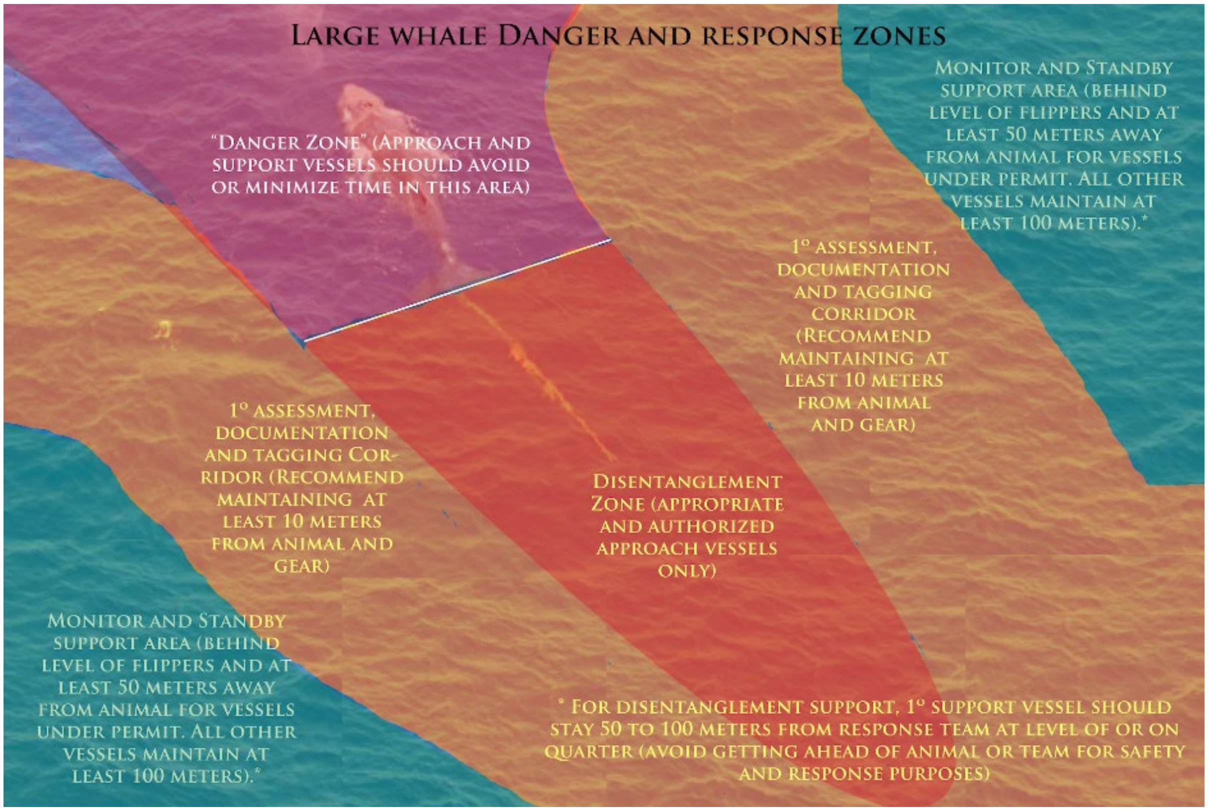


Figure 6: Large Whale Entanglement Response Danger and Response Zones

The point being, all entangled whales should be approached with caution. Whether assessing, monitoring, and/or attempting to free the whale, the animal's size, mobility, and unpredictable nature (considering it is stressed and very likely does not realize you are there to help), all pose significant risk factors on approaching an entangled whale. Be extremely wary in interpreting behaviors as docile, accommodating, or lethargic based on assessed impacts. Make no assumptions; even an animal severely impacted by what appears to be a long-term entanglement, poses significant risk (SAWDN, 2017). This holds true for procedures meant to change a whale's behavior in order to provide accessibility to the animal (*i.e.,* sedation; see Section 5). In regard to an approach, make no assumptions that procedures like constraint (*i.e.*, kegging) and sedation, will provide an accommodating, risk-free environment (*i.e.*, whale), as it will not. They may provide additional accessibility, but risks will remain.

Species-specific differences should also be considered when approaching whales. For instance, right whales should be approached with greater caution, as they are considered by many to have more power and stamina, and more likely to exhibit aggression towards an approach (Canadian Whale Institute, 2018; NMFS, 2009). Approach risk can also vary over time. For instance, an entangled whale may be more accommodating to initial approaches (*i.e.*, initial approaches are typically the more productive approaches); however, over time as the animal responds to the cumulative approaches, its behavior may become more evasive and/or aggressive. Another example of possible changes in behavior over time, are those that occur between breeding/calving and feeding grounds over a greater expanse of time. A mother whale with a recent calf on calving grounds may be more aggressive or protective of an entangled calf. An entangled adult male whale on the breeding grounds may exhibit a more energetic, or even aggressive, behavior, than the same animal while on the feeding grounds. Similarly, newly entangled whales may behave differently from those carrying long-term entanglements, and should only be approached with great care (IWC, 2015).

Risks associated with large whale entanglement and response can be broken down into two categories. The one category focuses on the individuals involved - humans (*i.e.*, the responders), while the other focuses on the animal. In many cases, the risks affecting the two are related. For instance, the risks of entanglement are generally greater for the smaller, subadult animals, yet due to their generally more unpredictable nature, they also pose greater risk to responders.

Personnel

Human safety is the primary concern in all large whale entanglement response efforts. Risks to personnel may involve exposure to environmental conditions, contact with the animal, injuries consistent with sharp knives, handling lines under heavy load, including getting caught in gear, impact with equipment, exertion and general vessel-related injuries. Responders should only perform roles (*i.e.*, procedures) for which they meet minimum qualifications and training, as doing otherwise significantly increases risk for that person and the entire mission.

Below is a list of the hazards/risk factors associated with large whale entanglement response affecting human safety. The hazards and their risks within the list generally run from least severe to more severe, based on the consequence and probability of encountering risk during entanglement response efforts (adapted from Lyman & Mattila, 2014).

- Psychological or emotional stress.
- Exposure to environmental conditions (*e.g.*, sun stroke, dehydration, hypothermia, drowning).
- Operation of vessel (*e.g.*, approach to whale, collision and operation).
- Physical stress (*e.g.*, exertion and fatigue; especially as it contributes to other risks).

- Use of disentanglement equipment, including knives, poles and lines (*e.g.*, risk of injury, entanglement or from heavy equipment).
- Contact or other negative interactions with the animal (*e.g.*, physical trauma or drowning).

RISKS TO HUMANS

Risk: Injury or death to personnel from contact with whale. Direct contact from the animal has the highest risk, especially when cutting the final line of the entanglement and freeing the animal (Lyman and Mattila, 2010).

***Mitigation*:**

- All personnel should avoid proximity to the animal – the danger zone surrounding the animal, especially at times when there may be a change in the animal's behavior, such as when making final cuts that may cause gear to shift or elicit a pain response.
- All personnel should wear appropriate PPE such as PFDs and helmets as necessary. The use of helmets is required for those using poles and other responders that are in the vicinity (*i.e.*, within the extended radius of the pole's 360° sweep). At the moment of attachment (*i.e.*, before a clip releases) the pole becomes an extension of the animal and poses additional risk.
- Designated safety persons should be assigned to continually watch over all personnel involved, warning the team of hazards such as changes in behavior of the animal and presence of other animals, and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated personnel should prioritize the use of flying knives (*i.e.*, knives that slip off poles) or thrown knives (*i.e.*, cutting grapple) to minimize time near the animal.
- Distressed animals are unpredictable; continuously monitor for signs of stress (*e.g.*, abrupt headrises; suddenly producing wheezie or trumpeting blows; changes in respiration, speed, or dives; bubble streams and blasts otherwise out of context; pronounced close approaches, especially belly towards [*i.e.*, a maintained rollover]).
- Teams should approach the animal as methodically and consistently as possible, giving time for the animal to habituate to the presence of the approach vessel (Ledwell & Huntington, 2018).

Risk: Injury or death to personnel due to getting harmed by or entangled in the gear entangling the animal.

***Mitigation*:**

- All personnel handling gear attached to the animal (*e.g.*, attaching tethered telemetry) should wear protective gloves to avoid chafe (*i.e.*, rope burns) impact.
- All personnel handling gear attached to the animal should carry a one-handed, safety knife.
- Support vessel team should remain alert and prepared (*e.g.*, cutting grapple ready to sever any links).
- Certain gear types, such as the pane of a gillnet or the mainline of a longline should not be directly handled (*e.g.*, securing telemetry directly to the entangling gear).
- Avoid the area close to and around the whale - the “danger zone.” This includes the area behind the animal, as the approaching vessel getting caught in the trailing gear is more likely.
- Any vessel closely approaching the animal (*i.e.*, in the danger zone) should be as free as possible of snag points, especially the engines and hull, and other areas of the vessel where gear might be handled.
- Small vessels with minimal open deck space, that will closely approach the whale and entangling gear, should only carry the necessary gear for that particular operation (even safety gear can be covered by the support vessel).
- All personnel handling gear attached to the animal should wear PFDs and protective clothing that are “clean” (*i.e.*, free of snag points).
- Do not get in the water near an entangled whale.
- Do not pull line/gear into the vessel that might still be attached to the animal.
- During line handling, only have a single bight of line in the vessel at any one time, as to reduce threat to personnel (*e.g.*, grabbing the trailing gear to attach a telemetry buoy).
- Always farelead the lines attached to the animal, especially if under load, to the outboard side of a vessel and outboard of all personnel to avoid being stripped or forced off a vessel (*e.g.,* during the process of deploying the telemetry buoy).
- All personnel should remain clear of gear being attached/deployed to the animal/entanglement (*e.g.,* clips, grapples, telemetry buoy) to avoid personally getting entangled.
- Make sure gear being attached to animal/entanglement is deployed from the vessel on the team’s terms. <u>Do not</u> let the animal pull gear off the vessel (*i.e*., make sure the telemetry buoy is deployed off the vessel as opposed to the whale taking it off the vessel).
- Do not wrap net or line around hands or fingers. Line handlers, like those deploying telemetry, should remove entanglement hazards (*e.g.*, rings, watches), and keep feet clear of lines and nets.

Use a five-gallon bucket or other receptacle to hold the telemetry buoy's tether line as it is being deployed.

- Responders handling gear should be familiar with the entangling gear, its associated risks (*e.g.*, a longline with gangions). Certain gear like gillnet and longline should not be directly handled.

Risk: Injury or death to personnel due to getting cut by one of the knives.

***Mitigation*:**

- All personnel handling knives should wear appropriate gloves to lend protection (*e.g.,* kevlar gloves).
- Keep knives sheathed until ready to use.
- Only carry the tools, including knives, you need for a particular task.
- All personnel deploying flying (*i.e.*, pole-delivered) or thrown knives (*e.g.,* cutting grapple) to a loaded line (*i.e.*, while being towed, being kegged, or otherwise applying load), should maintain distance from such knives once delivered and stay out of the line of fire (*i.e.*, do not remain directly behind and inline with the tool).

Risk: Injury or death to personnel due to contact with tools.

***Mitigation*:**

- All personnel using disentanglement tools, especially poles, should wear appropriate helmets. Personnel in the vicinity of the person using a pole should also wear helmets.
- During line handling, keep grapples and clips attached to the working line well in front (~2 m) of personnel to avoid contact. If the line is under load, distance between tools and personnel should be even greater (~5 m).
- All personnel should remain clear of gear being attached to the animal (*e.g.,* knives, clips, grapples, telemetry buoy).
- Make sure gear being attached to animal/entanglement is deployed from the vessel on the team's terms. Do not let the animal pull gear off the vessel.

Risk: Injury or death to personnel due to overall response (*e.g.,* fatigue, exposure, falls, strains).

***Mitigation*:**

- Monitor personnel exertion and fatigue levels. Have enough experienced responders to avoid fatigue. Do not push oneself or team to the limits.
- Responders should have appropriate attire and protection to minimize exposure.
- Communicate responder movements between vessels to helmspersons (*i.e.,* “stepping over”).
- Monitor emotions or desire to “save the animal.” Emotions can, and do cloud judgement(s).
- Terminate/abort effort if risk factors (*e.g.,* fatigue, emotion) become a concern and cannot otherwise be resolved.

As always, one major all-encompassing mitigating measure is standing down, or aborting a procedure or entire operation/mission. There is no obligation to respond.

Some primary points related to human safety that might not fall under the examples above or apply to all are:

- While there is no obligation to respond, there are obligations to meet certain criteria and protocols under the MMHSRP and its permit, if initiating a response.
- Obtain necessary authorizations as they are there primarily for safety.
- Ensure first aid kits and automated external defibrillators (AED) are available and located with each response group.
- Create a written safety protocol with emergency numbers to be kept with first aid kits.
- Do not put the whale's rescue above human safety.
- Never initiate an action that has not been thoroughly thought through and discussed.
- Review worst-case scenario protocols; have an exit strategy for each procedure. Consider the “what ifs.”
- When in doubt, tag (if the tagging decision matrix is met), regroup (*i.e.*, attempt another day with more assistance, better conditions, and/or new tools and procedures) or entirely abort the mission. Aborting a response is a viable option.
- All members of the team should understand and agree upon response actions.
- Pre-mission briefs should be conducted.
- Responders should only conduct procedures for which they meet minimum qualifications and training.
- Responders should maintain proficiency and focus on their respective role(s).
- Personnel should wear appropriate PPE such as, non-slip footwear, gloves, and protective clothing as necessary.
- Do not get in the water near an entangled whale.

- Avoid the area close to and around the whale, including directly in front and behind, as this represents a danger zone in which contact with the animal or entanglement in the gear is more likely.
- Distressed animals are unpredictable; therefore, it is important to continuously monitor a response to anticipate any risk and maintain safety.
- Communication within and between the disentanglement teams, including briefings, is critical to minimize risk and avoid hazards.
- If drugs are used, all responders should be familiar with the drugs and reversals, including symptoms of accidental exposure and if/when/how to treat prior to the arrival of medical personnel.
- Assess the probability of success of the mission relative to the risks posed.

Animal:

Risks to the entangled animal may include drowning, starvation, degeneration of health, systemic infections, physical trauma, and/or a general reduction in fitness. Entanglement may also result in reduced production (*i.e*., calving) or even death. The outcome of the entanglement depends on its severity; whether the animal is reported, a response effort mounted, and the success of the effort; and whether the animal self-released or succumbed to the entanglement. In addition, the actual response effort may pose additional risks to the animal (Lyman & Mattila, 2014). For instance, unintentional contact with a vessel and physical trauma from drag forces (*e.g.,* telemetry, kegging, Nantucket sleighride of approach vessel). Minimizing these risks provides for a safer response effort, as it minimizes the distress of the animal and risk for responders alike. The following are some of the primary hazards and considerations for minimizing risk of entanglement response efforts to the animal:

- Use decision matrices (see Sections 2.13.8, 3.11, 4.11, 5.11 and 6.11) prior to large whale entanglement response efforts to ensure risks and mitigation are planned and accounted for by all responders.
- Minimize the stress that comes with large whale entanglement response, especially constraint and cumulative approaches.
- Appropriately evaluate the need for attaching telemetry.
- To avoid injuries, be aware of vessel operations so to minimize disturbance and unintentional contact with the animal.

- Minimize injuries due to knives and lines (*i.e.*, a working line becoming part of the entanglement).
- Use appropriate sedatives and sedation delivery techniques with appropriately trained personnel and attending veterinarian(s) to minimize negative effects.
- Confer with veterinarians or other experts prior to removing deeply embedded gear. It may be more beneficial for the animal, and safer for the response team to trim deeply embedded wraps.
- Be methodical and consistent, as to reduce stress and negative response to effort (*e.g.,* avoid shifting in and out of gear, or revving engines).

The following outlines the assessed risks and mitigating factors towards the broader scope of large whale entanglement response for the entangled whale. As is the case for human risk mitigation, one major risk mitigating measure is standing down from the response. Remember, there is no obligation to respond, only an obligation to minimize risk. Additional risks and their mitigating measures are outlined for each response section (see Sections 3.10, 4.10, 5.10 and 6.10).

RISKS TO ANIMALS

Risk: Injury or death to whale due to contact with response vessels.

***Mitigation*:**

- Use prop guards around propellers (may also reduce catching trailing gear).
- Have experienced and knowledgeable operators at helm that are familiar with vessel, maneuvering around whales, and the operations.
- Avoid operating in the danger zone. Doing so not only reduces risk to responders, but also to the whale.
- Be methodical and as consistent as appropriate in approach as to be predictable to whale.
- Only approach the whale if necessary/ minimize the number of approaches.

Risk: Injury or death to whale due to drag forces (*i.e.*, kegging, tethered telemetry, towing approach vessel - Nantucket sleighride).

***Mitigation*:**

- Use of constraint (addition of kegging buoys/sea anchors) only when deemed necessary (see decision matrix).
- Use of telemetry when pros outweigh cons (see telemetry decision matrix).
- Use lower drag telemetry buoys.
- Use weaklinks or timed-release clips to avoid long-term attachments.
- Methodical use of kegging as to reduce stress and only use constraint when required for mission objectives.
- Avoid applying force to gear or tethered working line that conveys force to a vulnerable, traumatized parts of the body (*i.e.*, to a deeply embedded wrap on a body appendage).
- Avoid applying force to entangling gear that involves strong, small diameter lines or rolled-up gillnet as both can produce significant and rapid trauma, especially if wraps are involved.
- Understand the type of entangling gear involved and its associated hazards.

Risk: Injury or death to the whale due to contact with equipment (other than vessels).

***Mitigation*:**

- Use of hooked knives with dull outer surfaces by experienced responders.
- Appropriate use of drones (UAS) by FAA-licensed and experienced pilots.

Risk: Injury or death to animal due to use of sedation.

***Mitigation*:**

- Have only experienced and trained responders administer drugs.
- Confer with veterinarians or other experts prior to administering drugs.
- Provide drugs as early as possible to avoid fight or flight response.
- Have reversing drugs available and ready to administer.

Risk: Injury or death due to removal of gear.

***Mitigation*:**

- Confer with veterinarians or other experts prior to removing deeply embedded gear. It may be more beneficial for the whale and safer for the response team to trim such deeply embedded wraps.

As always, one major all-encompassing mitigating measure is standing down or aborting a procedure or the entire operation/mission. There is no obligation to respond.

Other risks:

Other risks include the animal and entanglement being a "hazard to navigation" (*e.g.,* a vessel getting caught in the trailing gear); well-intentioned public attempting to free the animal and getting injured; resources being lost or damaged during a response (*e.g.,* loss of telemetry buoy, approach inflatable being cut); and an unsuccessful mission causing stress (emotional and otherwise) to managers, responders and the community in general. These risk factors affect response risks either indirectly or directly, and should not be ignored when addressing risk mitigation.

○ 2.13 Intervention Criteria/Decision Matrices

There are two main tools or checklists that help determine or quantify the risk factors associated with a particular response – GAR models or checklists, and decision matrices that help determine the nature of the response, including whether to respond at all, or abort – Go/No Go decision matrices.

The Risk Factor or GAR (Green-Amber-Red) checklist allows for time-critical risk assessment and involves all members of the team. These risk assessment checklists can be done for different aspects of the response. For instance, a GAR may be done for vessel operations, specifically for the entanglement response, or refined for a particular aspect of the entanglement – like sedation. The GARs not only involve entire teams, but are shared among teams, including shoreside contacts, to identify risks and appropriate mitigation measures. This model/checklist is not entirely a simple Go/No Go model. While high (red) risk levels for the overall GAR, as well as, a high-risk value for any particular category, do dictate not initiating or aborting a response, a No-go, lower level may allow continued response. If the summed risk levels across multiple areas (*e.g.,* team composition, mission complexity) are within the cautionary yellow range, teams must work with the IC and/or contact the permit principal investigator (*i.e.*, the MMHSRP), prior to acting to discuss mitigation measures or stand down. Figure 7 depicts a GAR checklist for general large whale entanglement response; Appendix L contains the entire GAR table and instructions on how to use it (designed by

Jamison Smith for the 2010 IWC Report of the Workshop on Welfare Issues Associated with Entanglement of Large Whales).

Key considerations or questions to be asked in the risk factor analyses (GAR):

- **Is the entanglement life threatening?** Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury, and if the potential risks of response for the whale and human responders are minimized (see pp 34-35 NMFS Serious Injury Procedure for details).
- **Is there an appropriate level-designated CI for the response that can act as IC (*i.e.*, Supervision)?**
- **Are there appropriately trained and experienced personnel for the roles required by the mission (*i.e.*, Team selection and fitness)?** Are there adequate responders to safely complete the mission and address unforeseen situations?

Disentanglement Risk Assessment

OPERATIONAL DISENTANGLEMENT RISK ASSESSMENT

		Comments
Weather Conditions	Max score = 5	
Responder Experience Level	Max score = 5	
Complexity of Operation	Max score = 5	
Animal Behavior	Max score = 5	
Disentanglement Gear Condition	Max score = 5	
Operating Area	Max score = 5	
Resources Available	Max score = 5	
Boat & Crew Fitness	Max score = 5	
TOTAL RISK	0	
	Max Total Score = 40	

WHALE RISK ASSESSMENT

		Comments
Age Class of Animal	Max score = 5	
Number of Lines	Max score = 5	
Number of Wraps	Max score = 5	
Lines Cutting In	Max score = 5	
Additional Weighting of Gear	Max score = 5	
Degree of Cyamid Coverage	Max score = 5	
Body Parts Involved	Max score = 10	
TOTAL RISK	0	
	Max Total Score = 40	

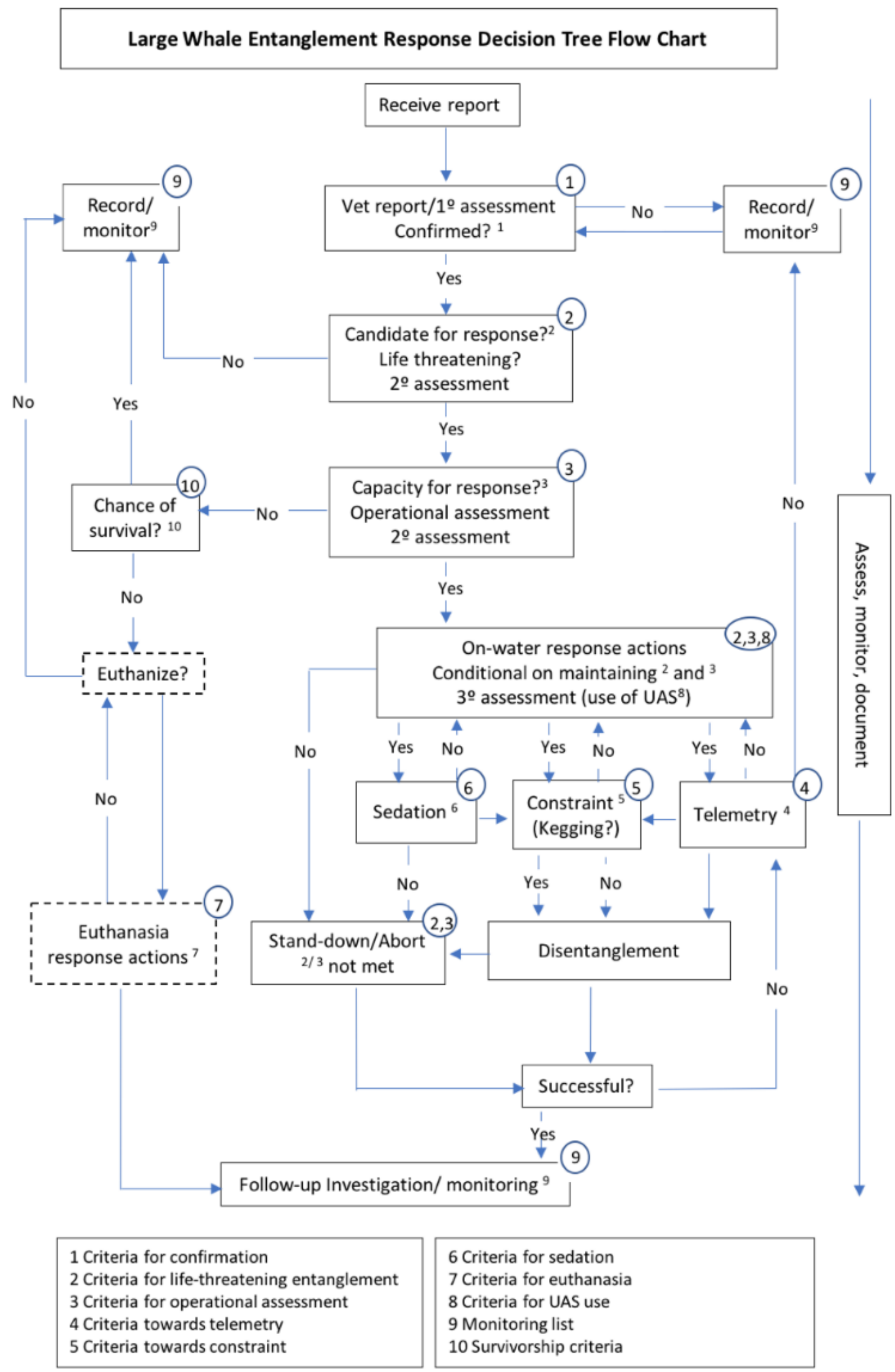
GREEN = 0 - 14 (Go, Low Risk)
AMBER = 15 - 28 (Use Extra Caution)
RED = 29 -40 (Stop, High Risk)

Figure 7: A GAR large whale disentanglement risk assessment table

- **Are there appropriate resources to safely and efficiently conduct the mission (*i.e.*, Resources)?** Is all necessary gear functional, available, and ready? This includes, vessels, tags, sampling gear, instrumentation, disentanglement tools, and emergency equipment.
- **Does weather pose a threat to the animal or responders (*i.e.*, heat stress or hypothermia or threatening storms)?** If so, is there a way to mitigate it?

- **Are the conditions (*i.e.*, Environment) conducive to safely and efficiently mounting a response?** Medical facilities nearby or other animals present?
- **What is the Mission complexity and can associated risks be mitigated?** What are risks posed to the whale and humans?

Decision matrices represent a systematic series of questions, typically representing risk factors, that help determine how and whether to respond. Like the risk assessment GARs, there can be different decision matrices for different aspects of the response (*e.g.,* one matrix for overall entanglement response and another on how and whether to use telemetry). Below, in Figure 8, is a generalized decision matrix/flow diagram that integrates criteria lists (listed as footnotes and also included below) for the different actions listed (adapted from 2010 IWC Report of the Workshop on Welfare Issues Associated with Entanglement of Large Whales).



Adapted from a decision tree in 2010 Report from the Workshop on Welfare Issues Associated with Entanglement of Large Whales

Figure 8: Large whale entanglement response decision tree/flowchart

■ 2.13.1 Confirmation of Large Whale Entanglement Cases/Reports

Since the primary source of large whale entanglement reports is opportunistic (*e.g.,* tour vessels, fishermen, and other members of the on-water community), reports of entangled whales may not be reliable and thus confirmed. Determining whether a report represents a confirmed entanglement is thus the first step in determining whether a response might be mounted and the initial decision within many large whale entanglement response decision matrices - "Is the whale entangled?" In 2016 NMFS instituted a standardized definition of what represents a "Confirmed" large whale entanglement case, and provided criteria (*i.e.*, decision matrix) to make those determinations.

Under the National guidance, a **Confirmed** report represents an animal with "attached human-made materials" (may include rope, net, monofilament line, or debris), with or without associated materials (hooks, buoys, pots/traps, etc.). Relative severity of the entanglement (minor - life-threatening) does not matter for case confirmation.

Criteria to deem a report "confirmed" can include:

- Photographic or video evidence (*IDEAL*);
- NOAA staff has direct visual observation;
- The report came from a trusted source (trained or professional observer);
- A follow-up interview of the reporting party was conducted by an experienced network member (Level 3+), or agency expert, using non-leading questions, and the network member/agency expert believes that the whale was entangled; or
- Corroborated, independent, and multiple sources of reports have been received with detailed descriptions of the animal and entanglement.

For additional details, including criteria for "Unconfirmed" and "Not Entangled," see National Criteria for Determination of Large Whale Case Confirmation in Appendix N.

■ 2.13.2 Criteria to Determine Whether an Entangled Whale is a Candidate for Response - Evaluative Assessment

The primary criteria in determining whether an entangled large whale is a candidate for response is determining whether the entanglement is **life-threatening** or is likely to become life-threatening. Additional and associated criteria are listed below:

- Impact on species, population or stock

  - Endangered status/population level
  - Population in decline
  - Sex of animal (*i.e.*, productivity concerns)
- Existing or present impacts
  - Severity of injuries (*e.g.,* lines cutting in to body)
  - Body condition (*e.g.,* emaciated, nuchal depression)
  - Stress indicators (*e.g.,* cyamid coverage, light or rough skin)
- Potential for future impacts:
  - Age class (*e.g.,* younger animals more susceptible)
  - Nature of entanglement (*i.e.*, tight wraps, # of wraps, amount of gear involved and trailing, multiple body regions involved)
  - Mobility (*e.g.,* affecting feeding, predator avoidance, breathing)
  - Location/time considerations (*e.g.,* amount of time fasting, energy expenditures)
  - Reproductive status (*e.g.,* pregnant, lactating)
  - Gear configuration (*e.g.,* gear type, condition of gear)
  - Potential to self-release

Risk Factor and levels		Table 1. Risk Factors Specific to Response to Animal		
		1 Low	3 Medium	5 High
Impact on Species/ Population	**Endangered status/pop'n**	Least concern/Near threatened	Vulnerable/ Endangered	Critically endangered
	Pop'n stability	Increasing	Appears to be stable	Critically low/ declining
	Sex of animal (productivity concerns)	Male or unknown sexed animal	Known female of any age	Known productive female in prime
Existing or Present Impacts	**Severity of injuries**	Minimal- superficial Injuries - epidermal or dermal	Moderate injuries - dermal or deeper	Severe injuries - deep subdermal. Threaten appendages/rostrum
	Body condition	Good - not emaciated	Fair to moderate - slightly emaciated	Poor-emaciated
	Stress indicators	None to minimal light-colored and rough skin, along with cyamids	Patches of light-colored and rough skin; low to moderate light-colored cyamid coverage; some red cyamids	Large areas of light-colored/rough skin with heavy cyamid coverage, esp. red cyamids
Potential for Future Impacts	**Age class**	Adult	Juvenile/ Yearling	Calf/older individ.
	Nature of entanglement	Simple, single, loose wraps or drapes that are more likely to come off over time	Multiple loose to moderately tight wraps, and minimal to moderate gear involved/ trailing.	Tight/ large # of wraps; large amt. of gear and/or trailing; multiple body regions involved
	Mobility	Frees-swimming; no or minimal impairment	Animal mobile (*e.g.*, amt. and weight of gear) threatening future mobility. Feeding impaired.	Mobility severely impaired (*e.g.*, anchored). Inability to feed.
	Location/time considerations	On feeding grounds; known resident	Migrating from breeding grounds.	Migrating to or on breeding grounds
	Reproductive status			Pregnant/lactating female
	Gear configuration	No to low impact	Minimal to moderate impact (*e.g.*, weak to moderate gear, strength and lifespan)	Severe impact (*e.g.*, strong, long-lasting, small diameter)

This table complements the operational GAR

■ 2.13.3 Capacity for Response - Operational Assessment

The capacity to respond depends on meeting a broad range of criteria that cover everything from the animal, environmental conditions of its location, the gear and complexity of the entanglement and the availability of resources. These criteria mirror those found in operational risk assessment GARs and those outlined under ICS. As is the case in determining (*i.e.*, assessing) whether the animal is a candidate for response, there is a principal overlying criteria for determining whether to respond - human safety. Human safety is paramount and nearly all the different criteria point to human safety.

In addition, there is another comparison to be made between the criteria for determining whether the animal is a candidate for response, and whether there is the safe capacity to respond, and that is many of the criteria are comparable between the two. For instance, a calf or a juvenile whale typically has a higher probability of being impacted by the entanglement, but at the same time, those animals typically represent a greater risk to the responders trying to free them. This comparison can be made for species status, mobility, the existence of tight and/or embedded lines, location on the body, and gear type.

- The entangled whale
    - Endangered status/population level (*i.e.*, affects emotional level - desire to save species)
    - Behavior differences (*e.g.*, disposition and temperament)
    - Morphological differences (*e.g.,* size and appendage differences, mobility, strength, stamina)
    - Condition (*e.g.,* healthy and strong vs poor condition and weak)
    - Mobility (*e.g.,* free-swimming, anchored)
    - Age class (*e.g.,* calves with mothers, juveniles more unpredictable; emotions)
- Nature of the entanglement (*i.e.*, complexity)
    - Number of wraps
    - Location on body (*e.g.*, forward and deep typically less accessible; dangerous)
    - Number of body regions involved
    - Tightness of wraps/embedded (*e.g.*, challenges in accessing; responses from animal)
    - Amount of gear
    - Any trailing gear, amount trailing, and/or weighted?
    - Gear type (*e.g.*, gillnet and longlines generally have higher handling risk)

Risk level based on location of entangling gear on animal:



Higher ---------------------------- Impact to animal/ difficulty of response --------------------Lower

Photos courtesy of CCS

- Environment/conditions
  - How remote/offshore (*e.g.*, transit distance and distance to medical attention)
  - Time of day and length of day (*e.g.*, how much time for mission?)
  - Weather and sea state
- Availability of resources
  - Vessel support, including support vessels
  - Disentanglement tools
  - Associated documentation, data collection, communications, gear, etc.
  - Appropriate supervision (*e.g.*, IC)
  - Responder experience (*e.g.*, experienced and trained; level designations)
  - Roles filled
  - Team fitness (*e.g.*, on call and accounting for fatigue levels)
- Likelihood of success (apply risks to animal in assessing risk to responders)

Risk Factors and levels		Table 2. Risk Factors Specific to Operational Assessment		
		1 Low	3 Medium	5 High
The Entangled Whale	Endangered status/ pop'n level	Least concerned - less emotion involved	Vulnerable and endangered species - concern to save animal	Critically endangered - high concern to save animal
	Behavior differences	Normal, non-aggressive response, predictable	Evasive, unpredictable, moderately agitated	Highly agitated, unpredictable. Exhibiting surface active behaviors
	Morphological differences	Smaller, low stamina and mobility	Moderate size, stamina and mobility	Large, high stamina and mobility
	Condition	Lethargic/ weak	Moderate health and strength	Healthy and strong (*e.g.*, recently entangled)
	Mobility	Animal accessible - Slow free-swimming predictable	Moderate accessibility - Fast swimming, evasive, unpredictable	Mobility extreme or non-existent (*e.g.*, highly mobile or anchored animals
	Age class	Adults		Calves with mothers/ juveniles (unpredictable)
Nature of Entanglement	Number of wraps	None to few	Moderate	Many (*e.g.*, > 5)
	Location on body	Posteriorly located and dorsal	Mid-body wraps	Forward on body and ventrally located
	# of body regions involved	One		Multiple
	Tightness of wraps/ embedded	Draped or loose	Tight to extremely tight	Embedded to deeply embedded
	Amount of gear	Minimal	Moderate	Substantial
	Trailing gear	Substantial	Moderate	Minimal

	Gear type	Clean (*e.g.*, no gangions or netting) moderate diameter lines	Other netting	Gillnet or Longline
Environment/ Conditions	**Remoteness**	Close to shore and medical facilities	Somewhat close to shore and medical facilities	Far from shore and medical facilities
	Time of day and length of day	Early in day and long days		Late in the day and/or short length of day
	Weather and sea state	Good conditions/ Beaufort 0 - 3	Moderate conditions/ Beaufort 4 - 5	Inclement weather, Beaufort >5
Availability of Resources	**Vessel support, including support vessels**	Appropriate vessels with experienced helmspersons		Inappropriate vessel support with inexperienced helmspersons and crew
	Disentanglement tools	All tools available and operational	Tools available, not all operational, some unfamiliar	Minimal tools, unfamiliar with kit
	Documentation, Data collection, Communications, Gear	All gear available and operational	Most gear available/ operational	Key items not available or operational
	Appropriate supervision (IC)	High-level, experienced IC		No IC or lower level, less experienced IC
	Responder experience	All roles experienced	All core roles experienced	Some core roles not as experienced
	Roles filled	All roles filled	Critical roles filled; Some responders in dual roles	Minimal roles filled
	Team fitness	Entire team 100%	Some team not 100%, core at 100%	Core team members not at 100% (e.g., tired)

■ 2.13.4 Criteria Towards Determining Whether to Tag

Telemetry, for the purpose of tracking an entangled whale, is typically used when the above - capacity to respond, is not or can no longer be met. For instance, weather, environment, the behavior of the animal, lack of appropriate tools, or experienced responders, dictate an IAP that points to the use of telemetry. However, the use of telemetry still relies on the probability that the entanglement, within the timeframe of the tag's attachment, will remain a confirmed entanglement (1), the animal will remain a candidate for response - a life-threatening entanglement (2), and there will be a capacity to respond - resources and conditions are forecasted to allow a future response (3). However, all that said, there are some specific criteria that are forecasted (probabilities) in deciding to use tethered telemetry to relocate an entangled whale for additional response efforts. These are:

- Probability of impacts to the animal from the tag package?
    - Trauma to the attachment point on animal resulting in wounds, infection or amputation
    - Long-term energetic costs from drag resistance of gear
    - Additional mobility concerns
    - Tether becoming part of the entanglement
    - Tethered tag increasing probability of picking up other gear or involving another animal (*e.g.,* calf)
- Probability of impact to humans from pursuing tagging
    - Risk from deployment
    - Risk from follow-up response
    - Associated costs (*e.g.*, response, Argos, tag and buoy)
    - Sense of obligation to pursue and/or remove a long-term tag
- Probabilities of follow-up response?
    - Environment (*e.g.,* remoteness)
    - Weather
    - Availability of resources
- Probability of success
    - Better conditions
    - More resources
    - New, tested, and approved gear
    - New, tested and approved procedure
    - A better IAP

- Temporal aspect of survivorship (*e.g.,* Can the animal survive? Is it worth the risk? Value of tagging for future necropsy)

Risk Factors and Levels		**Table 3. Risk Factors Specific to Tagging**		
		1 Low	**3 Medium**	**5 High**
Probability of impacts to animal from tag package	**Trauma to the attachment point on animal resulting in wounds, infection or amputation**	Origin of tether and resulting force having little to no impact to animal	Origin of tether represents a wrap, but not tight. no immediate or devere impact	Origin of tether tight, embedded, threatening appendage or health of animal
	Long-term energetic costs from drag resistance of gear	Little to know energetic impact	Moderate injury and temporal impact	Animal already severely impacted and/or drag long-term
	Additional mobility concerns	Low	Moderate	High likelihood and
	Tether becoming part of the entanglement	Low	Moderate	High
	Tethered tag increasing probability of picking up other gear or involving another animal	Low	Moderate	High
Probability of impact to humans from pursuing tagging	**Risk from deployment**	Low	Moderate	High
	Risk from follow-up response	Low	Moderate	High
	Associated costs	Low	Moderate	High

	Sense of obligation to pursue and/or remove a long-term tag	Low	Moderate	High
Probability of follow-up response	**Environment**	Easily accessible		Very remote
	Weather	Clear forecast	Moderate conditions	Challenging conditions
	Availability of resources	Readily available		Resources missing or not functional
Probability of success	**Better conditions**	Low	Moderate	High
	More resources	Low	Moderate	High
	New, tested, approved gear	Low	Moderate	High
	New tested approved procedure	Low	Moderate	High
	A better IAP	Low	Moderate	High
	Temporal aspect of survivorship	Low	Moderate	High

In addition to the above, there is a risk factor associated with attaching a telemetry package on an entangled whale (beyond that of the procedure itself). This involves a sense of obligation to respond once the tag is attached. This is exacerbated by the ability to respond since the animal's location is known, and especially as time passes, the desire to remove something that a response team has added (and the potential impacts it carries). Remember, there is no obligation to respond; however, during a response there is an obligation to meet those criteria to maintain human safety.

There are efforts underway to design and fabricate telemetry packages that have lower drag, are more efficient, and cost less. In addition, timed-release clips that use galvanic releases have been designed to allow a tag package to release after a certain amount of time. See Appendix K for additional information on timed-release clip.

■ 2.13.5 Criteria Towards Constraint

Deciding to constrain an entangled whale is a matter of looking at the costs and benefits. On the one hand, constraining a whale due to mobility, and short surface intervals may make it more accessible for additional assessment and disentanglement. It may also reduce the unwanted movements (*e.g.,* a tail slash) of a whale, and thereby reduce the risks to responders. However, on the other hand, the extra drag forces may cause or exacerbate wounds, or provide added stress to the animal. This stress may translate to aggressive or evasive maneuvers that may add risk to the responders.

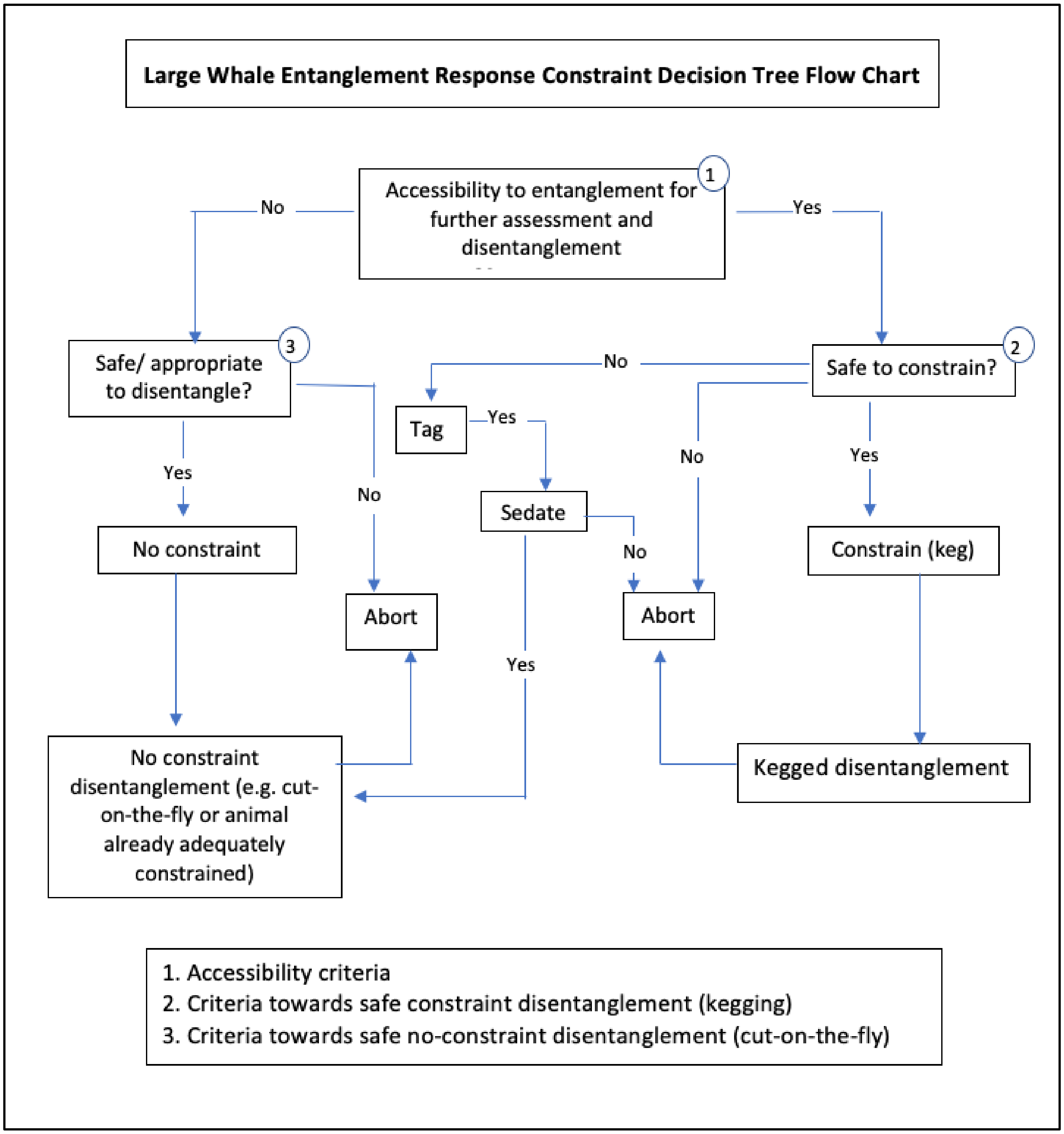


Figure 9: Large Whale Entanglement Response Constraint Decision Tree Flowchart

Criteria:

1. Accessibility of animal/entanglement:
   - Animal is fast moving
   - Animal is evasive/unpredictable
   - Animal is aggressive
   - Animal is exhibiting short surface intervals
   - Entanglement is deep (*e.g.,* weighted gear around a deep-lying tail) and/or forward on body (*e.g.*, mouth entanglement)

2. Safe to constrain animal

   - Drag force will not overtly affect mobility (*e.g*., prevent surfacing behavior)
   - Drag force to body likely not more traumatic than entanglement (*e.g.*, increase life-threatening wounds, amputation of limb; exacerbated by strong, small-diameter line on body part)
   - Tether line (*i.e.*, the working line) likely to not complicate the entanglement (*e.g.,* become part of or pick up additional gear)
   - Animal not likely to become more perturbed or aggressive (*i.e.*, animal and entanglement likely to become less accessible as opposed to more accessible)
   - Constraint likely to provide safer accessibility to animal and entangling gear (*i.e.*, slow the whale down, keep it at surface)

3. Safe to approach sans constraint

   - Animal is slow moving
   - Animal is predictable (*e.g.,* linear travel)
   - Animal calm
   - Animal/entanglement at surface long enough to access
   - Resources (*e.g.*, long pole system or tools [*e.g.,* cutting grapple] allow for more remote access)
   - Responder experience allows approach sans constraint (*e.g.*, experienced helmsperson and responder wielding pole-mounted knife)
   - Conditions allow

Cons/Risks:

- Potential impact to animal
    - Trauma to the attachment point on the animal, can result in wounds or amputation
    - Impact
    - Added energetic costs from drag resistance of kegging buoys/sea anchors
    - Working line becoming part of the entanglement
- Potential impact to responder
    - Elicit negative behavioral response from animal (*e.g.,* aggressive, evasive)
    - Working with lines under load and attached to animal

Necessity of great accessibility (*e.g.,* animal too mobile, erratic behavior, short surface intervals). The topic of constraint is also addressed in Section 4.9.

■ 2.13.6 Criteria Towards Sedation

Sedation in large whales is still being pursued. It has been used on three entangled North Atlantic right whales with mixed results. The drug delivery system has evolved over time with more recent drug delivery devices performing well in the field on both stranded and free-swimming animals. Sedation will be most effective if the animal is not excited (*i.e.*, minimizing the flight or fight response), prior to the administration of the drug(s). The ideal scenario would be to sedate the animal on the first approach of the day, when the animal may be less excited and the greatest effect of the drug(s) may be achieved.

Criteria for sedation:

- Entanglement is life-threatening;
- Traditional (non-chemical) disentanglement means not possible or warranted;
- Conditions and resources available towards sedation;
- Availability of experienced/trained responders; and
- Approvals obtained

Sedation is covered in more detail in Section 5.0.

■ 2.13.7 Criteria Towards Euthanasia

Euthanasia should only be considered if an entanglement is likely to lead to death and there are extreme individual welfare concerns. It should only be pursued in consultation with a veterinarian who has large whale experience, and after approval. If the animal cannot be disentangled, the decision to euthanize should be made on a summed appraisal of the following criteria:

- Animal is stranded;
- Animal cannot swim;
- Severe fluke injury, or loss or imminent loss of fluke;
- Compromised respiration, or a seal of the blowhole, or such compromise of seal is imminent; and
- Severe constriction of gear that cannot be removed from a vital body part, or such constriction is imminent.

This may be evaluated by scoring the health status of the animal. A positive answer to only one of the evaluation criteria may not be sufficient cause (IWC, 2010).

■ 2.13.8 Criteria for UAS Use

Use of an aerial drone or UAS can have substantial benefits towards assessing the animal (*e.g.*, condition and impact), the entanglement, documenting the effort for later evaluation, and education and outreach. However, the use of aerial drones also provides its own risks, and as in other procedures, requires experienced, trained and certified pilots, as well as support staff. Below are the current criteria on using UAS or drones for large whale entanglement response efforts under the MMHSRP permit (Appendix 5 of the MMHSRP permit):

- To the maximum extent practicable, UAS altitude adjustment and horizontal movements should be made away from the animals or conducted slowly when above the animals to minimize disturbance.
- The UAS should hover over an individual only long enough to obtain the needed data or samples to achieve the permitted objectives.

It is important to recognize that the UAS platform is considered an aircraft and thus, unless flying over 330 meters (1000 feet, which is not allowed in the U.S. due to FAA regulations limiting UAS operations to 400 feet AGL and less), will automatically be under permit.

1. For NOAA employees (*Some of these requirements may also apply to non-NOAA staff operating from NOAA vessels):
    a. FAA, Remote Pilot Part 107 license.
    b. OEM or manufacturer's training for the approved UAS platform(s).
    c. Experienced pilot (*i.e.*, logbook documentation of flying over water and over animals, familiar with response effort and that particular drone).
    d. Approved airspace (under 120 meters [400 feet]).
    e. Notice of intent to fly (NTIF) submitted.
    f. Availability of appropriate launching and recovery platform (*e.g.,* clear deck space free of obstructions). NOTE: if launching and recovering from a NOAA vessel, additional requirements may exist.
    g. An airworthy drone.
2. For non-NOAA employees:
    a. FAA, Remote Pilot Part 107 license.
    b. Experienced UAS pilot (*i.e.*, logbook documentation of flying over water and over animals, familiar with response effort and that particular drone).
    c. Approved airspace (under 120 meters [400 feet] as per FAA Part 107 regulations.
    d. Availability of appropriate launching and recovery platform (*e.g.,* clear deck space free of obstructions).
    e. An airworthy drone.

See Appendix T for UAS use checklist. There are additional criteria if flying from a NOAA vessel (*e.g.,* Line Office approval) that must be adhered to. For the latest on UAS operations under NMFS' MMHSRP permit, contact the MMHSRP.

While GAR risk assessments and decision matrices may be performed prior to a response, assessment and risk mitigation is again an ongoing effort. It should be noted that the process of gaining information towards establishing the level of risk, may in itself incur risk (*i.e.*, the close approach to an animal to determine the severity of an entanglement). The use of UAS in large whale entanglement response efforts is covered in more detail in Section 6.0.

3. First Response – Assessment, Documentation, Monitoring (Levels 1 - 3)

○ 3.1 Overview

First Response represents the initial response, whether directed or not, to the report of an entangled whale in order to provide valuable assessment and documentation (*i.e.*, the hardcopy of assessment). The information gained during first response is foundational, as it allows for initial risk assessment - both evaluative for the animal and operational for the responders. That risk assessment and other information gained is instrumental in making an informed decision on how to proceed, or whether to proceed at all (*i.e.*, populate the decision matrices). First response may also involve monitoring the animal, if further response has been deemed likely (*i.e.*, response is warranted, authorized; conditions and resources are available). Under certain circumstances monitoring may involve tagging the whale (directly on the animal or indirectly via attachment to trailing gear) to remotely track the animal. First response may represent the mission or may be the precursor (*i.e.*, the foundation) to the broader mission of disentangling a large whale (Section 4).

A **First Responder** is anyone within the Network directed to respond to an entanglement report under Network protocols and authorization. At a minimum, they will voluntarily provide assessment and documentation, attempt to standby with an entangled whale and, depending on training, experience, authorization and equipment available, may also tag the whale.

Primary First Responders are Network members that have additional training and experience, and typically have higher level designations (*e.g.*, level 3 - 5). As such, Primary First Responders, under certain conditions and authorization, may attempt disentanglement as part of a first response, or assist as part of an associated full disentanglement effort. These individuals typically have rapid access to vessels and specialized equipment, and are on call. Due to the possibility of higher risk activities and their association with large whale disentanglement, primary first responders and their roles are covered in more detail under the disentanglement section (Section 4).

○ 3.2 Preparation and Training

The first responder role is broad in scope, ranging from lower risk monitoring of the whale from a safe and legal distance (*e.g.*, 100 m or more), to closer approaches for assessment, documentation, monitoring, including polework and tagging, and in some cases they may assist directly with disentanglement activities. Whether monitoring from a distance or making a close approach, any approach to a large whale entangled in gear has inherent risks for both the responders and the animals, which dictates preparation and training. Responders should at least have level 1-2 first responder training, and otherwise be qualified and/or trained for the various roles required (*e.g.*, maneuvering a vessel, documentation). If the response involves close approach assessment (*i.e.*, within 100 m, polework), or attaching telemetry, then responders should have level 3 or higher response training - both classroom and hands-on, and additional experience. Level 3 or higher training is required for the IC, while the person in charge of the telemetry should be well versed in its use and safe attachment. Skillsets and familiarization with the protocols and procedures needs to be maintained through response opportunities or continued training (*i.e.*, refreshers). See Authorization regarding Heightened Consultation protocols for tagging, and other close-approach procedures when reporting on a response effort and requesting authorization.

On-line large whale entanglement response first responder trainings:

Pacific Islands online first responder training:
https://pacific-islands-training.whaledisentanglement.org/

Alaska online first responder training:
https://alaska-training.whaledisentanglement.org/

West coast online first responder training:
https://west-coast-training.whaledisentanglement.org/

○ 3.3 Authorization and Supervision

First responders that are not directed to respond (*e.g.*, a tour boat that reports the animal and/or stands by) and do not approach the entangled animal within 100 m, maintaining a safe and legal distance, are not under the authorization of the MMHSRP and their permit. However, due to the unpredictable nature of an entangled animal and undetermined trailing gear, risks exist. Any effort that represents approaching the entangled animal within 100 m, or is otherwise directed, will require authorization under the MMHSRP as a permitted activity. Activities that represent close approach assessment, and/or tagging, will require at least one level 3 or higher responder to act as IC (unless authorization is received). Authorization is also dependent on consulting Regional Stranding or LWERCs to receive approval as part of Heightened Consultation*. In the event that Heightened Consultation cannot be met (*e.g.*, no cellular service, unable to relay via VHF radio, no satellite phone), activities requiring close approach, including tagging, will require a level 4 responder.

Heightened Consultation policy (Required reporting and consultation for level-designated roles, and **case-by-case** authorizations):

- Provide a detailed assessment of entanglement and animal.
- Provide an IAP, including available resources, personnel, and conditions.

If consultation contact cannot be reached:

- Level 3s are only authorized to document above water; no pole cameras, tagging or cutting (*i.e.*, close approach)
- Level 4s are authorized to document and apply tag, but no cutting
- Level 5s are authorized to document, tag, cut anything on any species except right whales
- Right whales will be authorized on a case-by-case basis

○ 3.4 Team Member Roles

While first response may represent lower risk, non-permitted activity, it may also involve an unintentional, or directed close approach to an unpredictable, and likely stressed animal possibly trailing an undetermined amount of gear in the water. Thus, approaching a large whale entangled in gear is inherently risky for both the responders and the animal, and warrants adherence to ICS and the planning it embraces. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential for a safe and successful response. The recommended roles that follow are based, in part, on implementation of the ICS. The number of responders needed for a response varies widely depending on the vessel, the amount and type of documentation needed, whether tagging is involved and the length of the mission, to name a few variables (Table 4). For instance, using Table 4, even on a small vessel, while attempting to assess and tag an entangled whale, the mission should represent at least a team of six, and preferably eight, qualified response crew.

Table 4. Suggested number of personnel and roles required for a typical large whale entanglement first response effort.

Team member role	Number of personnel required
Incident Commander/Safety Officer	1-2
Vessel captain (may also represent Safety Officer)	1-2
Crew (vessel dependent)	1 - 3 (roles can be shared with other roles)
Data collector	1
Documenters	1 - 3 (roles can be shared with other roles)
Communications person	1 (role can be shared with other roles)
Tagging (familiar with tag setup and deployment; takes 2 people, along with helm position to deploy)	2 (roles can be shared with other roles)
Optional – UAS pilot (see UAS; Section 6)	2 - 3 (roles can be shared with other roles)

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, IC and SO; 2º documentation and data collection).

- **Incident Commander (IC)** - The IC, working closely with shoreside (or otherwise remote) authorizing parties (*e.g.*, NMFS Regional Stranding Coordinator [RSC]/ LWERCs, National LWERC), is responsible for the on-scene oversight and supervision of the first response operation. The IC may participate directly in the operation depending on circumstances, but typically does not directly participate (*i.e.*, hands-on) in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that safety is maintained for responders, the public, and animals.

  - **Qualifications** – Completion of the ICS free or paid courses, level 3 or higher for any close-approach assessment or tagging operations (Level 4 or higher in cases of not meeting Heightened Consultation protocol). Must be trained and/or experienced in protocols, procedures, risks, and risk mitigation in all aspects of the first responder mission being carried out.

- **Safety Officer (SO)** – The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate with the team and adjust the strategy of the response as needed. The SO works very closely with the IC. Under certain circumstances and depending on experience, the role of the SO can overlap with that of the helmspersons of the support or approach vessels, and if necessary and otherwise appropriate, the role of IC and SO can be performed by one person.

- **Qualifications** – Experience in previous large whale entanglement response efforts, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e*., not adhering to protocols, presence of other animals, incoming environmental or weather changes, and time of day considerations). Willingness and ability to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.

  - **Helmsperson(s)** – This person(s) is responsible for the safe transit and operations of the vessel(s), including the safe maneuvering around and approach to entangled whales, and the trailing gear that might exist. Helmspersons should have experience operating the vessel around the animal and all aspects of the response operation. They typically take on the key role of operational safety and may take on the role of SO. As such, the helmsperson role whether on the transit, support, or approach vessels is one of the most important roles beyond that of the IC.

- **Qualifications** – Experience, training, and in some cases certifications *(e.g.,* USCG license, NOAA certified components course) in order to "captain" a vessel. Helmspersons should have experience operating the vessel around large whales and all aspects of the response operation.

  - **Data collector** – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets and data loggers, including the assessment of the animal, recording identity of associated documentation, the entanglement (*e.g.*, nature of the entanglement, gear type), behavior of animal (*e.g.,* respirations, changes due to response), the response efforts (*e.g.,* an outline of response steps taken, risk factors encountered, who was involved), and telemetry (*e.g.,* tag identity, frequency of VHF, fine tuning).

- **Qualifications** – Familiarity with procedures and data sheet/dataloggers, attention to details. Ability to accurately and completely compile a great deal of information. Lacking a disposition to seasickness is valuable.

- **<u>Documenter(s)</u>** – This person(s) is/are responsible for obtaining and maintaining (*e.g.*, identifying and safe storage) still and video imagery on all aspects of the response. They work closely with the Data Collector and the helmsperson. This person may also serve as the data collector. Under certain circumstances, responders with other roles may take on, in part, the role of documenter, through use of helmet or vessel-mounted POV cameras. However, such persons must maintain focus on their primary role and maintain safety. POV cameras should be turned on and forgotten by the user and instead either tended to or operated remotely by a dedicated documenter.

○ **<u>Qualifications</u>** – Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response (see an example of media guidance in Appendix E and documentation pointers in Appendix R).

- **<u>Communications</u>** – This person is responsible for maintaining all-important communications aboard vessels, between vessels (*e.g.*, a supporting partner vessel) and to shoreside contacts, including floatplan contact and NMFS authorizing agents (*e.g.*, Regional and/or National LWERCs). Shoreside contacts typically take on the role of further disseminating information, including to agency partners/leads, any other authorizing agencies, and media coordinators. Communications at this stage do not involve the media as this is the role of media coordinator and others at later stages (see Appendix E for media guidance along the West Coast).

○ **<u>Qualifications</u>** – Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response.

- **<u>Telemetry taggers</u>** - This role is responsible for the pre-deployment preparation, including the testing of the transmitters and receivers and setup of the telemetry buoy, the appropriate deployment of telemetry, receiving Argos, GPS and real-time VHF fixes, and the interpretation and forecasting of telemetry data towards use in relocating the animal for future efforts.

○ **<u>Qualifications</u>** – These persons need to be trained or otherwise familiar with the appropriate preparation (*i.e.*, testing, tuning, and mounting to the telemetry buoy) of telemetry gear, deployment, reception, and interpretation of telemetry. The two-person team attaching a tag must work closely with a helmsperson. Both persons - one making the attachment (*e.g.*, throwing a grapple) and the other person dedicated towards making sure the telemetry buoy is deployed cleanly off the vessel, need to be physically capable, trained and experienced in the procedure, and familiar with all risk factors. At least someone on the team needs a level 3 designation or approval to proceed otherwise. Heightened Consultation criteria may require Level 4 designation.

- **Unmanned Aircraft System (UAS)** - If permitted to operate a UAS during the response, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success or safety of the operation, or causing disturbance to any animals.

- **Qualifications** – Pilots must have an FAA Part 107 Remote Pilots license, follow all existing FAA and other local/state regulations, and be trained and/or experienced operating a UAS over water from a vessel during response operations. More detail on UAS use is addressed in Section 6.

3.5 Communications

Communications between team members on a particular vessel, between vessels and to shoreside contacts have serious implications towards maintaining safety. While communications involve all members of the team, it is especially important for the IC, the SO, the Communications person, and the primary shoreside contact to maintain a strong working relationship. Well-established and consistent communications on the water will have strong operational bearing on maintaining an efficient and safe working environment, while communications with the shoreside will facilitate authorization and reporting requirements. Shoreside contacts typically take on the role of further disseminating information, including to agency partners/leads, any other authorizing agencies, and media coordinators. On-water/on-site direct communications do not involve the media, as this is the role of media coordinator(s) and others at later stages.

Some examples of key communications are:

- Alerting and approval of helmsperson of an action (*e.g.*, movements aboard, on and off vessels);
- Alerting and approval of helmsperson on the deployment of gear (*e.g.*, deploying the telemetry);

- Notification and acknowledgement of UAS deployments and recoveries;
- Providing risk assessments and IAP to Regional or National LWERCs;
- Providing regular status updates to all shoreside contacts for further dissemination;
- Communications between documenters and data collector on imagery taken;
- Alerting the response team of a change in behavior from the animal and;
- Alerting team members of hazards (*e.g.*, gear in the boat, line in the water near engines).

○ 3.6 Data Collection

Data collection is essential in recording all aspects of the entanglement response, including the assessment of the animal, recording identity of associated documentation, the entanglement (*e.g.*, nature of the entanglement, gear type), behavior of animal (*e.g.*, respirations, changes due to response), the response efforts (*e.g.*, an outline of response steps taken, risk factors encountered, who was involved), and telemetry (*e.g.*, tag identity, frequency of VHF, fine tuning). The information gained has benefits towards evaluating the threat (*i.e.*, the animal risk assessment) and the operational risk assessment (*i.e.*, assessment of the risks and impacts posed by the response to humans and animals).

It is important that dataforms and/or data loggers are prepared and maintained (*e.g.*, batteries charged), and appropriate team members are familiar with their use prior to the start of any entanglement response. During a response, data collection needs to be maintained (the role of a dedicated data collector), and appropriate communications are on-going with the entire team to collect all data required. Some examples of data collected are:

- General response narrative (*e.g.*, when departed, on-scene, a procedure performed, the whale is freed and gear collected);
- Cataloging of imagery;
- Animal behavior, including response to procedures;
- Risks posed to responders (in the case of injury or worse, incident reports will need to be completed);
- Telemetry setup (*e.g.*, PTT ID, VHF frequency and fine tuning);
- Personnel and supporting agencies, along with their roles;
- Information on the entanglement (*e.g.*, how entangled, gear description and markings); and
- Information on the animal (*e.g.*, condition, sex, age class, impacts, fluke ID).

○ 3.7 Resources

The primary resources of first response, beyond the team itself, are vessel support, safety gear, personal safety gear, data collection gear (*e.g.*, imagery and data forms), and telemetry and equipment towards deployment. A breakdown of each of these is provided below.

Vessel Support:

- Appropriately sized, equipped, and operated within the speed and range to safely respond.
- Have capacity for at least four to six response crew to fulfill all roles (six based on deployment of telemetry).
- If making closer approaches, vessel should have greater maneuverability, which may be related to size of vessel (*e.g.*, smaller size typically increases responsiveness and maneuverability).
- For documentation, safe access for documenters with a clear unobstructed field of view.
- If deploying telemetry, clear deck space, preferably forward, with low gunwale/rail system and limited snag points to accommodate deploying telemetry, including the clean deployment of the telemetry buoy.
- Accommodate communications between members of the team, especially involving the helm position (*e.g.*, flybridge and center consoles).

Response Equipment:

- Tether (*i.e.*, for telemetry/working lines) to initiate accessibility and/or constraint under "Disentanglement" (Section 4).
- Attachment tools (*e.g.*, grab grapples and pole-mounted skiff hooks).
- Receptacles (*i.e.*, a five-gallon bucket) to hold and cleanly deploy lines/tethers.
- Cutting grapple for remote cuts, but also for a safety tool.

Telemetry Gear:

- Transmitters (*e.g.*, Telonics whale tag)
- VHF receivers
- Antennas and associated cables
- Telemetry buoy

- Timed-release clips

Documentation:

- DSLRs, video cams or comparable cameras with a variety of lenses.
- POV cameras (*e.g.*, GoPros) to mount on helmets, parts of the vessel, and poles.
- Drones or UAS platforms for aerial documentation.
- Enough batteries and cards to complete the mission.

Data Collection:

- Data forms, checklists and/or data loggers (*i.e.*, Level A, response report form, photo-documentation forms, telemetry data forms).
- Watch/timer
- Binoculars
- Memory cards for various cameras.

Personal Safety Gear and Protective Clothing:

- Appropriate footwear (*e.g.*, closed-toe shoes or boots).
- Protective clothing (*e.g.*, wetsuits, work suits, UV protective wear).
- Chafe and cut-resistant gloves (*e.g.*, Lamars, Atlas) that fit well.
- Appropriate Personal Floatation Device (PFD; Will depend on environment, but also role). Personnel making close approaches and handling gear attached to the animal need to also wear PFDs with limited risk of getting caught in gear (*i.e.*, fits well, is simple, and has few snag points).
- Appropriately fitted and protective helmets (*e.g.*, Gath, Team Wendi, AquaSport). Helmets can have integrated eye and face protecting visors. Helmets are required for those using poles, in the vicinity of poles, or in the vicinity of animal and gear.
- Personal, one-handed safety knife for personnel that are handling gear or in a position to possibly handle or interact with gear, especially if it might be attached to the animal.
- Optional - eyewear, knee pads, sunscreen, hat.

Medical and Safety Equipment:

- First aid kit
- AED

- Backboards, neck collar, splints (immobilization gear)

If further offshore, remote or removed from medical attention:

- Lift cages and harnesses
- Oxygen kit
- Satellite phone
- An appropriately trained person (advanced medical training, EMT) to use more advanced medical equipment and provide additional emergency care.

○ 3.8 Environment and Weather

The scope of first response and its actions is fairly broad, and as such, so are the conditions it can be performed under. The use of larger vessels towards rapid first response may allow a greater response range due to the vessel's range and speed, and ability to handle adverse conditions. A faster vessel, along with the typically shorter duration first response missions, may allow for initiating efforts later in the day. In addition to larger vessels, the generally less complex and involved missions of first response also typically allow for higher sea states. While dependent on other variables, the typical cutoff on first response is Beaufort 5. However, any environmental limitations are based on safe operating conditions, and are affected by range, distance from medical attention, travel time, daylight affecting operations and transit, air and water temperature, visibility (*e.g.*, fog, heavy precipitation, darkness), certain types of precipitation (*e.g.*, snow, sleet, hard rain), and other environmental factors (*e.g.*, lightning, approaching hurricanes). Assess the following environmental conditions prior to mounting an effort/approaching the animal:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold).
- Environment (*e.g.*, remoteness, exposure to higher sea states).
- Time of day (*i.e.*, close to sunset).
- Conspecifics (*e.g.*, other potentially interacting whales in the area).
- Predators (*e.g.*, sharks, killer whales).

○ 3.9 Procedure and Mission Goals/Complexity

First response represents either opportunistic or directed efforts with a primary mission to provide assessment and documentation, and under certain circumstances, attach tethered telemetry towards disentanglement operations. First response can be from safe (at least 100 meters) and legal distances (where they apply, and thus not a permitted activity [levels 1 - 2]), or represent closer approaches that fall under the MMHSRP permit (level 3). First response may represent the entire mission by meeting all mission objectives required and warranted based on risk assessments and decision matrices, or it may represent the initial stages of a much more involved effort including telemetry and/or the attempted disentanglement of the animal (Section 4).

Response team assess an entangled gray whale in order to formulate an action plan (PMMC/ NOAA MMHSRP permit # 932-1905)

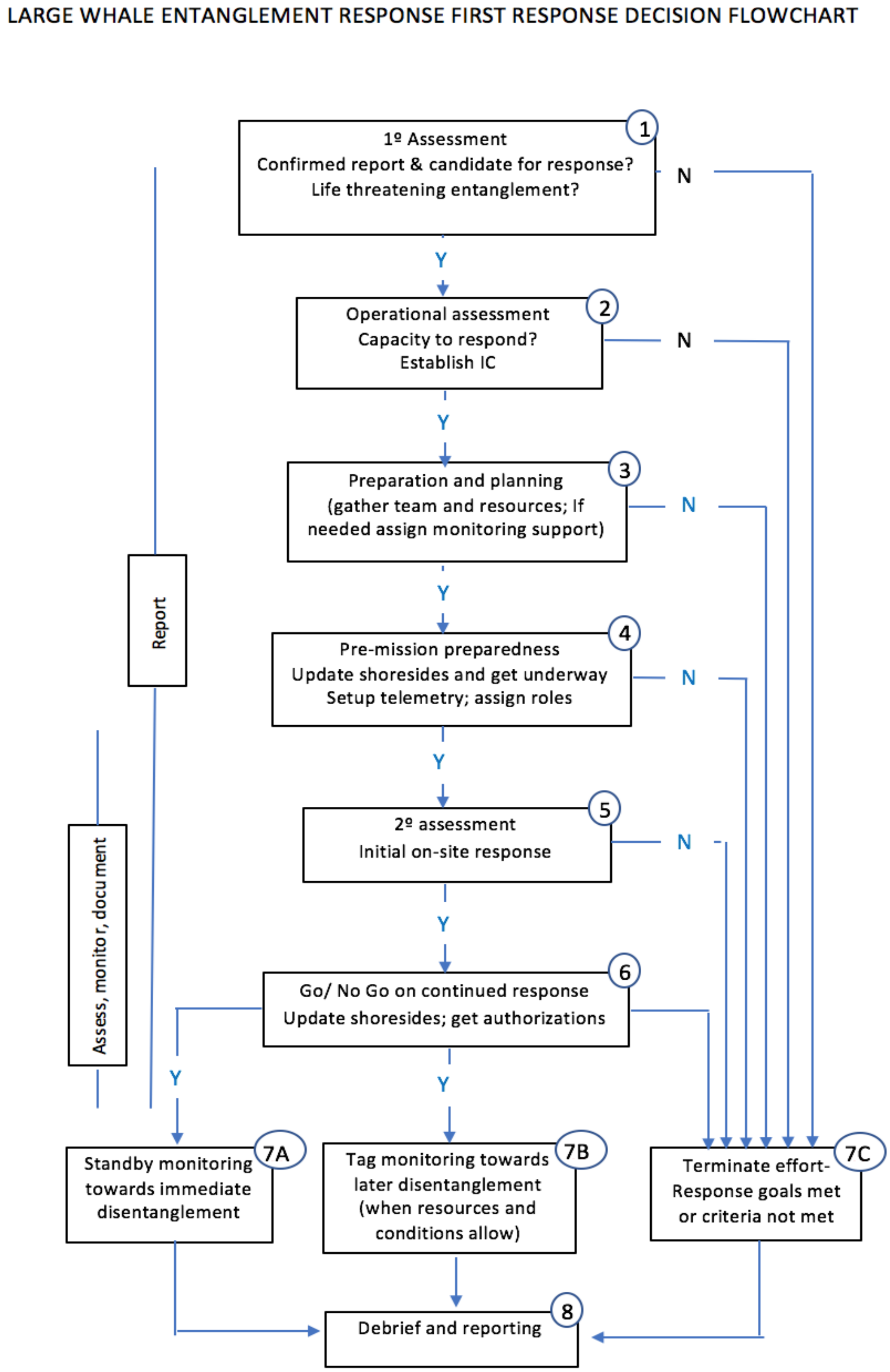


Figure 10: Large Whale Entanglement Response First Response Decision Flowchart

Generalized outline of first response, including attaching telemetry:

Step 1: On obtaining an initial assessment and determining that report represents a confirmed case and animal is a candidate for response (*e.g.*, a life-threatening entanglement).

Step 2: Establish an IC and perform an operational assessment (*i.e.*, is there the capacity to respond and do conditions allow?). First response, like any large whale entanglement response effort, requires use of decision matrices and appropriate risk assessment.

Step 3: Response preparation (*e.g.*, gather team and resources, assign roles) and planning (*i.e.*, draft initial IAP). As part of planning and preparation, as it does require time, consider this time, as well as the transit time to the animal, as part of the response IAP. Is the animal anchored, otherwise immobile, on a predictable heading and speed? Is there historical data suggesting the animal will stay in the area? Is there standby support monitoring the animal, and/or are there resources (aerial support) to otherwise relocate the animal? After just two hours, the search area of even a slow moving (3 kts) entangled whale can grow to nearly 255 sq. nms.

Step 4: Perform initial pre-mission briefs (*e.g.*, standard vessel and response operations) and GARs with team. Update NMFS on status and establish shoreside contacts. Get underway. Maintain vessel operational requirements (*e.g.*, captain or qualified person at helm, observers), refine roles (*e.g.*, who gets what camera), and prepare response resources, including telemetry if it has possibility of use. Turning on the telemetry early will make sure it is fully operational well before the decision is made to deploy it. Safely transit to the last known or predicted position of animal.

Step 5: Arrive on scene (*i.e.*, animal passed off by standby vessel or otherwise relocated). Approach as needed, appropriate, and authorized to obtain additional (2º assessment) and documentation. The documentation person should ensure all photo and video equipment is on and recording. Information to include the animal (*e.g.*, species, age class, condition and impacts, the ID), the gear (*e.g.*, gear type, how entangled, status of gear, gear ID), and the conditions. Safety persons maintain a watchful eye on animal(s), the team, and actions (*i.e.*, the overall environment).

Be methodical and slow in approaching the whale and entangling gear. Avoid using reverse or sudden throttle changes, and be predictable on the approach. Approach from the side and slightly behind as to avoid any trailing gear (*e.g.*, net and line). Maintain a safe distance, avoiding the ‘danger zone.’ While initial approaches are typically the most productive, never assume it is safe to closely approach the animal. Remember, the animal’s behavior may be temporarily consistent, but can change for the worse in a moment's notice. Only approach the animal as needed and authorized. Back off if the animal shows signs of stress. Maintain operational assessment and mitigate risks to responders at all times.

Step 6: Update shoreside contacts. Consult with National or Regional LWERCs and/or response experts, and use results of 2º assessment to determine continued actions and their authorization (*i.e.*, will disentanglement be pursued, animal tagged, or operations terminated?). Criteria will be based on authorization requirements and decision matrices **- Go/No Go determination.** If operations are to proceed, especially if close approaches may be required, the first response team should attempt to limit their approaches to minimize the effect on the animal (*i.e.*, animals typically become more evasive over time). Save some of the initial approaches for other activities (*e.g.*, tagging and cutting the animal free).

Response team off Kodiak, Alaska assess an entangled humpback whale prior to engaging (NOAA MMHSRP permit # 932-1905)

Step 7a: If monitoring while additional resources (*e.g.*, additional tools and personnel towards disentanglement) arrive on scene, fall back at least 100 meters to a position abeam or off the quarter of the animal. Make sure team members are assigned to monitoring the animal and not doing other roles.

Tips on standby monitoring:

- Time the sounding dives, and estimate heading in order to determine the pace of the animal.
- Don't rely solely on the entanglement to identify the entangled animal. These may change (*e.g.*, an air-filled buoy not recovering after a dive, or a line no longer draped over the back).

- Use identifying features of the animal to track it (*e.g.*, pigmentation differences, scars, age class).
- If the whale does not surface within the time that you expect, assume that you missed the surfacing.

Assessing stress and warning signs (*i.e.*, when to back off or terminate a response):

- Evasive maneuvers (*e.g.*, changes in direction, time between dives)
- Trumpeting or wheezy-like blows
- Headrises
- Tail slashing and swishing
- Surface-active behaviors (*e.g.*, breaches)
- Changes in respiration

Step 7b: If tagging has been determined appropriate, make final preparations of gear (*i.e.*, tag is operational, secured to buoy and ready for deployment). Responders handling lines, telemetry buoy, and/or deployment gear (*e.g.*, clip on a pole, a grapple hook), should have appropriate attire and PPE on (*e.g.*, helmets, gloves, PFDs, jewelry removed). Establish and review all roles with the team, including all procedures, mitigating measures - any emergency response, and confirm team members fully understand, are capable, and are mentally prepared. Discuss when response should be aborted and who makes the decision. Review animal warning signs, and the appropriate emergency response actions. Re-evaluate operational assessment and mitigating measures using decision matrices. Update IAP, review with team, and get approvals from shoresides as required. The inability to consult with regional coordinators or experts (*i.e.*, Heightened Consultation) regarding tagging (a level 3 activity) and its IAP, may require the IC to have a greater level designation. If met, tagging may proceed, but otherwise, the effort will need to be terminated. The IC should ensure all personnel and equipment are ready and perform the final Go/No Go determination.

Telemetry buoy with transmitter trailing behind entangled animal (NOAA AKPRD)

The three primary steps to prep and deploy a tethered telemetry package:

- Tag package is operational:
  - Initial GPS fix received
  - VHF frequency fine-tuned
- Tag secured to buoy
- Tag secured to animal (via the entanglement)

See Appendix J for more detail on maintaining and preparing telemetry for use in Hawaii.

Tagging is typically used when disentanglement response cannot or should not be mounted immediately, or needs to be temporarily suspended. As such, it represents an alternative to proceeding with disentanglement or aborting the mission.

The use of tethered tags provides:

- Time to gather resources.
- Rapid response of moderately experienced teams (*i.e.*, they may not be able to disentangle the animal, but they can assess and tag it for potential follow-up).
- Multiple efforts over time.
- Safety (*i.e.*, that alternative when conditions and resources do not allow or warrant further response - tag it and go home).
- Proof of later release or self-release of gear (allowing for gear recovery).

Step 7c: If evaluative and operational assessments, including Heightened Consultation, and their corresponding decision matrices are not maintained, then first response activities must be terminated, or fall back to activities in which they would be met.

Step 8: No matter what path the first response leads to, the entire response team needs to review the response for any operational risks and means of mitigation (*e.g.*, a change in protocol and new tool). It is important to discuss as soon as possible while memories of the event are fresh. Debrief reports should be drafted. Ensure all datasheets and reports are complete and reporting requirements met (*e.g.*, incident reports, permit reports, debrief reports).

Appendix I provides an example of a generic first response checklist for large whale entanglement response under NOAA's MMHSRP. Figure 11 below depicts that portion (shaded in green) of the overall response that might represent a first response. First response generally refers to tier 1 through tier 3, but can support tier 4. Everyone has an investment in tier 5 in as much as it represents the gathering of information to better understand and mitigate the large whale entanglement threat.

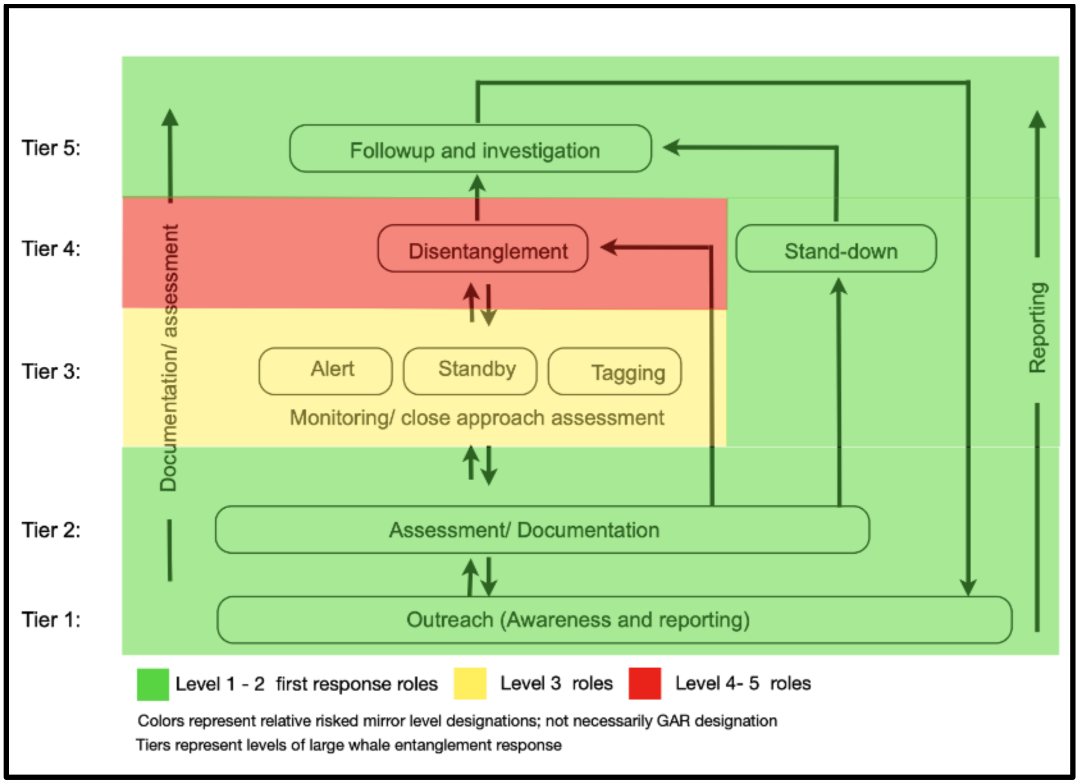


Figure 11: Large Whale Entanglement Response Flowchart

○ 3.10 Risk and Mitigation

Risk mitigation should be no different for first response than that of a more involved operation, like disentanglement. Even the simple task of approaching a large whale to obtain an ID (*e.g.*, a fluke ID of a humpback whale) can incur risk as the vessels' outboards have become entangled in the trailing gear. First response still represents approaching or just being in the vicinity of a likely mobile, stressed, unpredictable, entangled large whale, while the team is in a relatively small boat in the open ocean. Experienced and trained responders still need (and are required) to be prepared, plan, and be aware of the risk factors and their mitigations. The adherence to protocols and application of decision matrices still need to be met. Don't make assumptions of what might be perceived as a lower level of risk of first response, as things can and do change.

RISKS TO HUMANS

Risk: Injury or death to personnel from contact with a whale. Direct contact from the animal has the highest risk, especially when cutting the final line of the entanglement and freeing the animal (Lyman & Mattila, 2010).

Risk assessment prior to mitigation: II/ E High Risk

***Mitigation*:**

- All personnel should avoid proximity to the animal – the danger zone surrounding the animal, especially at times when there may be a change in the animal's behavior, such as when making final cuts that may cause gear to shift or elicit a pain response.
- All personnel should wear appropriate PPE such as PFDs and helmets as necessary. The use of helmets is required for those using poles and teammates that are in the vicinity (*i.e.*, within the extended radius of the pole's 360º sweep). At the moment of attachment (*i.e.*, before a clip releases) the pole becomes an extension of the animal and poses additional risk.
- Designated safety persons should be assigned to continually watch over all personnel involved, warning the team of hazards such as changes in behavior of the animal and presence of other animals, and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated personnel should prioritize the use of flying knives (*i.e.*, knives that slip off poles) or thrown knives (*i.e.*, cutting grapple) to minimize time near the animal.
- Distressed animals are unpredictable; continuously monitor for signs of stress (*e.g.*, abrupt headrises; suddenly producing wheezie or trumpeting blows; changes in respiration, speed, or dives; bubble streams and blasts otherwise out of context; pronounced close approaches, especially belly towards (*i.e.*, a maintained rollover).
- Teams should approach the animal as methodically and consistently as possible, giving time for the animal to habituate to the presence of the approach vessel (Ledwell & Huntington, 2018).

Risk Assessment following mitigation: I/E Moderate Risk

Risk: Injury or death to personnel due to getting harmed by, or entangled in the gear that the animal is entangled in.

Risk assessment prior to mitigation: II/ D Moderate Risk

***Mitigation*:**

- All personnel handling gear attached to the animal (*e.g.*, attaching tethered telemetry) should wear protective gloves to avoid chafing (*i.e.*, rope burns) and impact.
- All personnel handling gear attached to the animal should carry a one-handed safety knife. Note: Do not use the safety knife as a utility knife.
- Support vessel team should remain alert and prepared (*e.g.*, cutting grapple ready to sever any links).
- Certain gear types, such as the pane of a gillnet or the mainline of a longline should not be directly handled (*e.g.*, while securing telemetry directly to the entangling gear).
- Avoid the area close to and around the whale - the "danger zone." This includes the area behind the animal, as the approach vessel can get caught in the trailing gear.
- Any vessel closely approaching the animal (*i.e.*, in the danger zone) should be as free as possible of snag points, especially the engines and hull, and areas of the vessel where gear might be handled.
- For small vessels with minimal open deck space that closely approach the whale and entangling gear, only carry the necessary gear for that particular operation (even safety gear can be covered by the support vessel).
- All personnel handling gear attached to the animal should wear PFDs and protective clothing that are "clean" (*i.e.*, free of snag points).
- Do not get in the water near an entangled whale.
- Do not pull line/gear into the vessel that might still be attached to the animal.
- During line handling, only have a bight of line in the vessel at any one time as to reduce threat to personnel (*e.g.*, grabbing the trailing gear to attach a telemetry buoy).
- Always farelead the lines attached to the animal, especially if under load, to the outboard side of a vessel and of all personnel as to avoid being stripped off the vessel (*e.g*., during the process of deploying the telemetry buoy).
- All personnel should remain clear of gear being attached/deployed to the animal/entanglement (*e.g*., clips, grapples, telemetry buoy) to avoid personally getting entangled.
- Make sure gear being attached to animal/entanglement is deployed from the vessel on the team's terms. <u>Do not</u> let the animal pull gear off the vessel (*i.e.*, make sure the telemetry buoy is deployed off the vessel as opposed to the whale taking it off the vessel). Use a dedicated person to deploy telemetry or kegging buoys.

- Do not wrap net or line around hands or fingers. Line handlers, like those deploying telemetry, should remove entanglement hazards (*e.g.*, rings, watches), and keep feet clear of lines and nets. Use a five-gallon bucket or other receptacle to hold the telemetry buoy's tether line as it is being deployed.
- Responders handling gear should be familiar with the entangling gear, its associated risks (*e.g.*, a longline with gangions). Certain gear like gillnet and longline should not be directly handled.

Risk Assessment following mitigation: I/C Low Risk

Risk: Injury or death to personnel due to contact with tools.

Risk assessment prior to mitigation: III/ C Moderate Risk

***Mitigation*:**

- All personnel using disentanglement tools, especially poles, should wear appropriate helmets. Personnel in the vicinity of the person using a pole should also wear helmets.
- During line handling, keep grapples and clips attached to the working line well in front (~2 m) of personnel to avoid contact. If the line is under load, the distance between tools and personnel should be even greater (~5 m).
- All personnel should remain clear of gear being attached to the animal (*e.g.*, knives, clips, grapples, telemetry buoy). An animal eliciting a negative response to the tool, may throw it a long distance (*e.g.*, from a tail slash).
- If deploying tools from poles, test animal's behavior prior to committing to the use of the tool (i.e., touch the whale with the back of a clip or knife prior to attachment and immediately clear - lift the pole, to see if there is a response).
- Clear poles (*e.g.*, lift or pull back and stow) after use.
- Make sure gear being attached to animal/entanglement is deployed from the vessel on the team's terms. Do not let the animal pull gear off the vessel. Use a dedicated person to deploy gear (*e.g.*, buoys).

Risk Assessment following mitigation: II/B Low Risk

Risk: Injury or death to personnel due to overall response (*e.g.*, fatigue, exposure, falls, strains).

Risk assessment prior to mitigation: IV/ B Low Risk

***Mitigation*:**

- Monitor personnel exertion and fatigue levels. Have enough experienced responders to avoid fatigue. Do not push oneself or team to the limits.
- Responders should have appropriate attire and protection to minimize exposure.
- Communicate responder movements between vessels to helmspersons (*i.e.*, "stepping over").
- Monitor your fellow responders.
- Monitor emotions or desire to "save animal." Emotions can and do cloud judgement(s).

Risk Assessment following mitigation: III/A Minimal Risk

As always, one major all-encompassing mitigating measure is standing down or aborting a procedure or the entire operation/mission. There is no obligation to respond.

Some primary points related to human safety that might not fall under the examples above or apply to all are:

- While there is no obligation to respond, there are obligations to meet certain criteria and protocols under the MMHSRP and its permit, if initiating a response.
- Obtain necessary authorizations as they are there primarily for safety.
- Ensure first aid kits and AED are available and located with each response group.
- Create a written safety protocol with emergency numbers to be kept with first aid kits.
- Do not put the whale's rescue above human safety.
- Never initiate an action that has not been thoroughly thought through and discussed
- Review worst-case scenario protocols; have an exit strategy for each procedure. Consider the "what ifs."
- When in doubt, tag (if decision matrix met), regroup (*i.e.*, attempt another day with more assistance, better conditions, and/or new tools and procedures) or entirely abort the mission. Aborting a response is a viable option.
- All members of the team should understand and agree upon response actions.
- Pre-mission briefs should be conducted.
- Responders should only conduct procedures for which they meet minimum qualifications and training.
- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as necessary.

- Do not get in the water near an entangled whale.
- Avoid the area close to and around the whale, including directly in front and behind, as this represents a danger zone in which contact with the animal or entanglement in the gear is more likely.
- Distressed animals are unpredictable; therefore it is important to continuously monitor a response to anticipate any risk and maintain safety.
- Communication within and between the disentanglement teams, including briefings, is critical to minimize risk and avoid hazards
- If drugs are used, all responders should be familiar with the drugs and reversals, including symptoms of accidental exposure and if/when/how to treat prior to the arrival of medical personnel.

RISKS TO ANIMALS

Like human safety, first response still carries risks for the animal. The response team needs to adhere to protocols, apply decision matrices, and assess and mitigate any risks to the animal(s) relative to that of the threat.

Risk: Injury or death to animal due to contact with response vessels.

Risk assessment prior to mitigation: II/ B Low Risk

***Mitigation*:**

- Use propeller guards around propellers (may also reduce catching trailing gear).
- Have experienced and knowledgeable operators at helm that are familiar with vessel, maneuvering around whales, and the operation.
- Avoid operating in the danger zone. Doing so not only reduces risk to responders, but also to the animal.
- Be methodical and as consistent as appropriate in approaching the animals as to be predictable.

Risk Assessment following mitigation:I/A Minimal Risk

Risk: Injury or death to animal due to drag forces (*i.e.*, kegging, tethered telemetry, towing approach vessel - Nantucket sleigh ride).

Risk assessment prior to mitigation: III/ C Moderate Risk

***Mitigation*:**

- Use of constraint (addition of kegging buoys/sea anchors) only when deemed necessary (see decision matrix).
- Use of telemetry when pros outweigh cons (see telemetry decision matrix).
- Use lower drag telemetry buoys.
- Use weaklinks or timed-release clips to avoid long-term attachments.
- Methodical use of kegging as to reduce stress and use only constraint when required for mission objectives.
- Avoid applying force to gear or tethered working lines that convey force to a vulnerable, traumatized part of the body (*i.e.*, to a deeply embedded wrap on a body appendage).
- Avoid applying force to entangling gear that involves strong, small diameter lines or rolled up gillnet, as both can produce significant and rapid trauma, especially if wraps are involved.
- Understand the type of entangling gear involved and its associated hazards.

Risk Assessment following mitigation: II/C Low Risk

Risk: Injury or death to animal due to contact with equipment (other than vessels).

Risk assessment prior to mitigation: II/ B Low Risk

***Mitigation*:**

- Use of hooked knives with dull outer surfaces by experienced responders.
- Appropriate use of drones (UAS) by FAA Part 107 Remote Pilot licensed and experienced pilots.

Risk Assessment following mitigation: I/A Minimal Risk

As always, one major all-encompassing mitigating measure is standing down or aborting a procedure or the entire operation/mission. There is no obligation to respond.

Other risks:

Other risks include the animal and entanglement being a "hazard to navigation" and a vessel getting caught in the trailing gear; well-intentioned public attempting to free the animal and getting injured; resources being lost or damaged during a response (*e.g.*, loss of telemetry buoy, approach inflatable being cut); and an unsuccessful mission causing stress (emotional and otherwise) to managers, responders and the community in general. These risk factors affect response risks either indirectly or directly, and should not be ignored when addressing risk mitigation.

○ 3.11 Intervention Criteria/Decision Matrix (Go/No Go)

A risk intervention tool or decision matrix (Appendix M – Decision Matrix [Go/No Go]) should always be used prior to any response. Factors that should be considered include environmental, team selection and fitness, animal condition, permission, resources, and mission complexity.

Table 5. First Response Risk Assessment Coding under Five Steps of Assessment

Step 1. Identify Risk Factors			Step 2. Access Hazards (who/ what?)	Step3. Evaluate Risk and Mitigate		Step 4. Record and Implement	Step 5. Monitor and Review
Response Categories	Hazards/ Risks	Causes	Initial RAC	Develop Controls	Residual RAC	How to Implement	How to Monitor
During first response, disentanglement, sedation	Injury or death to personnel from contact with whale	Operating in danger zone, loss of situational awareness, startle or pain response from animal	II/ E = High Risk	Avoid danger zone, only experienced personnel in close proximity, dedicated SO	I/ E = Moderate Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO	IC/CI will ensure compliance at scene. PI ensure compliance under program

During first response, disentanglement, sedation	Injury or death to personnel due to getting harmed by, or entangled in the entangling gear	Operating in the danger zone, loss of situational awareness, abrupt changes in animal's behavior	II/ D = Moderate Risk	Avoid danger zone, only experienced personnel in close proximity, use of safety knives, dedicated SO	I/ C = Low Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO	IC/CI will ensure compliance at scene. PI ensure compliance under program
During first response and disentanglement	Injury or death to personnel due to contact with tools	Lack of situational awareness, too close to tools under load, abrupt response from animal	III/C = Moderate Risk	Use experienced personnel, wear PPE, stay clear of tools under load or being deployed	II/B = Low Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO	IC/CI will ensure compliance at scene. PI ensure compliance under program
During first response, disentanglement, sedation	Injury or death to personnel due to overall response	Inexperience of personnel, too much emotion, fatigue	IV/ B = Low Risk	Use experienced personnel, wear PPE, maintain methodical approach and fatigue levels	III/ A = Minimal Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO and focus on big picture	IC/CI will ensure compliance at scene. PI ensure compliance under program
Response Categories	Hazards/ Risks	Causes	Initial RAC	Develop Controls	Residual RAC	How to Implement	How to Monitor
During first response, disentanglement, sedation	Injury or death to animal due to contact with response vessels	Lack of experience and situational awareness, too many vessels approaching or in danger zone, fast transit	II/ B = Low Risk	Use experienced helmsperson (s). Avoid operating in danger zone. Maintain observers and prudent/safe speed	I/ A = Minimal Risk	Adhere to all criteria and guidelines established for vessel use around animals	IC/CI will ensure compliance at scene. PI ensure compliance under program

During first response and disentanglement	Injury or death to animal due to drag forces (*i.e.*, kegging, tethered telemetry, towing approach vessel	Inappropriate use of telemetry (animal not a candidate), attachment to an embedded wrap.	III/C = Moderate Risk	Use risk assessment and decision matrices. Adhere to criteria.	II/C = Low Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program
During disentanglement	Injury or death to animal due to contact with equipment (other than vessels)	Inappropriate use of equipment, lack of situational awareness.	II/ B = Low Risk	Use experienced personnel, maintain methodical approach	I/ A = Minimal Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program

Hazard Severity:

Category A – Negligible: The hazard presents little to no threat to personnel, animal, equipment, vessels, and environment (*e.g.*, minor sunburn, minor chafe/rope burn; additional chafe wounds to animal).

Category B – Minor: The hazard may cause minor injury/impact to personnel and animal, minor damage to equipment and/or vessels that is easily repaired, minor impact to environment (*e.g.*, superficial cut, twisted ankle, snapped utility blade; superficial wounds to animal due to kegging).

Category C – Moderate: The hazard may cause moderate injury to personnel and animal, moderate damage to equipment and vessels, and moderate impact to environment (*e.g.*, deeper cut, but no threat to function of body, loss of gear that can be replaced with minimal cost and effort; deeper dermal laceration wounds to animal due to kegging).

Category D – Major: The hazard may cause major injuries to personnel and whale, loss of expensive equipment and/or major damage to vessel, and/or major impact to environment (*e.g.*, deep cut or impact to head requiring professional medical attention, loss of equipment compromising safety/mission, high cost and effort of replacement, impact to whale possibly life threatening).

Category E – Catastrophic: The hazard poses a life-threatening threat to personnel and whale, loss or complete destruction of equipment and/or vessels, impact to environment is extreme (*e.g.*, loss of life – personnel and/or animal, another animal struck and killed enroute to respond, vessel stove in and sunk, major oil slick).

Likelihood:

Category I. – Very unlikely: Not likely to occur at all or very unlikely over broad expanse of time.

Category II. – Unlikely: Not likely to occur over a broad expanse of time.

Category III. – Possible: Might occur in time over duration of response lifespan (*i.e.*, time average person remains active in response, lifespan of equipment).

Category IV. – Likely: Expected to occur several times to personnel, animal or equipment over the response lifespan (*i.e.*, duration of multiple efforts).

Category V. – Very likely: High probability of occurring frequently or within a short period of time.

Table 6. Large Whale Entanglement Response Risk Matrix

Likelihood ↑ / Severity →	A Negligible	B Minor	C Moderate	D Major	E Catastrophic
V. Very likely	Low Risk	Moderate Risk	High Risk	Extreme Risk	Extreme Risk
IV. Likely	Minimal Risk	Low Risk	Moderate Risk	High Risk	Extreme Risk
III. Possible	Minimal Risk	Low Risk	Moderate Risk	High Risk	High Risk
II. Unlikely	Minimal Risk	Low Risk	Low Risk	Moderate Risk	High Risk
I. Very unlikely	Minimal Risk	Minimal Risk	Low Risk	Moderate Risk	Moderate Risk

4. Disentanglement (Level 3 and Higher)

○ 4.1 Overview

Disentanglement involves the authorized Network response under NOAA's MMHSRP to safely free entangled large whales from life-threatening entanglements. However, it represents only one part of the broader effort that tries to gain information on the threats associated with large whale entanglements, and mitigate those threats and impacts in the future.

The disentanglement of large whales is entirely vessel-based. There is NO in-water component. The overall process of freeing a multi-ton, likely free-swimming, stressed whale from entangling gear is based principally on accessibility to the animal to safely assess it, and possibly cut it free. While the process is disciplined, it is also varied, and as such flexible. It represents a suite of tools and techniques (*i.e.*, SOPs) that have proven themselves over time. Many countries, with similar network efforts, also rely on them. It is estimated that over 1,400 large whales worldwide have been at least partially freed from life-threatening entanglements through similar efforts.

The primary techniques and tools are discussed throughout this section. Section 4.8 will cover the tools that are required, while Section 4.9 will provide some details on procedures. While there are some hard and fast rules/criteria under the MMHSRP's authorized response, the procedures outlined do not represent a comprehensive manual on how to cut a whale free. Many aspects represent guidelines.

In addition, there are some other (*i.e.*, beyond getting in the water) misconceptions regarding large whale entanglement response, including:

- Cutting the trailing gear is enough to save the animal (doing so may leave lethal wraps behind).
- The need to respond quickly (remember, the impacts are not typically immediate; the response generally has time).
- They are gentle giants (never assume that the whales realize you are trying to help them).
- A large whale cannot be spooked (They can and have. Whether a startle or a pain response, the outcome to responders may be the same).

Lastly, first response, or at least the assessment and possible tagging, that it addresses (Section 3.0), is typically the foundation or predecessor of a large whale disentanglement effort, and in many ways is very much part of the large whale disentanglement, or better yet, entanglement response. As such, the primary roles of **First Responder** and **Primary First Responder** still apply, along with Primary disentanglers. These roles and their descriptions are listed below. More detail and greater breakdown of roles is provided in Section 4.4.

A **First Responder** is anyone within the Network directed to respond to an entanglement report under Network protocols and authorization. At a minimum, they will voluntarily provide assessment and documentation, attempt to standby with an entangled whale and, depending on training, experience, authorization and equipment available, may also tag the whale.

Primary First Responders are Network members that have additional training and experience, and typically have higher level designations (*e.g.*, level 3 - 5). As such, Primary First Responders, under certain conditions and authorization, may attempt disentanglement as part of a first response, or assist as part of an associated full disentanglement effort. These individuals typically have rapid access to vessels and specialized equipment and are on call. Due to the possibility of higher risk activities and their association with large whale disentanglement, primary first responders and their roles are covered in more detail under the disentanglement section.

Primary Disentanglers are individuals who can perform all of the responsibilities of a primary first responder, but who also meet the criteria used by NMFS for selecting individuals who may undertake the very dangerous activity of disentangling (*i.e.*, attaching to, stopping, and cutting), a large whale. Primary Disentanglers must have the experience, training, support and proper equipment to conduct a full disentanglement with a high likelihood of success. Primary Disentanglers are those rated at Level 4 or higher in the network.

○ 4.2 Preparation and Training

Disentanglement operations require a broad scope of roles ranging from generally lower risk roles aboard a support vessel of helmsperson, safety officer, communications, data and gear persons, and documenters; to the higher risk roles of disentanglers and approach vessel helmsperson. Whether monitoring from a distance or making a close approach, any approach to a large whale entangled in gear has inherent risks for both the responders and the animals, which dictates preparation and training. Responders should at least have level 1-2 first responder training, and otherwise be qualified and/or trained for the various roles required (*e.g.*, maneuvering a vessel, documentation). If the response involves close approach assessment (*i.e.*, within 100 m, polework) or attaching telemetry, then responders should have level 3 or higher response training and additional experience. Due to the more complex mission of whale disentanglement and the fact that responders may take on the additional roles of sampling (*i.e.*, biopsy), additional telemetry, drone operations, sedation, to name a few, additional, specialized training will likely be required or at least recommended. In addition, responders potentially involved in actual disentanglement efforts should have more advanced classroom and hands-on, on-water training. These trainings should be scenario-based (*e.g.*, tight vs loose wraps, near vs far reaches, fixed vs flying knives, kegging vs cutting-on-the-fly), and address the “what ifs,” and mitigating risk through emergency response. While all roles need to remain current in their experience and training, this is especially true of the higher-risk role of large whale disentanglers. See Authorization regarding Heightened Consultation protocols for tagging, and other close-approach procedures when reporting on a response effort and requesting authorization.

○ 4.3 Authorization and Supervision

Disentanglement activities require level 4 or higher designation involvement. The IC must be a level 4 for species other than right whales and a level 5 for right whales (unless authorization is otherwise received). Authorization is also dependent on consulting Regional Stranding or LWERCs to receive approval as part of Heightened Consultation*. In the event that Heightened Consultation cannot be met (*e.g.*, no cellular service, unable to relay via VHF radio, no satellite phone), disentanglement of species other than right whales will require a level 5 designated responder acting as CI and disentanglement efforts involving right whales will have to be aborted until criteria under Heightened Consultation can be met.

○ 4.4 Team Member Roles

Disentanglement response represents higher-risk permitted activities. The approach to a large whale entangled in gear is inherently risky for both the responders and the animal and warrants adherence to ICS and the planning it embraces. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential for a safe and successful response. The recommended roles that follow are based, in part, on implementation of the ICS. The number of responders needed for a disentanglement response varies depending on the number of vessels involved, the duration of the effort, whether constraint or sedation is involved, and the use of biopsy sampling and/or UAS, to name a few. For instance, using Table 7, a full disentanglement effort involving both approach and support vessels should represent at least a team of six, and preferably eight or more, qualified response crew to reduce dual roles and provide depth on the bench towards reducing fatigue. If conducting sedation, UAS operations, biopsy sampling, or other additional tasks, the number of responders will need to increase. Sedation and UAS operations are covered in more detail in Sections 5 and 6, respectively.

Table 7. Suggested number of personnel required for a typical large whale entanglement first response effort.

Team member role	Number of personnel required
Incident Commander	1
Vessel captain	1 (may also represent Safety Officer)
Crew (vessel dependent)	1 - 3 (roles can be shared with other roles)
Disentanglers	2 - 3 (roles can be shared, but not concurrently)
Safety Officer	1 (dedicated role)
Data collector	1 (role can be shared with other roles)
Documenters	1 - 3 (roles can be shared with other roles)

Gear person	1 (role can be shared with other roles)
Communications person	1 (role can be shared with other roles)
Tagging (familiar with tag setup and deployment; takes 2 people, along with helm position to deploy)	2 (roles can be shared with other roles)
Biopsy sampling	1 (roles can be shared with other roles)
Optional – UAS PIC and VO (see UAS)	2 - 3 (roles can be shared with other roles)

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, IC and SO; 2º documentation and data collection).

- **Incident Commander (IC)** - The IC, working closely with shoreside (or otherwise remote) authorizing parties (*e.g.*, NMFS RSC/LWERCs, National LWERC), is responsible for the on-scene oversight and supervision of the first response operation. The IC may participate directly in the operation depending on circumstances, but typically does not directly participate (*i.e.*, hands-on) in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that safety is maintained for responders, the public, and animals.

○ **Qualifications** – The IC needs to be at least a level 3 or higher for any close-approach assessment or tagging operations, a level 4 for overseeing the disentanglement of all large whales except right whales, and a level 5 for right whales (unless otherwise authorized). Under Heightened Consultation protocols, tagging requires a level 4 designation, and for the disentanglement of other species beyond right whales, a level 5 designation. If unable to consult a regional LWERC or experts, right whale disentanglement efforts must be aborted. The IC must be trained and/or experienced in protocols, procedures, risks, and risk mitigation in all aspects of the first responder mission being carried out.

- **Safety Officer (SO)** – The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate with the team and adjust the strategy of the response as needed. The SO works very closely with the IC. Under certain circumstances and depending on experience, the role of the SO can overlap with that of the helmspersons of the support or approach vessels, and if necessary and otherwise appropriate, the role of IC and SO can be performed by one person.

○ **Qualifications** – Experience in previous large whale entanglement response efforts, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, not adhering to protocols, presence of other animals, incoming environmental or weather changes, and time of day considerations). Willingness and ability to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.

- **Helmsperson(s)** – This person(s) is/are responsible for the safe transit and operations of the vessel(s), including the safe maneuvering around and approach to entangled whales and the trailing gear that might exist. Helms persons should have experience operating the vessel around the animal and all aspects of the response operation. They typically take on the key role of operational safety and may take on the role of SO. As such, the helmsperson role, whether on the transit, support, or approach vessels, is one of the most important roles beyond that of the IC.

○ **Qualifications** – Experience, training, and in some cases certifications (USCG license, NOAA certified components course) in order to "captain" a vessel. Helmspersons should have experience operating the vessel around large whales and all aspects of the response operation.

- **Disentanglers** – These persons are responsible for cutting the animal free. The role involves, as appropriate, the establishment of a working line, the safe handling of the working lines and entangling gear towards additional assessment (3º assessment) and accessing the animal and entanglement, the adding of constraint - kegging buoys and sea anchors, and the handling of various knives towards safely cutting the animal free. This higher-risk role may overlap with other roles only to a limited extent. For instance, documentation through use of a pole, vessel or helmet-mounted POV cameras, communications, or operating the helm position. However, focus needs to be maintained on the animal, the gear, and the other members of the team. The best-case scenario is to have a dedicated, experienced helmsperson who can cover communications, with two dedicated, experienced, trained and approved disentanglers.

○ **Qualifications** – At least two of the disentanglers in the approach/task vessel need to be experienced in their roles and/or have level 3 designation or higher. Disentangling right whales requires even greater experience and/or designation of a level 4 or higher. Disentanglers should be familiar with the tools and procedures they will use, the vessel they are working from, and the entangling gear and the species of whale they are working on.

- **Data collector** – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets and data loggers, including the assessment of the animal, recording identity of associated documentation, the entanglement (*e.g.*, nature of the entanglement, gear type), behavior of animal (*e.g.*, respirations, changes due to response), the response efforts (an outline of response steps taken, risk factors encountered, who was involved), and telemetry (*e.g.*, tag identity, frequency of VHF, fine tuning).

○ **Qualifications** – Familiarity with procedures and data sheet/data loggers, attention to details. Ability to accurately and completely compile a great deal of information. Lacking a disposition to seasickness is valuable.

- **Documenter(s)** – This person(s) is/are responsible for obtaining and maintaining (*e.g.*, identifying and safe storage) still and video imagery on all aspects of the response. They work closely with the data collector and the helmsperson. This person may also serve as the data collector. Under certain circumstances, responders with other roles may take on, in part, the role of documenter, through use of helmet or vessel-mounted POV cameras. However, such persons must maintain focus on their primary role and maintain safety. POV cameras should be turned on and forgotten by the user, and instead, either tended to or operated remotely by a dedicated documenter.

○ **Qualifications** – Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response (see an example of a media checklist in Appendix E).

- **Communications** – This person is responsible for maintaining all-important communications aboard vessels, between vessels (*e.g.*, a supporting partner vessel) and to shoreside contacts, including float plan contact and NMFS authorizing agents (*e.g.*, Regional and/or National LWERCs). Shoreside contacts typically take on the role of further disseminating information, including to agency partners/leads, any other authorizing agencies, as well as media coordinators. Communications at this stage do not involve the media, as this is the role of media coordinator and others at later stages.

- **<u>Qualifications</u>** – Experience using documentation equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and videos, and ability to post-process photos/video after the response.

  - **<u>Gear person</u>** – This person is responsible for maintaining, preparing, and dispensing all disentanglement tools (*e.g.*, attachment tools, working lines, means of constraint, and the different knives). They work closely with disentanglers to meet needs, with SO and helmspersons regarding communications, and data collector on noting what gear/tools were deployed/used.

  - **<u>Qualifications</u>** – Experience with and knowledge of disentanglement equipment. Knowledge of how the equipment operates, and risk factors associated with use of the equipment (see an example of a gear checklist in appendices).

  - **<u>Telemetry taggers</u>** - This role is responsible for the pre-deployment preparation, including the testing of the transmitters and receivers and setup of the telemetry buoy, the appropriate deployment of telemetry, receiving Argos, GPS and real-time VHF fixes, and the interpretation and forecasting of telemetry data towards use in relocating the animal for future efforts.

- **<u>Qualifications</u>** – These persons need to be trained or otherwise familiar with the appropriate preparation (*i.e.*, testing, tuning, and mounting to the telemetry buoy) of telemetry gear, deployment, reception, and interpretation of telemetry. The two-person team attaching a tag must work closely with a helmsperson. Both persons - one making the attachment (*e.g.*, throwing a grapple) and the other person dedicated towards making sure the telemetry buoy is deployed cleanly off the vessel, need to be physically capable, trained and experienced in the procedure, and familiar with all risk factors. At least someone on the team needs a level 3 designation or approval to proceed otherwise. Heightened Consultation criteria may require Level 4 designation.

  - **<u>Biopsy sampler</u>** - This role is responsible for maintaining biopsy gear (*e.g.*, crossbow or airguns, darts, and collection vials), safely obtaining the sample, and its storage and processing (*e.g.*, labelling).

- **<u>Qualifications</u>** – The person needs to be trained and otherwise familiar with the safe use of the crossbow or pneumatic gun. Additional training, like gun handling, is recommended.

The person obtaining the biopsy sample must work closely with the helmsperson and the data person.

- **Unmanned aircraft system (UAS)** - If permitted to operate a UAS during the response, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success or safety of the operation, or causing disturbance to any animals.

- **Qualifications** – Pilots must have an FAA, Part 107 Remote Pilot license, follow all existing FAA and other regulations, and be trained and/or experienced operating a UAS over water from a vessel during response operations. More detail on UAS use in large whale entanglement response is addressed in Section 6.

4.5 Communications

Communications between team members on a particular vessel, between vessels and to shoreside contacts, have serious implications towards maintaining safety. While communications involve all members of the team, it is especially important for the IC, the SO, the Communications person, and the primary shoreside contact to maintain a strong working relationship. Well-established and consistent communications on the water will have strong operational bearing on maintaining an efficient and safe working environment, while communications with the shoreside will facilitate authorization and reporting requirements. This is especially true of disentanglement efforts as they carry more risk and will generally garner greater interest. Shoreside contacts typically take on the role of further disseminating information, including to agency partners/leads, any other authorizing agencies, and media coordinators. On-water/on-site direct communications do not involve the media, as this is the role of media coordinator(s) and others at later stages.

Some examples of key communications are:

- Alerting and approval of helmsperson of an action (*e.g.*, movements aboard, on and off vessels);
- Alerting and approval of helmsperson on the deployment of gear (*e.g.*, deploying the telemetry);
- Notification and acknowledgement of UAS deployments and recoveries;
- Providing risk assessments, IAP, Heightened Consultation, updates to Regional or National LWERCs;

- Providing regular status updates to all shoreside contacts for further dissemination;
- Communications between documenters and data collector on imagery taken;
- Communication between documenters and helmsperson on positioning of the vessel;
- Communications between an approach and the support vessels ;
- Communication between disentanglers, SO, and gear person regarding gear needs;
- Alerting the response team of a change in behavior from the animal;
- Alerting team members of hazards (*e.g.*, gear in the boat, line in the water near engines); and
- Communicating actions (*e.g.*, line handling examples - "up-from-behind" to provide slack, "line-over-head" to establish a fairlead, and "walk-it-back" to control an exit while working the working line.

4.6 Data Collection

Data collection is essential in recording all aspects of the entanglement response, including the assessment of the animal, recording identity of associated documentation, the entanglement (*e.g.*, nature of the entanglement, gear type), behavior of animal (*e.g*., respirations, changes due to response), the response efforts (an outline of response steps taken, risk factors encountered, who was involved), telemetry (*e.g.*, tag identity, frequency of VHF, fine tuning), and any samples obtained (*e.g*., biopsy sample, removed and recovered entangling gear). The information gained has benefits towards evaluating the threat (*i.e.*, the animal risk assessment) and the operational risk assessment (*i.e.*, assessment of the risks and impacts posed by the response to humans and animals).

It is important that dataforms and/or dataloggers are prepared, maintained (*e.g*., batteries charged), and appropriate team members are familiar with their use prior to the start of any entanglement response. During a response, data collection needs to be maintained (the role of a dedicated data collector) and appropriate communications established with the entire team as to collect all data required. Some examples of data collected are:

- General response narrative (*e.g.*, when departed, on-scene, a procedure performed, the whale is freed and gear collected);
- Cataloging of imagery;
- Animal behavior, including response to procedures;
- Risks posed to responders (in the case of injury or worse, incident reports will need to be completed);
- Telemetry setup (*e.g.*, PTT ID, VHF frequency and fine tuning);

- Response to and logging of any samples obtained (*e.g.*, biopsy samples, recovered gear);
- Personnel and supporting agencies, along with their roles;
- Information on the entanglement (*e.g.*, how entangled, gear description and markings); and
- Information on the animal (*e.g.*, condition, sex, age class, impacts, fluke ID).

4.7 Resources

The primary resources of large whale disentanglement, beyond the team itself, are vessel support, disentanglement gear, safety gear, personal safety gear, documentation and data collection gear, telemetry and equipment towards deployment. These are the tools of the trade - large whale entanglement response, and like any tool, they must be maintained and used properly, or additional risk will be incurred. This is especially the case for large whale disentanglement, in which risk levels are already elevated.

A breakdown of the primary resources, their criteria and some operating parameters is provided below.

Vessel Support

For full disentanglement efforts, at least two vessels should be used - an approach or task vessel, and a secondary support or safety vessel. The **approach or task vessel** is typically a smaller (4 - 7 meters [12-21 feet]), more maneuverable, lower drag vessel, that lends itself to more responsive close approach work and less drag for allowing the team to tow and/or haul themselves up behind an animal for assessment and disentanglement purposes. Soft-bottom inflatables make great approach vessels as lines can be bent over the bow using the material as friction to tow the boat. Never secure a line attached to the whale to a vessel, or bring gear into a vessel that might still be attached to the animal. Soft-bottom inflatables also provide less drag and tack less - they are more forgiving on the tow. In addition, the approach vessel needs to be as free of snag points as possible, be a simple open design, and have appropriate deck space. Low gunwales accommodate the throwing and clearing of tools and gear. The outboard should be adequate to power the vessel, but small enough that with manual tilt is easily liftable. The approach vessel should accommodate at least three responders and the gear needed to complete a particular task. In fact, only that gear that is required for the next task should be transported in the approach vessel. Gear transport is the role of the support vessel. All vessels must be operated by experienced helmspersons that are familiar with the vessel, maneuvering around the animal, and the overall operation. The vessels are large tools and a tool is only as good as the person using it. An experienced operator will make the rest of the team look good, and make a significant contribution to creating a safe environment.

The support vessel is generally a larger platform to provide safety support for the smaller approach vessel and hold all additional personnel, equipment, and safety gear. Depending on circumstances (*i.e.*, risk assessment) a larger vessel may become the approach vessel. If so, like the approach vessel, characteristics such as adequate and simple deck space, lower gunwales or openings in rails for deploying gear, easy communications aboard the vessel, and responsiveness are beneficial. Support vessels will typically place themselves between 70 and 100 meters from an approach vessel and animal in a position abeam or off the quarters. Such a position should minimize unintentional involvement with the animal and gear, and yet at the same time provide for timely response to the approach vessel and team should assistance be required. The following outlines some of the main characteristics of approach and support vessels during large whale entanglement response:

<u>Approach Vessel:</u>

- Typically a smaller (4 - 7 meters [13 - 23 feet]) vessel, preferably a soft-bottom inflatable, maximizing responsiveness and maneuverability;
- Less drag (also accommodated by a soft-bottomed inflatable) for allowing the team to tow and/or haul themselves up behind an animal for assessment and disentanglement purposes;
- Soft-bottom inflatables also allow lines to be bent over the bow using the material as friction to “hold” the boat;
- Low gunwales to accommodate the throwing and clearing of tools and gear, and access to gear that is in the water;
- The outboard should be adequate to power the vessel, but small enough to allow manual trim and tilt - it should be easily liftable; and
- Should accommodate at least three responders and the gear needed to complete a particular task.

<u>Support Vessel:</u>

- Appropriately sized, equipped, and operated within the speed and range to safely respond and address an emergency situation;
- Have capacity for at least four to six response crew to fulfill all roles (six based on deployment of telemetry);

- If making closer approaches, vessel should have greater maneuverability, which may be related to size of vessel (*e.g.*, smaller size typically increases responsiveness and maneuverability);
- Accommodate communications between members of the team, especially involving the helm position (*e.g*., flybridge and center consoles);
- For documentation, safe access for documenters with a clear, unobstructed field of view;
- If deploying telemetry, clear deck space, preferably forward, with low gunwale/rail system and limited snag points to accommodate deploying telemetry, including the clean deployment of the telemetry buoy;
- In the event of approaching a relatively immobile animal, vessel support allows for a haulback system or otherwise an exit strategy. Haulback systems can represent a secondary line (*i.e.*, independent of a working line) that is secured to a large enough vessel to pull the approach vessel away from danger. Alternatively, if it is determined there is no danger to the animal or risk of catching line and net at the surface, the approach vessel can be pulled up to the animal while the engine remains in idle reverse. If there is a need to move away, then the bow person just releases the working line and the approach vessel moves away; and
- Consider the use of propeller guards.

The following procedures should be adhered to when operating a vessel around an entangled whale:

- Never approach the whale directly from behind;
- Minimize your time in the danger zone of the whale (in the range of movement of the whale, and where trailing gear might lie);
- Lift the outboard out of the water when close to and/or towing (Nantucket sleigh ride) behind the whale;
- Be as predictable as possible in operating the vessel. Avoid sudden maneuvers, changes in gear, throttle and course;
- Be aware of the whale's location and behavior changes. Know the signs of distress and head warnings. May require terminating or at least delaying effort; and
- Make sure inflatable approach vessels are adequately inflated and the proper shafted outboard is used to avoid cavitation.

Note, in cases in which the required vessel support cannot be accommodated, either tailor the response to the vessel - use the tool for what it can do, or otherwise terminate the effort.

Aerial support:

Aerial assets can be used towards locating, assessing, documenting, monitoring (albeit limited), transport of crew and gear, and medical evacuation. UAS can represent a relatively low-cost means of providing efficient aerial assessment and documentation.

Fixed-wing or rotary aircraft

UAS

- Approved UAS platforms
- Radio Controls
- Video Goggles
- Batteries
- Phone or Tablet for flight control software
- Chargers

Disentanglement tools:

Accessibility/ attachment tools:

- Grab grapples
- Skiff hooks

Tethers and working lines:

- Floating polyblend line (7/16” - 9/16”)
- Sinking line (⅜” - 7/16”)
- Short tether lines for kegging buoys

Constraint:

- Kegging buoys
- Sea anchors
- Carabiners

Pole systems:

- Segmented poles adapted for surface work
- Segmented poles adapted for work at depth
- Slip adapters for flying tools
- Counter-weighted and unweighted high-visibility, buoyant safety ends for poles
- Attachments for POV cameras

Cutting tools:

- Fixed hooked knives
- Flying hooked knives
- Long-bladed knives (Coughran "whale knife")
- Cutting grapples

Documentation:

- DSLRs, video cams or comparable cameras with a variety of lenses
- POV cameras (*e.g.*, GoPros) to mount on helmets, parts of the vessel, and poles
- Enough batteries and cards to complete the mission

Appendix R contains a documentation checklist of those aspects of an entanglement that should be documented.

Data Collection:

- Data forms, checklists and/or dataloggers (*i.e.*, Level A, response report forms)
- Watch/timer
- Binoculars

Sampling (including biopsy):

- Crossbow, pneumatic air rifle or other means of collecting a sample (*e.g.*, a sample net)
- Bolts or darts
- Cores or tips
- Associated sterilization and cleaning supplies
- Storage (*e.g.*, vials, preservatives, labels, ice chests)
- Maintenance (*e.g.*, tools, spare strings, nocks, stringer)
- Safety gear (*e.g.*, gloves, eye protection)

Personal Safety Gear and Protective Clothing

- Appropriate footwear (*e.g.*, closed-toe shoes or boots)
- Protective clothing (*e.g.*, wetsuits, worksuits, UV protective wear)
- Chafe and cut-resistant gloves (*e.g.*, Lamars, Atlas,) that fit well
- Appropriate Personal Floatation Device (PFD; Will depend on environment, but also role).
- Personal, one-handed safety knife for personnel that are handling gear or in a position to
- Optional - eyewear, knee pads, sunscreen, hat

Medical and Safety Equipment

- First aid kit
- AED
- Backboards, neck collar, splints (immobilization gear)

If further offshore, remote or removed from medical attention:

- Lift cages and harnesses
- Oxygen kit
- An appropriately trained person (advanced medical training, EMT) to use more advanced medical equipment and provide additional emergency care
- Satellite phone/In Reach

4.8 Environment and Weather

Responders freeing an entangled humpback whale in AK (Bracken/ PMMC/ MMHSRP permit # 932-1489)

The attempted disentanglement of a large whale by authorized response, due to the added complexity and risks involved, dictates that the criteria for conditions be conservative. While dependent on other variables, the typical cutoff for large whale disentanglement efforts is the low end of Beaufort 4, with extra caution being practiced at Beaufort 4 for larger vessel operations, and Beauforts 3 and 4 for small boat operations (See Figure 12 -

Beaufort operational scale diagram). As in first response, tethered tagging, especially from larger vessels and attached by a thrown grapple, might allow Beauforts up towards 6, with the sea state being the very reason the team is tagging - safe disentanglement conditions no longer exist.

BEAUFORT SCALE AND LARGE WHALE ENTANGLEMENT RESPONSE RISK ASSESSMENT							
Beaufort Number	**Name**	**Knots**	**Effects Observed on Water**	**Activities**			
				Disentanglement from small approach boat; Sedation; Close pole work; suction-cup tagging	Disentanglement from larger boat; Drones; Biopsy darting	Tethered telemetry tagging (grapple throw)	Assessment only from larger vessel
0	Calm	Under 1	Sea like mirror.				
1	Light Air	1-3	Ripples with appearances of scales; no foam crests.				
2	Light Breeze	4-6	Small wavelets; crests of glassy appearance, not breaking.				
3	Gentle Breeze	7-10	Large wavelets; crests begin to break; scattered whitecaps.				
4	Moderate Breeze	11-16	Small waves, becoming longer; numerous whitecaps.				
5	Fresh Breeze	17-21	Moderate waves, taking longer form; many whitecaps; some spray.				
6	Strong Breeze	22-27	Larger waves forming; whitecaps everywhere; more spray.				
7	Near Gale	28-33	Sea heaps up; white foam from breaking waves begins to be blown in streaks.				
8-12	STAY HOME						

Figure 12: Beaufort large whale entanglement response operation scale diagram

As with first response, safe operating conditions are affected by range, distance from medical attention, travel time, daylight affecting operations and transit, air and water temperature, visibility (*e.g.*, fog, heavy precipitation, darkness), certain types of precipitation (*e.g.,* snow, sleet, hard rain), and other environmental factors (*e.g.*, lightning, approaching hurricanes). Due to the greater complexity and risks of disentanglement, transit time and/or time to more extensive medical attention, and time of day, become even more critical. In many cases, disentanglement efforts take nearly a full day, and at times span several days. Full disentanglement operations involving constraint are typically not initiated in those cases in which less than four hours exist. The following environmental conditions are some of the variables that need to be assessed:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold).
- Environment (*e.g.*, remoteness, exposure to higher sea states).
- Time of day (*i.e.*, close to sunset).
- Conspecifics (*e.g.*, other animals in the area).
- Predators (*e.g.*, sharks, killer whales).

○ 4.9 Procedure and Mission Goals/Complexity

Large whale entanglements are complex and varied. Many scenarios exist from the animal being mobile or stationary (*e.g.*, anchored), gear being forward on the body and/or posterior, gear represented by lines and/or netting, whether gear is trailing or not, and the diameter of the lines entangling the animal. These are just a few of the variables that make the disentanglement of a large whale as complex and diverse a process as the entanglement itself. The techniques used will depend heavily on the assessment and the use of decision matrices from first response (Section 3.0) or otherwise, that have likely already been performed.

Disentanglement procedures will utilize the on-site (risk) assessment (*i.e.*, 3º assessment) of the current entanglement, along with the risk assessment and use of decision matrices outlined (Sections 2.12, 2.13, 3.10, and 4.10), to determine the disentanglement portion of the IAP. The disentanglement IAP will rely on key assessment factors including:

- Is the animal restricted in its mobility, or how accessible is the animal towards an approach (*e.g.*, free-swimming vs anchored)?
- Where does the gear lie on the animal (*i.e.*, forward vs posterior)? How complex (# of wraps) is the entanglement? What is the animal's behavior towards approach? What are the variables that have bearing on accessibility, through time spent in proximity to the animal, and that proximity - avoiding the danger zone.
- What type of gear is involved? Is it lines and/or netting? If net, is it open or rolled? If line, what is its strength and gauge? Is the gear buoyant or sinking? Is it weighted? Is there any gear trailing?

Answering these questions will have bearing on techniques and tools. Some are introduced here, but will be described in more detail further within this section. Risk mitigation for these tools and techniques is addressed in Section 4.10.

- Whether to constrain or not constrain (*e.g.*, cut-on-the-fly) the animal.
- Whether to use a hooked knife vs a long-bladed, open-face knife.
- Whether to use a fixed knife (*i.e.*, stays attached to the pole) or a flying knife that can detach and cut more remotely.
- Whether to use a towed or thrown sweep, a haulback system, and/or multiple working lines.
- To use a smaller vessel with more responsiveness and control, or a larger, more stable, higher platform as the approach vessel.
- Of course the most important decision is whether to proceed or not.

Due to the complexity already mentioned, it is challenging to create a flow diagram or even a step-by-step description of a generalized disentanglement response to a large whale. There are so many variables, and thus variations involved. However, here is an attempt at the primary steps:

1. Determining safe access/approach to the entangled animal. Should constraint, no constraint, and/or sedation be used? Is the animal mobile or stationary/anchored?
2. Determine the best knife and technique for using that knife (hooked vs open, fixed vs flying, thrown vs pole-mounted).
3. Determine the best vessel/access platform to use to implement use of the knife/making the cut (large vs small vessel?).
4. Perform a pre-disentanglement mission brief and obtain any additional authorizations (review roles, setup equipment, contact shoresides, do disentanglement GARs).
5. Disentangle or stand down (Go/No Go).
6. If "Go," attempt to safely cut the animal free, recover gear, and gather additional information.
7. Follow-up (perform debriefs, prepare for next response, write reports, pursue further investigations).

Starting with determining access, this leads to the potential use of constraint.

Use of Constraints:

In those cases where the entangled animal has a limited surface interval, is fast moving, evasive, or otherwise inaccessible; and/or its movements are unpredictable and potentially aggressive; and otherwise appropriate for the animal, constraining techniques may be used. The primary constraining technique is 'kegging,' a modification of an old whaling technique. Historically, kegging involved harpooning a whale, not necessarily to kill it, but to attach barrels or kegs - hence kegging - to add drag and buoyancy to slow the whale and keep it at or near the surface. However, the modern equivalent involves establishing a working line - whether adding one or determining if an existing trailing line is appropriate (*e.g.*, easy and safe to handle, strong and of adequate length, and minimal additional impact to the whale). If adding a working line, it is typically attached via a thrown grab grapple, but can also be deployed using a pole system with a skiff hook attached. The latter is typically used once the animal is more accessible, for when an accurate attachment is required (*e.g.*, to avoid impact to the animal), and/or to establish a secondary unloaded (*i.e.*, little drag force applied) working line.

Response team fuses kegging buoys to help free an entangled humpback whale in Glacier Bay National Park, AK (GBNP/ NOAA MMHSRP permit # 932-1905)

Here is a list of scenarios in which two types of primary attachment tools - the grab grapple and the skiff hook, have advantages:

Grab grapple:

- Short and/or deep trailing gear
- Animal not as approachable
- Not safe to approach closely
- Best attachment means for first responders (addresses risk factors and experience level)
- Most used/safest means to attach a working line

Skiff hook or flying hook:

- Animal is more approachable

- Safer to approach closely
- Accurate attachment required
- Attaching to tight wraps (grapple cannot access)
- Typically used to attach a secondary working line (a clean/unloaded line)

Main points on establishing a working line:

- In most cases a working line is initially established by throwing a grab grapple into the entanglement's trailing gear. A typical throw is approximately 15 meters (50 feet), but distance will vary.
- Throws should be made just over the gear as to reduce the need to haul back line into the vessel and/or at your feet to set the grapple hook. Some gear may be paid out overboard, but even this has risks early on due to the threat of getting sucked up into jetdrive intakes or wrapped in propellers.
- If you can safely access the line by hand or with a boathook, do so. No throw is needed.
- A working line can also be established using a skiff hook attached to the end of a pole. This attachment technique has the advantage of greater accuracy of placement and is typically used to establish a secondary working line.

Team uses a "working" line to gain access to the entangled animal (CCS/ NOAA MMHSRP permit # 18786)

- On establishing the working line, make sure the gear is kept clear of personnel (*e.g.*, coil extra scope in a bucket) and make sure all gear (*i.e.*, the line and any terminus buoy) is deployed on the team's terms (*i.e.*, don't let the whale take the gear from the vessel).
- If necessary, establish a secondary working line to avoid handling lines under load that pose a threat to the animal (*e.g.*, physical impact to body), or pose some threat to the responders (*e.g.*, gillnet and longline).

Once the working line is established, the polyball kegging buoys (ranging in size from A3 to A5) are methodically added to provide the necessary drag and buoyancy forces to slow the animal down (but not necessarily stop it), keep it at or near the surface, and control its movements somewhat (as much as one can control a multi-ton animal) for access. Under certain circumstances (*e.g.*, polyballs do not provide access), a sea anchor, may be attached to provide additional drag.

In addition to the risk and decision factors already provided, her are the parameters for using kegging:

- The animal is not easily approachable.
- The animal is more mobile.
- More assessment of entanglement is needed.
- Entanglement is complex.
- More control of the environment - the animal, is required.
- May increase documentation of animal, and entanglement or gear (*i.e.*, animal and gear more accessible).
- May increase gear recovery (*e.g.*, buoys may keep removed entangling gear afloat).

Here are the main procedural points associated with kegging:

- The initial kegging buoy can be the telemetry buoy, as early on in the process the animal will likely be sounding and the hard plastic telemetry buoy will surface sooner (*i.e.*, no need to recover from depth) and stay at the surface longer.
- Buoys should be added methodically one by one (recommended 20 minutes between), to reduce stress on the animal, and decrease the chances of any unwanted radical response (*e.g.*, thrashing) from the animal that might increase risk for the animal and response team.
- Typically, A3 polyballs are added initially and then if necessary, the larger A4s and A5s.
- Sea anchors are typically used later in the process as needed and provide force whether the animal dives or not.
- Polyballs and sea anchors can be attached to an established working line by using carabiner clips or by tying them on. If the latter, never get hands and fingers in the loops of line while making knots. Additional buoys can be attached by snapping in front of an existing buoy.

- Multiples of both kegging buoys and/or sea anchors, and combinations of the two, can be used.
- Right whales, due to their strength and stamina, typically require the larger buoys and potentially more of them, as well as the use of sea anchors. The same is likely true for blue whales.
- Right whales and blue whales may require large-mouthed sea anchors.
- Other species may require additional drag force due to life-cycle behavior differences (*e.g.*, a humpback whale on the breeding/calving grounds).
- Only use the number of buoys and/or sea anchors needed.
- However, if it takes three buoys to get the whale to a point in which it is safe to approach, then use three buoys.
- Larger whales will generally require more constraint. Though subadults can be unpredictable and energetic.
- For smaller whales, like minkes or the calves of other species, kegging should be avoided.
- Even anchored whales may require kegging buoys, as the scope of the anchor line may be great enough to allow considerable movement and animals can still sound when anchored.
- Avoid loading a line that is attached to deeply embedded wraps as they may cause additional trauma and a negative response. Limbs have been amputated from the kegging process.
- Be aware of the load forces on the 'loaded' line for the animal and for the team. Loaded lines represent additional risks to the response team. As with the tools themselves, avoid getting between the kegging buoys and/or sea anchor and the whale. If possible, attach or establish an unloaded line to handle (*i.e.*, use as a new working line).
- As with the attachment of the telemetry buoy, the Ross timed-release clips can be used, but note they can only handle so much force.

The number of buoys and the time it takes to keg the animal, if done correctly, is typically worth the time investment. The key is being patient and to always monitor the process the entire time.

As described under risk assessment and within decision matrices (Sections 4.10 and 4.11), there are times when "no constraint" approaches might be more appropriate. Such situations will require an additional set of criteria, outlined below. The actual act of cutting the whale free (*i.e.*, cutting-on-the-fly) will be covered in more detail later. This situation calls for:

- An extremely experienced and knowledgeable helmsperson to orchestrate a safe close approach to a free-swimming whale.
- A very experienced pole person or grapple thrower to make the cut(s).
- An approachable animal (*e.g.*, longer surface time, linear travel, entanglement accessible). Generally, a more predictable and safer animal to approach.

Sedation, the use of administered drugs to chemically constrain the animal, is yet another means to gain access to the animal and the entanglement. It has been used on four occasions - all involving North Atlantic right whales, to assist in large whale disentanglement efforts. Due to its own challenges and potential risks posed to animals and responders alike, sedation is covered in a separate section - Section 5.

Note: Just because an animal or an implemented approach technique may allow an approach, only make those close approaches with the utmost caution, and only when necessary and authorized.

Line Handling:

Once the working lines are established and kegging buoys attached, there is an opportunity for additional line handling. Appropriate line handing will provide the team access to the animal, but also the means to gain additional information. For instance, the strength of the animal and whether gear is shifting at the origin of the entanglement (*e.g.*, a mouth entanglement is shifting and thus may be able to be pulled from the animal's mouth). The act of towing behind the animal is not for a photo op. Line handling is one of the more dangerous activities if not done correctly. The following outlines some of the procedural steps and cautionary messages regarding line handling:

- The bow person position tends the working line, and is responsible for watching it and the whale.
- The bow position must stay at or near the bow of the approach vessel. This is especially important for rigid-hulled inflatables, whose keel will result in the vessel tacking greatly if the working line is held too far off the bow.
- Under certain circumstances positioning the line off the bow can orient the bow of the vessel to one's advantage.
- Bending the line over the bow of an inflatable approach boat provides for a Nantucket sleighride. This may allow setting the grapple hook, testing the working line, and

determining the strength of the animal and nature of the entanglement (*e.g.*, line moving through the mouth, or around an appendage).

- Never tie off to the vessel.
- Once safe, hauling up on the working line provides access to the animal and entanglement.
- Do not bring the line into the vessel. Only bring a single bight of line into the vessel.
- Do not handle certain types of gear directly (*e.g.*, gillnet and longline). Possibly add a secondary working line to avoid handling these high-risk gear types.
- Do not get loops of line around responder body parts.
- Keep tools and lines away from the vessel and well in front of responders.
- Avoid working with a line that is under heavy load (*e.g.*, has several kegging buoys and/or sea anchors attached). Consider establishing an unloaded working line (*i.e.*, another line with very little drag on it) for responder access.

Like any procedure, things may not go as planned or actions need to be taken to mitigate risk. The following are some of the primary mitigating actions related to line handling:

- If the animal is moving fast or obviously sounding, let go of the working line. While an inflatable approach boat acts like a kegging buoy, it should not be treated as such. Let go, and let the dedicated kegging buoys and/or sea anchors do their job.
- If letting go of the working line from a small approach vessel and time allows, "walk out" by walking the boat as quickly as possible in a controlled manner along the working line until the terminus buoy is beside the boat (*i.e.*, on the boat's hip).
- If the working line loses its fairlead, or opposing forces along the line cross the vessel (*i.e.*, go abeam) as to potentially pinch the vessel, the bow person can initiate moving the working line to the other side of the vessel. In doing so, the bow person will call out the maneuver by yelling, "line over head" and will get acknowledgement from the rest of the team in the approach vessel before carrying out the maneuver.
- If the bow person (in an inflatable approach vessel) is losing the battle in maintaining the bend at the bow in order to hold the vessel's position, they can yell, "up from behind" to have his or her teammates pull slack up from behind.

Note: If there is too much resistance at the terminus (*e.g.*, a large polyball) of a working line being handled, making line handling more dangerous, the above mitigating procedures will not work. It is thus important to not have too much drag force behind the response team while on the working line.

Polework:

Poles allow more remote access to the animal. They may be used initially to attach working lines, move buoys up the working line, and at later stages wield knives that may cut a whale free. They can keep responders out of the danger zone, or draw them into the danger zone. However, at certain points - as the carabiner is being snapped in, or a knife is being hooked on the gear to make the cut, the poles can become an extension of the whale. Polework is very complex, especially when combined with the use of flying knives. Here are some primary considerations when using poles during disentanglement operations:

- Even with the greater reach, responders will likely be in the danger zone.
- Poles can become an extension of the animal, and with a sudden response from the animal, become a dangerous projectile.
- Responders should test the animal's behavior prior to committing to an attachment or cut (*i.e.*, use the back of a clip or knife to test the response of the animal).
- Keep poles clear when not in use.
- Keep poles outboard of all users when being used.
- Be aware of members of the team (everyone in the approach vessel should be wearing helmets).
- If poles become entangled in gear or otherwise a risk factor, get rid of them (*i.e.*, throw them overboard and into the water). Floats can be attached to keep poles afloat so that the support vessel might recover.

Use of a long pole with a knife on the end to cut a North Atlantic Right Whale free (CCS/ NOAA MMHSRP permit # 18786)

Whether throwing a grapple or using a pole with a hook on the end to establish a working line, there are circumstances in which making the attachment can be challenging. Some of these are:

- The animal is not approachable (for throw or polework).
- Little or no gear is trailing.
- The gear is rotten or represents a pane of netting.
- The gear is trailing deep.
- The gear represents only tight wraps.
- The gear is of a small diameter, or hard lay line that the grapple cannot grab - pinch.
- The grapple is worn.

3º Assessment:

Tertiary assessment provides for the formulation of a disentanglement action plan towards cutting the animal free. The principal questions regarding how and what tools to use are:

- Which vessel to use - large vs small?
- How to approach - through use of constraint, sedation, or cutting-on-the-fly (no constraint)?
- Which knife (knives) to use - fixed vs flying, hooked vs open, thrown vs pole-mounted?
- Where to cut?

Removing line and gear from the whale:

Like the entire process to this point, there are a lot of variables, and the same holds true when it comes to cutting the whale free. Here are some of the general rules regarding the tools and the process:

- Use the best knife for the job.
- Generally cut from head to tail.
- Minimize the number of cuts (Remember, you may have only so many approaches).
- Cut so as to try and remove all gear.
- Cut so that the working line is maintained until the end.
- Strategically use drag and buoyancy forces to make cuts.
- If possible (*i.e.*, there is a choice), cut against the lay of the line. For instance, most lines in the U.S. are right-hand laid and will typically cut easier from the right side of the line

(*i.e.*, a cutting grapple thrown off the starboard side of the vessel and over line originating from the animal) - the Bocek Principle.

- Cut as to maintain safety.
  - Minimize time in making cuts
  - Avoid the danger zone

Hooked vs long-bladed, open-face knives:

Responders throw a cutting grapple in an attempt to free a North Atlantic Right Whale of entangling gear (FWS/ NOAA MMHSRP permit # 932-1905)

The use of these two knife types is primarily about addressing different types of gear. The hooked knives are generally better at cutting lines, but generally bind up when addressing nets. The open-face blades are typically used for netting, their open face providing more action and avoiding binding, but they generally provide less mechanical advantage. Both knives are used from poles. The hooked knives have the advantage of reaching forward, grabbing a line in the hook, and using the angle to maintain the blade on the gear and make the cut. Here are some of the general rules regarding the use of these tools and the process:

- Hooked knives are generally used to cut lines, including pot buoy lines, longline mainlines, net head and footlines.
- Open-face knives are generally better at cutting open netting as they reduce binding.
- Hooked knives can slip under tight, but not embedded, wraps.
- Angling the hooked knife to approximately 45º off the animal, provides greater visibility on deployment and reduces probability of catching or cutting the animal.

Fixed vs flying pole knives:

The use of these two knives is more about the location of the entanglement on the animal and safety. While both knives are attached to poles, the fixed knife remains attached. As such it is better served for entanglements further back on the body (*i.e.*, in which the user is more likely to stay out of the danger zone), for smaller to moderate gauge lines (*i.e.*, shorter cut times), and fewer wraps (*i.e.*, fewer lines to cut and thus less time making cuts). In contrast, the flying knife is more appropriate for cutting lines further up on the body in which initial placement might put the responder in harm's way, larger gauge lines that will require more time and effort to cut, and more complex entanglements. The main point is that while fixed knives may provide more control, flying knives provide more safety by allowing the cut to be made more remotely. Due to the risks involved, flying knives should be prioritized. A flying knife can be held into its socket adapter making it a fixed knife and released if circumstances dictate. The flying knife has the added advantage of being able to be attached to buoys or sea anchors, and letting the resultant buoyancy and/or drag forces make the cut, more remotely and with less exertion.

Use of cutting grapples:

The use of thrown cutting grapples provides the most remote, and thereby potentially safer means of cutting an animal free. However, due to lack of accuracy in placement, there are limitations in their use, and risks to responders and animals still exist if not used properly. Cutting grapples can be used to remotely remove trailing gear or make cuts that are otherwise inaccessible (*e.g.*, used on a sweep to cut an anchoring or weighted line).

No constraint cutting - cutting on the fly:

Use of the "Slay" knife on a sedated North Atlantic right whale (NOAA MMHSRP permit # 932-1905)

In those cases in which cutting-on-the-fly is deemed appropriate (*i.e.*, safe), it is the flying knife or the cutting grapple that are typically used. While the use of flying knives or cutting grapples may reduce risk, they also impose some complexity, and thus risk. The use of flying knives and cutting grapples typically represents multiple responders working closely together and in communication with each other. The helmsperson will maneuver the approach vessel to get it in position - a key role, a person will be handling the pole or throwing the grapple, and a third person will be dedicated to getting line and the terminal buoy off the vessel safely. These tools generally cut easily and it is a good idea to leave at least 10 meters (30 feet) between the tool and the responders when applying force for the cut. The tools have been known to spring back seven to eight meters. Here are some key points on making cuts-on-the-fly:

- The animal is initially approachable.
- It is safe to approach.
- There is no need for additional assessment.
- Used in order to take advantage of an opportunity.
- Used to avoid any constraint to the animal.

Double-edged "Thompson" blade to cut embedded lines (HIHWNMS/ NOAA MMHSRP permit # 932-1905)

In addition, due to its remote and potentially rapid use, the cutting grapple has a safety role. In the inadvertent scenario in which the approach vessel, or worse yet, one of the responders, has got caught in the gear entangling the whale, then breaking this connection as quickly as possible is imperative. One tool, if available, is the safety knife that each responder in the approach vessel should carry on their person. However, in some situations, the safety knife may not be readily available, or the person needing to use it, incapacitated. Under these circumstances, having a dedicated person (and with a good arm) with the cutting grapple on the bow of the support vessel at the ready to make an approach and use the cutting grapple to rapidly sever that link between vessel/person and whale.

Embedded lines:

In some circumstances, wraps of line and netting may become tight and embedded. In these cases, the regular hooked and open-face knives do not work well. Hooked knives that are sharp on the outside as well as the inside face, allow cutting into the tight and embedded gear (*e.g.,* Thompson blade), while guillotine-style knives can be cocked to chop at a tight wrap (*e.g.*, Slay knife). On a number of occasions, a broadhead arrow shot from a crossbow has been used to nick, and thereby weaken, tight wraps under load on entangled North Atlantic right whales that were positioned on the body, (*i.e.*, near the head) as to otherwise pose additional risk to responders (Landry Gobbler Guillotine). These tools take additional training and pose their own risks (*e.g.*, shooting a crossbow). Here are some considerations regarding tight and embedded gear:

Gobbler Guillotine broadhead used to remove tight, life-threatening wraps of line around a right whale's head (CCS/ NOAA MMHSRP permit # 932-1905)

- Forcibly pulling embedded lines free, may open deep wounds and increase risk of infection possibly causing additional trauma (*e.g.*, open an artery).
- If lines do not pull free easily - leave them. If possible, trim as close as you can to minimize the risk from drag forces and of the entanglement getting worse.
- Veterinarians have indicated that it's best to let the animal's body eject such lines over time.
- Pulling an embedded line from a wound may also elicit a startle or pain response from the animal, posing additional risk to nearby responders.

Signs of distress:

Because whales are generally being approached closely and as time elapses, this increases the probability that an animal may exhibit an aggressive or otherwise dangerous response to a team making the approaches, it is important to read the animal's behaviors for signs of stress - warning signs. While these will vary from species to species and from individual to individual, here are some typical and general signs of stress to watch for and heed:

- Abrupt changes in speed and dive patterns exhibited from the animal.
- Abrupt approaches from the animal while rolling on its side or on its back.
- Flaring of an appendage before a strike.
- The animal produces forceful headrises.

- Trumpeting and/or wheezie-like blows from an animal that doesn't normally exhibit such blows.
- An animal producing bubble blasts or streams that are not otherwise in context or potentially a response to other animals.

Anchored whales - Whether to use a towed or thrown sweep, a haulback system, and/or multiple working lines:

In many ways anchored animals are more dangerous to address than free-swimming ones. First, the animals are likely somewhat restrained, and thereby more stressed. Just because they are anchored doesn't mean they are immobile. An anchored whale, depending on how it is anchored (*e.g.*, origin of anchoring line or scope of anchoring rope), can still be quite dangerous to approach. In many cases, access to the anchored animal is still needed as the attached gear may lie at depth. In such cases, thrown or towed sweeps can be used to sweep up the more vertically oriented lines. Typically, a much longer sinking line is used for the sweeps in order to facilitate having the grapple get to depth. However, establishing a working line on an anchored whale poses some risks. Instead of having the option to let go and have danger swim away as is the case for a mobile animal, the response team may be stuck next to an animal that has become a risk. Under such circumstances a haulback system is required to allow the team to pull themselves quickly out of the danger zone created (*i.e.*, out of harm's way). A haulback system should be an additional or separate line from the working line that is attached to a larger vessel (or anchor system) that allows the response team to pull the approach vessel away from the animal or risk. Alternatively, if there is no gear at the surface and otherwise deemed safe, the outboard of the approach vessel can be left in idle reverse, and the approach vessel pulled up against this consistent force. In the event of danger, the bow person slacks the working line and the approach pulls away from the animal. As is the case for general approach to an animal, do not change gear or throttle while near the animal. Keep things predictable and consistent. Here are some main points regarding anchored whales:

- The animal may seem more approachable, but is likely stressed and more unpredictable.
- The animal may be less mobile, but still able to move. Risks still exist.
- The entanglement is likely more complex and involved.
- Some of the gear will be weighted and may decrease gear documentation and recovery.
- The access will still be difficult and dangerous.

Responders off California use a haulback line to safely free an anchored humpback whale (NOAA MMHSRP permit # 18786)

Sampling (gear recovery and biopsy sampling):

<u>Gear Recovery:</u>

On making cuts, whether partially or fully freeing an animal, the recovery of the gear is an important component of the disentanglement response. Not only does it remove the gear from the water column to reduce threat to other animals, but it represents a data point that will help better understand entanglement threat and reduce its impacts in the future. Some important reminders regarding the recovery of gear are:

- Do not initiate recovery (*i.e.*, haul gear into the boat) until it is certain that the whale is no longer attached. Whales have been known to lay motionless for extended periods of time below the surface.
- Be aware that the gear itself may pose risks (*e.g.*, weighted, have hooked gangions, and/or represent entangling gillnet).
- Document the gear as much as possible while on the animal and on-scene, including gear configuration and how it entangled the animal. Memories will fail the responders at a later time and date.
- Label gear as soon as possible.
- Obtain descriptive data (*e.g.*, length, line types, colors, gauge, materials).

- Log and safely store gear or at least a sample of the gear as able.

Biopsy sampling:

While there are many other samples that can be taken, biopsy sampling should be considered standard when resources and conditions allow. Samples are typically obtained through the use of a crossbow or pneumatic rifle, shooting a bolt or dart with a stainless steel core or tip that collects a sample of skin and plug of blubber (dermis) from the whale. As such, biopsy sampling imposes additional risks and should be performed only by those with specific training and experience. In some cases, samples may be obtained passively from skin having sloughed off the animal or residing within the gear (*i.e.*, the lay of the line) itself. Some critical points regarding biopsy sampling are:

- Crossbows or pneumatic rifles represent weapons and should be treated as such. Only load when necessary and always point away from other personnel.
- Keep safety on until ready to fire. Communicate with the rest of the team (*e.g*., "safety is off").
- Biopsy sampler needs to work closely with the helm, documenter and data persons.
- Never rush a second shot.
- Appropriately label, log and store samples.
- Always maintain gear and do status checks (*e.g.*, make sure a crossbow string or bow is still in good condition).

To use a smaller vessel with more responsiveness and control, or a larger, more stable, higher platform as the approach vessel:

The entire procedure is vessel-based, and what you do will be based on the vessel(s). There are certain situations where a larger vessel might have the advantage:

- Behavior of the whale suggests it may respect the larger platform more (*e.g.*, mother and calves, male whales on breeding grounds).
- The greater platform height and stability are advantageous.
- A greater sea state provides benefits of being on a larger vessel.
- There is no advantage of using a smaller vessel.
- Kegging is not likely due to risk to the whale or responders, thus no need for smaller vessel.

- The entanglement (*e.g.*, no or limited gear at the surface to pose risk) or animal (*e.g.*, more predictable) allows for the use of the larger, less responsive vessel.
- Availability of a long pole system, experienced pole person and helmsperson team.

Angle-of-attack. Represented by the following:

The angle of attack is a major theme throughout the disentanglement process. It applies to everything from the approach of the vessel, to how the poles are held, the angle of the blade on the knife, and the angle of that blade held against the animal when it is used. Here are some of the examples of angle -of-attack in whale disentanglement:

Responder attempts to free an unrestrained humpback whale calf cutting-on-the-fly from a higher-platformed large approach vessel (HIHWNMS/ NOAA MMHSRP permit # 932-1905)

- The angle of approach vessel to the animal and gear.
- The angle of the throw in attaching a working line.
- The angle of the knife blades towards providing efficient and fast cuts (*i.e.*, Bocek Principle).
- The angle of the pole-mounted knife based on the angle of the pole.
- The angle of the blade against the animal on making the cut.

Some of these are based on the manufacturing of the tool, while others are based on the responder, especially the helmsperson role.

Overall safety:

Again, safety - human safety, is a primary goal. The responders themselves are the most important resource. Here are some valuable reminders:

- Have cutting grapple and safety knives for inadvertent attachments.
- Be aware of the knives at all times.

- Watch yourself during last cuts.
- Standing down is a viable option.

Disentanglement - what is a success?

- All potentially lethal gear off the animal.
- Minimum injuries to the whale and none to rescuers.
- Documentation of the whale (*e.g.*, species, individual ID, condition, impact).
- Documentation of the entanglement (*i.e.*, how entangled).
- Retrieval of gear (*e.g.*, gear type, origin).

Wrap Up - authorized disentanglement:

- Is a proven suite of techniques developed from extensive experience?
- Involves minimal direct contact with the whale and therefore minimizes risk to rescuers - Respect the Animal!!
- It is a disciplined approach, but
- Has flexibility in its structure to address the variable nature of work.
- Most important resource and protocol is human safety. Put human safety before freeing the whale.

4.10 Risk and Mitigation

The disentanglement of large whales is challenging, complex, and potentially a dangerous undertaking. It involves multiple assets, concurrent actions, multiple teams with different roles, an unforgiving environment - the ocean, and a multi-ton animal entangled in gear that does not realize you are trying to help it. The operation requires preparation, planning, and the adherence of protocols based on the past and present assessment of risk factors and their mitigation. The goal of risk assessment and mitigation for humans is to entirely mitigate (*i.e.*, prevent) any risk factors and their impacts.

The response team - the most important response resource, with gear removed from an entangled whale. (NOAA HIHWNMS)

■ 4.10.1 Human Safety

Risk: Injury or death to personnel from contact with a whale. Direct contact from the animal has the highest risk, especially when cutting the final line of the entanglement and freeing the animal (Lyman & Mattila, 2010).

Risk assessment prior to mitigation: II/ E High Risk

***Mitigation*:**

- All personnel should avoid proximity to the animal – the danger zone surrounding the animal. It is particularly important to stay clear when there may be a change in the animal's behavior, such as when making final cuts that may cause gear to shift, or elicit a pain response.
- All personnel should wear appropriate PPE such as PFDs, and helmets as necessary. The use of helmets is required for those using poles and teammates that are in the vicinity (*i.e.*, within the extended radius of the pole's 360º sweep). At the moment of attachment

(*i.e.*, before a clip releases), the pole becomes an extension of the animal and poses additional risk.

- Designated safety persons should be assigned to continually watch over all personnel involved, warning the team of hazards such as changes in behavior of the animal and presence of other animals, and be able to communicate to the team when to adjust a strategy, or call off the effort as necessary.
- Designated personnel should prioritize the use of flying knives (*i.e.*, knives that slip off poles) or thrown knives (*i.e.*, cutting grapple) to minimize time near the animal.
- Distressed animals are unpredictable; continuously monitor for signs of stress (*e.g.*, abrupt headrises; suddenly producing wheezie or trumpeting blows; changes in respiration, speed, or dives; bubble streams and blasts otherwise out of context; pronounced close approaches, especially belly towards [*i.e.*, a maintained rollover]).
- Teams should approach the animal as methodically and consistently as possible, giving time for the animal to habituate to the presence of the approach vessel (Ledwell & Huntington, 2018).

Risk Assessment following mitigation: I/E Moderate Risk

Risk: Injury or death to personnel due to getting harmed by or entangled in the gear entangling the animal.

Risk assessment prior to mitigation: II/ D Moderate Risk

***Mitigation*:**

- All personnel handling gear attached to the animal (*e.g.*, attaching tethered telemetry) should wear protective gloves to avoid chafing (*i.e.*, rope burns).
- All personnel handling gear attached to the animal should carry a one-handed safety knife. Note: Do not use the safety knife as a utility knife.
- Support vessel team should remain alert and prepared (*e.g.*, cutting grapple ready to sever any links).
- Certain gear types, such as the pane of a gillnet, or the mainline of a longline, should not be directly handled (*e.g.*, while securing telemetry directly to the entangling gear).
- Avoid the area close to and around the whale - the “danger zone.” This includes the area behind the animal, as the approach vessel can get caught in the trailing gear.

- Any vessel closely approaching the animal (*i.e.*, in the danger zone) should be as free as possible of snag points, especially the engines and hull, and areas of the vessel where gear might be handled.
- For small boats with minimal open deck space that closely approach the whale and entangling gear, only carry the necessary gear for that particular operation (even safety gear can be covered by the support vessel).
- All personnel handling gear attached to the animal should wear PFDs and protective clothing that are "clean" (*i.e.*, free of snag points).
- Do not get in the water near an entangled whale.
- Do not pull line/gear into the vessel that might still be attached to the animal.
- During line handling, only have a single bight of line in the vessel at any time as to reduce threat to personnel (*e.g.*, grabbing the trailing gear to attach a telemetry buoy).
- Always farelead the lines attached to the animal, especially if under load, to the outboard side of a vessel and of all personnel as to avoid being stripped off the vessel (*e.g.*, during the process of deploying the telemetry buoy).
- All personnel should remain clear of gear being attached/deployed to the animal/entanglement (*e.g.*, clips, grapples, telemetry buoy) to avoid personally getting entangled.
- Make sure gear being attached to animal/entanglement is deployed from the vessel on the team's terms. <u>Do not</u> let the animal pull gear off the vessel (*i.e.*, make sure the telemetry buoy is deployed off the vessel as opposed to the whale taking it off the vessel). Use a dedicated person to deploy telemetry or kegging buoys.
- Do not wrap net or line around hands or fingers. Line handlers, like those deploying telemetry, should remove entanglement hazards (*e.g*., rings, watches), and keep feet clear of lines and nets. Use a five-gallon bucket or other receptacle to hold the telemetry buoy's tether line as it is being deployed.
- Responders handling gear should be familiar with the entangling gear and its associated risks (*e.g*., a longline with gangions). Certain gear like gillnet and longline should not be directly handled.

Risk Assessment following mitigation: I/C Low Risk

Risk: Injury or death to personnel due to getting cut by one of the knives.

Risk assessment prior to mitigation: III/ C Moderate Risk

***Mitigation*:**

- All personnel handling knives should wear appropriate gloves to lend protection (*e.g.*, kevlar gloves).
- Keep knives sheathed until ready to use.
- Only carry the tools, including knives, in the approach vessel that you need for a particular task.
- All personnel deploying flying (*i.e.*, pole-delivered), or thrown knives (*e.g.*, cutting grapple) to a loaded line (*i.e.*, while being towed, being kegged, or otherwise applying load), should maintain a safe distance from such knives once delivered. Do not remain directly behind and inline with the tool. In addition, a response from the animal may "throw" knives long distances.

Risk Assessment following mitigation: II/B Low Risk

Risk: Injury or death to personnel due to contact with tools.

Risk assessment prior to mitigation: III/ C Moderate Risk

***Mitigation*:**

- All personnel using disentanglement tools, especially poles, should wear appropriate helmets. Anyone in the vicinity of the person using a pole should also wear helmets.
- During line handling, keep grapples and clips attached to the working line well in front (~2 m) of personnel, to avoid contact. If the line is under load, the distance between tools and personnel should be even greater (~5 m).
- All personnel should remain clear of gear being attached to the animal (*e.g.*, knives, clips, grapples, telemetry buoy). An animal eliciting a negative response to the tool, may throw it a long distance (*e.g.*, from a tail slash).
- If deploying tools from poles, test animal's behavior, prior to committing to the use of the tool (*i.e.*, touch the whale with the back of a clip or knife prior to attachment and immediately clear - lift the pole, to see if there is a response).
- Clear poles (*e.g.*, lift or pull back and stow) after use.
- Make sure gear being attached to animal/entanglement is deployed from the vessel on the team's terms. <u>Do not</u> let the animal pull gear off the vessel. Use a dedicated person to deploy gear (*e.g.*, buoys).

- If obtaining a biopsy sample using a crossbow or air gun, treat devices as the weapon they represent.

Risk Assessment following mitigation: II/B Low Risk

Risk: Injury or death to personnel due to overall response (*e.g.*, fatigue, exposure, falls, strains).

Risk assessment prior to mitigation: III/ C Moderate Risk

***Mitigation*:**

- Monitor personnel exertion and fatigue levels. Have enough experienced responders to avoid fatigue. Do not push oneself or any team member to the limits.
- Responders should have appropriate attire and protection to minimize exposure.
- Communicate responder movements between vessels to helmspersons (*i.e.*, "stepping over").
- Monitor your fellow responders.
- Monitor emotions or the desire to "save the animal." Emotions can, and do cloud judgement(s).

Risk Assessment following mitigation: II/B Low Risk

As always, one major all-encompassing mitigating measure is standing down or aborting a procedure or the entire operation/mission. There is no obligation to respond.

Some primary points related to human safety that might not fall under the examples above or apply to all are:

- While there is no obligation to respond, there are obligations to meet certain criteria and protocols under the MMHSRP and its permit, if initiating a response.
- Obtain necessary authorizations as they are there primarily for safety.
- Ensure first aid kits and AED are available and located with each response group.
- Create a written safety protocol with emergency numbers to be kept with first aid kits.
- Do not put the whale's rescue above human safety.
- Never initiate an action that has not been thoroughly thought through and discussed.
- Review worst-case scenario protocols; have an exit strategy for each procedure. Consider the "what ifs."

- When in doubt, tag (if decision matrix met), regroup (*i.e.*, attempt another day with more assistance, better conditions, and/or new tools and procedures), or entirely abort the mission. Aborting a response is a viable option.
- All members of the team should understand and agree upon response actions.
- Pre-mission briefs should be conducted.
- Responders should only conduct procedures for which they meet minimum qualifications and training.
- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as needed.
- Do not get in the water near an entangled whale.
- Avoid the area close to and around the whale, including directly in front and behind, as these represent danger zones in which contact with the animal or entanglement in the gear is more likely.
- Distressed animals are unpredictable; therefore, it is important to continuously monitor a response to anticipate any risk and maintain safety.
- Communication within and between the disentanglement teams, including briefings, is critical to minimize risk and avoid hazards.
- If drugs are used, all responders should be familiar with the drugs and reversals, including symptoms of accidental exposure, and if/when/how to treat prior to the arrival of medical personnel.

■ 4.10.2 Animal Safety

Like human safety, the authorized effort to free a whale from a life-threatening entanglement carries risks for the animal. The response team needs to adhere to protocols, and apply decision matrices, as well as assess and mitigate any risks to the animal(s) relative to that of the threat. While the goal for human risk reduction is to avoid (*i.e.*, prevent) risks entirely, that same goal for the animal(s) is to minimize risk from the actual operation.

Risk: Injury or death to animal due to contact with response vessels.

Risk assessment prior to mitigation: II/ B Low Risk

***Mitigation*:**

- Use propeller guards around propellers (may also reduce catching trailing gear).

- Have experienced and knowledgeable operators at the helm that are familiar with the vessel, maneuvering around whales, and the operation.
- Avoid operating in the danger zone. Doing so not only reduces risk to responders, but also to the animal.
- Be methodical and as consistent as appropriate in approaching the animals as to be predictable.

Risk Assessment following mitigation: I/A Minimal Risk

Risk: Injury or death to animal due to drag forces (*i.e.*, kegging, tethered telemetry, towing approach vessel - Nantucket sleighride).

Risk assessment prior to mitigation: III/ C Moderate Risk

***Mitigation*:**

- Use of constraint (addition of kegging buoys/sea anchors) only when deemed necessary (see decision matrix).
- Use of telemetry when pros outweigh cons (see telemetry decision matrix).
- Use lower drag telemetry buoys.
- Use weaklinks or timed-release clips to avoid long-term attachments.
- Practice a methodical use of kegging, as to reduce stress. Additionally, only use constraint when required for meeting mission objectives.
- Avoid applying force to gear, or a tethered working line that conveys force to a vulnerable, traumatized part of the body (*i.e.*, to a deeply embedded wrap on a body appendage).
- Avoid applying force to entangling gear that involves strong, small diameter lines or rolled up gillnet as both can produce significant and rapid trauma, especially if wraps are involved.
- Understand the type of entangling gear involved and its associated hazards.

Risk Assessment following mitigation: II/C Low Risk

Risk: Injury or death to animal due to contact with equipment (other than vessels).

Risk assessment prior to mitigation: II/ B Low Risk

***Mitigation*:**

- Use of hooked knives with dull outer surfaces by experienced responders.
- Appropriate use of drones (UAS) by FAA Part 107 Remote Pilot licensed and experienced pilots.

Risk Assessment following mitigation: I/A Minimal Risk

Risk: Injury or death to animal due to use of sedation.

Risk assessment prior to mitigation: III/ D High Risk

***Mitigation*:**

- Have only experienced and trained responders administer drugs.
- Confer with veterinarians or other experts prior to administering drugs.
- Provide drugs as early as possible to avoid fight or flight response.
- Have reversing drugs available and ready to administer.

Risk Assessment following mitigation: II/D Moderate Risk

Risk: Injury or death due to removal of gear.

Risk assessment prior to mitigation: III/ D High Risk

***Mitigation*:**

- Confer with veterinarians or other experts prior to removing deeply embedded gear. It may be more beneficial for the animal, and safer for the response team to trim such deeply embedded wraps.

Risk Assessment following mitigation: II/D Moderate Risk

As always, one major all-encompassing mitigating measure is standing down, or aborting a procedure or the entire operation/mission. There is no obligation to respond.

Other risks:

Other risks include the animal and entanglement being a "hazard to navigation" which can result in a vessel getting caught in the trailing gear; well-intentioned public attempting to free the animal getting injured; and resources being lost or damaged during a response (*e.g.*, loss of telemetry buoy, approach inflatable being cut). In addition, an unsuccessful mission can cause stress (emotional and otherwise) to managers, responders and the community in general. These risk factors affect response risks either indirectly or directly, and should not be ignored when addressing risk mitigation.

○ 4.11 Intervention Criteria/Decision Matrix (Go/No Go)

Risk intervention tools (*e.g.*, Appendix L – GAR Risk Assessment Checklist) or decision matrices (*e.g.*, Appendix M – Decision Matrix [Go/No Go] Risk Factor Table) should always be used prior to any response. Factors that should be considered include environment, team selection and fitness, animal condition, authorizations, resources, and mission complexity. Risk assessment is a team effort.

Table 8. Disentanglement Risk Assessment Coding under Five Steps of Assessment

Step 1. Identify Risk Factors			Step 2. Assess Hazards (who/ what?)	Step3. Evaluate Risk and Mitigate		Step 4. Record and Implement	Step 5. Monitor and Review
Response Categories	**Hazards/ Risks**	**Causes**	**Initial RAC**	**Develop Controls**	**Residual RAC**	**How to Implement**	**How to Monitor**
During first response, disentanglement, sedation	Injury or death to personnel from contact with whale	Operating in the danger zone, loss of situational awareness, startle or pain response from animal	II/ E = High Risk	Avoid danger zone, only experienced personnel in close proximity, dedicated SO	I/ E = Moderate Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program

During first response, disentanglement, sedation	Injury or death to personnel due to getting harmed by, or entangled in the entangling gear	Operating in the danger zone, loss of situational awareness, abrupt changes in animal's behavior	II/ D = Moderate Risk	Avoid danger zone, only experienced personnel in close proximity, use of safety knives, dedicated SO	I/ C = Low Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program
During disentanglement	Injury or death to personnel due to getting cut by one of the knives.	Lack of situational awareness, too close to flying knives, abrupt response from animal	III/C = Moderate Risk	Use experienced personnel, wear PPE, maintain methodical approach	II/B = Low Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program
During first response and disentanglement	Injury or death to personnel due to contact with tools	Lack of situational awareness, too close to tools under load, abrupt response from animal	III/C = Moderate Risk	Use experienced personnel, wear PPE, stay clear of tools under load or being deployed	II/B = Low Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program
During first response, disentanglement, sedation	Injury or death to personnel due to overall response	Inexperience of personnel, too much emotion, fatigue	IV/ B = Low Risk	Use experienced personnel, wear PPE, maintain methodical approach and fatigue levels	III/ A = Minimal Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO and focus on big picture	IC/CI will ensure compliance at scene. PI ensure compliance under program

Response Categories	Hazards/ Risks	Causes	Initial RAC	Develop Controls	Residual RAC	How to Implement	How to Monitor
During first response, disentanglement, sedation	Injury or death to animal due to contact with response vessels	Lack of experience and situational awareness, too many vessels approaching, vessel(s) in danger zone, too fast of a transit.	II/ B = Low Risk	Use experienced helmsperson(s). Avoid operating in danger zone. Maintain observers and prudent/ safe speed.	I/ A = Minimal Risk	Adhere to all criteria and guidelines established for vessel use around animals.	IC/CI will ensure compliance at scene. PI ensure compliance under program
During first response and disentanglement	Injury or death to animal due to drag forces (*i.e.*, kegging, tethered telemetry, towing approach vessel	Inappropriate use of telemetry (animal not a candidate), attachment to an embedded wrap.	III/C = Moderate Risk	Use risk assessment and decision matrices. Adhere to criteria.	II/C = Low Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program
During disentanglement	Injury or death to animal due to contact with equipment (other than vessels)	Inappropriate use of equipment, lack of situational awareness.	II/ B = Low Risk	Use experienced personnel, maintain methodical approach	I/ A = Minimal Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Maintain SO.	IC/CI will ensure compliance at scene. PI ensure compliance under program
During/ as a result of sedation	Injury or death to animal due to use of sedation	Miscalculation of extraneous variables, mis-dosage	III/D = High Risk	Use risk assessment and decision matrices. Adhere to criteria. Continuousl	II/D = Moderate Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on	IC/CI and onsite veterinarian will ensure compliance at scene. PI ensure

				y monitor animal.		procedures and tool use.	compliance under program
During disentangle ment	Injury or death due to removal of gear	Inadvertent or well-intentioned removal of embedded gear	III/D = High Risk	Use risk assessment and decision matrices. Adhere to criteria.	II/D = Moderate Risk	Adhere to all criteria, follow ICS, guidelines and proven SOPs on procedures and tool use. Consultation with veterinarians	IC/CI will ensure compliance at scene. PI ensure compliance under program,

Hazard Severity:

Category A – Negligible: The hazard presents little to no threat to personnel, animal, equipment, vessels, and environment (*e.g.*, minor sunburn, minor chafe/rope burn; additional chafe wounds to animal).

Category B – Minor: The hazard may cause minor injury/impact to personnel and animal, minor damage to equipment and/or vessels that is easily repaired, or minor impact to environment (*e.g.*, superficial cut, twisted ankle, snapped utility blade; superficial wounds to animal due to kegging).

Category C – Moderate: The hazard may cause moderate injury to personnel and animal, moderate damage to equipment and vessels, or moderate impact to the environment (*e.g.*, deeper cut, but no threat to function of body, loss of gear that can be replaced with minimal cost and effort; deeper dermal laceration wounds due to kegging).

Category D – Major: The hazard may cause major injuries to personnel and animal, loss of expensive equipment and/or major damage to vessel, and/or major impact to environment (*e.g.*, deep cut or impact to head requiring professional medical attention, loss of equipment compromising safety/mission, high cost and effort of replacement, impact to animal possibly life threatening).

Category E – Catastrophic: The hazard poses a life-threatening threat to personnel and animal, loss or complete destruction of equipment and/or vessels, impact to environment is extreme (*e.g.*, loss of life – personnel and/or animal, another animal struck and killed enroute to respond, vessel stove in and sunk, major oil slick).

Likelihood:

Category I. – Very unlikely: Not likely to occur at all or very unlikely over broad expanse of time.

Category II. – Unlikely: Not likely to occur over a broad expanse of time.

Category III. – Possible: Might occur in time over duration of response lifespan (time person active in response, lifespan of equipment).

Category IV. – Likely: Expected to occur several times to personnel, animal or equipment over the response lifespan (*i.e.*, duration of multiple efforts).

Category V. – Very likely: High probability of occurring frequently or within a short period of time.

Table 9. Large Whale Entanglement Response Risk Matrix

Likelihood ↑ / Severity →	A Negligible	B Minor	C Moderate	D Major	E Catastrophic
V. Very likely	Low Risk	Moderate Risk	High Risk	Extreme Risk	Extreme Risk
IV. Likely	Minimal Risk	Low Risk	Moderate Risk	High Risk	Extreme Risk
III. Possible	Minimal Risk	Low Risk	Moderate Risk	High Risk	High Risk
II. Unlikely	Minimal Risk	Low Risk	Low Risk	Moderate Risk	High Risk
I. Very unlikely	Minimal Risk	Minimal Risk	Low Risk	Moderate Risk	Moderate Risk

5. Sedation

○ 5.1 Overview

The use of sedation - the administration of intramuscular anxiolytic and analgesic drugs, has been pursued as an alternative means to animal constraint (*i.e.*, kegging) or lack thereof, to reduce risks and increase effectiveness associated with large whale entanglement response. The goal is that the sedated whale will be more approachable (*e.g.*, less evasive and/or aggressive, or more predictable in behavior), improving the chances of an authorized response team freeing a whale from a life-threatening entanglement. Some species, such as North Atlantic right whales (NARW), are notoriously resistant to physical constraint methods, as well as more evasive to close vessel approaches, making entanglement response to these animals more difficult and dangerous. Across species, certain entanglement configurations are more challenging for rescuers, specifically those that require multiple head approaches to resolve. Additionally, by reducing the physical toll of the disentanglement process on whales by replacing kegging with chemical restraint, their stress levels and energy expenditure may be reduced and their overall survival may be improved in some cases.

However, like all procedures and tools, sedation is not without its risks (Brunson et al. 2002; Moore et al. 2010, 2013, 2017; van der Hoop et al. 2013b). These include tissue damage caused by the impact of the sedative darts (acutely or chronically if the needles do not pull out as designed), organ damage or pneumothorax if dart is too long, other trauma if dart impact occurs at an undesired site, over-sedation, loss of sedative darts at sea, risk of human exposure to super-potent sedatives, etc. For each case in which sedation is considered, a cost-benefit analysis must be undertaken prior to employment of sedation. A systematic entanglement case review of entangled large whales on the east coast of the United States revealed that free-swimming whales with head/mouth entanglements, no trailing gear, and no control line established are less likely to be disentangled on the first attempt, and therefore more likely to benefit from sedation (Sharp 2018, unpublished). Compared to other large whale species, entangled NARWs were also found to be more commonly free-swimming, have head/mouth involvement, and their entanglements were less likely to be resolved on the first attempt. Whether or not an entanglement is life-threatening must also be taken into consideration when deciding whether or not sedation is indicated. Entanglements that show significant cutting into soft tissue and or bone, or those that interfere with feeding have been shown to be serious injuries that are life threatening (Moore et al. 2004, Sharp et al. 2019).

Sedation delivery at sea to facilitate disentanglement of terminally entangled large whales has been conducted three times in the past, each with NARWs. The first attempt was with an adult male NARW (Catalog #1102, "Churchill") using a combination of midazolam and meperidine delivered from a cantilevered pole in 2001 (Moore et al. 2010). No appreciable level of sedation was visibly achieved with this animal despite multiple sedation attempts. The second case was the first field deployment of the current PaxArms remote sedation system and involved a chronically entangled six-year old male NARW (Catalog #3311, "Bridle"). Despite three sedation attempts with low doses of midazolam and butorphanol, only very minimal sedation effect was visibly achieved with no appreciable assistance to disentanglement efforts (Moore et al. 2010). The final case occurred in 2011 with a two year old female NARW (Catalog #3911, "Bayla"). She was darted with the Paxarms system using a combination of Butorphanol and Midazolam (at the current recommended doses) and sedation was appreciated through decreased boat avoidance, improved predictable behavior and an appreciable improvement in disentanglement operations was the result (Moore et al. 2013).

Clearly with so few large whale cases for which remote sedation has been deployed for disentanglement assistance, there is still a significant amount of work needed to improve protocols and efficacy of this tool. The following provides general information regarding the current best practices for large whale remote sedation, but this information is constantly evolving.

○ 5.2 Preparation and Training

All participating field personnel must be currently certified in first aid and CPR training. New personnel should receive training on immobilization and anesthesia prior to working on projects involving the use of these drugs on whales. Wildlife immobilization courses such as those taught by the Canadian Association of Zoo and Wildlife Veterinarians, American Association of Wildlife Veterinarians, various veterinary schools, SafeCapture or Global Wildlife Resources are acceptable introductory or refresher immobilization training. However, additional supervised training in the field with experienced personnel should be required prior to administration of chemical capture of whales. A refresher course is recommended every five years especially if field responses have been limited, but may be taken more frequently as methods and procedures evolve or personnel work with different species. Remote drug delivery using the whale sedation projector requires specific training and practice with the specialized equipment. Biopsy darting whales at sea provides pertinent experience with regards to timing of dart deployment on a surfacing, however intimate knowledge of the sedation system and its performance is an absolute requirement prior to field deployment.

Monitoring whales after remote delivery of sedatives requires a veterinarian experienced in monitoring cetaceans under sedation. All personnel that handle controlled substances must receive training on safe handling of drugs. Vessel operators must be trained in small boat operations and have experience operating boats while whales are in the water near the vessel. If possible, inexperienced personnel should watch the process and participate in low-level aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP can direct responders toward resources relevant to the species of interest, whenever available.

Prior to any operation

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected. This includes both land-based target practice and gaining familiarity with the equipment as well as at-sea target practice.
- Evaluate the location of the operation with regards to the distance of the whale from shore and the safe range of identified vessels.
- Choose experienced team members and assign roles.
- Consult with the NMFS Regional Stranding Network Coordinator, the MMHSRP, and the NMFS West or East Coast Large Whale Disentanglement Coordinator regarding the plan for sedation.
- In coordination with NMFS officials and the local entanglement response team, establish an operational plan in accordance with the Incident Command System.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vessels (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal including UAS assessment.
- If using satellite transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean (or sterilized, as appropriate), organized, packed, and ready for operations.

24– 72 hours prior to operation:

- The marksman should practice with the equipment to be used for the upcoming incident. Practice should include ensuring the accuracy and precision of the projector and darts, the effective and consistent deployment of the dart contents, and any predicted shot scenarios for the outing (distance of shot, angle of shot from vessel platform, wind and wave conditions, etc.).
- All critical sedation gear should be tested for function, including the projector, darts to be deployed (especially important are the rubber seals that create a pressurized system for successful administration of sedatives and that can be adversely impacted from long-term storage), UASs (if to be used), etc.
- Check predicted marine conditions, weather and wind forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), the MMHSRP, and the NMFS West or East Coast Large Whale Disentanglement Coordinator, law enforcement, EMS or local hospital, Native communities (where appropriate).
- Ensure appropriate authorization.

Immediately prior to operation:

- Conduct safety briefing.
- Re-check weather and marine forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations and make a final decision about response.

○ 5.3 Authorization and Licensure

As with other components of whale entanglement response, whale sedation at sea is conducted under MMPA (and ESA, as appropriate) authorization through an MMHSRP permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt whale sedation for disentanglement. A veterinarian experienced in cetacean behavior and sedation is required to be on scene for large whale sedation operations. This veterinarian must hold a current Federal Drug Enforcement Administration (DEA) registration for dispensing Schedule II-V controlled substances. For operations within state waters, a veterinarian with the appropriate state veterinary license as well as state controlled substances license (if required by that state) must be on site for the operations.

Employment of remote sedation to facilitate disentanglement must first be approved on a case-by-case basis by NMFS. As soon as possible prior to the event, the NMFS Regional Stranding Network Coordinator, the MMHSRP, and the NMFS West or East Coast Large Whale Disentanglement Coordinator must be consulted. All of the entanglement response activities (including sedation) will be under the direction of NMFS MMHSRP.

○ 5.4 Team Member Roles

Sedating large whales at sea has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. It is extremely helpful if the team has previously worked together. If not, practicing with the system ahead of time together can help to ensure everyone is on the same page. It is recommended that remote sedation and potentially UAS operations are based on a separate vessel platform from the primary entanglement response vessel. The remote sedation operations are conducted under the umbrella of the overall entanglement response structure and effective communications with the entanglement response team are critical to success.

Suggested team member roles may vary with the vessel capacity and specific operation (Table 5-1). The recommended roles that follow are based, in part, on implementation of the Incident Command System as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The system is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this system.

Table 10. Suggested number of personnel needed for a large whale remote sedation entanglement response (not including the separate entanglement response team). Responders can fulfill multiple roles and some roles are *optional.

Team member role	Number of suggested personnel
Safety Officer	1
Veterinarian	1-2
Marksman	1
Spotter	1
Animal monitor	1
Vessel operator	1
Data recorder	1
Photographer/videographer	1
*Optional – UAS pilot & catcher	2
*Optional- Communication Officer	1

● **Safety Officer (SO)** – The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed.

o **Qualifications** – Experience in previous remote sedation operations and whale entanglement response, ability to continually watch over all personnel involved, communicate with the team to adjust strategy or call off the effort as necessary, and watch for hazards. Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.

● **Veterinarian** – The veterinarian is responsible for the health and monitoring of the entangled animal during sedation, disentanglement, +/- reversal, and recovery process, until the animal is deemed sufficiently recovered to swim off on its own.

o **Qualifications** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent who is EXPERIENCED in cetacean medicine. This individual maintains the proper registration to purchase, store, and administer controlled substances, experimental drugs, and other drugs required for remote sedation, including ensuring that the appropriate reversal agents are available in sufficient quantity. Any licensed practitioner who distributes, prescribes, or dispenses any controlled substances (narcotics and dangerous drugs that fall under the jurisdiction of the Controlled Substance Act) must be registered with the DEA. If operations are to be conducted in state waters, the veterinarian should hold the appropriate state license and any state-mandated controlled substance registrations (in addition to DEA Registration).

- **Vessel operator** – Boat operators should be experienced with whale close approaches, remote sedation methods, and entanglement response operations. Vessel operators should also be comfortable operating offshore and monitoring weather and sea conditions.

    - **Qualifications** – U.S. Coast Guard boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with whales in or around the boat.

- **Marksman** – The marksman is ultimately responsible for safe and effective functioning of the remote sedation system, placement of the dart on the target animal, and follow-up security and cleaning of the darting equipment. The marksman determines the appropriate approach to the target as well as the optimal distance and angle of the shot attempt, communicating with and working closely with a Spotter and other personnel. Once the Spotter confirms that it is safe to attempt a shot (opens the shot window) and communicates this to the marksman, the marksman may make an attempt at their discretion until the Spotter closes the shot window. The marksman should have extensive practice using the dart projector prior to darting a live animal. Specifically, practice should be organized and methodical, with marksman shooting a target a) from various distances, b) with different pressures, c) in all types of weather conditions (*e.g.*, rain, snow, wind), and d) from different angles. The marksman should be well versed in how to safely handle the dart projector, darts, charges, pressurizing and depressurizing the projector, and be able to demonstrate accuracy in hitting a target under the various conditions described above.

    - **Qualifications** – Demonstrated proficiency in skills and experience described above. The marksman does not need to be a veterinarian and should work under the direction of a veterinarian regarding the drugs used in the darts. Thorough knowledge of the anatomy of the target species will increase safety and effectiveness of dart placement selection and delivery. Experience biopsy darting whales is helpful, but specific knowledge of and experience with the remote sedation system is required.

- **Spotter** – This person is paired with the marksman and is in charge of both opening and closing the shot window for the marksman. The Spotter uses a laser rangefinder to measure out distances to the target animal, ensures that the area immediately surrounding the target remains clear of non-target animals or other hazards, and communicates with other personnel to direct proper placement of the vessel for the marksman.

  - **Qualifications** – Ability to use a laser rangefinder, experience approaching and tracking whales, understanding of whale behavior, ability to communicate with marksman, communicate with personnel on vessels, and experience around dart projector and drugs.

- **Animal monitors** – Monitors the animal's behavior and respiration rate prior to, during, and after darting. This person may also be the data recorder.

  - **Qualifications** – Familiar with tracking large whales at sea and whale behavior.

- **Data recorder** – The data collector is essential in recording all aspects of the remote sedation event. This person is responsible for ensuring all data are complete on data sheets, the animal is given an identifying number, and any deployed tag numbers are recorded.

  - **Qualifications** – Familiarity with whale behavior, ability to track whales at sea, familiarity with data sheet and information to be recorded and ability to accurately record data legibly.

- **Photographer/videographer** – This person is responsible for operating still and/or video photography to document the operation. This person should also monitor the status of camera batteries and memory to ensure there is no lapse in documentation coverage. While not ideal, this person may also serve as the data collector.

  - **Qualifications** – Experience using photographic equipment including at-sea footage. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video. Understanding of the remote sedation process and what images and video are of highest priority is important.

- **Unmanned Aircraft System (UAS; optional)** - If licensed and permitted to operate a UAS during the remote sedation process, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the operation or causing any disturbance to the target or other animals.

- **Qualifications** – an FAA certified Part 107 Remote Pilot's license, a permit to operate during an entanglement response, and experience operating a UAS during previous large whale field operations.

- **Communication Officer (Optional)** – If there are an adequate number of responders available and room on the vessel, the communication officer can communicate information about whale remote sedation.

- **Qualifications** – Effective communicator. Communication should be clear, concise, accurate, coherent, and courteous.

5.5 Communications

Communication between the remote sedation and entanglement response teams is absolutely essential to success. Both teams must be in agreement about the plan, including indications for sedation and a point at which remote sedation efforts may be called off in favor of a traditional disentanglement response. It is crucial that all team members understand that the situation is dynamic, with continually changing conditions of the animal, sea state, weather, and daylight. Communicating safety concerns among the teams, both human and animal, is critical to a safe operation. While this may be the primary role of the Safety Officer, safety must always be every responder's first priority.

The remote sedation team should have a satellite phone or other means of contacting NMFS officials and potentially additional veterinarians for consultations prior to, during, or following the remote sedation operation. Otherwise, all communications equipment for remote sedation efforts are the same as those for general disentanglement response. After the teams are safely back to land, a debriefing of the event with all appropriate parties should be held.

5.6 Data Collection

Supply checklists and data needs are well thought out prior to the start of any remote sedation response and data forms and instructions are available during a response. Important forms to have accessible specific to remote sedation efforts include: applicable permits; remote sedation gear checklists; whale monitoring forms (Appendix F - Free swimming whale monitoring forms); remote sedation worksheets (*e.g.,* Appendix U - Whale Sedation Datasheet); drug dosing sheets (*e.g.,* Appendix V – Drug Dosing Charts), and length-weight charts or formulas for the appropriate species.

If time and resources allow, and it is agreed upon in consultation with the on-site disentanglement team, the UAS can be deployed in order to better investigate the entanglement configuration, wound severity, and to obtain photogrammetric measurements (length and max width in relation to vessel length) for weight estimation. Ideally, this is done prior to close vessel approaches to the whale and in preparation for darting. All available information is relayed as soon as possible to the entanglement response team.

○ 5.7 Resources

Data, observation, and recording supplies

- Datasheets as noted above (*i.e.*, whale monitoring, and sedation forms)
- Length-weight curves and calculations for appropriate species
- Pencils/clipboard
- Watch with timer
- DSLR camera and video camera (*e.g.*, GoPro)
- Laser Rangefinder
- Binoculars

Personal protective equipment

- Vessel-appropriate closed-toe footwear
- Protective clothing as appropriate for conditions, preferably waterproof outer layer
- PFD
- Helmets for each responder on the remote sedation vessel
- Non-permeable gloves (nitrile exam gloves, etc.)
- Eye protection (goggles, safety glasses, sunglasses, or face shield)
- Tyvek arm sleeves
- Cotton, neoprene, or Kevlar gloves for retrieving dart tether, handling lines
- Safety knives kept on the person of each responder

Human medical equipment

- First aid kit

- Human reversal for sedatives (Naloxone, flumazenil)
- Ambu bag, CPR mask
- Eye wash
- Antiseptic wipes
- Tourniquets
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

Medical supplies

- Controlled drug kit including sedatives and reversals
    - Sedatives: compounded midazolam (50 mg/ml) and butorphanol (50 mg/ml), both available from zoopharm.net
        - Dosages of 0.1mg/kg have been previously used and believed effective to sedate free-swimming entangled right whales (Moore et al. 2010, Moore et al. 2012)
        - Bring sufficient volume to dose (and re-dose once) the expected size of whale (see dosage chart)
    - Reversals: compounded naltrexone (50 mg/ml; zoopharm.net) and commercially available flumazenil (0.1 mg/ml)
        - Bring sufficient volume of naltrexone to dose (and re-dose once) the expected size of whale (see dosage chart)
        - Top off naltrexone syringes with Flumazenil for a total volume of 57 ml, since higher concentrations of this drug are not available and at a mammal dose of 0.01 mg/kg, the volume of this drug makes appropriate dosing not possible with the current system)
- Medical kit (*e.g.*, injectable antibiotics)
    - Ceftiofur (200 mg/ml) is a commercially available, long-acting, broad-spectrum antibiotic that may be deployed using the remote sedation darting system, if indicated. Dosage is 6.6 mg/kg for smaller marine mammals (Meegan et al. 2013). Metabolic weight has been previously used to dose antibiotics in free-swimming humpback whales (Gulland et al. 2008). The decision to inject a dose of ceftiofur remotely to an entangled whale should take into consideration the costs and benefits, including additional close approaches to the animal, dart impact, potential dart

complications, etc. Such a decision must be made in consultation with MMHSRP staff.

- Other miscellaneous medical supplies:
  - Alcohol pads to aseptically prepare drug vials
  - Sterile gauze 4x4 pads
  - Sterile swabs
  - Nitrile gloves of varying sizes
  - Needles and syringes of varying sizes, appropriate for volumes of drugs needed
  - Label tape

Drug delivery system

- Projector (below, assembled with dart in barrel and tethered float attached) - Remotely delivered drugs may be administered by a custom-designed ballistic rifle (www.paxarms.com). This system was designed specifically for the purpose of delivering sedatives to free-swimming large whales and was adapted from an existing whale biopsy dart rifle configuration. The rifle operates using 0.22 caliber blank cartridges. The projector has a red dot sight, control valve, and a safety lock mechanism. Regular maintenance of the projector system is necessary to maintain it in safe, working condition.

Figure 13. Paxarms large whale custom-made remote sedation system with assembled dart loaded into projector barrel and tether/float attached to barrel. (Photo credit: IFAW)

- Darts and needles (below, assembled syringe/needle and float/tether) – Darts are custom-made to hold 57 ml of injectable drugs. Dart components consist of a syringe barrel, plunger, valve, needle, port sleeve, and stopper. Needles are tapered stainless steel with a carbon fiber liner for structural support on impact. There are currently three customized needle lengths – 6”, 9”, and 12” and the selected size is based on animal species, size, and estimated blubber thickness data. All needles have an outside diameter of 7 mm, a solid, tapered tip, and three side injection ports.

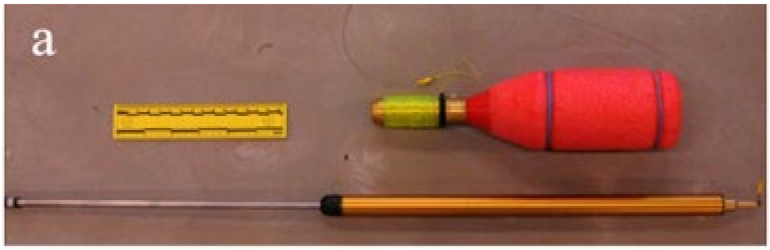


Figure 14. Paxarms whale dart (bottom) and tether and float (top) from Moore et al. 2013

- Dart tether and float (above, top) – 23 meters of monofilament line are wound onto a spool and on a foam float which attaches to the back end of the dart. The tether and float are used for three purposes: 1) to ensure retrieval of a loaded dart that is deployed but misses the animal; 2) for darts that make contact with the whale, to assist with dart extraction from the injection site by allowing light backward traction on the dart; and 3) to assist with straight and level flight characteristics of the dart. The float is attached to the rifle barrel and either self-deploys with the dart or can be maintained by the marksman if the whale is less than 23 m from the vessel when the dart is fired.
- Dart box – a box capable of holding the assembled loaded darts until the marksman is ready to deploy the system. Can be lined with a sterile field.
- Splash box/bag/shield (custom-made splash box below) – for safe assembly of the darts while at sea, extra safety precautions should be taken to minimize the risk of human exposure to the concentrated sedatives. With whatever system is employed, persons should practice assembling the darts and handling the necessary medical equipment in it prior to deployment.

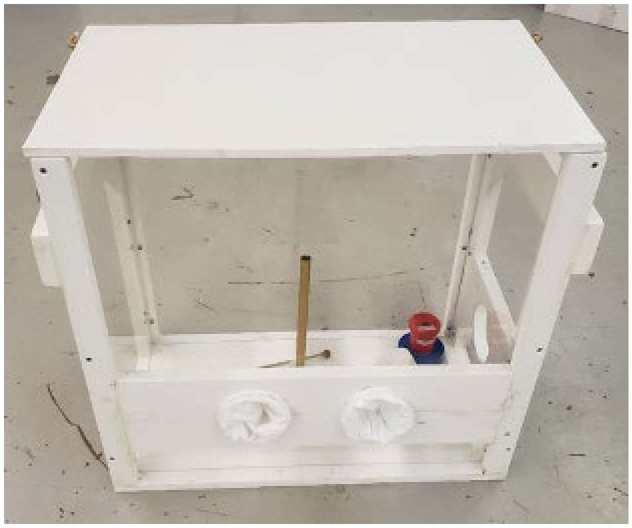


Figure 15. Custom-made splash box for safer at-sea dart loading (photo credit: IFAW)

- Additional darting equipment - pressurizer, magazine, threaded pliers, sleeve applicator, o-rings of various sizes, 0.22 caliber blank charges, rubber bands, ram rod, cold sterile solution, and silicone lubricant.
- All darting equipment should be maintained in waterproof pelican cases or similar. It is recommended that spares of key equipment are brought on board the vessel. Components that can be sterilized ahead of time should be. Cold sterile solution and sterile saline flush should be available on board for last-minute sterilization.

Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s)

Vessels

The vessel used for remote sedation operations would ideally be separate from the primary entanglement response vessel in order to allow for more flexibility and fluidity of procedures during the event. The ideal vessel has a tower, bowsprit or pulpit, or other elevated darting platform that provides height above the water for improved whale tracking and an ideal shot angle. The vessel operator should be experienced in whale approaches, entanglement response operations, and should communicate well with the spotter and marksman. The UAS team may also operate out of this vessel with the understanding that darting operations take priority. The vessel size and design must allow it to be a relatively stable platform for darting while allowing it to be able to handle seas well, and provide protection from the elements appropriate to the response area. RHIBs (rigid-hulled inflatable boats) and SAFE boats are examples of good remote sedation platforms. The vessel should hold at least five responders.

○ 5.8 Environment and Weather

Since the desired outcome is a more approachable animal for the purposes of disentanglement, the range of weather and environmental conditions considered for sedation should be the same as, or better than those considered for disentanglement operations. Additionally, available daylight hours must be sufficient to allow post-sedation recovery monitoring of the whale. Building seas and inclement weather will increase darting difficulty and reduce the ability to track an animal's recovery from sedation. Therefore, initiating remote sedation efforts under these circumstances should be discouraged.

○ 5.9 Risk and Mitigation

To minimize the risk to human responders and whales, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each remote sedation operation. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding any remote sedation efforts for entangled whales. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough de-brief and come up with lessons learned that can be applied to the next response. When performing remote sedation on entangled whales, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

Additional possible risks and mitigation measures are listed below.

- All remote sedation attempts must be approved by NOAA Fisheries' Marine Mammal Health and Stranding Coordinator (MMHSC) staff and the permit PI, on a case-by-case basis, prior to attempting sedation.
- Approved remote sedation protocol documents, including drug protocols, equipment, and a list of trained personnel that must include a veterinarian, should be on file prior to any remote sedation attempt.

● As soon as the information is available and a remote sedation is being considered, situation specific documentation for large whale remote sedation attempts must be provided to the MMHSRP for approval (including species, size estimate, entanglement configuration, general location information, proposed date and time for remote sedation attempt, number of boats, number of personnel, and a specific personnel list).
● After each remote sedation attempt, a written report should be filed with the MMHSRP permit holder and appropriate staff within 72 hours of the capture attempt when feasible and within two to four weeks if the response was conducted remotely in the field. This written report must include a detailed description of the darting logistics (number of darts/shots, needle length, distance from target, dart impact location, when/how darts retrieved), effects of the drug combination on the whale including dose administered, time to effect, duration of effect, reversal agent if used and dosage, time to recovery, any negative impacts of the drug or darting, and any changes necessary to the remote sedation system or protocol.

RISKS TO HUMANS:

Risk: Human exposure to drugs by injection, absorption, or ingestion
The doses of immobilization and sedative drugs required to achieve an adequate response in large whales are all potentially lethal if accidentally injected into a human. Therefore, drug safety procedures must be carefully followed at all times.
Mitigation:
● Prior to using a particular chemical immobilizer or tranquilizer, it is each project leader's responsibility to determine and document that all personnel are familiar with the human safety aspects of the drug. These instructions shall include knowledge of the symptoms following accidental injection; emergency treatment procedures, including cardiopulmonary resuscitation (CPR); and name, location, and dosage of a reversal agent (if any). Written instruction should be close by and easily accessible at all times during a response.
● PPE: Basic safety precautions must be taken by all personnel to prevent exposure to drugs. These include wearing gloves, waterproof clothing, and Tyvek sleeves when handling drugs/darts. Additional safety measures are required to prevent drug exposure across mucous membranes (eyes, mouth) when filling, charging, or disassembling darts. Equipment should include at least one of the following in addition to gloves: safety goggles, splash guard mask, splash box or safety screen.
● OSHA Universal Standards for handling sharps are used https://www.osha.gov/SLTC/etools/hospital/hazards/sharps/sharps.html.

- ● Marine radios, cell phones, and satellite phones ensure that emergency rescue personnel can be alerted should a team member be exposed to a drug. Local EMS should be notified prior to operations and informed of drug types and concentration, work locations, number of personnel, and safety equipment on board.
- ● All response staff are CPR certified.
- ● Reversal drugs are drawn up and kept readily available.

Risk: Injury or death to personnel by drowning, falling or other vessel-related hazards.
Mitigation:

- ● Appropriate personnel should decide if operations are safe under the current and expected sea and weather conditions.
- ● Wear appropriate PPE such as strong, non-slip footwear, gloves, PFDs, and helmets as necessary.
- ● Designated SO should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- ● Designated SO should be watching for and warning the team of hazards.

Risk: Injury or death to personnel due to perceived safe approach to a sedated whale
Mitigation:

- ● Entanglement response team should be trained on the effect of sedatives in large whales, especially with regards to maintaining vigilance when approaching whales that have been sedated.
- ● The veterinary/remote sedation team will continue to monitor whale behavior and sedation plan during the entanglement response and notify responders of any observed or anticipated changes (*i.e.*, expected duration of sedative effects).

Risk: Loaded dart is lost at sea
Mitigation:

- ● Marksman practices sufficiently to ensure darting accuracy at sea.
- ● All darts are tethered with floats to increase the likelihood of their recovery if the target animal is missed.
- ● Handling of darts on-board the vessel should be minimized as much as possible. All loaded darts should be maintained in an appropriate dart box until loaded into the projector.

RISKS TO ANIMALS

Risk: Injury to animal from dart

Mitigation:

- Personnel should be trained in techniques that minimize injury to the animal including: knowledge of the desired impact location; dynamic adjustment of the firing velocity based on distance from target; and proper needle length selection.
- If possible, darts should be retrieved using the tether/float shortly after drug delivery is complete (~5 seconds after impact) to minimize shearing of the needle along the blubber-muscle interface.

Risk: Unintentional disturbance of non-entangled protected species

Mitigation:

- Evaluate the possibility of unintentional take of non-entangled animals before remote sedation is attempted. Do not attempt remote sedation if a negative impact on a non-target animal is likely.
- The safety officer(s) should continuously watch for the presence of non-entangled animals in and around the operational area throughout the event, and communicate with the team appropriately.

Risk: Animal appears overly sedate, receives an overdose of sedatives, or develops an adverse reaction to sedatives

Mitigation:

- Reversal agents should be administered under the direction of the veterinarian.
- Attempts should be made to continue to stimulate the whale with vessel approaches in order to disrupt the onset of sedation.
- If possible, a control line on the entanglement should be established by the entanglement response team to provide additional stimulation.

Risk: Non-entangled animal is hit with a loaded dart.

- Every effort should be made to track the animal, administer a reversal agent, and monitor the animal. The entanglement response team should remain with the target animal, if possible and the remote sedation team can track the non-target whale (unless additional monitors are needed for the sedated animal).

Risk: Animal fatality.

Mitigation:

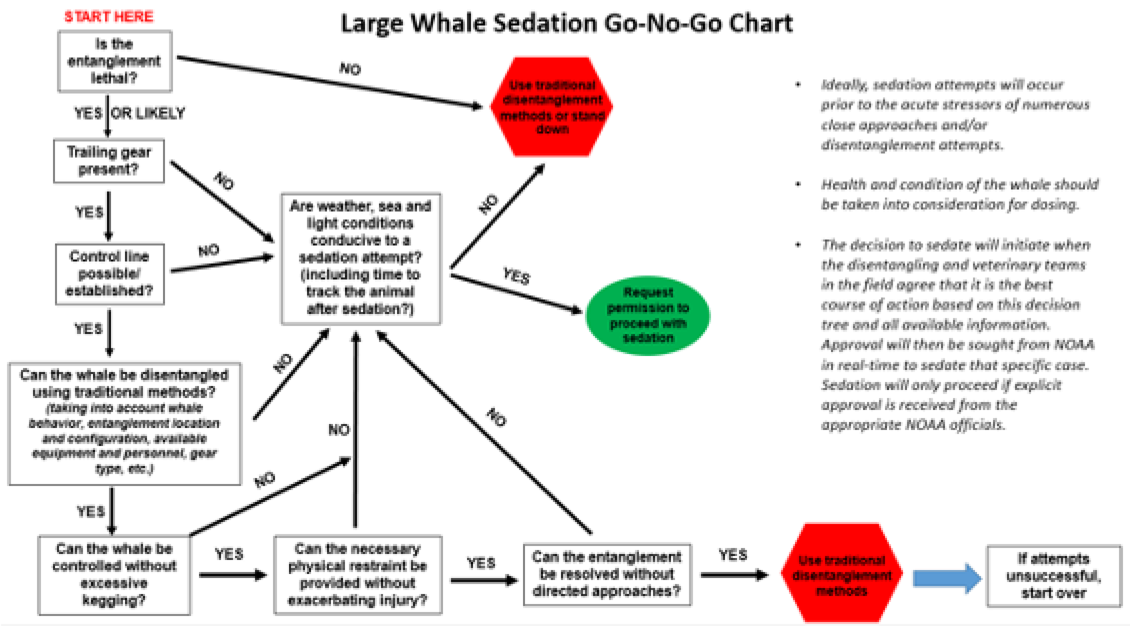
- Every effort should be made to recover the carcass for necropsy.

● External documentation should be performed immediately upon carcass recovery.

● The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.

● Large whale remote sedation activities should immediately cease until necropsy is completed and new mitigation measures are approved by NMFS.

○ 5.10 Intervention Criteria/Decision Matrix (Go/No Go)



○ 5.11 Procedure and Mission Goals/Complexity

As indicated on the decision matrix above, remote sedation of free-swimming, entangled large whales should only be undertaken under very specific circumstances dictated by the whale, entanglement configuration, personnel, equipment, weather and sea conditions. The whale must be an especially challenging disentanglement case either due to entanglement configuration, whale behavior, or both. Well-trained and well-prepared personnel including an experienced whale veterinarian and marksman must be available for the attempt. The necessary equipment must be well-maintained and operational. The entanglement responders and appropriate NOAA MMHSRP staff including the permit holder must be in agreement that remote sedation is indicated in each particular case.

Case selection criteria should be developed ahead of time specific to the species and entanglements in a given response region. On the east coast of the U.S., remote sedation case selection criteria include: free-swimming whales, head/mouth entanglements, no trailing gear, and no control line established (Sharp 2018, unpublished). Additionally, wrapping entanglements, those that cut into soft tissue and/or bone, or those that interfere with feeding have been shown to be serious injuries that are life threatening (Moore et al. 2004, Sharp et al. 2019).

Traditional whale disentanglement efforts are incredibly complex in their own regard, and adding highly concentrated sedatives delivered remotely from a secondary vessel only increases the level of complexity for these operations at sea. The goals of remote sedation in this context are to enhance the efficiency and human/animal safety of large whale disentanglement response in selected cases where traditional disentanglement techniques may prove challenging or more dangerous than usual. Pharmacologically, the goal of these remote sedation attempts falls short of true sedation, essentially bringing about behavioral modification to desensitize the animal while preserving its ability to swim, respire and maintain equilibrium. The true desired effects are more properly termed anxiolysis (reduced anxiety) with the added benefit of mild analgesia (pain relief) rather than true sedation.

There are two primary scenarios for deployment of a large whale remote sedation team: 1) an entangled whale is satellite tagged by an entanglement response team and an assessment has already indicated that remote sedation will likely be a desired tool; or 2) a remote sedation team is deployed alongside the entanglement response team to respond to a report of an entangled whale. In either case, consultations with the entanglement response team, appropriate NMFS MMHSRP staff, and the primary permit holder should be initiated as soon as possible to discuss the plan and potential use of remote sedation.

With the understanding that every scenario will likely be slightly different, below is an outline of the large whale remote sedation procedure in brief.

Large Whale Remote Sedation Procedure Overview

- Prior to Deployment (also see: Preparation and Training 5.2)
    - Ensure that all darting equipment is operational, sterilized (as appropriate), and packed in sea-worthy cases.
    - Inventory and pack adequate sedatives and reversal agents for a minimum of two attempts per trip (this also accounts for possible loss of filled darts during attempts). An adequate volume of antibiotic should also be packed. All drugs will be maintained by a licensed veterinarian in a lock box when not in use.

- Pack all equipment including locked projector case, remote sedation equipment cases, locked drug case, spares case, and any UAS equipment (if desired).
- Consult with the entanglement response team, appropriate NMFS MMHSRP staff, and the primary permit holder as soon as possible to discuss the plan and potential use of remote sedation. If permission is received for a remote sedation attempt (or at least a deployment for further assessment of remote sedation need), proceed with deployment.

- On-scene Assessment
  - Once on scene, evaluate and document the whale (visually and with UAS if approved by local Air Traffic Control [ATC]). Establish behavioral and respiration 'normals' for comparison to post-sedation data.
  - Apply the case selection criteria and Decision Matrix (Go/No-Go paradigm) to determine if sedation is indicated.
  - Estimate weight of the animal using best available data (visually estimated length, or UAS-derived photogrammetry)
    - Mn: Lockyer 1979, Stevick 1999, Trites and Pauly 1999, available stranding data
    - Eg: Miller et al. 2012, Fortune et al. 2012
  - Calculate the volume of drug necessary to sedate the animal and determine if sufficient drugs are on the vessel.
    - Sedative doses: Butorphanol 0.1 mg/kg and Midazolam 0.1 mg/kg
  - If sedation is indicated, contact the appropriate NMFS MMHSRP staff and primary permit holder (on cell/sat phone) to request permission to sedate, providing the indications for sedation, any situation-specific risks, and the plan.
  - If permission is received, proceed with a sedation plan.
- Sedation
  - Dart preparation
    - Draw up human doses of Naloxone and Flumazenil in separate syringes, clearly label and store in splash box or other readily accessible location. Notify all on-board where the human reversals are located.
    - Fill dart(s) with appropriate sedative dose and top off with sterile saline for total dart volume of 57 ml. Straight mg/kg dosing is preferred. Label this dart clearly "SEDATIVE" and sedative name ("MID" or "BUT" or "MID + BUT"). If multiple sedative darts are needed, label them as "SEDATIVE

1/2" and "SEDATIVE 2/2" and so on. If multiple darts are needed, the current recommendation is to dart with the butorphanol dose first and then follow up with midazolam dose, since midazolam uptake is twice as fast (at least in terrestrial spp).

    - Fill dart with dose of whale reversals (Naltrexone dose and top off with Flumazenil) for a total volume of 57 ml. Straight mg/kg dosing is preferred. Label this dart clearly "REVERSALS."
    - If indicated, fill antibiotic dart with an appropriate dose. Label this dart clearly "ANTIBIOTIC." Metabolic scaling can be used for antibiotics (Gulland et al. 2008), but if animal size and drug volume allow, straight weight dosing is preferred.
    - Store all loaded (unpressurized) darts in the dart box in sterile draping until deployment.
- Darting
    - Remove projector from locked case and check that the chamber is empty.
    - Assemble the projector (without the barrel) and set the control valve to 15 m. Load the magazine with a .22 blank charge and fire in a safe direction to clean out the chamber. Place the lever in half cock position until ready to fire. Secure the projector and always point it in a safe direction.
    - Marksman and spotter ascend to the darting tower or platform with the projector, darts in a dart box and all necessary equipment (charges, pressurizer, etc). Attach safety tethers from personnel to the vessel, as appropriate.
    - Communicate with primary disentanglement vessel that darting operations are about to begin and ensure that the plan is still a go.
    - Once a darting approach is given the green light, take the first sedative dart out of the dart box, charge with the pressurizer to 130 psi, and check for leaks.
    - Check that the projector chamber is empty, attach barrel and load dart ensuring that the tether is properly threaded in the groove and the tether float is affixed to the barrel.
    - Load two cartridges in the magazine and insert into the projector. Remain half-cocked with safety engaged until ready to fire. Always point the barrel of the projector in a safe direction.

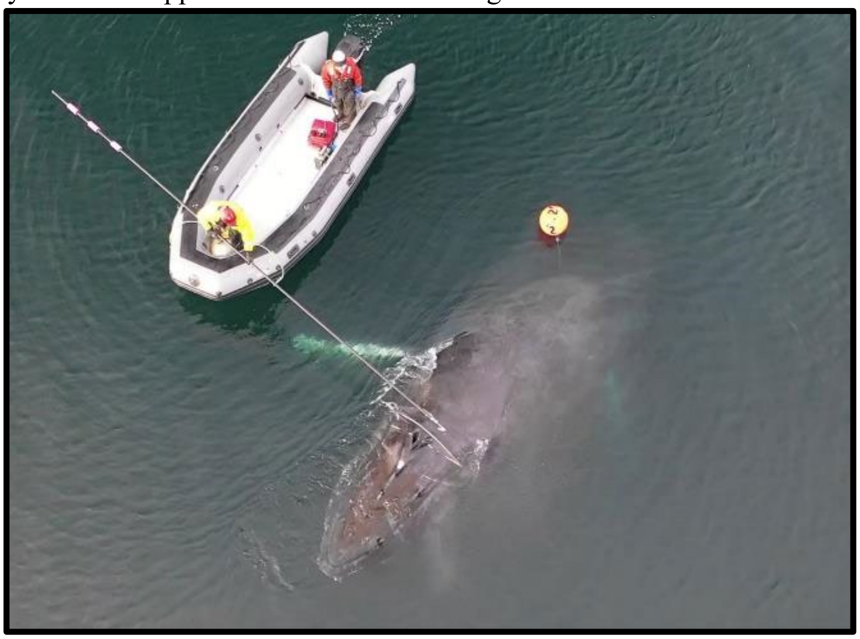
        - Communicate with the entire team that the projector is now loaded and an approach will be attempted.
        - Monitor whale behavior to determine when a darting approach is appropriate. Have spotter constantly calling out distance to the whale, sufficiently loud for both the marksman and the vessel operator to hear.
        - The desired firing distance from the projector to the whale is 15 m. The target darting location is cranial to dorsal fin (more cranial preferred but sufficiently caudal to the skull), as close to dorsal midline as possible.
        - When ready to take a shot, marksman notifies the boat operator and team.
        - Once shot is fired, unload the projector, check that the chamber is empty, and store in a secure location.
        - Data recorder and photographer document all actions thoroughly including dart impact location, angle of impact, and time of impact.
        - If possible, marksman maintains the tether/float (or passes off to another crew member) and counts for a minimum of 5 seconds after the moment of impact prior to initiating traction in the opposite direction (180 degrees to angle of impact) on the tether line to retrieve the dart. If distance is too great between the whale and the vessel, the float is tossed overboard for later retrieval.
        - If a second sedative dart is necessary due to the size of the animal, fall back from the whale to charge and load the dart while still maintaining behavioral and respiratory monitoring of the whale. Follow the above procedure until all sedative darts have been fired.
- Post-sedation
    - Drop back off the animal to minimize stimulation and allow for the sedatives to take effect, but maintain a visual on the animal and track from a distance to monitor behavior and respiration rate. Data recorder and photographer should be documenting all events thoroughly.
    - Monitor animal for 30-60 min to evaluate level of sedation. Sedation may increase for up to an hour and may be sustained for a few hours. If no or minimal sedation is appreciated by 60 minutes after the last sedative dart was fired, consider a second (1/2 dose of sedatives) and discuss with NOAA prior to re-darting.
    - Document whale behavior and sedative effects thoroughly.

- Work closely with the disentanglement team to determine when disentanglement approaches can be made and when it is appropriate to retrieve darts.
- Retrieve darts with a boat hook. Ideally the darts are removed early in the process in order to minimize potential soft tissue damage by the dart, being mindful that additional approaches to the animal prior to the onset of sedation may delay sedative effects. Dart retrieval may be done by the entanglement response team or the remote sedation team, as appropriate. Treat any recovered darts as still loaded and pressurized and handle with the utmost caution and proper PPE: waterproof gloves, eye protection, and waterproof clothing.
- Depressurize the darts in a safe location (*i.e.*, splash box) and document the remaining contents to estimate dosage administered.
- Dart with reversals, if indicated (and recover darts).
- Dart with antibiotics, if indicated (and recover darts).
- If available and approved by NMFS MMHSRP and permit PI, attach a temporary, non-invasive tag (satellite transmitter, dtag, etc.) to the whale following sedation and disentanglement to track its longer term behavior and location.
- Continue monitoring whale after darting/disentanglement as long as practical and safe to monitor and record the depth and duration of sedation and recovery periods. Ideally track the whale until it is deemed sufficiently recovered to safely swim off on its own.
- Follow-up with NOAA MMHSRP staff regarding results.

6. Use of UAS

6.1 Overview

The advantages of UASs, for large whale entanglement response are numerous. They are a tool that provides a safe, cost-effective, low impact means to monitor, assess, and document entangled large whales. The deployment of UAS platforms may not only document authorized response activities, but will have bearing on those same activities (*e.g.,* how best to cut a whale free or towards estimating the necessary dosage to sedate an entangled animal [see Section 5]). They represent the perfect tool, if used correctly, for providing critical, time-sensitive, remote risk assessment. Risk assessment is a key component of authorized large whale entanglement response efforts. It helps minimize risks associated with the response and helps garner information on the animal and entanglement to reduce risks associated with the threat. If criteria is met, UAS can be deployed in order to provide information on the entanglement, behavior of the animal, and the animal's condition. However, assessment can be challenging. The close approaches typically needed for assessment can be difficult and in themselves dangerous. Animals may become evasive or aggressive. Large whale entanglement response efforts typically require multiple close approaches, and thus possible interactions, between authorized responders (in the vessel) and the animal. The use of UASs allows for close, detailed assessment without physically approaching the animal, thereby minimizing the number of physical close approaches towards obtaining much-needed assessment. This not only minimizes risk associated with obtaining the assessment by minimizing the interaction, but also minimizes risk associated with disentanglement, as the overall number of interactions with the animal has been reduced. Both significantly increase safety for the responders and the animal.



Disentanglement of humpback whale off Unalaska, Alaska (Dietrich, NOAA MMHSRP, permit # 18786-03)

○ 6.2 Preparation and Training

Pilots flying as part of and under the MMHSRP's large whale entanglement response effort will require their FAA, Part 107 Remote Pilot's license, and be experienced with the approved UAS platform(s) being used in large whale entanglement response efforts and their over-water operation. For flights off NOAA vessels, operated by NOAA personnel or directed by NOAA personnel, an Original Equipment Manufacturer (OEM) training of the specific UAS platform is required in addition to the Part 107 license.

UASs are a tool that, like any tool, require maintenance, continued training, familiarization and evaluation to remain competent and confident in their use. The evaluation of UAS platforms and their use includes: vessel launch and recovery capability; stability allowing hand launch and catch recovery; electronic safety features (loss-of-link procedures, geo-fences, dynamic return-to-home function); quality of high-resolution imagery and video downlink; single pilot operation capability; battery status; functionality of digital and/or optical zoom and performance of the fully gimbaled camera system.

○ 6.3 Authorization and Supervision

The use of UASs as part of large whale entanglement response is authorized under NMFS MMHSRP permit 18786 that allows animals to be taken through close approaches by UAS's for observations, assessments, monitoring, photo-identification, documentation, photogrammetry, behavioral observation and unintentional harassment. The NMFS' MMHSRP enhancement and research permit provides, to the maximum extent practicable, UAS altitude adjustment and horizontal movements should be made away from the animals or conducted slowly when above the animals to minimize disturbance. It also prescribes that the UAS should minimize the time it hovers over an individual to just that time required to obtain the necessary data or samples to achieve the permitted activities and objectives. UAS flights themselves fall under the jurisdiction of the FAA. All pilots need to have their FAA, Part 107 Remote Pilot's licenses, and adhere to FAA regulations on the operations of UAS platforms. For NOAA staff, all UAS operations will be conducted pursuant to NOAA Aircraft Operations Center (NOAA AOC). All missions will be flown under the NOAA/FAA MOA or Part 107 in Class G airspace under Part 107 VFR weather conditions, utilizing aircraft that have received NOAA certification of their airworthiness, and using pilots and crew members that have been qualified under NOAA Aircraft Operations Manual, UAS Policy 220-1-5. For non-NOAA staff, all UAS operations will be conducted pursuant to FAA Part 107 regulations. All missions will be flown in Class G airspace under Part 107 VFR weather conditions, unless otherwise authorized through an FAA authorization or waiver. The number of flights flown per day would be restricted to daylight hours, environmental conditions, number of charged batteries available, and flight team fatigue. Additionally, permits and authorization may be needed for flights anticipated in restricted airspace, such as military areas, NOAA National Marine Sanctuaries, and National Parks.

○ 6.4 Team Member Roles

The number of responders needed for UAS operations will depend on whether part of a first response effort or a dedicated platform during disentanglement operations. A dedicated operation, including UAS operations, will need to have adequate personnel to safely and effectively conduct the mission without having personnel fulfill numerous critical roles (*i.e.,* vessel captain and UAS pilot). There should be adequate personnel to fill each needed role.

Table 10. Suggested number of personnel required for a typical large whale entanglement first response effort.

Team member role	Number of personnel required
Incident Commander	1 (may be on another vessel)
Vessel captain	1 (may also represent Safety Officer)
Crew (vessel dependent)	1 - 2 (roles can be shared with other roles)
Mission Commander	1 (may be offsite)
Safety Officer	1 (dedicated role)
Data collector	1 (role can be shared with other roles)
Pilot in Command	1 (dedicated role)
Pilot	1 (additional pilot as backup/fatigue)
Visual Observer	1 (role can be shared with other roles)
Communications person	1 (role can be shared with other roles)

Clear roles and responsibilities need to be maintained during UAS operations to ensure safe and effective operations - whether as part of a supporting organization/ party, or as a NOAA UAS operations (*e.g.,* aboard NOAA vessels and/or using NOAA UAS pilots) Roles associated with UAS operations listed below are established for NOAA UAS operations.

- **Incident Commander (IC)** - The IC, working closely with shoreside (or otherwise remote) authorizing parties (*e.g.*, NMFS RSC/LWERCs, National LWERC), is responsible for the on-scene oversight and supervision of the first response operation. The IC may participate directly in the operation depending on circumstances, but typically does not directly participate (*i.e.*, hands-on) in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that safety is maintained for responders, the public, and animals.

  ○ **Qualifications** – The IC needs to be at least a level 3 or higher for any close-approach assessment or tagging operations, a level 4 for overseeing the disentanglement of all large whales except right whales, and a level 5 for right whales (unless otherwise authorized). Under the Heightened Consultation protocol, tagging requires a level 4 designation, and for the disentanglement of other species aside from right whales, a level 5 designation. If unable to consult LWERCs or experts, right whale disentanglement efforts must be aborted. The IC must be trained and/or experienced in protocols, procedures, risks, and risk mitigation in all aspects of the first responder mission being carried out.

- **The Mission Commander (MC)** – The MC is tasked with the overall responsibility for the safe execution of NOAA UAS missions. The Mission Commander will ensure that all flights have authorizations and permits, including Notice of Intent to Fly (NTIF)[if required], response permits, and airspace clearances, as required and as they pertain to UAS flights. This includes compliance with FAA regulations, NOAA AOC 220-1-5 policy (if applicable as a NOAA employee or operating from a NOAA vessel), and flight reporting requirements (SITREPS, NOTAMS, Incident/Accident reporting as required). The MC works in conjunction with the AOC UAS office, when the UAS operations are conducted by NOAA employees or operating from NOAA vessels, to ensure all crew members are properly trained and current, and has final oversight authority on the go/no-go decision.
  - Qualifications – While the MC does not have to be physically on-site of flight operations, he or she does need to be a federal government employee of NOAA or a partner agency. He or she must be familiar with the overall mission operating procedures and objectives. The MC will work closely with the PIC and IC that are on-site. For more details on MC qualifications and requirements, see NOAA UAS handbook and NOAA AOC 220-1-5 policy (FAA, 2016; NOAA 2017).

- **Pilot in Command (PIC)** – The PIC is in command of the UAS operation; they operate/pilot the aircraft, maintain visual contact with the aircraft, monitor the video feed and aircraft systems data (altitude, ground speed, heading, position, orientation relative to the pilot, and battery status) and make certain that non-flight operations personnel stay well clear of the launch and landing areas. The PIC is directly responsible for the operation of the UAS regardless of who is piloting the platform.
  - Qualifications – For operations in FAA National Airspace, at a minimum the PIC is required to have an FAA, Part 107 Remote Pilot's license for operating UAS, and be familiar with overall mission procedures, goals and parameters (*i.e.*, trained or have experience in LWER). For additional qualifications and requirements, see FAA regulations, NOAA UAS Handbook and NOAA AOC 220-1-5 policy. (FAA, 2016; NOAA 2017).

- **<u>Visual Observer (VO)</u>** – The VO is tasked with observing the aircraft and surrounding airspace throughout each flight and providing the PIC information on the aircraft's flight path and proximity to all aviation hazards necessary to prevent collision.
    - Qualifications – The VO must be familiar with the overall mission procedures and objectives (*i.e.*, trained or have experience in LWER). They must work closely with PIC/ pilot, and have excellent visual acuity.
        - **<u>Safety Officer (SO)</u>** – The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate with the team and adjust the strategy of the response as needed. The SO works very closely with the IC. Under certain circumstances and depending on experience, the role of the SO can overlap with that of the helmspersons of the support or approach vessels, and if necessary and otherwise appropriate, the role of IC and SO can be performed by one person.
    - **<u>Qualifications</u>** – Experience in previous large whale entanglement response efforts, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, not adhering to protocols, presence of other animals, incoming environmental or weather changes, and time of day considerations). Willingness and ability to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.
        - **<u>Helmsperson(s)</u>** – This person(s) is/are responsible for the safe transit and operations of the vessel(s), including the safe maneuvering around and approach to entangled whales and the trailing gear that might exist. Helmspersons should have experience operating the vessel around the animal and all aspects of the response operation. They typically take on the key role of operational safety and may take on the role of SO. As such, the helmsperson role, whether on the transit, support, or approach vessels, is one of the most important roles beyond that of the IC.
    - **<u>Qualifications</u>** – Experience, training, and in some cases certifications (USCG license, NOAA certified components course) in order to "captain" a vessel. Helmspersons should have experience operating the vessel around large whales and all aspects of the response operation.

6.5 Communications

As in any operation, UAS operations require communications prior to and during the operation. Prior to any NOAA UAS operation, the UAS team must have an approved NIF, check airspace requirements and obtain any FAA clearances/approvals needed, and notify any Airspace Managers as required. During operations, close communications need to be established between response vessels, as once the response has progressed beyond the focus of assessment, a dedicated vessel to UAS operations will be needed. Communications onboard the UAS platform will include notice of launches and recoveries, as well as, status updates on the UAS. In many cases, UAS operations will involve communications from the approach and support vessels to align the operations (*e.g.*, having the UAS document an approach to cut the animal free).

○ 6.6 Data Collection

The primary goal of UAS use is assessment and documentation. The information gained has benefits towards evaluating the threat (the animal risk assessment) and the operational risk assessment (assessment of the risks and impacts posed by the response to humans and animals). In addition, its very use may reduce risk as it allows for risk assessment without physically approaching the animal (*i.e.*, avoiding the danger zone).

The flight crew will track flight information required by NOAA and FAA, and report to a designated contact at NOAA AOC as required. Numbers of animals taken will be tracked and submitted to the NOAA permits office in the annual MMHSRP permit report. All accidents will be reported to a designated contact at NOAA AOC, NMFS and FAA.

Some examples of data collected are:

- Information on the entanglement (*e.g.*, how entangled, gear description and markings)
- Information on the animal (*e.g.*, condition, sex, age class, impacts, fluke ID, photogrammetric assessment images)
- Animal behavior, including any observed response to procedures or UAS approaches
- Risks posed to responders (in the case of injury or worse, incident reports will need to be completed)
- Flight data (*e.g.*, number of flights, operational time of flights, pilot duty time)
- Animal approaches (*e.g.*, number of animals taken, overflight time, minimum altitude)
- Flight risk factors (*e.g.*, equipment malfunctions, the number and duration of lost link events)

○ 6.7 Resources

The primary resources for UAS operations supporting large whale entanglement response, beyond the team itself, are the vessel for on-site operations, UAS platforms, controllers, goggles and heads-up displays, helmets, eye and face protection, gloves for safely handling the UAS and any threatening battery, and battery fire bags in the event of a LiPo battery fire threat. A separate support vessel is required once the mission diverges (*e.g*., approach vessel has been launched) to allow the primary response vessel to work unimpeded from UAS operations. A breakdown of the primary resources is provided below:

- Dedicated UAS platform (once primary response vessel role is support towards an approach team)
- Approved, airworthy UAS platforms
- Tablet or phone displays, heads-up glasses, and goggles showing Flight Control Software
- Radio remote controller (some UAS have the ability to use a second controller for camera control)
- Safety helmets or hard hats
- Gloves (Kevlar lined)
- Safety glasses or face visors
- Batteries and appropriate chargers
- Battery fire bags
- Memory cards

○ 6.8 Environment and Weather

UAS operations require conditions (*i.e.*, environment and weather) conducive to safe operations and meeting mission goals. In the event that weather conditions are not suitable for UAS operations, as determined by the Mission Commander (MC), the Pilot in Command (PIC), and the IC, operations will be terminated. Flights shall be conducted under the following conditions:

- All flights will be conducted during daylight
- Under VFR conditions. Visibility 3 statute miles or greater
- Ceiling 300 m (1000 ft.) or greater
- Altitude limited to 120 m (400 ft.) AGL

- Wind 20 knots or less
- No rain or visible moisture
- Over water and away from populated areas
- Away from non-participating vessels (150 meters or ~ 450 feet from the launch/recovery vessel)
- When operating within 5 nm from civil airports, monitor for any conflicting traffic and establish prior communication/approvals
- When operating in any other no-fly zones (*e.g.*, National Parks, Military areas, MPAs) either avoid or obtain prior approvals

○ 6.9 Procedure and Mission Goals/Complexity

UAS-obtained image of an authorized disentanglement (L. James/ NOAA MMHSRP, permit # 18786-02)

One of the initial steps of large whale entanglement response is assessment and documentation. At this early stage, assessment is emphasized and prioritized, and as such the use of UAS is very much aligned. A vessel acting as the flight deck and the crew upon it (*e.g.*, helmsperson, PIC, VO, SO) can maintain their focus on their particular roles associated with the safe launch, photo-documentation of the animal and entanglement, and recovery. The use of UASs for risk assessment can reduce risk, but only if they are used correctly and do not incur additional risk. Thus, once or if the vessel takes on another role, such as acting as a support vessel for a team in an approach vessel, then UAS operations, if still occurring, should shift to an alternative, dedicated platform. This platform should also stand off the animal and the approach vessel by at least 150 meters to not stress the animal or inadvertently become involved (*e.g.*, get caught in trailing gear behind the animal). Risk assessment is ongoing, so there is value in UAS operations continuing as the response transitions from assessment to possible disentanglement. At later stages, when the animal has been cut free or the disentanglement effort otherwise terminated, UAS operations should once again carry out from the primary response vessel.

All missions will be flown under FAA Part 107 regulations, airspace and weather requirements. If operation in other airspace is required, the relevant controlling agency will be notified and, if required, any necessary permission obtained. For instance, acquiring any necessary authorizations within the boundaries of a NOAA National Marine Sanctuary (*e.g.*, Channel Islands National Marine Sanctuary) or National Parks (*e.g.*, Glacier Bay National Park and Preserve).

On site UAS response:

At this point, all permit, NIF, and airspace clearances (*e.g.*, FAA approved airspace or other restrictions) should be addressed. Pilots will have their FAA, Part 107 Remote Pilot licenses and required trainings, UAS platforms will have been approved and all equipment checked for readiness.

Pre-flight(s):

Flight goals and mission parameters will be reviewed with MC, PIC and IC/CI. Communications and updates will be maintained with shoreside contacts, including national/regional NMFS LWERCs. Prior to the first flight of the day, a briefing will be held with all appropriate personnel (*e.g.*, helmsperson, PIC, VO, SO, IC) to discuss procedures and perform GAR risk assessment. If there are any objections by any member of the team, the mission will be postponed until deemed safe by all members or cancelled due to unfavorable conditions (*i.e.*, inclement weather such as high seas or winds).

Prior to any UAS flight, UAS operations will be briefed and objectives discussed with a minimum of the flight crew. Just as the use of UAS can provide additional and continuous assessment throughout the response process (*i.e.*, first response assessment, disentanglement, and post effort assessment), it also dictates continuous risk assessment on its use. Briefing topics include:

- Mission objectives
- Weather conditions and forecast
- Identification of roles
- Safety concerns and GAR
- UAS status
- Scheduled launch time
- Launch procedures
- Recovery procedures
- Limiting airspace factors

- Emergency procedures

All non-essential personnel will be kept at a safe distance from the flight crew and UAS operations as possible. Under circumstances in which the flight vessel is small enough such that crew/personnel not associated with flight operation cannot be kept at a safe distance, all personnel should wear protective headwear (*e.g.*, helmets) and eyewear. Everyone on the flight vessel should maintain vigilance. Just prior to launching, all systems will be reviewed for readiness.

<u>Launching:</u>

The UAS flight vessel will be held stationary or head into the wind. The flight team will be in close proximity to each other with open and clear views of the horizon with no obstructions to interfere with safe operation of the UAS (*i.e.*, vessel VHF antenna). The PIC will coordinate with the helmsperson and VO and when ready to launch the UAS by hand by the VO or off the deck as appropriate. During these operations the VO will wear protective Kevlar gloves, a helmet, long sleeve protective clothing, and eye wear.

<u>Flights:</u>

One individual will act as Pilot in Command (PIC) of the aircraft. While not required under FAA Part 107 regulations, it is valuable to have a second individual acting as a Visual Observer (VO) to observe the aircraft and surrounding airspace throughout each flight. The VO provides the PIC information on the aircraft’s flight path and proximity to all aviation hazards necessary to prevent collision. All flights will be conducted in the National Airspace (NAS) in accordance with FAA Part 107 and will be coordinated by contract and partner personnel. All flights will be conducted during daylight and under VFR conditions. All surveys will be flown in manual control with contingency plans in place in the event of loss of radio contact. Flights will be aborted and the UAS retrieved if there is any deficiency in the telemetry link, or evidence of worsening wind or sea state. The UAS will hover over an individual only long enough to obtain a photograph or video sequence. The majority of the flights will typically be of about 12-14 minutes duration and the aircraft will return to the launch site with at least 20% of battery capacity remaining.

<u>Recovery:</u>

At the terminus of the flight the PIC will manually pilot the UAS back to the flight vessel, or may initiate the ‘automatic return home’ procedure. The PIC needs to be aware that unless changed in the flight control software parameters, the home point is automatically recorded as the initial take off location, when operating from a vessel this location may be different due to movement of the vessel. To prevent an automatic landing of a UAS in the ocean at the initial takeoff location, the option to dynamically return to the controller should be selected in the flight control software. The PIC or the VO will alert the rest of the crew on the return of the UAS, and position themselves for hand or deck recovery. Proper Personal Protective Equipment (PPE) will be worn. Once safely recovered, the PIC will immediately power down the UAS. The PIC will initiate a post flight checklist and prepare for any subsequent flights.

All protocols will be adhered to as outlined in NMFS MMHSRP permit, by the FAA, and NOAA Unmanned Aircraft Systems Operations (Policy 220-1-5 as required by NOAA staff pilots or when operating from NOAA vessels).

6.10 Risk and Mitigation

The use of UAS allows for close, detailed assessment without a human physically approaching the animal, thereby obtaining much-needed information, while minimizing operational risk associated with obtaining that information. However, the UAS represents a tool, and as such, it must be maintained and used properly, or additional risk will be incurred. This is especially the case for large whale disentanglement, in which risk levels are already elevated.

All criteria regarding UAS platforms, procedures, and authorization need to be met. Operational risk management assessments will be conducted prior to each deployment and risk mitigation measures will be documented. Communications will be maintained between the flight team, and support and approach teams. Prior to flights, pre-mission briefs will be conducted by MC or PIC that include:

- Weather
- Safety
- Status of equipment and personnel
- Communications plan
- Objectives
- Other relevant information as necessary

Risk: Injuries caused by propellers - lacerations:

Risk assessment prior to mitigation: III/C Moderate Risk

***Mitigation*:**

- All personnel in the vicinity of launch and recovery operations (*e.g.*, foredeck or on a smaller vessel, the entire vessel) wear safety glasses or facial shields, and helmet or hard-hat during launch and recovery phases.
- Only allow the flight team within vicinity of the aircraft during operations.
- Operations vessel (*i.e.*, the launch and recovery platform) maintains only one mission (*e.g.*, support vessel that is lending support to an approach team cannot be a platform for UAS operations). Once disentanglement operations underway, a dedicated platform/vessel is required for UAS operations.
- Only allow VO to hand launch and hand recover aircraft.
- The VO or UAS handler will wear full PPE, including long sleeves, safety gloves, safety glasses or facial shields, and helmet or hard-hat during launch and recovery phases.
- VTOL is typically equipped with plastic propellers, but certain UAS models have carbon fiber propellers and extra caution needs to be shown with these UAS..
- Only experienced, FAA certified Part 107 Remote Pilots familiar with over-water flights and the overall large whale entanglement response mission.
- Use approved, air-worthy UAS platforms.
- Use smaller UAS platforms.
- Use less expensive UAS platforms that are otherwise appropriate (*i.e.*, less hesitation on safely ditching UAS platform).

Risk Assessment following mitigation: II/B Low Risk

Risk: Impact injuries from UAS with personnel (*e.g.*, mis-recovery, loss of control):

Risk assessment prior to mitigation: III./D High Risk

***Mitigation*:**

- ○ All personnel in the vicinity of launch and recovery operations (*e.g.*, foredeck or on a smaller vessel, the entire vessel) wear safety glasses or facial shields, and helmet or hard-hat during launch and recovery phases.
- ○ Only allow the flight team within vicinity of the aircraft during operations.
- ○ Operations vessel (*i.e.*, the launch and recovery platform) maintains only one mission (*e.g.*, support vessel that is lending support to an approach team cannot be a

platform for UAS operations). Once disentanglement operations underway, a dedicated platform/vessel is required for UAS operations.

- Only allow VO to hand launch and hand recover aircraft.
- The VO or UAS handler will wear full PPE, including long sleeves, safety gloves, safety glasses or facial shields, and helmet or hard-hat during launch and recovery phases.
- Alert all personnel in vicinity of UAS operations prior to commencing and immediately following each flight.
- PIC and VO will ensure that the UAS stays well clear of all personnel (VO: except during launch and recovery) and under no circumstances directly overfly personnel.
- If documenting the disentanglement effort of the approach team, UAS does not directly overfly personnel. UAS should be at least 5 meters (15 feet) horizontal distance and 10 meters vertical distance (30 feet) from the team at all times.
- Ensure there is a means to notify personnel if necessary to prevent potential injury following UAS malfunction.
- Brief personnel on potential hazards and the need for situational awareness during UAS operations.
- Only experienced, FAA certified Part 107 Remote Pilots familiar with over-water flights and the overall large whale entanglement response mission, pilot UAS platforms.
- Use approved, air-worthy UAS platforms.
- Use smaller UAS platforms.
- Use less expensive UAS platforms that are otherwise appropriate (*i.e.*, less hesitation on safely ditching UAS platform).

Risk Assessment following mitigation: II/C Low Risk

Risk: Impact injuries from UAS with whale (*e.g.*, mis-recovery, loss of control):

Risk assessment prior to mitigation: II./ B Low Risk

***Mitigation*:**

- Operations vessel (*i.e.*, the launch and recovery platform) maintains only one mission (*e.g.*, support vessel that is lending support to an approach team cannot be a platform for UAS operations). Once disentanglement operations underway, a dedicated platform/vessel is required for UAS operations allowing the flight team to maintain focus.

- UAS should be at least 10 meters (30 feet) from the whale at all times.
- Only experienced, FAA certified Part 107 Remote Pilots familiar with over-water flights and the overall large whale entanglement response mission, pilot UAS platforms.
- Use approved, air-worthy UAS platforms.
- Use smaller UAS platforms.
- Use less expensive UAS platforms that are otherwise appropriate (*i.e.*, less hesitation on safely ditching UAS platform).

Risk Assessment following mitigation: II/A Minimal Risk

Risk: Impact with other vessels and other manmade structures:

Risk assessment prior to mitigation: III./ C Moderate Risk

***Mitigation*:**

- UAS Operations will only occur over water, away from populated areas, never directly overflying non-participating personnel and vessels.
- PIC will suspend flight operations if a non-participating vessel approaches within a CPA (closest point of approach) of 150 meters (~ 450 feet) of the launch/recovery vessel.
- Alert all parties (support teams) involved with the mission and any non-participating parties that might approach UAS operations. If necessary, a perimeter can be established and enforced by USCG, OLE, and/or other enforcement agencies.
- Only experienced, FAA certified Part 107 Remote Pilots familiar with over-water flights and the overall large whale entanglement response mission, pilot UAS platforms.
- Use approved, air-worthy UAS platforms.
- Use smaller UAS platforms.
- Use less expensive UAS platforms that are otherwise appropriate (*i.e.*, less hesitation on safely ditching UAS platform).
- Have backup UAS platforms.

Risk Assessment following mitigation: II/B Low Risk

Risk: Impact with aerial objects (*e.g.*, other UAS platforms and/or aircraft):

Risk assessment prior to mitigation: III./ C Moderate Risk

Mitigation**:**

- VTOL flights will not exceed 400' AGL and line of site from the flight crew.
- The VO will maintain a constant lookout for aircraft in the airspace surrounding the VTOL operations and notify the PIC of any aircraft in the vicinity.
- If an aircraft appears in the operation area the PIC will descend and automatically return the VTOL to home and land.
- When operating within 5 nm from civil airports, flight crew will have a dedicated aviation band radio tuned to local CTAF, monitoring for any conflicting traffic and establish prior communication/approvals as detailed in Ops Plan.
- Only experienced, FAA certified pilots familiar with over-water flights and the overall large whale entanglement response mission, pilot UAS platforms.
- Use approved, air-worthy UAS platforms.
- Use smaller UAS platforms.
- Use less expensive UAS platforms that are otherwise appropriate (*i.e.*, less hesitation on safely ditching UAS platform).
- Have backup UAS platforms.

Risk Assessment following mitigation: II/A Minimal Risk

Risk: Loss of control of UAS platform - fly-away:

Risk assessment prior to mitigation: III./ C Moderate Risk

Mitigation**:**

- If the VTOL experiences "Lost Link" for more than 30 seconds, the UAS is programmed to return to the most recently updated home waypoint using GPS and altimeter.
- If UAS begins to perform abnormally and becomes unresponsive to commands due to motor loss, motor failure, or prop damage the PIC will safely ditch the UAS in the water.
- Frequently update home point and geo-fencing.

  - Only experienced, FAA certified Part 107 Remote Pilots familiar with over-water flights and the overall large whale entanglement response mission, pilot UAS platforms.
  - Use approved, air-worthy UAS platforms.
  - Use smaller UAS platforms.
  - Use less expensive UAS platforms that are otherwise appropriate (*i.e.*, less hesitation on safely ditching UAS platform).
  - Have backup UAS platforms.

Risk Assessment following mitigation: II/B Low Risk

Risk: Loss of propulsion of UAS platform:

Risk assessment prior to mitigation: III./ C Moderate Risk

***Mitigation*:**

- Use only fully charged batteries when initiating a flight.
- Condition batteries and test prior to launch.
- Monitor the battery status throughout the flight.
- UAS Pilot will return to the launch platform with at least 20% battery capacity.
- Properly dispose of any batteries that show swelling.

Risk Assessment following mitigation: II/B Low Risk

Risk: Loss of UAS platform - inadvertent or directed ditching:

Risk assessment prior to mitigation: III./ B Low Risk

***Mitigation*:**

- Personnel shall not enter the water (*i.e.*, take no additional risks) to recover the UAS.
- Use of less expensive platforms.
- Have backup UAS platforms to complete the mission as appropriate.
- Only experienced, FAA certified Part 107 Remote Pilots familiar with over-water flights and the overall large whale entanglement response mission, pilot UAS platforms.
- Use approved, air-worthy UAS platforms.

- Use smaller UAS platforms.

  Risk Assessment following mitigation: II/A Minimal Risk

Risk: Battery fires:

Risk assessment prior to mitigation: III./ C Moderate Risk

***Mitigation*:**

- VTOL operators will be familiar with batteries' condition and follow the manufacturer's recommendations.
- All personnel associated with UAS operations will be aware of response protocol should there be a battery fire.
- Only carry batteries needed for mission.
- Use only appropriate charging systems with monitoring safeguards.
- Have readily available fire suppression bags for LiPo batteries. LiPo fire can be suppressed and contained with water.
- Personnel shall be kept well clear of any smoke or fumes from the fire.
- Any battery that shows signs of damage or "puffiness" will be fully discharged in salt water and then disposed of.
- When not in use, batteries will be contained and charged in fire-resistant LiPo bags, and stored in a hard-sided container.
- Ensure Class D (or ABC Co2 or dry chemical) fire extinguishers are onboard the vessel and ready for use.

  Risk Assessment following mitigation: II/B Low Risk

○ 6.11 Intervention Criteria/Decision Matrix (Go/No Go)

Table 11. UAS Flight Risk Assessment Coding under Five Steps of Assessment

Step 1. Identify Risk Factors			Step 2. Assess Hazards (who/ what?)	Step 3. Evaluate Risk and Mitigate		Step 4. Record and Implement	Step 5. Monitor and Review
Response Categories	Hazards/ Risks	Causes	Initial RAC	Develop Controls	Residu al RAC	How to Implement	How to Monitor
Flight phase, Launch and Recovery phase	Injury caused by propellers/ lacerations	Mishandling and impact from VTOL	III/C = Moderate Risk	Only allow flight team in vicinity of launch/recovery. PPE including safety gloves, glasses, and helmet	II/B = Low Risk	Make sure safety procedures implemented and complete	PIC and IC will ensure compliance
Flight phase, Launch and Recovery phase	Impact injuries from UAS with personnel	Loss of propulsion, improper control inputs	III/ D = High Risk	Alert personnel in vicinity of launch/recovery ops.	II/ C = Low Risk	Ensure that only essential crew will be present at launch or landing location.	PIC and IC will ensure compliance
During flight	Impact injuries from UAS with whale	Loss of propulsion, improper control inputs	III/ B = Low Risk	UAS should be at least 10 meters (30 feet) from the whale at all times.	II/ A = Minim al Risk	Only experienced, FAA certified pilots used	PIC and IC will ensure compliance
During flight	Impact with other vessels and other manmade structures	Loss of situational awareness of surroundings	III/C = Moderate Risk	Lookout maintained for vehicles. Terminate flight if vehicle CPA < 200 m.	II/B = Low Risk	VO will alert PIC if surface vessels are near.	PIC and IC will ensure compliance .

During flight	Impact with aerial objects	VO not alert/ multi-tasking.	III/C = Moderate Risk	Vigilant watch will be maintained, ops will not exceed 400 feet. If non-participating aircraft detected, flight ops will be terminated.	II/ A = Minimal Risk	VO will alert PIC if aircraft are near. PIC will maintain good comms with EO.	PIC and IC will ensure compliance.
During flight	Loss of control of UAS platform	PIC lacks experience, airworthiness compromised	III/C = Moderate Risk	VTOL programmed to return home after loss of link. After abnormal operations detected, PIC will initiate "come home" command.	II/ B = Low Risk	VO will alert PIC to any abnormal operations. Operations conducted in remote area.	PIC and IC will ensure compliance
During flight	Loss of propulsion of UAS platform	Battery voltage not monitored. Poor battery health.	III/C = Moderate Risk	PIC maintains proper battery health and continuously monitors batteries.	II/ B = Low Risk	PIC returns UAS to vessel at prescribed time; observes battery status.	PIC and IC will ensure compliance
During flight	Loss of UAS platform - inadvertent or directed ditching	Loss of control, power.	III/B = Low Risk	No personnel will enter water.	II/ A = Minimal Risk	Acceptable because of low costs.	PIC and IC will ensure compliance
Flight phase, Launch and Recovery phase, other phases	Battery fires	Poor battery health or condition. Improper storage.	III/C = Moderate Risk	Water and Dry Chem extinguisher available. Manufacturer's recommendations will be followed	II/B = Low Risk	PIC will ensure proper extinguishers Safety Guidelines available in User Manual	PIC and IC will ensure compliance

Hazard Severity:

Category A – Negligible: The hazard presents little to no threat to personnel, animal, equipment, vessels, and environment (*e.g.*, minor sunburn, minor chafe/rope burn; additional chafe wounds to animal).

Category B – Minor: The hazard may cause minor injury/impact to personnel and animal, minor damage to equipment and/or vessels that is easily repaired, minor impact to environment (*e.g.*, superficial cut, twisted ankle, snapped utility blade; superficial wounds to animal due to kegging).

Category C – Moderate: The hazard may cause moderate injury to personnel and animal, moderate damage to equipment and vessels, and moderate impact to environment (*e.g*., deeper cut, but no threat to function of body, loss of gear that can be replaced with minimal cost and effort; deeper dermal laceration wounds due to kegging).

Category D – Major: The hazard may cause major injuries to personnel and animal, loss of expensive equipment and/or major damage to vessel, and/or major impact to environment (*e.g.*, deep cut or impact to head requiring professional medical attention, loss of equipment compromising safety/mission, high cost and effort of replacement, impact to animal possibly life threatening).

Category E – Catastrophic: The hazard poses a life-threatening threat to personnel and animal, loss or complete destruction of equipment and/or vessels, impact to environment is extreme (*e.g.*, loss of life – personnel and/or animal, another animal struck and killed enroute to respond, vessel stove in and sunk, major oil slick).

Likelihood:

Category I. – Very unlikely: Not likely to occur at all or very unlikely over broad expanse of time.

Category II. – Unlikely: Not likely to occur over a broad expanse of time.

Category III. – Possible: Might occur in time over duration of response lifespan (time person active in response, lifespan of equipment).

Category IV. – Likely: Expected to occur several times to personnel, animal or equipment over the response lifespan (*i.e.*, duration of multiple efforts).

Category V. – Very likely: High probability of occurring frequently or within a short period of time.

Table 12. Large Whale Entanglement Response Risk Matrix

Likelihood / Severity	A Negligible	B Minor	C Moderate	D Major	E Catastrophic
V. Very likely	Low Risk	Moderate Risk	High Risk	Extreme Risk	Extreme Risk
IV. Likely	Minimal Risk	Low Risk	Moderate Risk	High Risk	Extreme Risk
III. Possible	Minimal Risk	Low Risk	Moderate Risk	High Risk	High Risk
II. Unlikely	Minimal Risk	Low Risk	Low Risk	Moderate Risk	High Risk
I. Very unlikely	Minimal Risk	Minimal Risk	Low Risk	Moderate Risk	Moderate Risk

7. After-Action Mitigation

Again, the primary goal of large whale entanglement response is gaining information towards reducing the overall threat of large whale entanglements - be it to the animal, the industries whose gear may be involved, the public that may try and free a whale, and the responders that are authorized to do so. As such and in many ways, this is the most important section. However, the data collected covers a broad range of topics and thus only some examples are provided here.

First, there is information collected towards reducing operational risk. These are typically represented by information in debrief, permit, and any incident reports. A **debrief or after-action report** is a thorough accounting of the response considering the review and assessment of procedures, personnel and their roles, equipment, the whale and conditions. It is a structured process that also evaluates the pre-mission risk assessments and outcomes of decision matrices, as well as, the success and failures of the mission. The information contained in debrief reports (or meetings/calls) provides for an assessment of performance that can further mitigate risks in the future. An example of a debrief report is provided in Appendix W. Debriefings (*e.g.*, reports or calls) typically include the following elements:

- Active participation of all involved
- A focus on lessons learned,
- A thorough review of events
- Recommendation and directives on remedying deficiencies, addressing needs, and making improvements (*e.g.*, additional training, a new piece of equipment)

An **incident report** is a tool that documents any event that may have caused injuries or otherwise harm to responders and/or the animals, or damage or loss of equipment, vessels, or other resources. An incident report can be used in the assessment and investigation of a response effort. It includes the perceived causal factors and corrective measures to reduce the risk factors under similar efforts in the future. Incident reports are required of fisherman in order to record any unintentional takes, and under the permit for response efforts. Under the MMHSRP permit, incident reports must be submitted within two weeks of a serious injury and mortality event or in case of exceeding authorized takes. Incident reports must contain a complete description of the incident and identification of steps that will be taken to mitigate that risk factor(s) or resolve exceeding take limits in the future.

Permit reports are required annually and cover everything from the number of animals taken under the response, other impacts to animals (*e.g.*, reactions to procedures), any follow-up monitoring, information on any incidents that occurred, and any additional or improved mitigation measures. In many ways, the permit report is both a debrief and incident report representing all permitted response efforts undertaken for the period and under NMFS MMHSRP permit.

Risk assessment workshops and meetings are another example of disseminating and evaluating the information gained towards reducing operational risk associated with authorized large whale entanglement response efforts. In 2018, NMFS OPR hosted a meeting of the Regional Network Coordinators and higher-level (*i.e.*, designated) responders under the MMHSRP Large Whale Entanglement Response Network. The focus of the two-day meeting was to assess past response efforts for risk factors, to review efforts in which there were injuries (albeit minor) or in which serious injury or mortalities could have occurred. Through these assessments and evaluations, risk factors were discussed that should be incorporated in future risk assessment and operational decision matrices to further reduce overall risk associated with large whale entanglement response efforts. Some of the common risk factors identified from the meeting were:

- Pressure (*e.g.*, presence of media, perception on need to save the animal)
- Fatigue (*i.e.*, physical and mental)
- Experience and training (i.e., lack of trained and experienced personnel was identified as a significant risk factor)
- Equipment (*e.g.*, having appropriate and functioning tools and safety gear)
- Animal behavior (*e.g.*, animals exhibiting sudden and unexpected changes in behavior)

Similar meetings have incorporated safety and risk reductions into their agendas. A workshop of the Global Whale Entanglement Response Network (GWERN) hosted by the IWC immediately after the NMFS Risk Assessment meeting, reviewed other close-calls and accidents from other countries, new tools and procedures, and any implications towards large whale entanglement response risk reduction.

On July 10, 2017, a trained and experienced large whale entanglement responder was killed during disentanglement operations on a North Atlantic right whale in the Gulf of St. Lawrence, Canada. As a result, all large whale entanglement response activities conducted in the United States under the MMHSRP's permit were temporarily suspended while NMFS, coordinating with Canadian officials, convened a thorough review of the incident. As a result, NMFS drafted recommendations for a phased re-initiation of large whale entanglement response operations, and highlighted the following procedural and safety considerations:

- Emphasizing the case-by-case differences of large whale entanglement response
- The different risk levels of various tools (*e.g.*, fixed knife vs flying knife)
- The avoidance of the "Danger zone" (*i.e.*, proximity to the whale, particularly near flukes)
- The emphasis of qualifications for the helm position as far as experience and training in entanglement situations
- Standing down at any point in the operation is a viable option

Second, there is the continued garnering of information on entanglement rates, their impacts on the animals, the gear types and parts of gear involved, the spatial and temporal parameters of the entanglement, and the socio-economic impacts, such as loss of fishing gear and regulations that might impact fisheries (*i.e.*, answer the questions of who, where, when, why and how?). The data will help inform managers, scientists and conservationists of the level of and effects of entanglement on large whales, and provide monitoring on the effectiveness of any mitigation measures.

This dataset is an important part of and aligns with NMFS' National Bycatch Reduction Strategy objectives of:

- **Monitor and estimate** the rates of bycatch and bycatch mortality in fisheries to understand the level of impact and the nature of the interaction.
- **Conduct research** to improve our bycatch estimates, understand the impacts of bycatch on species and community dynamics, and develop solutions to reduce bycatch and bycatch mortality.
- **Conserve and manage** fisheries and protected species by implementing measures to reduce bycatch and its adverse impacts.
- **Enforce** fishery management measures, including those aimed at reducing bycatch and bycatch mortality, to ensure compliance with applicable laws.
- **Communicate** to develop a common understanding of bycatch, to share information on our efforts to address bycatch, and to identify areas where we can improve.

  * From NMFS National Bycatch Reduction Strategy Objectives:
  https://www.fisheries.noaa.gov/international/bycatch/national-bycatch-reduction-strategy

These strategies are very similar to those listed in the five steps of operational risk assessment and reduction outlined in Section 2.12 - Identify risk factors, who and what can be harmed, evaluate the risk and mitigate, record the findings and implement risk reduction, and monitor and review. This makes sense as the goal in both is to reduce the overall threat of large whale entanglement. Here are some examples of how the information gained from authorized response and monitoring efforts have been used to better understand and mitigate large whale entanglement threat:

<u>Gear Investigation</u> - One of the most valuable pieces of data is identifying the gear that was entangling a whale as it provides information on the source of the threat. Knowing the identity may provide information on whether it was being actively-fished or ALDFG (Abandoned, Lost, or otherwise Discarded Fishing Gear); the gear type, part and configuration; where, when and how set; and how the whale might have become entangled and why (*e.g.*, due to movement patterns and distribution resulting in overlap of whales and gear). Since 1998, NMFS, along with others, have actively pursued the investigation of gear found on and recovered from entangled whales.

Serious Injury Determinations - Under the MMPA, NMFS is mandated to provide statistically reliable estimates of incidental mortality and serious injury of marine mammals, including the large whales, taken during commercial fishing operations and other human-caused entanglements (Section 107). This assessment of large whale entanglements in part is used to categorize commercial fisheries on their level of impact to marine mammals (Section 118). In 2007, a NMFS-convened workshop established uniform and consistent guidelines based on criteria for known outcome cases (Anderson et al., 2008; NMFS, 2012). The resulting assessments are incorporated into Stock Assessment Reports (SARs), and marine mammal conservation management regimes (*e.g.*, Take Reduction Teams [TRTs], Take Reduction Plans [TRPs], ship speed regulations).

Bycatch Reduction and Fishermen Workshops - The availability and dissemination of information allows managers, scientists, conservationists, and the fishing industry to better understand the threat and work together to develop ideas to reduce large whale entanglements and their broad-based impacts. While the fishing industry may be part of the problem, they are also part of the solution. A Fishermen's Workshop in 2006 in Petersburg, AK, resulted in one of the first examples of fishermen providing Best Practices to other fishermen on how to reduce whale entanglements in fishing gear. More recently, in 2016, the California Dungeness Crab Fishing Gear Working Group produced a Best Practices Guide to reduce whale entanglements caused by Dungeness Crab fishing gear.

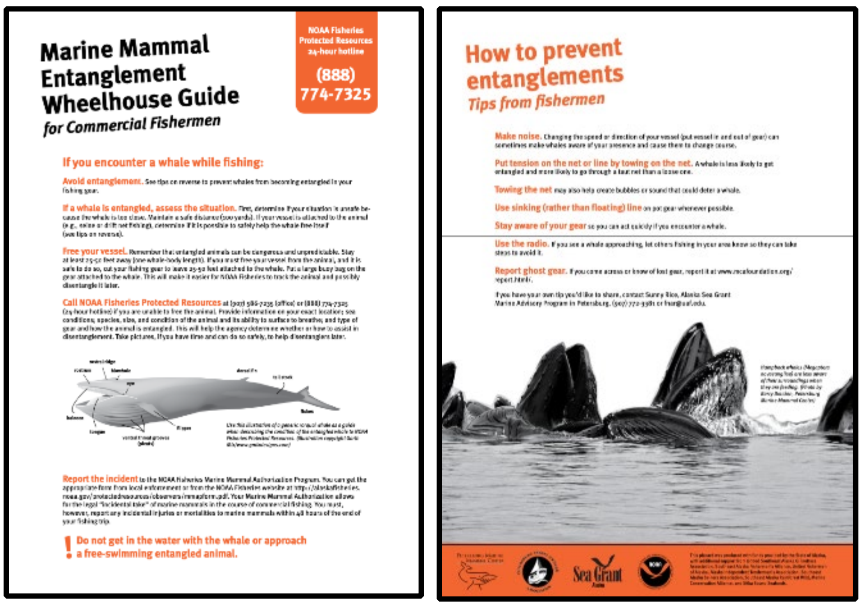


Figure 16: Fishermen's Wheelhouse guide and tips on reducing large whale entanglements

Take Reduction Teams - Under the MMPA, Take Reduction Teams (TRT), may be formed to limit the impact of Category I and II fisheries on strategic marine mammal stocks. The teams are composed of fishing industry representatives, state and federal agencies, and scientific and conservation organizations, which meet on a regular basis to suggest mitigation measures for NMFS to consider. Analyzed recovered gear from disentanglement operations is frequently used in TRTs as it offers insight into particular fisheries that may be a greater threat and if mitigation measures are working appropriately.

8. Funding

Funding of NMFS MMHSRP large whale entanglement response is provided by a variety of sources. The primary one is from NMFS itself directly and through The John H. Prescott Marine Mammal Rescue Assistance Grant Program, which provides funding for eligible Network members and collaborators through an annual competitive grant process (subject to annual appropriation from Congress). These grants support the rescue and rehabilitation of stranded marine mammals (including large whale entanglement response), data collection from living or dead marine mammals for health research, and resource operation costs. Funds are also obtained from other federal and state agencies, through allocations, grants and private donations from NGOs, and private individuals. In addition, a great deal of in-kind support is provided by state and federal agency partners, the on-water community (tour and fishing industry), network organizations and the responders themselves.

9. Conclusions

There have been many advances in large whale entanglement response over the years. For instance, tools have become refined and engineered to precise specifications, and developed with specific goals of cutting a particular gear type, accessing gear on a certain part of the body, and different means of deployment (*e.g.*, pole-deployed, thrown, shot from a crossbow). Tools and techniques have advanced, reducing responders' time in proximity of the animal (longer and lighter poles, use of drones, POV cameras), minimizing constraint (lower drag telemetry buoys, less kegging) and increasing the accessibility of the animal over time (sedation, telemetry for remote tracking), all of which may reduce risk. The network response to entangled large whales has become more structured through the use of ICS, and the continued oversight, support, and risk mitigation of NMFS MMHSRP. As a result, along with the participation and support of federal and state agencies, NGOs, members of the on-water community, and others, a safer and more effective network response to large whales has grown in the U.S. This growth has contributed to the establishment and development of similar authorized large whale entanglement response network efforts in other countries from around the globe.

However, even with these advances, large whale entanglement response remains a challenging and potentially dangerous undertaking. Again, within the greater global effort, people have been killed. We must remember Joe Howlett, who was killed during a response to an entangled North Atlantic right whale in 2017, both as a prime example of a dedicated and experienced responder, but also as a reminder to all that approaching these animals, whether to cut them free or gain information, poses risks. We need to maintain a balanced approach to continue reducing the risks posed to animals, and especially responders in our large whale entanglement response efforts.

The growth of network response efforts and the efforts of responders like Joe Howlett and many others, have contributed to our ultimate goal of garnering information to better understand the threat and applying it towards prevention. The network has emphasized this goal for decades – it is why we refer to the effort as “entanglement response” in order to emphasize the broader goals. While progress has been made, much more needs to be done. Managers, scientists, network responders, fishermen, and others, need to not only continue to work together, but increase that collaboration. By working together, we can mitigate large whale entanglements at the source and thereby reduce the risks and their impacts for animals and responders alike. Prevention is the key to solving what is a global problem affecting many species.

10. Final Thoughts

The disentanglement of a large whale is a challenging, complex, and potentially dangerous undertaking. It involves multiple assets, concurrent actions, multiple teams with different roles, an unforgiving environment - the ocean, and a multi-ton entangled animal that almost certainly does not realize you are trying to help it. The operation requires preparation, planning, the adherence to protocols based on the past and present assessment of risk factors and their mitigation, and collaboration. The goal of risk assessment and mitigation for humans is to entirely mitigate (*i.e.*, prevent) any risk factors and their impacts, and at the same time minimize the risk factors and impacts for the animals. As such, in balancing our risks, human safety comes first. There is no obligation to respond. However, if one steps up to respond (*i.e.*, under the MMHSRP’s authorization), there are obligations (*e.g.*, criteria) that need to be met in order to <u>safely</u> respond. The entire effort surrounding large whale entanglement response is about risk reduction.

11. Acknowledgements

These Best Practices have been compiled from the cumulative experience of many large whale entanglement responders, managers, and researchers from around the globe. It also benefits from similar and previously drafted large whale entanglement response Best Practices, Risk Assessments, and Field Operation Guides, including the following (alphabetically):

- Campobello Whale Rescue Team Whale Rescue Guidelines DRAFT (Canadian Whale Institute, 2018).
- Entanglement of cetaceans in pot/trap lines and set nets and a review of potential mitigation methods (Laverick et al., 2017).
- Fisheries and Oceans Canada Conservation and Protection Directorate Marine Animal Incident Response Standard Operating Procedures.
- Fisheries and Oceans Canada Marine Mammal Response Program Overview of Disentanglement Procedures and Safety Considerations (Cottrell, 2014).
- Guidelines for the safe and humane handling and release of bycaught small cetaceans from fishing gear - DRAFT (Hamer, 2019).
- Investigating Techniques, Procedures, Protocols, Technology and Tools used in Disentanglement of Large Whales in Fishing gear on the East Coast of North America (Coughran, 2004).
- Large Whale Disentanglement Protocols and Training Program for the Newfoundland and Labrador Region DRAFT (Ledwell & Huntington, 2018).
- Large Whale Entanglement Response Field Operations Guide (Folkens, pers. comms.)
- Large Whale Disentanglement Protocol (RABEN). 2016. CONANP, SEMARNAT, México 36 pp.
- Principles and Guidelines for Large Whale Entanglement Response Efforts (International Whaling Commission, 2011).

- Risk Assessment for Disentanglement Activities and associated Efforts around the Main Hawaiian Islands DRAFT (Lyman & Mattila, 2010).
- South African Whale Disentanglement Network Operational Protocols (SAWDN, 2017).

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13. Appendices

○ Appendix A – Level A and Human Interaction Form

Level A forms, Human Interaction forms, and a complete and detailed examiners guide can be found online here. Level A. Form – Page 1.

MARINE MAMMAL STRANDING REPORT - LEVEL A DATA

FIELD #: ____ NMFS REGIONAL #: ____ (NMFS USE) NATIONAL DATABASE#: ____ (NMFS USE)

COMMON NAME: ____ GENUS: ____ SPECIES: ____

EXAMINER Name: ____ Affiliation: ____

Address: ____ Phone: ____

Stranding Agreement or Authority: ____

CONFIDENCE CODE (Check ONE): ☐ Unconfirmed - Low ☐ Confirmed - Minimum ☐ Confirmed - Medium ☐ Confirmed – High

INITIAL OBSERVATION ☐ Same information for Level A Examination

DATE: Year ____ Month: ____ Day: ____

First Observed: ☐ Beach/Land/Ice ☐ Floating ☐ Swimming

LOCATION: State: ____ County: ____ City: ____

Body of Water: ____

Locality Details: ____

Lat (DD): ____ N

Long (DD): ____ W

☐ Actual ☐ Estimated

How Determined: (check ONE)

☐ GPS ☐ Map ☐ Internet/Software ☐ Other ____

CONDITION AT INITIAL OBSERVATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh Dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate Decomposition ☐ 6. Condition Unknown

LEVEL A EXAMINATION Examined? ☐ YES ☐ NO

DATE: Year ____ Month: ____ Day: ____

First Examined: ☐ Beach/Land/Ice ☐ Floating ☐ Swimming

LOCATION: State: ____ County: ____ City: ____

Body of Water: ____

Locality Details: ____

Lat (DD): ____ N

Long (DD): ____ W

☐ Actual ☐ Estimated

How Determined: (check ONE)

☐ GPS ☐ Map ☐ Internet/Software ☐ Other ____

CONDITION AT EXAMINATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh Dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate Decomposition

LIVE ANIMAL INFORMATION

INITIAL LIVE ANIMAL DISPOSITION (Check one or more)

☐ 1. Left at Site ☐ 5. Died at Site

☐ 2. Immediate Release at Site ☐ 6. Died During Transport

☐ 3. Relocated and Released ☐ 7. Euthanized

4. Disentangled ☐ 8. Transferred to Rehabilitation:

☐ a. Partially Date: Year: ____ Month: ____ Day: ____

☐ b. Completely Facility: ____

☐ 9. Other: ____

CONDITION/DETERMINATION (Check one or more)

☐ 1. Sick 7. Location Hazardous

☐ 2. Injured ☐ a. To animal

☐ 3. Out of Habitat ☐ b. To public

☐ 4. Deemed Releasable ☐ 8. Unknown/CBD

☐ 5. Abandoned/Orphaned ☐ 9. No Rehabilitation Options

☐ 6. Inaccessible ☐ 10. Other: ____

DEAD ANIMAL INFORMATION

CARCASS STATUS (Check one or more)

☐ 1. Frozen for Later Examination/Necropsy Pending

☐ 2. Left at Site ☐ 5. Landfill ☐ 8. Towed: Lat ____ Long ____

☐ 3. Buried ☐ 6. Incinerated ☐ 9. Sunk: Lat ____ Long ____

☐ 4. Rendered ☐ 7. Composted ☐ 10. Unknown/Other ____

NECROPSIED ☐ YES ☐ NO ☐ Limited ☐ Complete

☐ Carcass Fresh ☐ Carcass Frozen/Thawed

CARCASS CODE AT NECROPSY ☐ Code 2 ☐ Code 3 ☐ Code 4

NECROPSIED BY: ____

Date: Year: ____ Month: ____ Day: ____

PHOTOS/VIDEOS TAKEN: ☐ YES ☐ NO

Photo/Video Disposition: ____

MORPHOLOGICAL INFORMATION

SEX (Check ONE) ESTIMATED AGE CLASS (Check ONE)

☐ 1. Male ☐ 1. Adult ☐ 4. Pup/Calf

☐ 2. Female ☐ 2. Subadult ☐ 5. Unknown

☐ 3. Unknown ☐ 3. Yearling

☐ Whole Animal ☐ Partial Animal

Straight Length: ____ ☐ cm ☐ in

☐ Actual ☐ Estimated ☐ Not Measured

Weight: ____ ☐ kg ☐ lb

☐ Actual ☐ Estimated ☐ Not Weighed

SAMPLES COLLECTED (Check one or more)

☐ 1. Histology ☐ 2. Other Diagnostics ☐ 3. Life History

☐ 4. Skeletal ☐ 5. Other ____

PARTS TRACKING (Check one or more)

☐ 1. Scientific Collection ☐ 2. Educational Collection

☐ 3. Other: ____

OCCURRENCE DETAILS ☐ Restrand GE# ____ (NMFS Use)

Group Event: ☐ YES ☐ NO

If Yes, Type: ☐ Cow/Calf Pair ☐ Mass Stranding ☐ UME # Animals: ____ ☐ Actual ☐ Estimated

Was the Marine Mammal Human Interaction Report completed? ☐ YES ☐ NO

Findings of Human Interaction: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

If YES evidence of: 1. Vessel Interaction ☐ YES ☐ NO ☐ CBD

2. Shot ☐ YES ☐ NO ☐ CBD

3. Fishery Interaction ☐ YES ☐ NO ☐ CBD

4. Other Human Interaction: ____

If YES, what was the likelihood that the human interaction contributed to the stranding event?

☐ Uncertain (CBD) ☐ Improbable ☐ Suspect ☐ Probable

Gear/HI Items Collected? ☐ YES ☐ NO Gear Disposition: ____

Other Findings Upon Level A: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

If Yes, Choose one or more: ☐ 1. Illness ☐ 2. Injury ☐ 3. Pregnant ☐ 4. Other: ____

How Determined (Check one or more): ☐ External Exam ☐ Internal Exam ☐ Necropsy

☐ Other: ____

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Level A. Form – Page 2.

TAG DATA

Tags Were:

		ID#	Color	Type	Placement* (Circle ONE)	Applied	Present	Removed
Present at Time of Stranding (Pre-existing):	☐ YES ☐ NO				D DF L R LF LR RF RR	☐	☐	☐
Applied during Stranding Response/Release:	☐ YES ☐ NO							
Applied during Rehabilitation/Release:	☐ YES ☐ NO				D DF L R LF LR RF RR	☐	☐	☐
Absent but Suspect Prior Tag:	☐ YES ☐ NO							
					D DF L R LF LR RF RR	☐	☐	☐

* D= Dorsal; DF= Dorsal Fin; L= Left Lateral Body R= Right Lateral Body LF= Left Front; LR= Left Rear; RF= Right Front; RR= Right Rear

ADDITIONAL IDENTIFIER: ____________ (If animal is restranded, please indicate any previous field numbers here)

ADDITIONAL REMARKS:

DISCLAIMER

THESE DATA SHOULD NOT BE USED OUT OF CONTEXT OR WITHOUT VERIFICATION. THIS SHOULD BE STRICTLY ENFORCED WHEN REPORTING SIGNS OF HUMAN INTERACTION DATA.

DATA ACCESS FOR LEVEL A DATA

UPON WRITTEN REQUEST, CERTAIN FIELDS OF THE LEVEL A DATA SHEET WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR CREDIT THE STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE. THE NATIONAL MARINE FISHERIES SERVICE WILL NOTIFY THE CONTRIBUTING STRANDING NETWORK MEMBERS THAT THESE DATA HAVE BEEN REQUESTED AND THE INTENT OF USE. ALL OTHER DATA WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR OBTAIN PERMISSION FROM THE CONTRIBUTING STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE.

PAPERWORK REDUCTION ACT INFORMATION

PUBLIC REPORTING BURDEN FOR THE COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 30 MINUTES PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTIONS, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THE COLLECTION INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THE BURDEN TO: CHIEF, MARINE MAMMAL AND SEA TURTLE CONSERVATION DIVISION, OFFICE OF PROTECTED RESOURCES, NOAA FISHERIES, 1315 EAST-WEST HIGHWAY, SILVER SPRING, MARYLAND 20910. NOT WITHSTANDING ANY OTHER PROVISION OF THE LAW, NO PERSON IS REQUIRED TO RESPOND, NOR SHALL ANY PERSON BE SUBJECTED TO A PENALTY FOR FAILURE TO COMPLY WITH, A COLLECTION OF INFORMATION SUBJECT TO THE REQUIREMENTS OF THE PAPERWORK REDUCTION ACT, UNLESS THE COLLECTION OF INFORMATION DISPLAYS A CURRENTLY VALID OFFICE OF MANAGEMENT AND BUDGET (OMB) CONTROL NUMBER.

NOAA Form 89-864; OMB Control No.0648-0178; Expiration Date 03/31/2020

Human Interaction Form – Page 1.

OMB Control No. 0648-0178; Expiration Date 3/31/2020

MARINE MAMMAL HUMAN INTERACTION REPORT

Exam Information *(fill in or circle most appropriate)*

1 Field #: ______ Species: ______
2 Examiner: ______ Recorder: ______
3 Date of exam: ______ Condition code (at exam): 1 2 3 CBD
4 Preservation: alive fresh frozen frozen/thawed Body condition: emaciated not emaciated CBD
5 Documentation: digital print slide video Image disposition: ______
6 Integument : normal abnormal decomposed % Skin missing: <10% 10-25% 25-50% >50%
7 Explanation of terms:
YES = I have examined the area and/or found signs of this pathology, natural marking, or human interaction
NO = I have examined the area and/or did not find signs of this pathology, natural marking, or human interaction
CBD = I have examined the area and could not determine whether there were signs of human interaction (*i.e.* the part was missing, degraded, or signs were ambiguous)
NE = I did not examine the area
NA = this animal doesn't normally have that part (*i.e.* seals have no dorsal, dolphins have no rear flippers)

	WHOLE BODY EXAM	YES	NO	CBD	NE	NA	Image taken
8	External pathology *(pox, tattoo lesion, abscess, fungal patches)*						
9	Natural markings *(scars, tooth rakes, unusual pigmentation)*						
10	Appendage(s) removed / Mutilation *(with instrument)*						
11	Pelt removed / Mutilation *(with instrument)*						
12	Body sliced / Mutilation *(with instrument)*						
13	Gear / Debris present on animal *(including tags)*						
14	Gear / Debris retained *(name & contact info in Comments)*						
15	HI lesions *(fishery, gunshot, propeller, healed HI scar, brand)*						

16 Predation / scavenger damage *(circle all anatomical areas where damage hinders evaluation; numbers coincide with anatomical areas below)*: 17 18 19 20 21 22 23 24 25 26 27 28 29 NONE

FILL IN TABLE FOR **ALL POSSIBLE FINDINGS OF HI**
Do not use for natural markings/pathology.

						Type of Lesion					Origin of Lesion: Gear- Line			Gear/Debris			Other			
	DETAILED EXAM OF ANATOMICAL AREAS	YES	NO	CBD	NE/NA	Impression/ Laceration	Penetrating wound	Healed HI scar	Abrasion	Other / CBD	Twine / line	Net	MO/MU/CBD*	Hook	Packing Band	Other / CBD	Propeller	Gunshot	Other / CBD	Image taken?
17	Rostrum/snout																			
18	Mandible																			
19	Head and/or neck																			
20	L Front appendage																			
21	R Front appendage																			
22	L Body																			
23	R Body																			
24	Dorsum/dorsal fin																			
25	Ventrum																			
26	Peduncle																			
27	L Rear appendage																			
28	R Rear appendage																			
29	Flukes/tail																			

* If Gear-Line is the lesion origin, mark the MO/MU/CBD column: "MO" for monofilament, "MU" for multifilament, and "CBD" if the type of line cannot be determined.

Human Interaction Form – Page 2.

Field #:

30–38	INTERNAL EXAM Date	YES	NO	Partial	CBD	Image taken	Detailed Info (circle all that apply)
30	Internal exam conducted						Details in Comments section -use line number
31	Bruising/blunt trauma						Details in Comments section -use line number
32	Skeleton examined						Details in Comments section -use line number
33	Broken bones present						Associated tissue reaction: YES NO CBD
34	Mouth/GI tract examined (circle contents)						intact prey partially digested hard parts only debris/gear empty other
35	Lungs/bronchi examined						Details in Comments section -use line number
36	Lung/bronchi contents						froth fluid air (color:)
37	Bullet/projectile found						found using: CT X-ray dissection (collected? Y N)
38	Other lesions noted						Details in Comments section -use line number

39 **Comments** *(note line number from left margin before each comment)*:

40 **Findings of Human Interaction:** ☐YES ☐NO ☐CBD (Exam Type: external__ internal__ both __)
(transfer to Level A Datasheet)

41 Type of HI: (provide details in comments)

☐ Entanglement (gear__ debris__ CBD__) ☐ Vessel trauma (sharp__ blunt__ both__)
☐ Hooking (recreational__ commercial__ CBD__) ☐ Gunshot ☐ Mutilation
☐ Ingestion (gear__ debris__ CBD__) ☐ Harassment ☐CBD/Other________

42 **Stranding Event History/Circumstances:**

43 **INITIAL HUMAN INTERACTION EVALUATION:** If you marked YES above (line 40) evaluate the external exam, necropsy, carcass condition and circumstances surrounding the stranding event to answer the question below. *Remember to be conservative in your subjective evaluation.* **What is the likelihood that the finding of human interaction (line 40), contributed to the stranding event?**

0: Uncertain (CBD) 1: Improbable 2: Suspect 3: Probable

44 **Justification:**

Final human interaction evaluation requires additional data from level B and C analyses as well as review by experts (e.g. a veterinary pathologist)

- ## Appendix B – NATIONAL MARINE FISHERIES SERVICE (NMFS) CRITERIA FOR DISENTANGLEMENT ROLES AND TRAINING LEVELS

Levels of Participation in the Disentanglement Network – Definitions

Roles	Levels
First Responder	1-5
Primary First Responders	3-5
Primary Disentanglers	4-5

First Responder is a general term that is used to describe anyone in the Network with any level of training who may respond to an entanglement report under Network protocols and authorization. At a minimum they will voluntarily attempt to standby with an entangled whale and, depending on training, experience, authorization and equipment available, may also assess and perhaps tag the whale. Individuals with higher Network ratings (Levels 3-5) may act as **Primary First Responders** in local areas. Primary First Responders direct efforts locally and, under certain conditions and authorization, may attempt disentanglements during first response. These individuals have rapid access to vessels and specialized equipment. Additionally, Primary First Responders are on call full- time or at least during those times when there is a high likelihood of an entanglement report in their area of responsibility.

A First Responder's anticipated range of tasks is generally dependent on their classification in the Network. Classifications to various levels are determined on an individual basis and are based on a number of factors including, but not limited to the following:

- Preexisting experience and skills
- Willingness and commitment to build experience and improve skills
- Training
- Opportunity and available resources
- Location
- Commitment to being “on-call”
- Commitment to respond as needed

Primary Disentanglers are individuals who can perform all of the responsibilities of a first responder, but who also meet the criteria used by NMFS for selecting individuals who may undertake the very dangerous activity of disentangling (i.e. attaching to, stopping and cutting a whale free). Primary Disentanglers must have the experience, training, support and proper equipment at the time of the event to conduct a full disentanglement with a high likelihood of success. Primary Disentanglers are those rated at Level 4-5 in the Disentanglement Network. A summary of the various levels of certification follows.

DISENTANGLEMENT NETWORK CERTIFICATION

LEVEL 1

Targeted Individuals: Professional mariners (*i.e.* fishermen, naturalists, Marine Patrol Officers) Boating experience and/or experience around whales is highly suggested (*i.e.* professional fishing, field biology, marine law enforcement, whale watching, etc.)

Responsibilities

<u>Level 1 activities</u>: report, standby, and assess (within experience)

- Rapidly alert Disentanglement Network of first-hand and/or second-hand knowledge of local entanglements
- Depending on experience, stand by an entangled whale until backup arrives, and/or
- Communicate with crew on the vessel that is directly standing by the entangled whale and offer to replace the stand by vessel until additional backup or the response team arrives (if needed and within experience)

Criteria for certification

- Completed Level 1 classroom training, or
- Viewed Provincetown Center for Coastal Studies (PCCS) Training Video and demonstrated equivalent knowledge and experience (submit resume)

LEVEL 2

Targeted Individuals: Professional mariners (*i.e.* fishermen, naturalists, Marine Patrol Officers). There is a higher expectation of commitment and participation from Level 2 responders.

Responsibilities

<u>Level 2 activities</u>: report, stand by, and assess at a higher level (within experience)

- Provide a thorough assessment of the nature of the entanglement and the species, condition and behavior of the whale
- Provide local knowledge, transportation, and assistance to Primary First Responders, as needed, on a voluntary basis
- Be on call, as available, to assist in planned disentanglement operations on telemetry tagged whales

Criteria for certification

Level 1 certification in addition to the following:

- Completed Level 2 on-water training, or
- Viewed PCCS Training Video and demonstrated equivalent knowledge and experience (submit resume)

LEVEL 3

Targeted Individuals: Whale researchers and naturalists, fishermen, natural resource agency personnel, Marine Patrol Officers.

Responsibilities

<u>Level 3 activities</u>- report, stand by, assess, document and attach a telemetry buoy. Other activities may include:

- Be on call 24 hours and should respond if conditions allow
- Initiate and maintain preparedness with local fishing industry, Coast Guard, and other resources
- Prepare local disentanglement action plan
- Provide entanglement assessment, documentation and recommendations to Primary
- Disentanglers during events
- Attach telemetry equipment to entangling gear if needed and authorized

- May be asked (depending on experience) to disentangle a minor entanglement with potential to adversely affect any whale other than right whales under the supervision/authorization of Level 4 or 5 network members. Authorization and supervision may be given over the phone or radio depending on the circumstances and level of experience.

Criteria for certification

Level 1 and 2 certification and experience in the following elements:

- Large whale species identification and behavior, and the ability to safely follow a free swimming, entangled whale
- Boat handling and safety including basic seamanship, driving, and close approaches to whales
- Line handling and safety including knowledge of knots, handling lines under pressure, and an understanding of how working lines behave
- Follows instructions and response plans

Note: Each candidate will be evaluated for each element and any deficiencies must be supplemented with adequate training and/or experience.

Additionally, all Level 3 responders must have:

- Basic Level 3 training, or
- Advanced Level 3 training - an apprenticeship with PCCS

LEVEL 4

Targeted Individuals: Whale researchers and naturalists, fishermen, natural resource agency personnel, Marine Patrol Officers.

Responsibilities

<u>Level 4 activities</u>-

- Report, stand by, assess, document, attach a telemetry buoy, consult on an action plan and disentangle all large whales except right whales
- Report, stand by, assess, document and attach a telemetry buoy to right whales

- On a case by case basis and after consultation (see commitment to consult under Level 5 below), certain cuts on known entangled right whales may be permitted at level 4 ***if the proposed action is first approved by level 5 Disentanglers and NMFS Please Note:*** Entangled whale behavior varies considerably by species. However, Level 4 Disentanglers should routinely be able to attempt disentanglement of all large whales other than right whales.

Criteria for certification

Basic or Advanced Level 3 Certification and:

- Direct experience in a supervised (by PCCS/Network coordinators or NMFS) large whale disentanglement, documentation of that experience, and a positive evaluation from NMFS using information provided by PCCS/Network Coordinators and any hard documentation (*i.e.* video)
- When possible, commitment to consultation as detailed in Level 5 below

LEVEL 5

Targeted Individuals: Level 4 Responders

Responsibilities

Level 5 activities - report, stand by, assess, document, attach a telemetry buoy, consult on an action plan and disentangle all large whales including right whales.

Please Note: Right whales are aggressive and therefore generally the most difficult whales to disentangle. North Atlantic right whales are among the most critically endangered large whales in the world. Certification at this level is highly selective and specialized.

Criteria for certification

Level 4 certification and:

- Experience w/ right whale behavior and/or includes a person on the team directly involved in the whale disentanglement (in the boat with the whale) that is experienced in right whale behavior
- Documented participation in a right whale disentanglement and/or NMFS/PCCS review

of video of participation in a right whale disentanglement that followed NMFS protocol

- Commitment to Consultation to include: Immediate Consultation: when possible, use satellite/cell phones to bring in additional ideas/experience from other level 5s and level 4s (and vets and behaviorists if appropriate) while on scene with an entangled right whale
- Action Plan Development: For a tagged right whale, consultation required with NMFS, level 5s and 4s, veterinarians, behaviorists, etc.

Rationale for consultation: First assessments and strategies almost invariably change with more discussion or information. Consultation will likely help to increase human safety and critical choices regarding risks to whale health must be made with the best available information.

○ Appendix C – IWC, Principles and Guidelines for Large Whale Entanglement Response Efforts

INTERNATIONAL WHALING COMMISSION

Principles and guidelines for large whale entanglement response efforts

to read this guidance in Spanish or French please use the translate buttons at the top of this page.

DEDICATION

This document is dedicated to the memory of Tom Smith from Kaikoura, New Zealand. A kind and generous man, Tom was a fisherman and conservationist who tragically died during an attempt to disentangle a humpback whale while he was in the water. Particularly as a result of this and other human injuries recorded worldwide, an important motivation for these guidelines and principles is to try to prevent similar tragedies and to honour his family.

DISCLAIMER

While these principles and guidelines have been developed to try to maximise safe and successful operations, disentanglement operations are complex and can be unpredictable; following these guidelines does not necessarily guarantee personal safety, an animal's successful release, or operation in accordance with national rules and regulations (permits and/or letters of authorisation). All responsibility is upon the operator to undertake safe activities under their best judgment. The IWC and the authors of this document are not liable for any actions taken as a result of these guidelines and principles. This is a living document, intended to be dynamic and evolving as new information and experience is gained. It is **not** an instruction manual.

OBJECTIVE

Based on the most recent information, the objective of this document is to provide principles and guidelines for trained persons to safely and effectively respond to reports of entangled live whales at sea. The objective of an entanglement response is to remove all detrimental entangling gear safely from the whale and learn as much from the entanglement as possible to ultimately prevent entanglements from occurring. Actions by well meaning untrained persons can worsen an entanglement, through a lack of subject knowledge and experience.

For example, removing easily accessible trailing gear from entangled whales may leave the most critical components on a whale, making future, organised disentanglements more difficult or even impossible, potentially resulting in severe harm or death to the animal.

Regional entanglement response scenarios and complexities may require different techniques and strategies (see Annex F on capacity building and training).

GOALS OF ENTANGLEMENT RESPONSE

(a) Human safety

(b) Animal welfare

(c) Contribution to the conservation of large whale populations, recognising that prevention is the ultimate goal

(d) Data collection to assist with identifying key fisheries and whale populations and thus better specification of actual entanglement problems within a region to assist with mitigation and prevention.

(e) Awareness of issues at all levels to improve reporting and appropriate measures to address issues (a) to (d)

1. GENERAL SAFETY

(a) **At no time should an individual enter the water**. It is not necessary given the proper disentanglement training, tools and techniques. Over a thousand successful disentanglements have occurred with a boatbased technique without significant human injury, whereas human life has been lost during dive-based disentanglement attempts.

(b) Do not put the whale's rescue above human safety at any time

(c) Only trained and authorised operators should participate in disentanglement activities.

(d) Actions must be thoroughly thought through and planned, with full briefing to all **participants** and **team members**. All **participants** need to be clear on aims, objectives, operational procedure and roles.

(e) Do not secure a line from the whale to the vessel.

(f) In addition to focussing on the disentanglement itself, pay careful attention to the overall environment.

(g) Actions must not be pressured by weather, time of day, onlookers, media, or the perceived need to act.

(h) When in doubt about safety or the success of the operation, stand down, if possible attach a satellite telemetry device for tracking and/or try again on another day with better support, conditions, and/or resources.

2. PERSONNEL

(a) Human safety is the number one priority.

(b) Appropriately, trained, experienced and authorised personnel should be used for the roles required and actions/efforts must be based on the qualifications of personnel on hand.

(c) Roles must be assigned to team members based on their experience, training, and overall qualifications.

(d) Personnel should be monitored (e.g. for fatigue, dehydration, emotional state) at all times to maintain

(e) Team members must be encouraged to speak up if they are not comfortable with a particular action or the general situation. Leaders must respect any concerns raised and not instruct personnel to take a role or action that they are not comfortable with.

3. PERSONNEL EQUIPMENT

(a) Personnel working near or with entangling gear must carry emergency safety knives on their persons at all times.

(b) Gloves must be used when handling lines or netting under load (i.e. attached to whale).

(c) Helmets must be worn by personnel operating near the whale and/or using poles.

(d) Appropriate attire and personal floatation/protection must be worn at all times. Examples include PFDs, wetsuits, drysuits, worksuits that are snag-free (without straps, D-rings, and clips that can act as snag points for lines/ gear).

(e) Proper communication tools must be available (e.g. waterproof VHF handheld, cellular phones).

(f) Carry sufficient water and food.

4. PLATFORMS

Response efforts are generally conducted from two vessels, a primary response vessel and a support/safety vessel.

Primary response vessel (PRV)

(a) This vessel is the main operational platform to assess, perform the entanglement removal and monitor the situation. It is essential that only disentanglement staff and essential equipment be carried.

(b) It should be maintained by a helmsman, a specialist crew member at the bow and a third specialist crew person to ensure trailing lines are clear of the engine leg and to assist the crew at the bow.

(c) Its deck must be kept clear and free of loose objects and any other materials or equipment which may potentially interfere with the safe deployment of running lines during the operation.

Support/Safety Vessel:

A support vessel is needed to carry necessary personnel, equipment and to maintain adequate redundancy in communication systems (i.e. 'two is one, and one is none'). This includes human first aid and resuscitation equipment and qualified staff to deal with possible emergencies.

5. ASSESSMENT

The following factors are used to determine whether an animal is a response candidate through methodology outlined in IWC/62/15.

Animal and Entanglement Conditions

(a) Size

(b) Species

(c) Temperament

(d) Behaviour

(e) Health condition (Appendix IV, IWC/62/15): body profile, cyamid coverage, general skin condition

and colouration.

(f) Nature of injuries

(g) Company of other cohorts (pod members, calves) and the presence of sharks or other predators

(h) Mobility (anchored, small circles, big circles, free-swimming)

(i) Type and nature of gear (rope, line, pot, netting, chain, etc).

(j) Body part(s) affected and not affected

(k) Configuration and condition of gear

Environmental conditions

(a) Weather conditions and forecast

(b) Sea state

(c) Navigational constraints (e.g. rocks, ice, depth)

(d) Time of day (e.g. remaining daylight)

(e) Remoteness of location

(f) Availability of resources

Other conditions

(a) Visibility of event

(b) Media or public presence

(c) Surrounding vessel traffic

(d) Military operations

(e) High recreational use areas

6. SAFETY CONCERNS ON APPROACHING AN ENTANGLED WHALE

(a) Time spent in the danger zone (area immediately in front of and beside animal that is in range of tail flukes and/or flippers) must be avoided or at least minimised.

(b) A swimming entangled whale must never be approached in its wake, as unseen trailing gear may foul the approaching vessel's engines.

(c) Only the minimum required equipment and personnel should be present on the PRV (store non immediate gear on support vessel). The approach boat must be kept 'clean' in order to minimise the risk of lines getting caught on the boat or gear stowed on boat.

(d) Sudden boat manoeuvres (e.g. gear shifting or sudden velocity changes) must be avoided as these have a higher probability of startling the whale.

(e) Approaches should be methodical and consistent. Animals may avoid and respond unpredictably to any perceived threat. It should be assumed that an animal does not know the responders are there to help.

7. ENTANGLEMENT RESPONSE PROCEDURES

Disentanglement procedures generally involve some control of the animal, cutting away gear using specialised tools, and documentation and follow-up of the event. The details of disentangling a whale involve a specialised discipline that is dangerous for both the responder and the entangled whale; as noted in the introduction this is **not** an instruction manual; specific disentanglement procedures should be addressed through a thorough and strict training programme (see Annex F).

8. DOCUMENTATION AND DE-BRIEFING

Documentation gathered during disentanglements offers one of the best and only opportunities to understand the scope and extent of regional entanglement issues.

Documentation may include:

(a) Photographs of operations and of the animal before, during, and after a response

(b) Video from point-of-view cameras mounted to safety helmets

(c) Collection and documentation of gear removed

(d) Biological sampling (biopsy, skin in gear)

(e) Field observations (operational log, behavioural log, etc)

This information should be assembled into a full disentanglement case study and shared with regional and international entanglement response networks. Every attempt should be made to build documentation/data gathering into operational procedures. Data should identify species, individual, level of injuries, disentanglement activities and state of the animal and its entanglement at the end of an operation.

Effort should be made to monitor post-disentanglement behaviour and survival through the use of telemetry, genetics and or photo identification of individual animals.

Follow-up of an entanglement response is an opportunity to discuss the level of preparedness, the equipment,the process, and identify any changes to procedure or equipment that could be made to improve future disentanglement attempts.

NB: As discussed under Items 3 and 8 of this report, there is work underway on consideration of standardising to the extent practical data that are collected, methods of storing these and facilitation of sharing data.

○ Appendix D – Generic Gear Checklist

Hawaii Large Whale Entanglement Response Gear Checklist

Documentation	Personal PPE	Telemetry	Cutting Tools
☐ DSLRs and lenses (X3) ☐ Video cameras ☐ GoPros (X8) ☐ VR cameras ☐ Real-time streaming goggles ☐ Batteries ☐ Chargers ☐ Memory cards ☐ Housings ☐ Mounts	☐ Helmets (X8) ☐ Gloves ☐ Safety knives (X8) ☐ Knife retractor (X6) ☐ PFDs (X8) ☐ Eye protection ☐ Protective wear (wetsuits, UV wear, hat, knee pads, appropriate footwear, sunscreen)	☐ Transmitter ☐ Telemetry buoy ☐ VHF receiver (X2) ☐ Antennas & cables ☐ Headsets ☐ "Ross" timed-release clips	☐ Fixed hooked knife (X3) ☐ Flying hooked knife(X3) ☐ "Coughran whale knife" ☐ Cutting grapple (X2) ☐ Gobbler guillotine ☐ "Thompson" blade ☐ Spare blades (X3) ☐ Knife sharpeners ☐ "Wong" knife sheaths ☐ "Goodwin" cutting grapple sheath
Data	**Medical Emergency**	**Kegging**	**Pole System**
☐ Data forms/ Checklists ☐ iPad logger ☐ Timer/ Watch	☐ First aid ☐ AED ☐ Oxygen kit ☐ Backboard ☐ Neck brace ☐ Splints	☐ Polyballs (X5) ☐ Sea anchors (X2) ☐ Working lines (buoyant & sinking) (X6) ☐ Buckets (X3) ☐ Carabiners (X8) ☐ Pump (buoy & boat)	☐ Poles ☐ Short tool handle ☐ Slip joints ☐ Safety ends ☐ Jointed pole ext.
Communications	**Sampling**	**Misc.**	**Attachment Tools**
☐ Cell phones ☐ Waterproof VHF (X2) ☐ Satellite phone ☐ VOX radios & headsets ☐ GPS	☐ Crossbow ☐ Bolts (X8) ☐ Cores ☐ Vials w/ preservative ☐ Sample net	☐ Duct tape ☐ Electrical tape ☐ Wire ties ☐ Hose clamps ☐ Tools ☐ Utility knives ☐ Binoculars ☐ Hose clamps ☐ Tool kit (pliers, wrench, screwdrivers) ☐ Paperwork (permit, protocols, phone list) ☐ Permit flag	☐ Pole grapple (X2) ☐ Medium grapple (X2) ☐ Large grapple ☐ Skiff hook (X2) ☐ Carabiners ☐ Tine hook
Drone	**Sedation**		**Approach Boat**
☐ Drones ☐ Controller ☐ Monitor ☐ Safety glasses/ Face visors ☐ Goggles ☐ Batteries ☐ Charger ☐ Memory cards	☐		☐ Inflatable ☐ Outboard ☐ Fuel ☐ SCUBA tanks (X2) ☐ Foot pumps (X2) ☐ Inflation system ☐ Fuel line

July 7, 2020

- **Appendix E – Large Whale Entanglement Response Network *Media Guidance for Information, Images, and Video 2020***

NOAA FISHERIES
Protected Resources Division

Large Whale Entanglement Response Network

Media Guidance for Information, Images and Video

Introduction:

Along the West Coast, NOAA Fisheries' Protected Resources Division oversees the Large Whale Entanglement Response Network, which is comprised of whale biologists, researchers, the tour industry and their naturalists, veterinarians, veterinary technicians, whale watchers, the U.S. Coast Guard, and state agencies. Due to the dangerous nature of responding to entangled large whales, our responders go through extensive training and many years of apprenticeship to learn the proper techniques and protocols to ensure their safety and that of the animals. Responders are experts at understanding whale behavior, biology and health, vessel operations, handling ropes under tension, and coordinating entanglement response teams. This work is authorized under a permit (18786-02) held by NOAA's Marine Mammal Health and Stranding Response Program (MMHSRP).

Information Sharing:

Prior to releasing any media relating to high profile response events, you must coordinate with NOAA Fisheries. All information, press releases, images and video showing an entangled whale or response must be reviewed and cleared by NOAA Fisheries prior to publication. Multiple points of contact are listed below for review and clearance, NOAA understands this information needs to be reviewed in a timely manner and that our responders or partners may need review after hours.

Photography and Video Guidance:

Photographs taken under the authority of the MMHSRP permit may be maintained for training, research or educational use only and the permit number (NMFS Permit No. 18786-02) should be watermarked or listed in the metadata for every image or video. A copy of the photographs must be submitted to NOAA Fisheries upon request.

Image or Information Content	Appropriate for Release?
Fishing gear, tags, buoys, floats, etc.	Possibly – releasing these images may identify an individual fisherman and could lead to litigation. No buoy numbers should or can be readable in the image. May be approved on a case by case basis.
Response team	Yes – only if they are wearing the appropriate PPE such as a PFD, gloves, and helmet. Responder actions will be reviewed in this photograph as well.

Support vessel	Yes – this can show the perspective of a support vessel and the assistance they provide for the safety of the response vessel.
Response vessel	Yes – team should have appropriate PPE. Engine may be in the water at certain periods of time.
Specific Location (e.g., GPS points, map plot)	No – a general location such as county or a large geographic location can be shared. For example, Puget Sound, outer coast of Washington, Oregon Coast, etc. will be approved. Releasing a more specific location could lead to members of the public locating the whale and closely approaching the whale which will jeopardize our response or attempting to disentangle the whale themselves. **Releasing the location of anchored animals is strictly prohibited.**
Graphic Content	Yes – while entanglements may show blood or serious injuries it is important to show how entanglements can severely debilitate or kill large whales. We may choose not to show an amputed limb, free blood flow, or an open wound showing extensive damage – considered on a case by case basis.
Entangling lines in the response vessel	No – all gear that is attached to the whale should be outside of the approach/response vessel and clear of the engine.
Telemetry buoy	Yes – language explaining what the telemetry buoy is and why we use it should accompany the photograph. If we can avoid telling the media we have tagged the whale that is ideal, as this will reduce real time media requests and updates for information.
Go Pro or Video Content	This will be reviewed on a case by case basis just like the photographs and images and will be approved if it meets the above considerations or can be edited to remove sections of concern. In instances where cursing or inappropriate language is used the audio should be removed from the video. Messaging that accompanies the video will also be reviewed for approval.
Stand By Vessel	Yes – if the stand by vessel would like recognition for their efforts while waiting for the response team

	to arrive, the name or a photograph of the vessel can be shared.

Use of Social Media:

Information, photos or video may be posted on social media after NOAA Fisheries reviews and clears the material. If multiple agencies are involved in the response effort we request you acknowledge their presence in the information you are sharing. **Information and images cannot be shared in real time.** Large whale entanglements are extremely complex and the safety of the response team is our number one priority. The permit number (NMFS Permit No. 18786-02) must be listed on every image.

Talking Points:

Reporting: Prompt reporting is the best way to help entangled whales. Report entangled whales to our 24/7 Hotline by calling 1-877-SOS-WHALE (1-877-767-9425) or hailing the U.S. Coast Guard on VHF Channel 16. If an authorized response is to be mounted, please stay with the whale as long as it is safe to do so and you are able.

Attempting Disentanglement: **Never** attempt disentanglement, get in the water with the whale, or remove any gear without training and authorization. Stay 100 yards from the whale and beware that lines in the water could snag your vessel. Trained responders have been injured or killed, do not put your safety at risk.

Documentation: Video or photos showing the entangling gear are very useful to the response team, but your safety is the most important. If possible, take pictures or video of the gear, but remember to stay 100 yards from the whale and beware that lines in the water could snag your vessel. This information is vital to help identify the individual whale, gain information towards prevention and to encourage future re-sights.

Response Team: Forming a response to an entangled whale is very complex and requires a lot of time and coordination. Please understand that it is not always possible to respond to every entangled whale.

Review and Clearance Process:

Please contact the below individuals for review and clearance of information, photos, video or draft press releases for review and clearance. If you are not able to reach Kristin in a timely manner please feel free to reach out to Justin, Ed or Sarah.

Name	Email	Cell Phone Number
Kristin Wilkinson – Washington and Oregon Large Whale Entanglement Coordinator	Kristin.Wilkinson@noaa.gov	206-550-6208
Justin Viezbicke – California Large Whale Entanglement Coordinator	Justin.Viezbicke@noaa.gov	562-506-4315
Ed Lyman – Hawaii Large Whale Entanglement Coordinator	Ed.Lyman@noaa.gov	808-264-8023

Sarah Wilkin – National Large Whale Entanglement Coordinator	Sarah.Wilkin@noaa.gov	240-429-9161
Aleria Jensen – Alaska Large Whale Entanglement Coordinator	Aleria.Jensen@noaa.gov	907-586-7247

Outside of real-time emergency responses, the use of imagery for documentaries, films, brochures, marketing, fund raising, etc. needs to be approved by the Office of Protected Resources MMHSRP. Please submit your request, with attachments or links to the proposed imagery to nmfs.mmhsrp.hq@noaa.gov

NOAA Communications Team:

NOAA Fisheries' Regional Stranding Coordinators keep the NOAA Fisheries WCR Communications Team up-to-date on responses in the field. Media inquiries should be directed to Jim Milbury at 562-980-4006 for California cases, or Michael Milstein at 503-231-6268 for Oregon and Washington cases.

Media Resources:

Large Whale Entanglement FAQ's:
http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/entanglement_faq.html

2017 Annual Summary:
http://www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/5.2.2018_wcr_2018_entanglement_report_508.pdf

○ Appendix F – Reporting Forms - Hawaii Whale Response Reporting Data Form

WHALE RESPONSE REPORTING DATA FORM

Report:

Date of report: ________ Time: _______ Field ID: _________
Platform name: ______________ Homeport: ______________

Reporter/ contact #: ______________/ ___________ if different
Observer/ contact #: ______________/ ___________
Case status: New / Existing Source: shore/ surface / air

Nature of distress: entangled/ collision/ stranding/ floater
Out-of-habitat/ harassed/ other ______________________
Animal disposition: alive/ dead/ unc. Breathing: Y / N / unc

Detail:

Date of incident: ________ Time: ______
Location description: ______________________________________
Location latitude: ______________N/ ______________W
Report narrative: ____
____
____
Still on site: Y / N If yes, how long can stay? ______________
Are there other vessels that can assist? Y / N / Unc Name: _________
Documentation obtained: Y / N / unc. Doc disposition_____________
Getting documentation from safe distance is important!!

Animal:

Species: ________________ Age: Adult/ juvenile / calf or pup
Sex: male / female / unc Identity: ______________________
Description of animal (if species uncertain): __________________
____
General behavior (e.g. thrashing, logging): _____________________

Context/ role: ______________
Respiration: normal/ trumpeting / wheezie / gurgling
Posture: normal / vertical / hunched
Diving? Y / N / unc Fluking? Y/ N/ unc Speed: ________
Mobility? Mobile / circling / anchored / unc Heading: ______

Entanglement:

Where on body: head/mouth/body /rgt pec/ lft pec/stock/ tail/unc.
Description: ____
____
Full wraps: Y / N / unc Tight/ contricting? Y/ N/ unc
Trailing: Y/ N/ unc Distance? ___________ ft/m
Buoys? Y / N/ unc. Describe: _________________________________
Markings: ____________________

Type of line: _________________ Line color and size: _____________
Comments: ____

Condition:

Condition: Good / fair / poor / dead
Condition described: ___________________________________

Wounds? Y / N / unc Wound type: Laceration/ puncture
Blood: Y / N / unc. indent /
Wound described: ______________________________________
Emaciated: Y / N / unc Cyamids; Y / N / unc Loc.: ______
Skin: dark/ light / rough / smooth /sloughing/ pitted
Carcass cond.: fresh / moderate / decomposed

Contact:

Name of vessel involved: ______________ Homeport: _____________
Contact person: ___________________ Contact #: _________________
Company/ org.: ___________________ Vessel LOA: _________ ft/ m
Vessel detail (type and category): ______________________________
Vessel heading and speed at time of incident: _________/ _________
Incident description: ____

___________________________________Whale observers? Y/ N / unc

Case confirmed: Y / N / unc. Incident Threatening? Y / likely / possibly / not likely / N / unc Person filling form: ______________

Hawaii Whale Response - Response Data Form

WHALE RESPONSE – RESPONSE DATA FORM

Date: _______ Platform name/ type: ______________/ ______ 1º Platform contact #/ch.: _______ Depart location/ time: __________/______
Mission goal: assess / document / monitor / tag / sample / disentangle/ Investigation

CI/ lead:
Name: _________________________ Level: _____
Contact #: _______________ Affiliation: __________
Shore POC:
Name: __________________ Affiliation: __________
Contact #:________________

Supporting agencies/ orgs:
Name: ____________ Role: __________ Platform type: ______
Name: ____________ Role: __________ Platform type: ______
Name: ____________ Role: __________ Platform type: ______
Name: ____________ Role: __________ Platform type: ______
Name: ____________ Role: __________ Platform type: ______

Conditions:
Weather: _______
Sea state: _______
Swell: __________
GAR: ___________

Team roles	Role	Captain	Comms	Safety	Doc	Doc	Tag	Gear	Detangler	Detangler	Doc	Crew
	Initials											
	Affiliation											
	Level											

Event Timeline	**Event**	**Time**	**Latitude**	**Longitude**
	On site			
	Animal located			
	Animal engaged			
	Mission complete/abort			

Data obtained: none / photo/ video/ resp. narrative/ beh. narrative/ respirations/ veterinarian/other __________________

Imagery types: surface/aerial /uw /pole/ helmet / vessel /other ________________

Gear / wound details	**Mouth**	**Head**	**Body**	**Lft Pec**	**Rgt Pec**	**Stock**	**Tail**
Gear wrapping (Y, N, Unk)							
Gear constricting (Y, N, U)							
Wound type							
Wound color/bleeding							
Tis. penetration (dpth/%)							
Line type ()							
Line color/ size							
Gear trailing (lgth,descry)							

Telemetry: none/tethered/penetrating/ suction/ other ____________________

GPS PTT: ________ VHF: ______ Tune:___
Tag time: _______ Loc: _________________
Loc. On/rel. to body: _________________

Sample obtained:none/biopsy /sloughed/ from gear / feces / resp. / other __________

Gear removed: _______ ft/m Gear recovered: ________ ft/m Gear remaining _______ ft/m:
Gear type: ______________Gear fishery: __________ Set loc.: _____________ Date lost: _______
Post mitigation behavior:

Resp. status: not loc./assessed/document/ monitored /totally freed/ part. freed/ unsuccessful / other _________________

IWC Entanglement Response Data Form

ENTANGLEMENT RESPONSE DATA FORM

Date: __________ **Event#:** ________ **Species:** _________________ **Individual ID:** _____________ **Arrival at scene:** ____ **Departure from scene:** ____

DD/MM/YY

Team details	**Role**					
	Initials					

Event timeline	**Event**	**Time**	**Latitude**	**Longitude**
	Whale located			
	Whale engaged			
	Whale released/lost			

Gear and wound details	**Mouth**	**Head**	**Body**	**Left Flipper**	**Right Flipper**	**Peduncle**	**Tail**
Gear wrapping (Yes, No, Unk)							
Rope color/size							
Gear constricting (Yes, No, Unk)							
Tissue penetration (Epidermis-only, Blubber, Muscle, Bone, Other, Unknown. For flippers and tail, also indicate percentage penetration)				____%	____%		___%
Wound profile (Flat, Depressed, Raised, Unknown)							
Wound color (1=white/yellow, (2=pink/red, 3=green/blue/black, 4=unk)							

INSERT WHALE BODY DIAGRAM

Draw entanglement configuration, wound sites and disentanglement cuts

Gear trailing: _____ ft or m **Trailing profile**: floating / sinking **Visible components:** _______________

Gear type/parts (if known):_______________________________ **Anchored?** yes / no / unk

Gear type in area: _____________ **Whale movement**: stationary / circling / travel **Whale posture**: normal / hunched / head raised / tail raised / other

Estimated whale length: ______ ft or m **Class:** calf / juvenile / mature **Role (if applicable):** none / mother / other _________________

Body condition: normal / thin / emaciated **Odor detected?** breath / wound / gear Description: ____

Skin condition (for species): normal / pale / sloughing / pitted **Cyamid proliferation**: normal / at wounds / at blowholes / widespread

Other condition details (note species-specific indicators): ____

Whale activity time line	**None**	**Low**	**Average**	**High**	**Evasive**	**Aggressive**
Pre-approach						
At first approach						
During disentanglement						
At release						
Post release						

Bio samples obtained: none / biopsy / sloughed skin / skin from gear / scat / other

Other data collected: photos / video / ventilation rates / detailed ethology / veterinary procedures /

IFAW - Free-swimming Whale Assessment and Monitoring Datasheet

Marine Mammal Rescue and Research
Free-swimming Whale Assessment and Monitoring Datasheet

IFAW

Whale ID: ________________ IFAW#: ________________ Date: ____________________ Location: ____________________________

Response Vessel: ________ **Examiner:** ____________ **Recorder:** _________**Other Responders on Vessel:**______________**UAV used?** Y N

Species: *M. novaengliae* *E. glacialis* *B. physalus* *B. acutorostrata* *B. borealis* **Estimated Length:**_______ft **Age Class:** C J SA A CBD

Est. Str. Length: __________**(ft)** (**Method:** compared to vessel / photogrammetry / other) **Est. Weight:** ______________**(kg)** **Sex:** F M CBD

Body Condition: 1 (emaciated) 2 (thin) 3 (slightly thin) 4 (mesomorphic) 5 (robust) **BCS Notes:** ____

Skin Condition: Excellent Good Fair Poor N/E **Cyamid Coverage:** mild moderate severe N/E **Cyamid color:** ____________

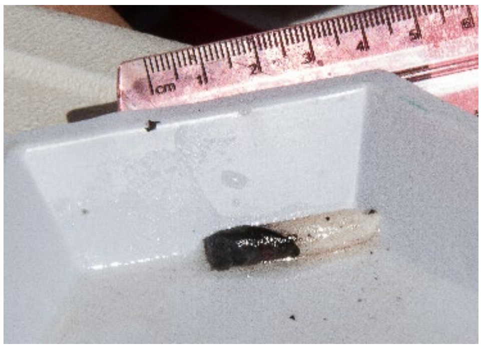
Entanglement Location: Head Mouth Flipper (R L) Body Peduncle Flukes **star locations with associated wounds and describe below*

Wound Description: ____

Initial Time on Animal: [ ] **Sedation Attempted:** N Y (see Whale Sedation Datasheet) **Time off Animal:** [ ]

Time of Surfacing or Activity/ Procedure (HH:MM:SS)	**Resps / Surfacing**	**Resp Rate /5 minutes**	**Respiratory Quality**	**Response to Vessel** (evasive (E) / approachable (A) / No Response NR)	**Swim Direction** (with respect to vessel)	**Swim Speed** (est. in knots or – fast, moderate, slow, stopped)	**Time of Dive** (HH:MM:SS)	**Comments / Activity / Procedure** **Whale activity:** At surface (S)/ just below surface (SS)/at depth (D), floating (F)/ logging (L) /actively swimming (AS) / slowly swimming (SS), feeding (FE), socializing (SZ), fluke slapping (FS), pec slapping (PS). **Procedures:** close vessel approach (CA), UAV flying, sedative dart fired (SDF), sedative dart recovered (SDR), entanglement attachment (EA), entanglement cutting (EC), reversal dart fired (RDF), reversal dart recovered (RDR), etc.

○ Appendix G – Tools and Techniques

Approach vessel (task boat)  	Typical platforms that make excellent approach vessels are soft-bottom inflatables between 3.5 and 5.5 meters (12 – 18 feet) in length. Such platforms typically accommodate closer approach work due to their responsiveness and simple layout.
Biopsy 	A sample of skin and blubber obtained for genetics, health assessment, and stress analysis. Biopsy samples are typically obtained with the use of darts shot from crossbows or air rifles.
Coughran "whale" knife 	Long-bladed knives.
Cut-on-the-fly 	No constraining of the animal prior to making a cut.
Cutting grapples	A grapple with knife blades incorporated in its tines. These can be used as a disentanglement tool and as a safety tool, as they can be rapidly and remotely be deployed to sever an unanticipated and dangerous connection between the whale

	and the team.
Fixed knife 	A knife that remains attached to the pole. As such it is better served for entanglements further back on the body (*i.e.*, in which the user is more likely to stay out of the danger zone), for small to moderate-gauge lines (*i.e.*, shorter cut times), and fewer wraps (*i.e.*, fewer lines to cut and thus shorter time making cuts). Fixed knives may provide more control than a flying knife.
Flying knife 	The flying knife is appropriate for cutting: lines further up on the body in which initial placement might put the responder in harm's way, larger gauge lines that will require more time and effort to cut, and more complex entanglements. Flying knives provide more safety than fixed knives by allowing the cut to be made more remotely. A flying knife can be held into its socket adapter making it a fixed knife and released if circumstances dictate. The flying knife has the added advantage of being able to be attached to buoys or sea anchors, and letting the resultant buoyancy and/or drag forces make the cut, more remotely and with less exertion.
Grapple (jam, grab or flying)	Grapples pinch a line between the tine(s) and the shaft, and are typically good for moderate holding times. A grab grapple is the most frequently used tool to get a hold of the animal via the entangling gear that otherwise is not accessible, at least initially.

	
Haulback system	In the event of approaching a relatively immobile animal, vessel support allows for a haulback system or an exit strategy. Haulback systems can represent a secondary line (*i.e.*, independent of a working line) that is secured to a large enough vessel to pull the approach vessel away from danger.
Kegging 	In those cases where the entangled animal has a limited surface interval, is fast moving, evasive, or otherwise inaccessible; and/or its movements are unpredictable and potentially aggressive; and otherwise appropriate for the animal, constraining techniques may be used. Such techniques have the goal of slowing the whale down (but not necessarily stopping it), keeping it at the surface, and controlling its movements somewhat (as much as one can control a multi-ton animal). The primary constraining technique is 'kegging,' a modification of an old whaling technique, in which harpoons attached barrels to add drag and buoyancy to slow and keep the whale at the surface. In this case, polyball buoys (typically A3 and A4) are methodically added to the established working line to create drag and buoyancy forces. Under certain circumstances, a sea anchor, a

	funnel-like device, may be attached to provide more drag.
Kegging buoys (Polyballs or Norwegian floats) 	Polyball buoys (typically A3 and A4), which are methodically added to the established working line to create drag and buoyancy forces.
Landry broadhead 	A broadhead arrow deployed from a crossbow (the Gobbler Guillotine), to cut a line forward on the body that might be under tension.
Ross timed-release clips 	Uses a predetermined galvanic releases built into the clips, like the loop of a pelican hook, to hold the clip closed until they dissolve and weaken in the saltwater. When used to attach the buoys to the entangling gear, they provide a predetermined defined time that the buoy will remain attached. Should a response not be possible, and the telemetry remain on, it should hopefully detach at a specified point in time.
Safety knife 	Personal, one-handed safety knife for personnel that are handling gear or in a position to possibly handle or interact with gear, especially if it might be attached to the animal.

Sea anchor/ drogue 	A funnel-like device that can be attached to provide more drag during the kegging process.
Skiff hook (mooring hook, flying carabiner) 	A skiff hook attached to the end of a pole can be used to establish a working line. This attachment technique has the advantage of greater accuracy of placement and is typically used to establish a secondary working line.
Slay whale knife	A pole-deployed guillotine knife for embedded lines.
Support vessel	
Telemetry (package, buoy)	The Network uses a combination of Argos (satellite), GPS-based and VHF radio transmitters housed in a single cylinder, as its primary telemetry package to track entangled whales for response purposes. The telemetry package is secured on a telemetry buoy (a 14" trawl buoy held within a stainless-steel collar), and attached to the entangling gear which typically is trailing behind the animal. The buoy is ballasted to maintain the transmitter in an upright position, clear of the water, and towed from a bail that allows the buoy to clear itself should it become fouled with debris or kelp.

  	
Thompson blade 	Hooked knife that is sharp on the outside as well as the inside face, to allow cutting into tight and embedded gear.
VHF receiver and antenna	Used to obtain real-time location of transmitter package.

 HIMB/ HIHWNMS/ NOAA Permit # 782-1438	

○ Appendix H – Sample Training Agenda

Agenda
Large whale entanglement response training
Kodiak, AK
May 21 – 23, 2019

Classroom component:
Date: Tuesday, May 21, 2019
Start time: 09:00
End time ~ 13:00
~ 4.0 hours
Location: AK Fisheries Science Center (i.e. the touch tank) conference room

Hands-on components:
Date: Tuesday 21 (afternoon) and/or Wednesday 22, 2019 (morning)

Hands-on large whale response training
Timing: TBD based on weather and participants' schedules; typically, 3 – 6 hrs.
Location/ staging: Gibson Cove

Hands-on opportunity with whales (research and response)
Timing: Potential all day on Wednesday 22 and/or Thursday 23 (weather dependent)
Location/ staging: Gibson Cove, NOAA OLE vessel

Goals of response effort:

- Release some large whales from life threatening entanglements
- Provide experienced, authorized, well-equipped, and coordinated response - a safe, measured response that meets NOAA Fisheries safety standards.
- Increase awareness.
- Document/ gather information in order to assess impact and reduce risk.

Training objectives:

- Review of threat as background
- Review standard and proven operating procedures (including ICS)
- Provide framework to pool available resources, and best use of expertise and

Knowledge

- Hands-on with tools
- Continued capacity building w/ focus on safety, people, information
- Firsthand experience with animals
- Risk assessment

Main themes:

- Safety
- Gaining information

Agenda details:

Tuesday, May 21, 2019, 09:00 – 13:00 Classroom

Background and objectives (.25 hr.)
Safety and authorization (.5 hr.)
Awareness and reporting (.25 hr.)
Risk assessment and documentation (.5 hr.)
Monitoring (.25 hr.)
Disentanglement/ stand-down; 1.5 hr.)
Debriefs and entanglement investigation (.25 hr.)
Preparedness and strategizing (.5 hr.)

Tuesday, May 21, 2019, 14:00 – 16:30 – Shoreside hands-on:

Grapple throws
Polework
Telemetry review
Overview of all tools/ review of cache of gear

Wednesday, May 22, 2019, 08:00 – 12:00 - Hands-on, on-water training:

Approaching animals (incl risk assessment) (support/ approach boats)
Grapple throws to establish a working line/ telemetry
Line handling (walking up and back, bending, clearing)
Adding "kegging" buoy
Nantucket sleighride
Attaching the flying cutter (simulated via the skiff hook)/ using the poles)
Use of cutting grapple for disentanglement
Communication
Documentation (use of DSLRs and sitecams)

Telemetry (setup, deployment and receiving)
Entanglement response safety (Clearing gear - cutting grapple, safety knives)
Data (support boat and on cruise)
Debrief

Thursday, May 23, 2019, 08:00 – 13:00 – Hands-on, on-water familiarization with animals

Locating whales (use of indicators)
Safe approach to whales
Monitoring a whale (for standby support and animal behavior)
Photo-documentation – positioning the vessel

** Hands-on response training simulates an entangled whale by having a boat pull gear (line and buoys) behind it. Approaches are made from appropriate boats (preferably ones that would be available in a response effort) and folks are proficient in. Exercises include establishing a control line, safely handing the line, kegging the animal (adding buoys), tagging an entangled whale, cutting it free via use of long poles, addressing "what if" scenarios, documenting the all aspects, gather data, and maintaining safety.*

Key messages:

1. Human safety is first/ primary. Do not put the whale's rescue before personal and team safety.
2. The primary goal of the response is **not** necessarily to free the animal, but to provide a safe and measured response that may gain additional information towards reducing the threat for the animals and ocean users (e.g. fishermen) alike.
3. Large whale entanglement response is covered under federal permit and requires authorization.
4. Imagery and messaging need to be approved prior to media use.
5. There is no obligation to respond. Standing down is a viable option. However, if we do respond under the Network's authority there are obligations/ requirements to be met.
6. Primary means of reducing risk during response is to minimize time and proximity to animal. Stay out of the danger zone.

○ **Appendix I – Response Checklist**

Response Mission Checklist

(See individual instructions and checklists for details)

☐ Receive initial report

☐ Contact primary observer if report is secondhand

* Use ***report form*** to obtain and document all pertinent information to determine whether to and how best to respond.

☐ Notify core team/vessel support (availability and time)

☐ Alert any nearby on-water resources (selective)

Primary assessment:

☐ Assess animal/entanglement
- Confirmed?
- Severity (Life threatening?)
- Animal condition
- Animal mobility

☐ Assess response conditions (use weather websites, charts, nav. software)
- Weather
- Time-of-day
- Distance offshore (safety and response time)
- Someone standing by

☐ Assess resources:

- Primary response platform and assoc. crew
- Responders (determine whether personnel resources are available)
  - Vessel crew
  - Level 3 and 4 responder(s)
  - Approach boat crew
  - Other required roles and responsibilities
- Support platforms (if not addressed above)
  - USCG (surface and/or aerial)
  - Aerial (e.g., Helicopters)
  - Researchers or other rapid responders that may already be on water

*** See *Personnel/Support Contact Matrix***

<u>If response deemed appropriate/possible:</u>

<u>Pre-departure:</u>

☐ Notify agency leads/approvals

☐ Establish communications person. Begin relaying information on report and preparations for response

☐ Establish ***float plan*** and shore-side contact (may be 1º communications person)

☐ Obtain shore-side gear (see ***gear checklist***)

☐ Ready response vessel/provide vessel safety orientation and mission brief prior to departure (per captain's instructions and ***vessel startup checklist***)

☐ Stow and secure all personal and shore-side gear

☐ Turn on GPS handheld or tracking software

☐ Prepare datalogger/report forms. Enter mission data and passenger manifest. Send floatplan.

☐ Perform GAR (mission/vessel ops risk assessment; proceed or abort)

☐ Establish roles:

____________________ Observer to assist captain while underway. May rotate into another role (e.g. documenter) once on site

____________________ Safety (likely stationed on bow during support ops and responsible for cutting grapple)

____________________ 1º Photographer

____________________ 1º Videographer

____________________ Gear person (know gear locations and assist with setups)

____________________ Communications (assist captain with relaying info/updates to shoreside POC. Capt. will do ship-to-ship

____________________ Data (Log all events and response steps. Use datalogger or data forms

____________________ 2º Photographer/videographer

Underway:

☐ Watch speed/have dedicated observers

☐ Prepare gear:

- ☐ Setup a polecam (GoPro on end of a pole)
- ☐ Setup a Boatcam (GoPro attached to vessel)
- ☐ Setup Helmetcams (helmets with GoPros)
- ☐ Setup a GoPro on inflatable instrument bar (if available)
- ☐ Setup telemetry and check for functionality. (Follow ***telemetry instructions***)
- ☐ Documentation familiarization and setup (see ***documentation checklist and instructions***)
- ☐ Setup two throwlines with buckets – one with medium grab grapple and the other with a cutting grapple. Know tool locations
- ☐ Inflatable setup (If warranted, begin inflation of approach vessel under direct instruction and supervision of captain)

☐ Communicate with any on-site resources (e.g. standby vessels)

**** On site/ Find animal (everyone should be looking)**

Secondary assessment:

☐ Assess animal/entanglement (get initial photo and video documentation)
Confirmed?
Severity (Life threatening?)
Animal condition
Animal mobility
Nature of entanglement (parts of body involved. type of gear, # wraps)

☐ Assess on-site response conditions
Weather
Time-of-day
Distance offshore (safety and medevac time)

☐ Assess resources (based on the additional information):
Responders (degree of experience on-site)
Support (Amount of support)
Equipment/ tools

☐ Establish preliminary action plan and review GAR (risk assessment)

☐ Update shore-side communications POC

Primary response:

*** * Continue to monitor the animal**

☐ Pre-brief on action based on on-site and secondary assessment
Review action plan
Re-establish/confirm roles (see ***personnel matrix***)
Review safety protocols (see ***safety overview***)
Establish working channel and communication protocol

☐ Launch inflatable (**Do not launch until stopped and with captain's permission**.)

☐ Monitor response (e.g. conditions, animal behavior, personnel)
☐ Communicate between platforms
☐ Update shore-side communication
☐ Maintain safety
☐ Log actions (**use datalogger** or ***appropriate data forms***)
☐ Document (see ***documentation checklist***)

Post event (disentanglement efforts):

☐ Sampling (i.e. biopsy - see ***documentation checklist***)
☐ Documentation (continued – obtain images of freed animal)
☐ Update shore-side communication to notify core network members of outcome
☐ Deflate and stow inflatable for travel
☐ Stow gear
☐ Contact media coordinators and coordinate with public relations dept.

Underway for home:

☐ Watch speed and have dedicated observers
☐ Short de-brief

☐ Compile notes

☐ Update shore-side communication

☐ Assign roles for handling data and documentation (video, stills, tissue samples – see ***Documentation checklist*** for details)

Back at Harbor:

☐ Secure vessel

☐ Remove personal and shore-side gear

☐ Clean, inventory, and stow gear

☐ Stow and re-check telemetry gear (see ***telemetry instructions***).

☐ Wash down vessels and rinse engines

**** See vessel shutdown, post event, and media checklists ****

Follow-up:

☐ Complete data forms; enter data into database

☐ Update website (if applicable) and notify network

☐ Full debrief

☐ Prep vessel (fuel, oil)

☐ Prep gear (charge batteries, clear cards, re-stock, etc.)

☐ Thank you letters

☐ Reports

☐ Update effort lists

* Note anything that needs repair (e.g. outboard) or is low in supply (e.g. oil)

Revised June 21, 2020

○ Appendix J – Sample Telemetry Instructions

TELEMETRY INSTRUCTIONS

For GPS/ Argos transmitter package
Juneau

The following set of instructions outlines basic information required to maintain, deploy, and retrieve data from a GPS/ Argos transmitter package used to monitor entangled whales.

The Telonics, Inc. GPS transmitter package is in fact three transmitters in one. It houses GPS, Argos PTT, and VHF transmitters. The advantages of the package are as follows:

- Greater accuracy and increased number of fixes through GPS technology.
- Argos PTT provides duplicity to and the means of obtaining the GPS data
- GPS and Argos-based systems provide broad-scale monitoring, while the VHF transmitter provides real-time tracking / re-location.

Maintenance

1) **Do not** store the tag near ferrous metals. The transmitter utilizes a magnetic reed switch, which may be compromised by surrounding metals.

2) Test the tag (and receivers) at least every 6 months. Allow tag to transmit for at least 2 hours. This will actually extend the tag's battery lifespan.

3) Remove or disconnect the batteries (9 volts) in the receiver (TR-4) and/or UHF tester (TSTR-4) until they are needed.

4) Store transmitter and receivers in an enclosed, dry location, preferably at constant room temperature. Cold temperatures will shorten battery lifespan and changes in temperature may cause condensation within electronics.

Operation

GPS fixes are obtained once every hour and stored on board. However, the system is equipped with the Argos PTT option and thus can relay data back to the user while the system is deployed. This is done by transmitting data to the "Argos Data Collection and Location System (DCLS)' carried aboard the polar-orbiting NOAA satellites. The satellites then forward this data to Argos-based ground stations. Fixes are then emailed to the Argos contract holder (Ed Lyman, Hawaiian Islands Humpback Whale National Marine Sanctuary) and the NMFS Regional Stranding Coordinators. One should expect delays between transmission and receiving the location data of as much as several hours. In addition, data is updated on the hour. The transmitter duty cycle is 24 hours.

Preparing the GPS/ Argos transmitter package for use is a bit more involved than just turning on the transmitter and deploying. For the GPS component of the tag to be functional it is essential that the tag obtain a GPS fix on its initial attempt. If the GPS transmitter is unsuccessful, it will not automatically attempt to reacquire a GPS fix, and you will need to shut the transmitter down and try again. For this reason, you should perform the system initialization well **BEFORE** deployment and monitor the process during initialization. During the period of time after initialization and before deployment, the GPS System should be stored outside with a clear view of the sky. This will reduce the amount of time and energy required to receive scheduled GPS position fixes. If stored inside, then each position fix attempt will consume the maximum amount of battery power. In addition, you may get position fixes prior to deployment that would also confirm the package's successful initialization.

It cannot be emphasized enough that the initialization procedure should be performed well BEFORE deploying the GPS transmitter package!

To monitor the GPS transmitter, and for that matter the VHF transmitter, you will use the VHF receiver tuned to the frequency of the onboard VHF transmitter. During the startup and initialization, the VHF transmitter will admit different series of pulses to inform you on the success or failure of GPS initialization.

VHF beacon monitoring pulses:

Very rapid pulses: The beacon utilizes these pulses to indicate special events.

4 pulses = system startup or system shutdown.
3 pulses = begin or end of GPS position acquisition. (*not* in Spread Spectrum systems)

Special Pulse Patterns: These are used to indicate system status.

2 pulses, pause, 2 pulses, pause – repeat = last GPS fix successfully acquired.
3 pulses, pause, 3 pulses, pause – repeat = last GPS fix not acquired
4 pulses, pause, 4 pulses, pause – repeat = system failure – call Ed Lyman
1 pulse, pause, 2 pulses, pause – repeat = main system battery pack exhausted.
1 pulse, pause, 3 pulses, pause – repeat = beacon's Real Time Clock not set.

The following ***MUST*** be performed in an area that allows the GPS System to have an unobstructed view of the sky. ***DO NOT*** attempt initialization inside a building, a boat cabin, or even a narrow fjord (for Alaska responders).

NOTE: NO OTHER RADIO DEVICES SHOULD BE ACTIVELY TRANSMITTING

Pre-deployment Checklist

☐ Note the frequency of the VHF tag and the platform number of the satellite GPS transmitter. Frequency and ID are written (and typically also engraved) on the side of the transmitter package. They are also noted below for your respective transmitter package:

VHF tag frequency:

151.820 (Channel 98 on TR-4 receiver)

Satellite tag platform ID:

108221

☐ Place the GPS system in an outdoor area where it will have clear access to satellites (no obstructions, including your body, above 10 degrees from the horizon). It is best to have the transmitter's antenna perpendicular to the horizon.

☐ Turn on the VHF receiver and tune to the VHF beacon frequency. You don't have to hook up the antenna, but should at least attach the coaxial cable. This will be enough of an antenna while you are testing the transmitters.

Note: TR-4 receivers are preprogrammed for 100 different discrete frequencies. The program sheet (found in the side pocket of the TR- 4 receiver's soft case) is used to determine which program number on the receiver corresponds to a given frequency.

TR-4 Receiver

☐ Remove the magnet and listen for the VHF beacon transmitter to begin, which should occur 7 seconds after pulling the magnet off. The beacon should pulse very rapidly 4 times, slowly a couple of times, very rapidly 3 times, and then go silent again. **Start your stopwatch now.** This sequence indicates that removal of the magnet has been sensed and that initialization has begun. VHF beacon transmissions are suspended during a position fix attempt to prevent interference with the GPS receiver. While the beacon is silent, the system is attempting to acquire its first GPS position. Use your stopwatch to measure the duration of the silence (the time the VHF beacon is *not* transmitting). This period typically lasts from 2 to 5 minutes. However, there may be cases where the silence could be as short as 20 seconds, or as long as 23 minutes.

☐ If the beacon is pulsing out a pattern of 2 beeps, pause, 2 beeps, pause, when it starts back up, then the initialization was successful and the GPS system has initialized properly. **However, if it took more than 9 minutes to acquire the position fix, it is recommended that you perform the initialization procedure again. Subsequent attempts to initialize should typically require only 2 to 5 minutes.** To do this, place the shutdown magnet on the system for at least 1 full minute, and then start the initialization procedure again at step 4.

If the beacon is pulsing out a pattern of 3 beeps, pause, 3 beeps, pause, then the last position fix attempt was unsuccessful, regardless of how long the attempt took. Shut down the GPS system by applying the magnet for at least 1 full minute. Verify that the system GPS antenna has clear view of the sky (no obstructions, including your body, above 10 degrees from the horizon). Reorient or relocate the system as required. It's possible that the system was unable to fix position due to poor satellite geometry (a temporary condition). If unsuccessful on the second attempt, wait 20 minutes before attempting to initialize the system again.

If the beacon is pulsing out a pattern of 4 beeps, pause, 4 beeps, pause, then the internal system failure has been detected. In this case, DO NOT DEPLOY THE SYSTEM. Call Humpback Whale Sanctuary/ Ed Lyman (808 – 264-8023).

These Special Pulse patterns will continue for a few minutes and then the VHF beacon should resume normal transmissions (single pulses every second).

NOTE: DO NOT DEPLOY THE SYSTEM UNLESS THE INITIAL GPS POSITION FIX HAS BEEN SUCCESSFULLY ATTAINED. IF THE GPS SYSTEM FAILS TO SUCCESSFULLY OBTAIN THE INITIAL FIX, IT WILL NOT ATTEMPT TO OBTAIN ANY FURTHER FIXES.

THE INITIAL GPS POSITION FIX ATTEMPT MUST BE SUCCESSFUL!

☐ If the GPS has successfully acquired its first fix and is now transmitting notify Ed Lyman of Hawaiian Islands Humpback Whale National Marine Sanctuary at (808) 264-8023, or email at Ed.lyman@noaa.gov, and/or contact the regional stranding coordinator. This will give them a heads up on the incoming data and allow them to provide you with fixes as soon as possible.

☐ By now you will know whether the VHF transmitter is working or not, but the transmitter still needs to be fine-tuned to account for any frequency drift, and maximize reception when it comes time to relocate the animal. Tune by turning the fine-tuning knob until you get the strongest, higher pitched return. Note this value for later.

☐ Attach the transmitter package to the rescue buoy by placing it in the buoy's center receptor (the snorkel) and securing it by use of a retaining bolt through the base of the snorkel and hole in the transmitter's tab located at the bottom of the unit.

☐ Attach a galvanic release, timed-release clip to the telemetry buoy via the swivel clip attached to the buoy's bail. The fixed side (smaller opening) should be attached to the buoy. The larger opening or side that opens should then be attached to the tether line (normally 70 – 80 feet in length). The timed-release will dissolve in approximately 10 - 14 days (depends on temperature and salinity) such that if no response is possible within that time frame, the galvanic release will dissolve, the clip will open, and allow the buoy to become detached, and thereby reducing additional impact to the animal. See time-release clip manual for additional details.

Timed-release clip

The length of the tether line may have to be adjusted, and the means of attachment to the entangled animal depends on the entanglement and how close you are able to get to the entangling gear (attachment point). Several options for attaching to the entangling gear (the whale) are: tying the buoy's tether or the buoy itself directly to existing gear, grappling the buoy into gear, and reaching out with the flying skiff hook and poles to attach the buoy to the gear.

The important thing to remember is, one, that the attachment of the telemetry buoy is done safely (for rescuers and whale). Two, that the attachment be reliable and functional, while minimizing the threat of increasing or complicating the existing entanglement.

Note: If a tag buoy is retrieved or tag set up, but not used, then remember to turn off transmitters by replacing the magnet back on the marked position on the top of the transmitter. Utilize the UHF and/or VHF receivers to determine whether tags are indeed turned off (see shutdown procedures below).

Users should note the exact time and location when a tag is deployed or recovered from a whale. The data from the tag will allow initial calculation of velocity and a complete picture of the animal's track.

Monitoring

VHF

There may be either a 2-element, (Nerf antenna) or a 3-element, fold up antenna, or perhaps both in your telemetry kit. **The 3-element antenna is the better antenna and should be used if conditions allow (see separate instructions in responder binder)**.

1) Assemble antenna (for 2-element antenna there may be a pair of shorter elements. If so, make sure they are screwed on forward; for the 3-element just fold out elements and tighten wingnuts) and attach to TR-4 receiver via coaxial cable.

2) Determine program number matching transmitter's frequency and enter that number into the TR-4 receiver. Set fine tune to value already determined during deployment. Initially set gain to point where you lose static. When you start picking up the transmitter's signal you may reduce gain even more. Lowering the gain will assist in directionalizing on the signal. Use headphones. There will either be basic headphones in the side pocket of the TR-4 receiver or a separate, higher quality, over-ear set in the kit.

2 – element Yagi antenna

Note: there is a front and back reception lobe to the antenna. You can pick up signals behind you as well as in front of you. Longer elements are to the rear.

3) Holding the antenna:

a. Always hold the antenna out and away from the body. Always use the handgrips that are provided. Stand behind the antenna, keeping your body at least arms length away from rear element. The rear element is always the longest element.

b. Holding the antenna higher is better. If possible, mount antenna to a pole (yard) to gain height.

RA-17, 3-element antenna

c. Whether hand-held or pole-mounted, keep coaxial cables, wires, other metal object, especially if wet, away from antenna. Do not bend elements (RA-17). If bent they can be straightened or replaced.

d. Hold the antenna vertically (antenna rays oriented vertically) until you get a hit. In this plane you typically get a more omni-directional reception lobe and greater range. When you get a hit turn the antenna horizontally to typically get better directionalizing capability.

e. Listen for differences in signal strengths as you rotate the antenna. You may notice that holding the antenna in one plane versus another may provide stronger signals. This has to do with the orientation or polarization of the two antennas (the transmitter's and receiver's).

f. To obtain a line of position (LOP) to the animal, you may have to estimate the midpoint of a sector in which you receive a signal and note the compass bearing. Since the tags only transmit at the surface and a surface interval may only last several seconds (several hits), you may have to work fast. This is one of your biggest hurdles. You may also have to deal with obstructions that block signals or cause secondary signals that have bounced off other objects (e.g. a mountain side). Be aware that VHF telemetry is only line-of-sight and depending on your platform height, you may only be able to pick up the transmitter from several miles (typically 4 - 7 nm) away.

Unless you have several stations picking up signals in order to triangulate compass bearings, you will have to keep refining your single bearing while you continue to move closer to the signal source.

Satellite

Hopefully once the GPS/ Argos transmitter has been turned on, then whenever an Argos satellite passes overhead Argos-based and GPS-based fixes on the buoy will be obtained. These will be sent to a ground station and processes. Fixes will be emailed to the Argos contract holder (Ed Lyman – Hawaiian Islands Humpback Whale National Marine Sanctuary, regional stranding coordinators, and the National Large Whale Entanglement Response Coordinator).

Shutdown

There is only a single control for starting up and shutting down the GPS System – the shutdown magnet. Should you need to shut it down again, use tape to secure the magnet back onto the top of the transmitter in the proper position (as indicated by a depression).

Thirty seconds after applying the magnet, the system will enter its shutdown mode, as indicated by the VHF beacon ceasing all transmissions.

If there are any questions please don't hesitate to contact Ed Lyman at (808) 264-8023.

Revised: October 2018

○ Appendix K – Ross Timed-Release Clip Checklist

Timed-release clip for Large Whale Entanglement Response
(AKA Ross Clip)

Background and Justification: In authorized large whale entanglement response efforts, buoys meant to track an animal for later response, or to slow it down and keep it at or near the surface, are at times added to the gear entangling an animal. These buoys by their very nature and/ or purpose provide drag and buoyancy that can negatively impact the animal. As in any procedure, a risk assessment is performed to determine whether the use the buoy is warranted. This involves weighing the risks from the additional drag force and the impacts the added buoy may cause, to the benefits of re-locating and subsequently freeing an animal from a life-threatening entanglement. Typically risks and impacts to the animal(s) increase over time. The longer the buoy(s) is on the animal, the more sever the impact from drag forces associated with the buoy are likely to be. While low-drag telemetry buoys have been investigated (Ross, pers. comm.; Woodward, pers. comm.), they have yet to provide an adequate solution, and while any buoy is added with a short-term resolution in mind, sometimes for a variety of reasons (some aimed at reducing human risks), buoys are left on the animal for longer than anticipated. The use of the Ross timed-release clips, that incorporate easily-obtained and dependable galvanic releases, can mitigate the longer-term risks associated with added drag and buoyancy forces through dependable release of the added buoy(s) at a user-defined time.

Objectives on use: Use of galvanic releases incorporated in custom-made clips to safeguard against impacts caused by unanticipated long-term attachment of kegging and telemetry buoys to gear entangling large whales. In addition, the clips will likely decrease operational risks by allowing the use of telemetry in circumstances where timely response cannot be assured, such as tagging an animal during its migration, and/or feeling pressured to respond or recover a buoy at times and places a response should not be mounted. In cases of weighted gear coming off an animal, and at shallower depths (*i.e.* 1000 feet or less), the time-releases may allow the telemetry to be recovered once it returns to the surface and starts transmitting again.

Description: The Ross clip is essentially a modified (custom-made) Pelican hook that instead of the loop that holds the clip closed, incorporates a galvanic release to allow dependable, accurate, and user-defined temporal release. Different galvanic releases can be selected to accommodate different release times based on assessment of entanglement and animal, response parameters, and water chemistry affecting dissolution rates of the releases.

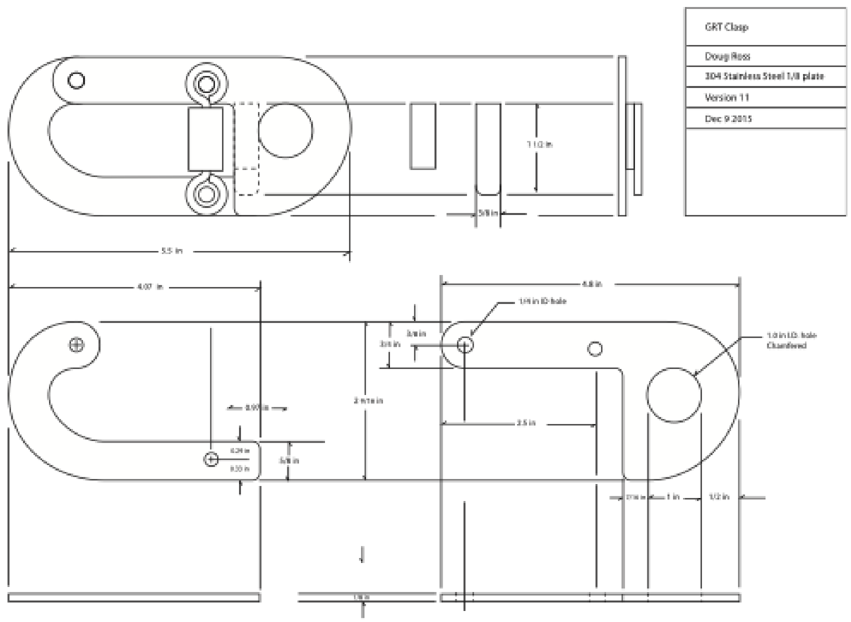


Figure 1: Schematic diagram of prototype Ross galvanic timed-release clip (D. Ross)

Future improvements: Many improvements have already been made. However, the use of round-stock, rather than plate stainless steel, are in the works.

Image of prototype galvanic timed-release

Instructions on use

Maintenance/ storage:

The clips themselves are stainless steel and fairly immune to effects of moisture; however, the galvanic releases are not and will start to dissolve if wet or even moist. **Clips must be stored in a dry location**.

If the galvanic releases have been used for more than 2 days (cumulatively) or are pitted (as opposed to smooth or burnished), then the galvanic release itself should be replaced. After removing the old galvanic release, keep all hardware; it will be used to mount the new release. If the release eyes do not match up (are not on the same plane), they can be slowly turned with a pair of pliers to line up. On securing to the clip, it is critical that the eyes, and thereby the galvanic release, be isolated from the rest of the clip by using either nylon or neoprene washers on either side of the eyes. Again, releases **need to be isolated from the rest of the clip to work properly**. Some models of the ROSS timed release have one eye floating in a socket (on release this allows the clasp side to be entirely free of any hardware and thus allow the tethered line to release cleanly), while others are secured on both side. If replacing an entirely spent galvanic release and working with the floating attachment model, you will need replacement hardware (10x24 ¾" SS) for attaching the one side of the galvanic release. Either way, the **hardware securing the galvanic release to the clip needs to be tight** or it might fail (see images).

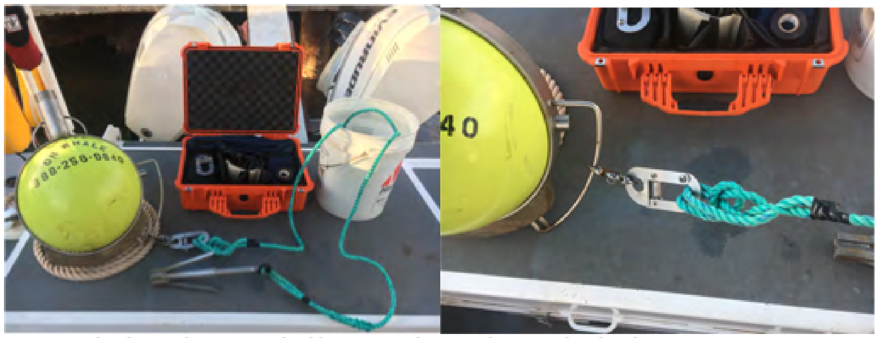
A new galvanic release isolated from the clip.

A burnished, un-isolated relase

Preparation:

The clips are attached at or near the buoys. For the telemetry buoy, the clip's smaller opening is secured to the existing clip attached to the buoy's bail. The tether line is attached to the larger opening either by using a knot (recommend a bowline with bitter end secured), or securing the clip on a spliced eye if it exists.

Make sure the galvanic release is fairly new (not pitted or smaller in diameter) and isolated, that the release hardware is secure/ tight, and that the tethering line and buoy are secure.



Ross timed-release shown attached between telemetry buoy and tether line.

Deployment:

The clip adds little complexity to the overall deployment and handling of the control line, thus maintaining minimal risk. Once the clip is secured to the telemetry buoy, deployment is really no different. It represents little threat of becoming caught in the entanglement or worse yet, catching a member of the team, since the clip resides right at the buoy. However, their use for kegging buoys may cause added risk as the user will have to work with the extra hardware and be aware of additional risks (snags and/or bangs). As always handle the gear with caution and make sure gear it is deployed on your terms (DO NOT let the animal take gear out of the boat).


A pitted galvanic release in need of replacement and a spent timed release in need of a new galvanic release. Not the missing hardware on the open clip side.

- ## Appendix L – Risk Assessment GAR

Disentanglement Risk Assessment

OPERATIONAL DISENTANGLEMENT RISK ASSESSMENT

		Comments
Weather Conditions		
Max score = 5		
Responder Experience Level		
Max score = 5		
Complexity of Operation		
Max score = 5		
Animal Behavior		
Max score = 5		
Disentanglement Gear Condition		
Max score = 5		
Operating Area		
Max score = 5		
Resources Available		
Max score = 5		
Boat & Crew Fitness		
Max score = 5		
TOTAL RISK	0	
Max Total Score = 40		

WHALE RISK ASSESSMENT

		Comments
Age Class of Animal		
Max score = 5		
Number of Lines		
Max score = 5		
Number of Wraps		
Max score = 5		
Lines Cutting In		
Max score = 5		
Additional Weighting of Gear		
Max score = 5		
Degree of Cyamid Coverage		
Max score = 5		
Body Parts Involved		
Max score = 10		
TOTAL RISK	0	
Max Total Score = 40		

GREEN = 0 - 14 (Go, Low Risk)
AMBER = 15 - 28 (Use Extra Caution)
RED = 29 -40 (Stop, High Risk)

OPERATIONAL DISENTANGLEMENT RISK ASSESSMENT

Anticipated Weather Conditions and Forecast (Max score is 5)

Category	Score
Beaufort sea state 0	1
Beaufort sea state 1	2
Beaufort sea state 2	3
Beaufort sea state 3	4
Beaufort sea state 4 or greater	5

Responder Experience Level (Max score is 5)

Category	Score
Level 5 responder	1
Level 4 responder	2
Level 3 responder	3
Level 2 responder	4
Level 1 responder	5

Complexity of Operation (Max score is 5) * Use whale risk assessment score*

Category	Score
Whale Risk Score 6 - 12	1
Whale Risk Score 13 - 19	2
Whale Risk Score 20 - 26	3
Whale Risk Score 27 - 33	4
Whale Risk Score 33 - 40	5

Animal Behavior (Max score is 5)

Category	Score
Anchored animal	1
Free-swimming, highly approachable	2
Free-swimming, short time on surface	3
Free-swimming, highly evasive, terminating surfacings, short time on surface	4
Free-swimming, highly evasive, terminating surfacings, short time on surface, other animals present	5

Disentanglement Gear Condition (Max score is 5)

Category	Score
All gear needed is present, working, new condition	1
All gear needed is present, working, moderate cond	2
All gear present, working, bad condition	3
Minor gear missing, majority functioning	4
Moderate gear missing, majority functioning	5
Majority gear missing, majority non-functioning	

Operating Area (Max score is 5)

Category	Score
Within 5-10nm from shore	1
Within 11-15nm from shore	2
Within 16-20nm from shore	3
Within 21-25nm from shore	4
Within 26-30nm from shore	5
Greater than 30nm from shore	

Resources Available (Max score is 5)

Category	Score
Aircraft, addtl vessel, mother ship support	1
Addtl vessel, mother ship support	2
Small addtl vessel support	3
Only aircraft support	4
No additional resources available	5

Boat & Crew Fitness (Max score is 5)

Category	Score
Crew well rested, boat in great shape	1
Crew moderately rested, boat in good shape	2
Crew rested, boat in fair shape	3
Crew tired, boat in good shape	4
Crew exhausted, boat in poor shape	5

Anticipated Weather Conditions & Forecast:

Is the forecast and expected weather conditions conducive to conducting a disentanglemenmt operation? Is there enough daylight remaining to initiate a disentanglement operation, or is there adequate time to deploy a tag and regroup when conditions are better? What effects will changing weather conditions have on operations? Can adjustments be made quickly or operations terminated in the event that the weather deteriorates? Can any added equipment or drag to the animal safely be removed prior to leaving the animal at the end of the day?

Responder Experience Level:

Do the responders have the proper training, experience and authorization to conduct the disentanglement mission? How familiar are the crew with the entanglement configuration? How familiar are the responders with the operating platform? Do the responders have the equipment and experience to properly assess and obtain biopsy samples (also see Resources Available)? Do the responders feel comfortable in attempting to conduct a disentanglement operation, is this true for everyone on board the responding vessel?

Complexity of Operation:

These value is taken from the Whale Risk Assessment Component. It focuses on: What is the nature and configuration of the entanglement? Are the flippers involved? Is the mouth involved? Are there significant injuries associated with the entanglement that would limit any additional drag being applied to the animal? Is there any trailing line behind the animal, enough to motor up to and acquire? Has the animal been the focus of a disentanglement previously that might influence its current behavior? Is the animal's behavior uncooperative to attempt a disentanglement (also see Animal Behavior)? How much daylight is left for operations?

Animal Behavior:

How approachable is the animal? Is the animal traveling, if so, how fast and what is the surfacing times, is it adequate to make any attempts? Has the animal been the focus of a disentanglement previously that might influence its current behavior? Is there more than jus the entangled animal? Is it a mother/calf? Are the animals in a SAG?

Disentanglement Equipment Available:

Are the appropriate disentanglement tools available? Are there specialty tools needed to properly address the entanglement? Is there telemetry available to deploy to buy additional time to get the appropriate tools required? Are there multiple tools available in the event that a tool is lost overboard? Are there multiple cutting tools available depending upon severity of line constriction on animal?

Operating Area:

How far from shore is the animal (NOAA small boat policies)? What resources will be available in a remote area where USCG or medical services will not be easily accessible? Will boat traffic, floating debris or tidal/current changes have an impact on the operations?

Resources Available:

Are the appropriate reqources available onboard the responding vessel (i.e. cutting and attachment tools, telemetry tag and buoy, additional floatation, documentation equipment, etc)? Are there any additional resources readily available if needed (i.e. USCG vessel near-by, additional research vessels in vicinity, aircraft support, etc)? Do the responders have biopsy equipment? Is there a satellite phone available if VHF communication equipment doesn't work? Has a float plan been filed?

Boat & Crew Fitness:

Is the boat in good working order? Has it undergone all needed recent preventative maintenance? Are all of the communication equipment onboard functioning properly? Is the crew well rested or were they required to drive long distances to get there? Has the overall mission compromised health or added stress? Do any of the response crew have medical conditions that might prevent them from safely participating in the mission?

○ Appendix M – LWER Decision Matrix

Severity

Likelihood	A Negligible	B Minor	C Moderate	D Major	E Catastrophic
V. Very likely	Low Risk	Moderate Risk	High Risk	Extreme Risk	Extreme Risk
IV. Likely	Minimal Risk	Low Risk	Moderate Risk	High Risk	Extreme Risk
III. Possible	Minimal Risk	Low Risk	Moderate Risk	High Risk	High Risk
II. Unlikely	Minimal Risk	Low Risk	Low Risk	Moderate Risk	High Risk
I. Very unlikely	Minimal Risk	Minimal Risk	Low Risk	Moderate Risk	Moderate Risk

○ Appendix N – Criteria for Determination Large Whale Entanglement Confirmation

In an effort to standardize the reporting and subsequent analytical use of large whale entanglement case numbers, we are instituting a nationally consistent, standardized definition of what constitutes a "confirmed" large whale entanglement case. The Regions provided the criteria that they currently use to determine if a reported entanglement case is considered to be a confirmed case (regardless whether it is a new case or a resight of a previously known case), versus an unconfirmed entanglement case, and a national standard was created based on this input.

Suggested National Criteria

Three different levels for entanglement case confirmation:

Entanglement- attached human-made materials (ropes, nets, line, debris, etc.), with or without associated materials (hooks, buoys, anchors, pots/traps, etc.)

1. Confirmed = criteria met on the affirmative that the animal was indeed entangled.

2. Unconfirmed = not enough information to successfully meet the criteria for confirmed; cannot be determined whether an animal is entangled or not.

3. Not Entangled = enough information provided to positively confirm that the animal was NOT entangled.

<u>Confirmed</u> = Large whales with attached human-made materials (may include rope, net, monofilament line, or debris), with or without associated materials (hooks, buoys, pots/traps, etc.). Relative severity of the entanglement (minor - life-threatening) does not matter for case confirmation. It is possible for a confirmed case to not have all of the details (exact species of whale, location, type of gear, etc.).

Reasons to deem a report "confirmed" can include:

- Photographic or video evidence (IDEAL);
- NOAA staff has direct visual observation;
- The report came from a trusted source (trained or professional observer);
- A follow-up interview of the reporting party was conducted by an experienced network member (Level 3+) or agency expert, using non-leading questions, and the network member/agency expert believes that the whale was entangled; or
- Corroborated, independent, and multiple sources of reports have been received with detailed descriptions of the animal and entanglement

Unconfirmed = Based on the information obtained from the reporting party, it cannot be confirmed if there are human-made materials attached to the animal.

Reasons to deem a report "unconfirmed" can include:

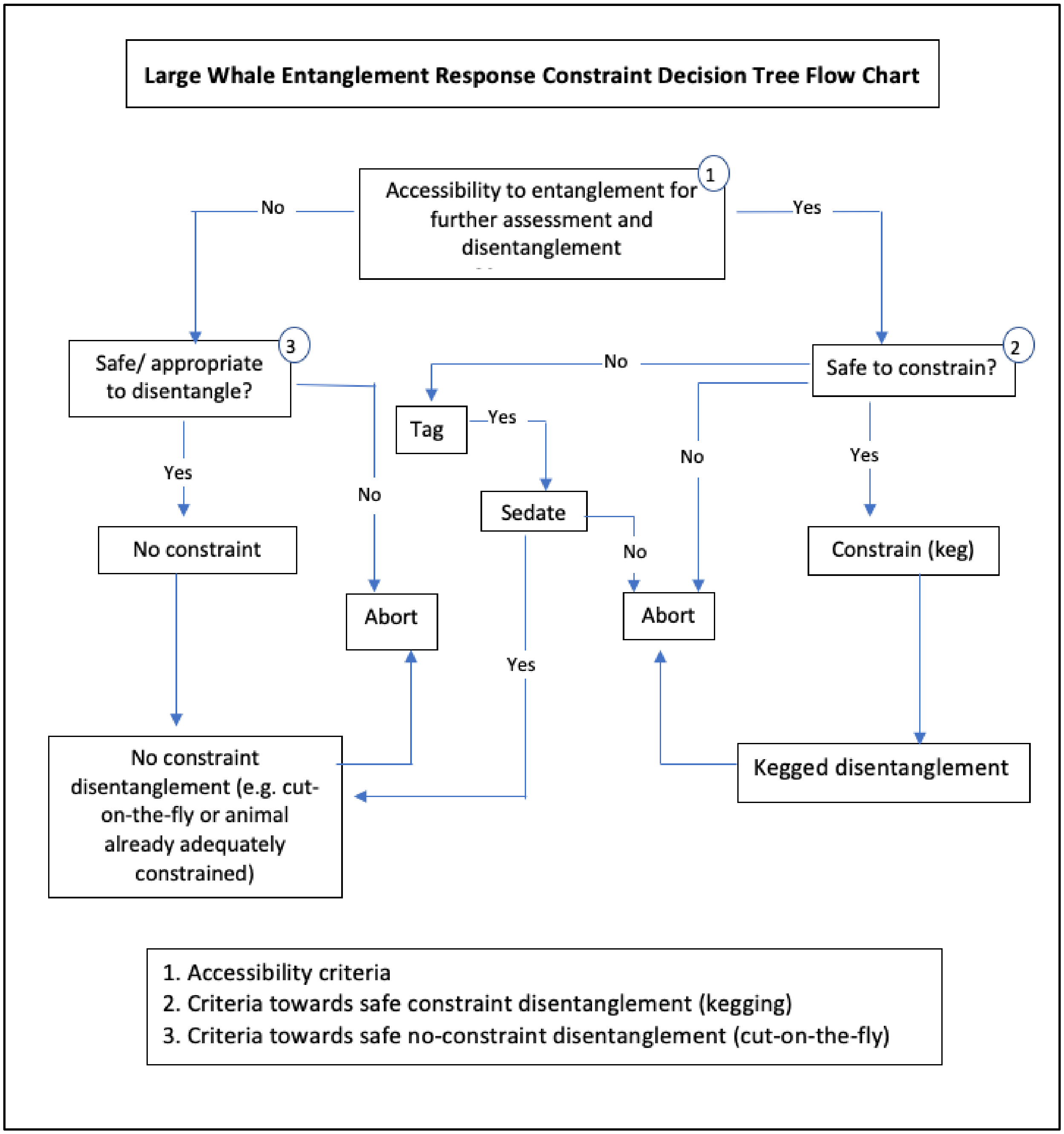
- No documentation/confirmation from photographic or video evidence (including only having photos of the whale that do not show any gear);
- Report from non-trusted source (untrained observer, general public);
- Information not able to be confirmed by follow-up interview or corroborated by subsequent reports
- Presence of gear in the vicinity, but unable to determine if attached to animal (whale logging near buoys, whale swimming/thrashing near fishing gear)
- Vague, uncertain, or limited descriptions
- 2^{nd} or 3^{rd} hand reports

Common incidents for this are they saw white on the animal (Mn flippers), there was a buoy next to the whale and it wasn't moving (potential logging), whale was thrashing about next to buoys. the report came from a non-trusted source (untrained observer, member of the public, etc.), the report is vague, the reporting party seems overly emotional or willing to say anything to provoke a response, or a limited/uncertain description, single sighting, or second or third-hand report.

Not Entangled = Documentation shows no gear attached to the animal. These may initially be considered "unconfirmed," but we acquire additional information that confirms that the animal was not entangled. Either gear was not ever present (common incidents for this are scars or other newly documented entanglement trauma), or gear was present in the area or on the animal but was not attached to the animal (animals interacting with gear but the gear does not become attached to the animal).

In certain situations, a group assessment (independent blind evaluation of reports with subsequent comparison of results) may be used to make the final category determination.

○ Appendix O – Constraint Flowchart/Decision Chart



○ **Appendix P – Heightened Consultation**

Highlights the procedural and safety considerations on the following topics:

a. Case-by-case differences
b. Tool options - fixed knife, flying knife, cutting grapple
c. “Danger zone” and proximity to the whale, particularly near flukes
d. Qualifications for boat captain as far as experience and training in entanglement situations or large whale science studies
e. Stand down option at any point in the operation

Heightened consultation represents consultation with regional-specific leads (GAR/SER - David Morin; WCR - Justin Viezbicke, AK/PIR/WCR - Ed Lyman, any - Sarah Wilkin) with:

a. Detailed assessment of entanglement
b. Proposed course of action (can include telemetry buoy with future cutting)

If contact cannot be reached (out of cell service, unavailable):

Level 3s only authorized to document above water, no pole cams, tagging or cutting.
Level 4s authorized to document and apply tag, no cutting
Level 5s authorized to document, tag, cut anything on any species except right whales (which will be authorized on a case-by-case basis)

○ Appendix Q – Response Briefing/Incident Action Plan Sample

GENERAL BRIEFING	1. INCIDENT NAME	2. OPERATIONAL PERIOD	3. INCIDENT ID
	Pinos Mn crabtrap	First	2015May05Mn

4. INCIDENT SUMMARY **Nature of Distress or Injury**

Mn w/ obvious entanglment
BlueSteel around peduncle at fluke insert
trailing about 50' behind w/ 2 floats –
one white, one red-over-green

Looks freshly entanlged, but not likely to
shed on its own
Presently traveling with two other Mn

Responding Party (RP)/Vessel: Alsia Schulman-Janiger / Sea Wolf MBWW

RP Contact Information: Cell: 818 555-1234

Date and Time of First Sighting: 2015 May 05 / 14:30
Time Report Received: 15:15

Species (if known, otherwise a general description): humpback - Mn
Est. Size/Age Class: 30' subadult

General Locality: ~ 5nm NNW of Pt. Pinos

Latitude: 36° 41.15'N
Longitude: 121° 58.11'W
confirm format
~~decimal degrees (nn.nnnn°)~~
decimal minutes (nn°nn.nn')
~~degrees min sec (nn°nn'nn")~~

Direction of Travel, Speed: SW 3kts

Weather/Sea State: partly cloudy, NW 5<10, swell 5'-7', <3' chop

5. COMMUNICATIONS PLAN

FUNCTION	MODE (Mobile Phone or VHF)	NUMBER OR CHANNEL DESCRIPTION	CHANNEL
COMMAND (TEAM — BASE)	Heather's mobile	415-555-2222	
TACTICAL (TEAM — TEAM)	M-VHF	USCG Ops	21A

TELEMETRY ARGOS Platform ID 834922 VHF Frequency 151.0700 RX Channel 92 GPS?

6. ACTION PLAN SUMMARY

MLS has WET telemetry, enroute to assess
Will report.
Fast Raft to stand by.
Stap, Marcos, & Ross on board.
Justin has been notified.

Photos or Video Taken? stills & video, iPhone

Can RP stay with the animal? How long? only 30 min (1600)

Hand-off Vessel(s)? MLS Albin & Fast Raft

Response team ~ Folkens, Berger, Koontz, Shaw on standby for 2nd Ops Period
Also JD, Benson, Willis
Shaw, JD, Benson Rendezvous @ WET trailer/MLML SBO for gear
Team assembles @ CG Jetty (Fulmar) if a go @ 0800

CWR-ICS 100 MMHSRP 12/15	7. PREPARED BY	8. DATE PREPARED	9. TIME PREPARED
	Pieter Folkens	2015 May 05	1540

○ Appendix R – Large Whale Documentation Instructions and Hints (PIR)

Large Whale Response Documentation Instructions and Hints

Compiled November 2014
NOAA Hawaiian Islands Humpback Whale National Marine Sanctuary
Documentation Instructions (for authorized responders):

Surface - still and video:

Always have support/documenting vessel maintain a safe distance and avoid getting in path of animal and effort. The best location is typically beside and slightly behind the animal and/or primary response vessel. If effort is underway, maintain at least 70 meters (75 yards) distance from animal and approach vessel.

Maintain communication with approach vessel. The approach vessel should be taking the lead here with response and safety being the priority; not obtaining the imagery.

If possible/safe, and while maintaining the above, work with support vessel helmsperson to have proper lighting and to have action more–or-less face you (people in approach vessel are facing you).

Try and get the following imagery depicting the broad nature of large whale entanglement response:

- Preparation*
    - Receiving initial report/assessment (*i.e.,* likely staged)
    - Authorization (*i.e.,* staged)
    - Gear preparation (assembly, programming, etc)
    - Training (*i.e.,* both classroom and on-water, hands-on)
    - Planning (action plan formulation)
    - Performing initial GARs
    - Alerting network and general communication
    - Loading support vessel with gear
    - Setting up telemetry

- Underway*
    - Getting underway (*e.g.,* response vessel from port/rescue inflatable from response vessel)
    - Vessel ops (*e.g.,* captaining, whale lookout while underway)
    - Vessel moving through water
    - Landmarks being passed
    - Searching
    - Preparation while underway (*e.g.,* setting up equipment)

- Animal
    - Identity (*e.g.,* species as well as individual – fluke, dorsal fin, scars)
    - Health (*e.g.,* emaciated? cyamids, blisters, color and texture of skin)
    - Wounds (*e.g.,* location, severity, identity of source)
    - Nature of distress (*e.g.,* entanglement, ship strike, stranding)
    - Behavior (*e.g.,* breaching, head rises, respirations, speed)

- Association with other animal(s)
  - Conspecifics
  - Other species (*e.g.,* dolphins)
  - Predation threat (*e.g.,* sharks)

- The entanglement
  - Identity of gear (*e.g.,* buoys, configuration of gear, close-ups of line)
  - How entangled (*e.g.,* origin, # of wraps, how tight)

- The response operation (get procedure, people, and whale in same shot)
  - Deploying inflatable
  - Initial approach
  - Assessment (*e.g.,* rescue team and whale, looking over side of boat)
  - Documenting (*e.g.,* shoot the other guy taking pictures)
  - Grapple (*e.g.,* try to have throw facing you)
  - Nantucket sleighride
  - Attaching telemetry
  - Kegging (*e.g.,* attaching as well as towing buoys)
  - Use of sea anchor
  - Cutting (*e.g.,* fixed knife and flying knife cuts)
  - Safety (*e.g.,* personnel with PFDs and helmets)

- People
  - Primary response team efforts (mostly covered above)
  - Network members/support team (*e.g.,* the team and other boats)
  - Interviews (ask personnel appropriate questions)
  - Pre and post briefs (*e.g.,* discussions, see planning)
  - Communication

- Post response*
  - Retrieval of gear
  - Breaking down inflatable and rescue tools
  - Returning to port (from vessel and from shore)
  - Unloading vessel
  - Communications and reports (*e.g.,* website)
  - Cleaning and stowing gear (next prep)
  - Gear investigation (*i.e.,* the science behind the response)
  - Obtaining telemetry fixes
  - Additional planning
  - Media

* Represents lower priority

Pick a good location on the vessel that allows flexibility, stability, personal safety, and avoids obstructions (*i.e.,* rigging). Always check/get permission from captain.

Helmsperson should always know you are shooting in these locations and maintain communication with helmsperson.

Watch yourselves. Don't get caught up so much with documenting the event that you put yourself at risk.

Additionally, as documenters you are in a role of assessing the overall operation. If you see someone doing something wrong/unsafe, or any risk, please point it out. What you document has value for assessment, training and media use. However, for media use certain criteria need to be met. For instance, personnel need to have PFDs on, and proper protocol needs to be displayed. Images will have to be reviewed prior to going out to the media.

Remember, certain lighting conditions, like glare off water, can fool a camera's automatic exposure settings. Sometimes it is best to use manual exposure settings and expose off neutral backgrounds or establish settings based on general lighting conditions. Generally, good surfaces/subjects to get exposure readings from are dark blue sky away from the sun, dark water on the shadowed side of boat (but not in the shadow), and a black Pelican case in the sun.

In low light conditions (dusk), set ASA higher. If conditions allow, ASA (ISO) should be set 400 or below. As it gets darker, ISOs (sensor light sensitivity) will have to be increased to maintain some shutter speed. Today's digital SLRs can accommodate high ISO settings, but be aware that at higher ISOs (> 3200) you may start to get grainy-looking images. You can also lower the shutter speed, but with a speed less than 1/500th of a second (assuming you are using a 300 mm lens), you are likely to have soft-focused images.

Prioritize shutter speed. Typically shoot at shutter speeds greater than 1/1000th of a second if possible. If there is a great deal of action or sea conditions are choppy, shoot at 1/1500th of a second or faster. This will be no problem on a sunny day.

Use polarizing filters when possible during bright days but be aware that their use reduces the amount of light entering the camera by 1.5 – 2 F-stops.

Video cameras are generally more forgiving in regard to exposure and low light conditions, but still be aware of their limitation. Both will have difficulty auto focusing as light levels decrease. You may be able to use the video cameras in lower light situations than the digital still cameras.

Under certain conditions, like grey cloudy days, or calm seas, autofocus may not work well in the digital still cameras. Use manual focus.

Don't over zoom. Images and even video can be cropped afterwards. If you do zoom with the video, do so smoothly and hold for a short moment (*i.e.,* 1 - 2 seconds, and then zoom back out. If you zoom with the digital still cameras remember to shoot with a faster shutter speed. The rule of thumb is to shoot faster than the fractional value of the focal length of your lens considering any aspect ratio. For instance, with a Canon 7D, Mark II, which has an aspect ratio of 1.6 (the camera sensor is smaller than film, so it seems like you are zoomed in when compared to a full-frame camera), and using a 300 mm lens (which multiplying by the 1.6 gives you an apparent focal length of 480 mm), you'd want to shoot at least 1/500th of a second.

Change lenses if necessary. If the action is close there are typically different focal length lenses (*e.g.*, wide angle).

Use data forms or iPad dataloggers to log what you have shot. For video, it helps to verbally log while you are shooting. You may provide some conservative narration (don't overstep your knowledge base or over analyze a situation) and be aware that any conversations you might have are being recorded.

Watch batteries/storage for capacity. Don't wait until batteries are dead, or cards are full. You may miss an important shot. Look for a break in the action to make battery and card changes. When switching cards and tapes, take the time to make sure the removed media is safely stored and properly labeled.

Digital SLRs should be set to shoot in RAW format. Many cameras will also provide JPEGs. In addition, be aware that you will likely only be able to rapidly shoot eight frames or less at a time (due to processor, image quality, and card speed).

Watch that lenses and cameras are kept clean (*e.g.*, spray, whale breath, fingerprints). Just a drop of saltwater making its way into the interior of today's digital equipment can wreak havoc. Protect cameras from rain. Use appropriate paper or micro-fiber wipes to keep lenses clean.

If you see a dull spot on your images when viewing images on the camera's display, and your lens is clean inside and out, this may be dust on the sensor. You may need to have the camera professionally cleaned. Be careful when switching lens and do so when the camera is off. Don't leave a lens off the camera for an extended period of time, since this is when dust particles find their way to the sensor. Periodically clean the sensors if experienced and have the correct tools. If using one of the newer cameras, there is typically a sensor cleaning function when you turn the camera on or off. Try switching the camera off and then back on to see if that solves the problem.

When not in use, stow gear safely (don't leave on deck or cases setting open on benches).

GoPro/POV cameras

These are miniature digital cameras that shoot stills, as well as, very high resolution (*e.g.,* 4K) video. They are typically housed in waterproof cases good to 10 meters or more. Their small size, fast shutter, wide angle of view (170º), ease of use, and most importantly, their ability to be programmed, means they can be mounted on a variety of surfaces, including support and approach vessels, helmets, and poles and spars to continuously document the action from the air, surface and/or in the water (using a pole).

Though programmable, they will need some tending. Batteries and card storage typically last more than an hour. They can be easily turned on and off. The newer models can be controlled over WiFi and Bluetooth.

As is the case with any of camera, the priority is on personal safety and focusing on roles that reduce risk. As an example, if using a helmet-mounted camera, do not let the camera divert your attention.

○ Appendix S – Biological Samples During Large Whale Entanglement Response Activities

1) Only highly experienced and well-trained personnel may perform intrusive procedures (including but not limited to biopsy, blood sampling, and tagging). A veterinarian or their designee must be present if animals will be sedated or anesthetized.

2) Biological samples must be collected from live animals in a humane manner (i.e., that which involves the least possible degree of pain and suffering).

3) Sterile, disposable needles, biopsy punches, etc. must be used to the maximum extent possible (always use sterile or sterile disposable needles for blood sampling and injections of drugs or other approved substances).

4) When disposables are not available, all instruments (e.g., biopsy tips) must be cleaned and disinfected using non-toxic and non-irritating disinfectants between and prior to each use.

5) In order to avoid, minimize, or eliminate impacts on the affected species, non-target species, and the environment, mitigation measures described in Chapter 5 of the FEIS must be followed for the biological sampling activities authorized by this permit: http://www.nmfs.noaa.gov/pr/pdfs/health/eis_chapter5.pdf. These mitigation measures must also be followed with regard to ensuring human health and safety.

6) Authorized personnel working with marine mammals and marine mammal parts are encouraged to report to the Permit Holder any illness resulting from zoonotic disease transmission. This information should be included in the annual report.

7) Biological samples must be collected, maintained, and transferred in accordance with Appendix 9 of the NMFS research and enhancement permit No 18786-04 issued to the MMHSRP.

○ Appendix T – UAS Criteria Minimum Operational Requirements (Section 6.14 in NOAA UAS Handbook, initial release)

The following requirements must be met prior to any NOAA UAS flight operation commencing:

a. Flight Authorization Memorandum from Commanding Officer, Aircraft Operations Center.

b. For flights in the National Airspace Systems (NAS), an approved FAA airspace authorization.

c. For flights in Special Use Airspace (SUA), an approval from the controlling agency.

d. For flights in non-U.S. airspace, written approval from the foreign aviation regulatory agency, diplomatic clearance through the U.S. State Department, and compliance with all International Traffic in Arms Regulations and foreign export requirements.

e. Meet AOC PIC requirements.

f. Meet AOC airworthiness and maintenance requirements, as applicable.

g. AOC approved Operational Risk Management (ORM).

h. NTIA frequency clearances.

i. Ops plan (required for complex operations, see Section 6.6)

j. Meet all applicable environmental compliance requirements.

k. Approved checklist from Appendix I – Line Office Administrative Review of UAS Operations.

UAS Pre-Acquisition Approval Checklist

The Line Office shall certify that proposed UAS acquisition or Commercial Aircraft Service (CAS) meets Line Office requirements, NOAA, DOC, and other applicable federal policies by addressing each checklist item and completing all signatures prior to contract solicitation. Completion of this checklist applies to the processing of all UAS acquisitions, regardless of dollar value or previous AOC UAS airworthiness determinations. The applicability of each checklist item for acquisitions of UAS and/or CAS is indicated.

Reference: NOAA UAS Handbook, Appendix H – UAS Pre-Acquisition Guidance.
Federal Policy Checklist

____ Inherently Governmental Functions Determination (CAS)

For services, determination that none of the functions being performed are inherently governmental (FAR 7.503[e] and CAR 1307.503).

____ Statement of Work Requirements (CAS)

This statement of work includes specific tasks to be performed and the deliverables to be provided.

For a service contract, the UAS operational tasks and a surveillance plan must be provided. These documents must be submitted with the purchase requisition and requisition package submission to AGO.

____ Liability Insurance Requirements (CAS)

This statement of work includes liability insurance requirements.

Contracted UAS operations expose NOAA to additional liability risk. Line Offices shall include liability insurance requirements for inclusion in solicitations for services.

____ NOAA UAS Privacy Policy (CAS)

This statement of work addresses NOAA's UAS Privacy Policy and does not change or remove any existing obligation of law or policy regarding privacy.

NOAA's UAS Privacy Policy outlines the collection, use, retention, and dissemination of information obtained by UAS operation and use to ensure that, in carrying out NOAA's mission, any UAS operation by NOAA, on behalf of NOAA (*e.g.*, by contractors), or with NOAA sponsorship (*e.g.*, by grantees), will not violate the privacy rights of the of the individuals whose Personally Identifiable Information (PII) may be collected or observed through NOAA's UAS activities.

____ Federal Cyber Policy (UAS Acquisitions and CAS)

This statement of work addresses Federal Cyber Security and Information Technology Policies.

This includes, but is not limited to Sec. 205 of the Cyber Security Information Sharing Act of 2015, OMB Circular A-130, NIST SP 800-37, and NAO 212-13 NOAA Information Technology Security Policy.

____ Environmental Compliance (UAS Acquisitions and CAS)

The Line Office has completed all applicable environmental compliance reviews, consultations, and permitting requirements, including, but not limited to, the National Environmental Policy Act, 42 U.S.C. § 4321 et. seq; NOAA Administrative Order 216-6A; Endangered Species Act, 16 U.S.C. § 1531 et seq., and Marine Mammal Protection Act, 16 U.S.C. § 1361 et seq. If applicable, the statement of work addresses any required mitigation measures, best management practices, monitoring, terms and conditions, or other environmental compliance requirements.

Approval

____UASPO Director (Acquisitions and CAS)

UASPO has been consulted regarding this pre-solicitation. (sign and date)

____OMAO UAS Advisor (CAS)

OMAO has reviewed the pre-solicitation specifications provided to ensure they include NOAA and FAA operational requirements. (sign and date)

OMAO-assigned clearance number.

____AOC UAS Section Chief (UAS acquisition)

The AOC UAS Section has reviewed the pre-solicitation specifications provided to ensure the UAS acquired will meet NOAA airworthiness and operational requirements. (sign and date)

____Line Office Executive Level Approval (sign and date)

The ___________________(Line Office) has reviewed this pre-solicitation form and supporting documents. Approval to proceed with this acquisition is granted.

- **Appendix U – Free-swimming Whale Sedation Datasheet (IFAW)**

Marine Mammal Rescue and Research
Free-swimming Whale Sedation Datasheet

ifaw

Whale ID: ____________________ IFAW#: ____________________
Date: ____________________ Location: ____________________________________

DARTING/SEDATION DATA		
Est. Weight (kg):	**Dart Dosing Weight (kg):**	**Actual Weight (kg):**
Projector: MK24C Daninject JM	**Dart Type:** Paxarms Daninject	**Marksman:**
Needle Length: **6" 9" 12"**	**Darting Attempted?** N Y	**Darting Time:**
Darting Distance (m):	**Dart Pressure Setting:** 130 PSI	**Wind Dir & Speed:**
Contact? N CBD Y: location on animal:		**Est Needle Depth/Angle:**
Post-Darting Behavior: dive delayed dive stayed at surface other:		
Dart Discharged? N CBD Y	**Est. % Discharged:**	***If darted, fill out disent and recovery data**
Midazolam (50mg/ml) **Target Dose (mg/kg):_______ Actual mg:________ Vol (mls):_________** **Actual Dose (mg/kg):__________**		
Butorphanol (50 mg/ml) **Target Dose (mg/kg):______ Actual mg:______ Vol (mls):_______** **Actual Dose (mg/kg):__________**		
Time to First Evidence of Sedation: __________ **(describe in notes)**		
Overall Level of Sedation: none mild moderate/ideal deep		
Add'l sedatives needed? N Y: (*note drug(s), volume, route, inj site if not noted in Capture Data Box*)		
Notes:		

Marine Mammal Rescue and Research
Free-swimming Whale Sedation Datasheet

ifaw

Whale ID: ______________________ IFAW#: ______________________
Date: ______________________ Location: ____

RECOVERY DATA		
Flumazenil (0.1mg/ml)	Volume (mls):_______ Route/Site:_________ Time:_______	
Naltrexone (50 mg/ml)	Volume (mls):_______ Route/Site:_________ Time:_______	
Time of initial behavior change:	Describe behavior:	
Time to RR/depth normal:	Time to swim speed normal:	Time to full recovery:
Time backed off animal:	Behavior:	
Monitoring vessel:	Behavior in the water:	
End vessel monitoring time:	Behavior at time of departure:	
Recovery Assessment: Smooth / Rough Fast / Average / Prolonged		
Recovery Notes:		

DRUG LOG (list all drugs drawn up today)

Drug	Bottle #	Volume (mL)	Used	Not Used

Other Comments:

- **Appendix V – Large Whale Dosage Charts**

Large Whale Sedation Dosage Chart (Midazolam and Butorphanol)

	0.1mg/kg dose of each	50 mg/ml concentration
Animal Weight (kg)	**Dose (mg)**	**Dose (mls) of each drug**
5,000	500	**10**
6,000	600	**12**
7,000	700	**14**
8,000	800	**16**
9,000	900	**18**
10,000	1,000	**20**
12,000	1,200	**24**
15,000	1,500	**30**
20,000	2,000	**40**
25,000	2,500	**50**
30,000	3,000	**60**
35,000	3,500	**70**
40,000	4,000	**80**
45,000	4,5000	**90**
50,000	5,000	**100**

Large Whale REVERSAL Dosage Chart: NALTREXONE

Naltrexone syringe(s) with Flumazenil (normal dose 0.01 mg/kg, concentration 0.1mg/kg = 1000mL dose for 10,000kg whale= not possible)

	0.1mg/kg dose Naltrexone	50 mg/ml concentration
Animal Weight (kg)	**Dose (mg)**	**Dose (mls) of each drug**
5,000	500	**10**
6,000	600	**12**
7,000	700	**14**
8,000	800	**16**
9,000	900	**18**
10,000	1,000	**20**
12,000	1,200	**24**
15,000	1,500	**30**
20,000	2,000	**40**
25,000	2,500	**50**
30,000	3,000	**60**
35,000	3,500	**70**
40,000	4,000	**80**
45,000	4,5000	**90**
50,000	5,000	**100**

Large Whale CEFTIOFUR Dosing Chart

(based on Gulland et al. 2008 & Meegan et al. 2013)

		Ceftiofur Dose 6.6mg/kg MbW	200 mg/ml concentration
Actual Weight (kg)	**Metabolic Weight (MbW) = W(kg)^0.75**	**Dose (mg)**	**Dose (mls)**
5,000	595	3,927	**20**
6,000	681	4,495	**23**
7,000	765	5,049	**25**
8,000	846	5,584	**28**
9,000	924	6,098	**31**
10,000	1000	6,600	**33**
12,000	1147	7,570	**38**
15,000	1355	8,943	**45**
20,000	1682	11,101	**56**
25,000	1988	13,120	**66**
30,000	2280	15,048	**75**
35,000	2559	16,889	**85**
40,000	2,828	18,665	**93**
45,000	3,090	20,394	**102**
50,000	3,344	22,068	**110**

- **Appendix W – Sample Debrief Report (Hawaii 3/8/2013)**

Response Debrief
3/8 – 3/11, 2013

Entangled subadult humpback whale off Maui

Event background:

On March 8, 2013 at 10:25 HST, tour vessel, Man-o-War, and a U.S. Coast Guard (USCG) helicopter located and reported a subadult humpback whale entangled off Lahaina, Maui. The animal had a single wrap of line around its tailstock and across its fluke blades, and a wrap of line just around the left fluke blade. A yellow toggle buoy rested right at the trailing edge of the flukes and a round (9" diameter), orange (faded red) buoy trailed about 5 feet behind the flukes. The entangling line, made up mostly of 3/8", 3-strand Blue Steel line, trailed about 30 feet behind. The animal was in good condition and not emaciated. The one wrap around the left blade was cutting in several inches into the leading edge of the fluke blade. The entanglement was assessed and considered life threatening.

Entangled humpback whale showing the wraps of gear around tail region (NOAA HIHWNMS/MMHSRP permit # 932-1905)

Operational synopsis:

A full complement of appropriate personal with all roles filled was utilized during both days of operation. All personnel had participated in entanglement response training at least once. On the first day's effort, 7 (of 9) personnel had firsthand experience in large whale disentanglement, and 3 personnel had hands-on experience. On the second day's effort, 6 (of 8) personnel had participated in previous large whale disentanglement efforts, and 4 personnel had hands-on experience. All response personnel were trained, prepared, and qualified for the roles they played. The Co-investigator (CI) under the NOAA Fisheries' Marine Mammal Health and Stranding Response Program (MMHSRP) enhancement permit for both efforts was Ed Lyman (level 5 responder from the Hawaiian Islands Humpback Whale National Marine Sanctuary), who also acted as the efforts' Incident Commander (IC). On the second day's effort Justin Viezbicke (level 4) was a member of the approach team. Justin had participated in 5 large whale disentanglements and was a valuable addition to the team.

Authorized approach team pulling up towards whale (NOAA HIHWNMS/MMHSRP permit # 932-1905)

The Sanctuary's 36-foot rigid-hulled inflatable, the Koholā, was the primary response vessel on both days. The entire cache of entanglement response equipment was already onboard and aided in rapid response capability. Additional (secondary) support vessels were used on the first day's effort in order to help maintain contact (visual) with the highly mobile animal, establish a perimeter in the higher traffic near shore environment, and provide increased safety. The secondary support boats were the U.S. Coast Guard's 45-foot patrol boat out of Maalaea Harbor and the Aloha Kai, a 22-foot catamaran, provided by a trained responder and operator of Ultimate Whale Watch. All boats were appropriate for conditions and response to the animal, and captained by appropriate personnel. The Sanctuary's

15-foot, soft-bottom response inflatable was used during both responses and crewed by appropriate personnel. Conditions were excellent for the first half of the first day's response and deteriorated as the day progressed, but remained well within working limits. The conditions during the second day's effort were optimum towards safety and productivity, a result of tracking the animal and waiting for the appropriate day.

Objectives:

The primary objective of entanglement response is not necessarily to free the whale, but to document the entanglement and its overall impact to the animal (at an individual, population, and species level) through recovery of gear, documentation of the entangling gear and animal, through scar study analysis, and tissue sampling; and maintain safety at all times. The information garnered, along with the documentation of aggregations of debris found floating free, will help answer such questions as where the gear is coming from, the type of gear, how was it set or lost, when and how might the animal have come in contact with it, and allow us to better quantify the degree of threat different gear types/ marine debris; and practices pose to whales and other marine animals. Again, if the entanglement is assessed as likely life threatening, and if resources and conditions allow, a response towards cutting the animal free may be mounted. In those cases where disentanglement effort is carried out, every precaution is to be taken to have **no harm** come to the responders and minimal harm to the animals being disentangled.

Outcome:

Responses mounted on March 8 and 11, 2013 involved the Hawaiian Islands Humpback Whale National Marine Sanctuary, the NOAA Corps, NOAA Fisheries Pacific Islands Regional Office, Kaho'olawe Island Reserve Commission, West Maui Rapid Response team (Ultimate Whale Watch and Hawaii Marine Education and Research), U.S. Coast Guard (station Maui and Air Station-Barbers Point), and MacGillivray Freeman Films (MFF- IMAX team), primarily through helicopter support.

On the first day's effort, the authorized response team was able to assess and document the entanglement, and remove approximately 75ft of trailing line. The initial response effort was halted due to diminishing daylight and the animal was tagged with a tethered transmitter buoy with the intent of resuming operations when weather and resources allowed. Three days later on March 11, those conditions were met and the response team re-located the animal using the tag package. On the second day's effort the response team was able to make several cuts using a fixed knife on the end of a pole to free the animal of over 125 ft of remaining gear. It is believed the animal will likely expel a small piece of line, which was left in one wound, over time. The wounds themselves, while around 4 inches and 1 inch deep along the leading edge of the left fluke blade, will very likely heal. Post mitigation assessment of the animal, which had over 200 feet of line removed, is that it will very likely survive its ordeal thanks to the collaborative efforts of the community working together.

Analysis/ post response risk assessment:

Vessels (including aerial platforms):

What worked well:

- *All vessels functioned well. Vessel operations themselves were seamless.*
- *Response and support vessels were equipped and fully staffed. Support vessels included sanctuary vessel, Koholā, West Maui first responder team's vessel, Aloha Kai, and the U.S. Coast Guard's 45-footer out of station Maui.*
- *The Koholā was the primary response vessel and is customized and outfitted specifically for the task of large whale response, providing turnkey and safe operations.*
- *Aerial support provided by MFF's chartered helicopter was critical to the success of the mission, since the crew provided valuable information on the entanglement and helped re-locate the entangled animal several times. The animal would have been certainly lost without this assistance.*

U.S. Coast Guard provides safety support towards large whale rescue operations

Improvements:

• While the entire bow of the approach inflatable has been cleared of lifelines, D-rings and some handles, a grapple on the working line did catch a handle on the vessel's starboard quarter temporarily before breaking free. Additional catch points on the approach inflatable still need to be cleared.

Note: Prior to repackaging the response inflatable, additional potential catch points, such as the remaining lifelines along the sides of the vessel, and some D-rings forward and amidships were entirely removed from the inflatable's spontsons.

Personnel:

What worked well:

• All necessary roles (e.g. helm, documentation, note taker, gear person, 1º disentangler, support/ safety, communications) were covered during both day's efforts.
• Both response and support personnel had received training and were qualified for their roles. Decision process on who took what role was based on experience, amount of training, present condition of person, level designation, and nature of operations, including the animal's behavior and the complexity of the entanglement (Part of action plan/ ICS protocol).
• For their experience level, team did very well and worked well together.
• Safety remained priority throughout the operation.
• Two additional network personnel - NOAA Corps Officer LTJG Joseph Carrier and Lee James (West Maui first response), got valuable firsthand, hands-on, on-water experience working near an entangled whale. Both had participated in several trainings and did extremely well as 1º disentanglers in the approach vessel.
• Considering the behavior of the animal during the initial response (fast paced/ not cooperative, having the added experience of Justin Viezbicke (level 4) during the second effort was prudent and much appreciated.
• Grant Thompson, who had participated in many trainings, including a scenario-driven, "what if" training, provided much greater overall safety during the second effort.

Improvements:

• Considering the difficulties surrounding the animal on the first day's effort, would have been nice to have had more experience/ depth towards the effort. Would have provided greater safety (though all primary roles were appropriately filled), and allowed for possible rotation of some roles to better manage fatigue and provide additional training opportunities. Unfortunately,

we did not have that depth on the initial response, but addressed this on the second effort.
• *Keep working towards, when opportunities present themselves, and appropriate, getting appropriate network responders additional hands-on experience. Immediate candidates who participated in these efforts, but did not get opportunities are: Nicole Davis, Grant Thompson, Cheryl King, Mark Deakos, and Jason Moore.*

Approach team during first day's effort (NOAA HIHWNMS/MMHSRP permit # 932-1905)

Equipment:

What worked well:

• *A full complement of equipment was available.*
• *Backup equipment was supplied through first responder caches provided by the West Maui first response team and the U.S. Coast Guard – station Maui, who were part of the effort.*

Improvements:

• *The angle of attack (angle of blade relative to pole) is critical and needs to be better addressed. On the initial attempts to make the cuts to lines encircling the fluke blades, the hooked knife fixed to the end of the pole would just bounce over the lines. On replacing the knife and bending the protective tip tab down*

(towards the animal and thus line), the knife readily slipped under the wraps and made the necessary cuts.
- *Remove additional catch points on approach inflatable (see above).*
- *Handheld VHFs for comms between inflatable and support vessels had issues. They may need to be replaced sooner than latter.*
- *Establish chargers and someone to maintain charge of electronics. We went through 3 cell phones trying to maintain comms with the IMAX helicopter.*
- *Make sure Koholā vessel inverter is functional.*
- *Utilize the boat hook when possible to grab trailing line (However, much of the time it the trailing line was too deep and in fact, we lost a boat hook due to the gear being too deep).*

Fixed knife at end of pole. Notice that knife is held with blade parallel to animal's body until time to engage entangling line (NOAA HIHWNMS/MMHSRP permit # 932-1905)

Assessment/ documentation:

What worked well:

- *The team obtained excellent above water and underwater documentation of the animal, the gear and the operation, including still and video.*
- *Utilized a wide variety of cameras, including DSLRs, handycams, helmetcams, boatcams, polecams, and housed DSLRs.*

• The second day's effort included a professional photographer, Jason Moore, who has participated in several trainings and could have filled in at other roles.
• Excellent documentation of entanglement, shedding light on impact, gear identity, how entanglement might have occurred. Documentation also drove much of the media, which is an important part of our outreach and awareness towards the threat. We continue to lead in this regard.

Final cuts. Images obtained by professional photographer, Jason Moore. (NOAA HIHWNMS/MMHSRP permit # 932-1905)

Improvements:

• Could have had support vessel be better prepared to obtain post mitigation documentation and biopsy sampling on final cuts, since, in hindsight, the animal provided no other opportunities once it was cut free.
• Could have utilized additional sitecams (helmet cams, polecams, boatcams) at times. However, the decision to not use cameras in some cases, and at some times, was based on the difficult nature of the effort.
• Have support vessel be closer on first day's effort as to obtain better documentation (this is also listed under protocol and safety as these are the priority).
• Used a professional photographer on the first day's effort.
• Obtained interview footage and video footage of setup and breakdown.

Note: The GoPro camera attached above the knife on the pole needs to be done in such a way as not to impede the cut or the cutter's view of the lines he or she is targeting. It is recommended that the camera be placed at least 1.5 feet above the knife and oriented at least 90º from the blade. In our case we removed the pole camera to expedite the final cuts. ***Cameras should be used only when they don't interfere or jeopardize operations and safety.***

Imagery captured by GoPro camera attached pole above skiffhook deployment to establish a clean working line (NOAA HIHWNMS/MMHSRP permit # 932-1905)

Animal:

What worked well:

• *Excellent documentation towards identifying the animal. While skin samples towards DNA were not obtained, dorsal fin and fluke images were.*

Improvements:

• *Obtain skin samples*
• *Investigate means to reduce impact of kegging, especially as it affects wounds.*

Entanglement:

What worked well:

- *Excellent documentation of gear and how it was wrapped on the animal both from surface and underwater.*
- *Gear investigation/ effort has provided the identity of the gear.*

Response team investigates gear to determine identity and how animal may have become entangled (NOAA HIHWNMS/MMHSRP permit # 932-1905)

Improvements:

- *Become better educated on various types of gear, especially local gear. Invest in or establish gear people to meet these goals.*

Illustration of how animal was entangled and where cuts were made

Conditions:

What worked well:

- *Conditions on both response days were excellent, especially considering the location of operations. However, conditions, including sea state and wind, were continuously evaluated and action plans throughout operations were based on conditions.*

Note: The first day's efforts were terminated in part not just due to an assessment of the disentanglement operation, but also on the assessment of risk associated with contact with a humpback whale on the transit back to port in failing light. In fact, we should have terminated earlier.

Note: For the second day's effort, the animal was monitored until conditions were conducive towards a response.

Improvements:

- *Avoid as much as possible transit in darkness. We did slow the boat to less than 10 kts.*

Protocols:

What worked well:

- *An action plan was established based on existing assessment and adhered to closely.*
- *The entire response, the animal, and the gear were well documented.*
- *Excellent communications (between boats, boats and shore, and boats and air)*
- *We were able to grapple/ attach to the entangling gear 5 times during the first day's effort. Considering the animal's mobility this was quite a feat.*
- *Re-located animal using telemetry. Excellent opportunity for several folks to become familiar with VHF telemetry.*
- *Attempted to maintain gear in front of approach vessel (e.g. attached a clean working line at one point, removed sea anchor)*

Improvements:

- *Maintain support vessels at appropriate distances. Stay alert to approach team as well as the entangled animal (see safety)*
- *Be aware of anything that is or is likely to be attached to the animal. This especially applies to tools, like clips and grapples. In general try and keep these at least several feet in front of you.*

- *One of the reasons we had to attach to the animal 5 different times on the first day, was in part that we likely loaded up the working line too fast, which resulted in the light gauge line either parting from load or stress from the grapple.*
- *Would have been nice to have obtained a skin sample*
- *The support boat's cutting grapple role in case the approach boat or someone in it should get caught in entangling gear was not assigned.*

Safety:

What worked well:

- *Safety protocols were adhered to (e.g. safety gear, handling line, wearing of PPEs, personnel and roles, communication, etc.)*
- *Safety maintained throughout operation; no injuries to response personnel (other than minor rope burns).*
- *Responsiveness of response team to emerging situations (i.e. whale suddenly diving deep, buoys coming up from behind, gear snagged on support vessel)*
- *Performed pre-briefs and post-briefs (after action plans – in process).*
- *Performed GAR-based risk assessment incorporating rescue mission (Initial GARS for 3/8 and 3/11 were 34 and 27 respectively)*

Improvements:

- *Positioning of support boats. At times, especially on the first day's effort, the primary support boat was too far away from the approach vessel. Part of the reason for this was the high speed and unpredictable nature of the animal and thus the effort. In fact, at one point the entangled animal doubled back and the entangling gear got caught on the engines of the secondary support vessel and the vessel had to be cut free. However, a higher degree of attention would of allowed closer proximity between approach and support vessels and thus increase in safety, and at the same time decreased the likelihood of interfering with the effort.*
- *Tools (grapples and clips) pose a risk of attaching to personnel and boats. The approach boat crew must work carefully around them and in general kept them in front, rather than behind, the approach vessel. On one instance, the approach crew allowed two grapples attached to the working line to get beside the vessel and one of the grapples did snag temporarily on a handle on the starboard quarter of the vessel.*
- *The support boat's cutting grapple role in case the approach boat or someone in it should get caught in entangling gear was not assigned.*

Main recommendations:

- **Better address angle of attack of knives.** This is critical towards success of getting hold of and thus subsequently cutting lines, especially those that are wrapped tight around the animal.
- Positioning of support vessels such that they are close enough to lend assistance should it be needed, but far enough not to complicate (i.e. affect the animal's behavior) or compromise the effort (I.e. get caught in trailing gear). **Be aware of your overall environment.**
- Be better prepared to collect biopsy or post mitigation documentation upon last cuts.
- Remain aware of amount of kegging relative to the animal's behavior. Kegging to quickly or too much may result in premature parting of entangling gear or working line and may also impact the animal through its impact in wounds.
- Maintain, as much as possible, gear attached to the animal in front of you.
- Fill contingency roles as well as known roles
- Use best person for the role. Includes professional photographers for documentation

Highlights:

Network participation: Several trained network members obtained additional firsthand and hands-on experience in large whale entanglement response.

Maintained safety: Held to proper protocols and prioritized safety. Operation carried out to level of experience on board.

Communications: Excellent communications adhered to on board, between vessels, and to shore side contacts.

Rapid response: Response team on site within 1 hour.

Persistence: Our ability to tag the animal 5 times during the first day's effort.

Teamwork: Everyone worked well together. Having the three support boats and the IMAX helicopter was key to maintaining contact with our animal.

Patience: We waited for the right conditions and built upon our personnel resources.

Innovation: Switching knives, modifying the knife, removing the polecam, and handling of line all contributed towards success of those final cuts.

Time line narrative:

3/8/2013

10:25 Initial report of entangled humpback whale received from the tour vessel, Man-of-War, and a USCG helicopter on patrol as part of Operation Koholā Guardian for an entangled whale reported the previous day. Animal was located just off Lahaina Shores (east end of Lahaina, Maui), in the company of one other whale, and moving rapidly off to NNW. Entanglement described as multiple wraps around the tailstock and trailing line with red and yellow buoys attached. Based on initial report, entanglement determined to possibly be life-threatening and response initiated. The reporting vessel stood by and monitored the animal until response teams arrived on scene. Considering the speed of the animal and peak season (number of other whales in area), decision made to have rapid response team out of Mala Wharf and USCG- station Maui deploy surface assets to get to the animal as soon as possible and take over standby support. Both teams could initiate assessment and documentation, and were equipped and trained to attach a telemetry buoy.

10:45 Sanctuary response teams depart for vessel.

11:00 Lee James and Mark Deakos with West Maui Rapid Response Team depart Mala Wharf with vessel, Aloha Kai, provided by Ultimate Whale Watch. They arrive on scene shortly and relieve Man-of-War of monitoring the animal.

11:20 Authorized and trained response team made up of Ed Lyman, Matt Dixon, Ka'au Abraham, and Rachel Finn of HIHWNMS, Joe Carrier of NOAA Corps, Nicole Davis of NOAA Fisheries Pacific Islands Regional Office, and trained responder Kate Eifler depart Maalaea Harbor on vessel Koholā. Inflatable is prepared while vessel is underway.

12:25 Koholā arrives at location of entangled animal where Aloha Kai has been standing by. A second whale is with the animal. The entangled animal has a single wrap of likely 1/2" Blue Steel line around the tailstock and a single wrap of the same line around the left fluke blade. A yellow toggle buoy trails right at the trailing edge of the flukes and a round (9" diameter) orange (faded red) buoy trails about 5 feet behind the flukes. The entangling line trails about another 30 feet behind. Decision is made to have James board the Koholā in preparation for Carrier and Lyman to be in the inflatable.

12:30 Helicopter carrying MacGillivray Freeman Film crew (filming a humpback whale film for IMAX) arrives and lends aerial support.

12:40 Teams begin to assess animal and document entanglement. Entanglement thought to likely be life-threatening upon further assessment.

12:51 Grapple is thrown from the Koholā and a transmitter package is attached to the entangling gear; it trails another 70 feet behind to a green, hard plastic buoy.

13:10 Inflatable (approach vessel) is launched carrying Lyman and Carrier. James is at the helm of the support vessel, Koholā.

13:20 A second buoy, polyball, is attached to the established control line.

13:32 Another polyball is added.

13:34 Another polyball is added. All of the added gear comes off of the animal along with approximately 75ft of the entangling gear.

13:45 The companion animal is no longer present.

13:49 The transmitter package is re-attached.

13:54 A polyball is re-attached.

14:30 A polyball is removed and a sea anchor is attached.

14:44 The sea anchor is removed due to difficulties in handling the working line and a polyball re-attached.

15:01 Another polyball is attached.

15:28 Entangled animal swims directly under support vessel, Aloha Kai, resulting in the added gear to catch on the vessel's outboards. As a precautionary measure, all but one buoy of the added gear is removed from the animal in order to free the vessel.

15:35 Telemetry buoy re-attached.

15:40 Additional kegging buoys re-attached.

15:44 Established control line parts with all attached buoys.

16:00 Animal lost in competitive group and choppier seas.

16:28 IMAX helicopter able to relocate animal, which is now in company of another whale, several miles off to the NW in middle of Pailolo Channel.

16:44 Response team catches up and now on site again with animal.

16:50 The transmitter package is attached for the fourth time of the day.

17:08 Two polyballs and a sea anchor are attached.

17:15 All added gear comes off animal yet again.

17:32 The transmitter package is attached for the fifth time.

17:57 Approach team of Lyman and Carrier make one more attempt to pull up within range of a cut. While close, attempt is unsuccessful.

18:19 Teams cease disentanglement effort due to diminishing daylight and depart for harbors. Animal left at position 21° 04.964'N / 156° 43.909' W

20:41 Koholā arrives back at Maalaea Harbor.

22:30 Argos telemetry shows whale in the middle of Pailolo Channel, heading westward. Weather forecast for next two days not optimal for response and plan is to stand-down until conditions are appropriate.

3/9/2013

04:17 Satellite fixes show the animal off the north shore of Lanai, perhaps taking advantage of a lee from gusty south winds.

14:00 Animal is off of the East shore of Lanai and is moving approximately 2.5kts. Tour vessel, Cross Winds, sights animal as it heads around Lanai's eastern shore

22:00 Animal is off of the west side of Kaho'olawe.

3/10/2013

04:17 Animal is off Keawikapu, Maui. Winds light right now, but forecasted to be 15 kts again from the south, which will make response difficult. Weather Monday, 3/11/2013, is still looking favorable with light NE winds.

21:00 Animal has continued to move WSW over last 10 hrs and is now approximately 18 nm from Maalaea or 5 nm NW of western-most point of Kaho'olawe.

3/11/2013

07:30 Justin Viezbicke, another Level 4-trained responder with HIHWNMS, arrives on Maui to assist with response effort. Decision was made to fly Justin over given the difficult nature of the response effort on 3/8/13.

08:10 Authorized and trained response team made up of Ed Lyman, Justin Viezbicke, and Rachel Finn of HIHWNMS, Joe Carrier of NOAA Corps, Grant Thompson of Kaho'olawe Island Reserve Commission, Nicole Davis of NOAA Fisheries Pacific Islands Regional Office, Lee James with West Maui Rapid Response Team, and trained responders Cheryl King and Jason Moore depart Maalaea Harbor on vessel Koholā. Inflatable is carried on aft deck.

08:40 Koholā is in the vicinity of last known satellite fix for animal provided by telemetry. VHF is used to locate animal's exact position.

10:20 Animal is located with telemetry package attached. Location: 20° 37.731'N / 156° 45.214' W

10:32 Inflatable launched. Decision is made to have Lyman and Viezbicke in the response vessel initially due to their advanced training levels and extensive experience.

10:45 First polyball is attached.

10:48 Decision made to have third person aboard inflatable to assist team in pulling up closer to animal and in positioning vessel for cuts. Thompson, who had been through additional training, elects to stay onboard Koholā to handle cutting grapple should it be needed and be gear person. James is selected as third person in inflatable. Davis provides long-lens images and Finn wide-angle and notes. King provides HD video. Moore in charge of documentation. Carrier is captain of Koholā.

10:54 Another polyball is attached.

11:15 A clean working line is established beyond grapples.

11:30 First cut is made to the line around the flukes using a fixed knife on 19 feet of pole. Cut is documented using helmetcams and polecam.

11:35 Animal is still able to dive and takes all gear under.

12:02 Two more cuts are made to the lines on the flukes and the animal is freed of over 125 ft of gear. A small piece of line is left in a wound, which will likely be expelled over time. All gear was recovered. Attempt to get post imagery and/ or tissue samples not successful. Animal is last seen at: 20º 41.507'N / 156º 44.069' W.

12:10 Inflatable brought onboard Koholā.

12:37 Team departs for harbor.

13:42 Koholā arrives back at Maalaea Harbor.

Other tour companies (e.g. Maui Nui, Cross Winds II, Wiki Wahine, and Trilogy Excursions) and charter vessels (e.g. Lucky Strike II) called in reports or helped monitor the animal.

Participants (training and experience level in parentheses):

3/8/13:

- Ed Lyman (on-site IC and CI, 1º disentangler, level 5)
- LTJG Joseph Carrier (Captain of sanctuary's support vessel, 1º disentangle, level 3)
- Nicole Davis (Documentor/ Communications, level 3)
- Rachel Finn (Documentor, level 3)
- Lee James (2º support, safety, level 3)
- Mark Deakos (2º support, level 3)
- Matt Dixon (Note taker/ gear, level 2)
- Ka'au Abrahams (Documentor/ note taker, level 2)
- Kate Eifler (Communications, level 2)

3/11/13:

- Ed Lyman (on-site IC and CI, 1º disentangler, level 5)
- LTJG Joseph Carrier (Captain of sanctuary's support vessel, safety, level 3)
- Nicole Davis (Documentor/ Communications, level 3)
- Grant Thompson (Gear, safety, level 3)
- Rachel Finn (Documentor, Note taker, level 3)
- Lee James (2º support, safety, level 3)
- Justin Viezbicke (IC, 1º Disentangler, level 4)
- Cheryl King (Documentor, level 3)
- Jason Moore (Documentor, level 3)

Shoreside:

David Schofield, NOAA Fisheries, off-site IC coordinator and POC (4)
Nancy Daschbach, Sanctuary, POC for Koholā float plan.

Support:

U.S. Coast Guard – station Maui and Air Station Barbers Point

Aloha Kai (Ultimate Whale Watch)

First Responders/ Sightings (tour and charter operations):

Man of War

Wiki Wahine

Maui Nui

Cross Winds II

Lucky Strike II

○ Appendix X - Glossary of Acronyms and Abbreviations

AED	Automated external defibrillator
AGL	Above Ground Level
ALDFG	Abandoned, Lost, or otherwise Discarded Fishing Gear
ALWDN	Atlantic Large Whale Disentanglement Network
AOC	Aircraft Operation Center
ARO	Alaska Regional Office (NMFS)
BWRI	Blue World Research Institute
CCS	Center for Coastal Studies
CI	Co-investigator
CWI	Canadian Whale Institute
CWR	California Whale Rescue
CWRT	Campobello Whale Rescue Team
DEA	Drug Enforcement Administration
DFO	Division of Fisheries and Oceans (Canada)
DSLR	Digital single lens reflex (camera)
DVM	Doctor of Veterinary Medicine
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FWS	U.S. Fish and Wildlife Service
GAR	Green-Amber-Red model/checklist
GARFO	Greater Atlantic Regional Field Office (NMFS)
GPS	Global Positioning System
GWERN	Global Whale Entanglement Response Network
HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
IAP	Incident Action Plan
ICS	Incident Command System
IC	Incident Commander
IFAW	International Fund for Animal Welfare
IWC	International Whaling Commission
LWER	Large Whale Entanglement Response
LWERC	Large Whale Entanglement Response Coordinator
MC	Mission Commander
MMPA	Marine Mammal Protection Act
MMHSC	Marine Mammal Health and Stranding Coordinator
MMHSRP	Marine Mammal Health and Stranding Response Program
MPA	Marine protected area
NARW	North Atlantic right whale
NEAQ	New England Aquarium
NEFSC	Northeast Fisheries Science Center
NGO	Non-governmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPLWERN	North Pacific Large Whale Entanglement Response Network
NTIF	Notice of Intent to Fly
OEM	Original Equipment Manufacturer
OMAO	Office of Marine and Aviation Operations
OPR	Office of Protected Resources
ORM	Operational Risk Assessment

OO	Operations Officer
PI	Principal Investigator
PIC	Pilot in Command
PMMC	Petersburg Marine Mammal Center
PNWERN	Pacific Northwest entanglement Response Network
PPE	Personal Protective Equipment
PFD	Personal floatation device
POV	Point of view
PTT	Platform Transmitter Terminal
RABEN	Red de Asistencia a Ballena Enmalladas (Mexico's Large Whale Disentanglement Network)
RHIB	Rigged-hull Inflatable boat
RSC	Regional Stranding Coordinator
ROV	Remotely Operated Vehicle
SAR	Stock Assessment Report
SAWDN	South Africa Whale Disentanglement Network
SOP	Standard Operating Procedure
TRT	Take Reduction Team
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
USCG	United States Coast Guard
VFR	Visual Flight Rules
VO	Visual Observer
VTOL	Vertical Takeoff and Landing
WET	Whale Entanglement Team
WCO	West Coast Office (NMFS)
WR&S	Whale Release and Stranding (Canadian)

Appendix XXI

Small Cetacean Entanglement Response Best Practices

Executive Summary

Entanglement in, hooking by, and ingestion of, fishing gear and marine debris is a global problem affecting hundreds of marine species. Small cetaceans (*i.e.*, porpoises, dolphins, and toothed species of whales, excluding sperm whales) can become entangled in active and derelict fishing gear and marine debris (*e.g.*, plastic packing bands, large rubber bands, garbage, etc.), as well as ingest fishing gear and marine debris, causing injury and death. Responding to entangled animals is often difficult or impossible due to the inaccessibility of the animal, inability to relocate the animal, inclement weather, lack of experienced and trained personnel, human safety concerns, and more. **PREVENTION** is key to reducing entanglements and should be the first consideration for all those involved in entanglement response. Until the influx of entangling materials and debris into the marine environment is reduced, responders must do their best, within the constraints of human safety and logistical concerns, to disentangle small cetaceans that are injured due to human behavior. This document provides small cetacean entanglement response Best Practices based on currently used methods. Best Practices include preparation and planning for a response, necessary authorization and qualifications, human and animal safety, and risk assessment and mitigation. Although this document includes Best Practices, responders should never stop striving for innovative and new methods and training to increase the safety and success of an entanglement response. These protocols are meant as overall Best Practices and should not limit advances in techniques or animal welfare during responses.

Table of Contents

Introduction

1.1. Background

Marine entanglement is defined as an interaction between marine species and human-made material in which the loops and openings of various types of fishing gear and debris entangle animal appendages or entrap animals (Laist 1997). Entanglement of non-targeted species in fishing gear such as traps, rope, and nets is of growing concern for wildlife worldwide and can result in serious injury and mortality (Reeves *et al.* 2003, Dau *et al.* 2009, Anderson *et al.* 2011, Adimey *et al.* 2014). Fishery gear, most notably monofilament and micro-multifilament lines, trap pot lines, and nets, has been documented as a significant source of entanglements for aquatic animals including sea turtles, marine mammals, and coastal and marine birds (Laist 1997, Adimey *et al.* 2014). Additionally, marine debris, which is any persistent solid material that is manufactured or processed and directly or indirectly disposed of or abandoned into the marine environment, is a significant global stressor on the marine and coastal environment (Coe and Rodgers 1997, UNEP 2009). The majority of marine debris is composed of various forms of plastic that are highly persistent, and chemically harmful either because they are themselves potentially toxic (Lithner *et al.* 2011) or because they absorb other pollutants from the surrounding seawater (Teuten *et al.* 2009, Rochman *et al.* 2013a). The impact of marine debris is of global concern, affecting at least 693 species (Gall and Thompson 2015). More than half of these reports documented entanglement in and ingestion of marine debris, and represented more than a 100% increase since the last review by Laist (1997), which reported 247 species impacted by marine debris.

Increasing concern over plastics in the ocean led to the introduction of Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which prohibits the at-sea disposal of plastic wastes. Annex V was signed in 1973, although a complete ban on the disposal of plastics at sea was not enacted until the end of 1988. Despite 134 nations agreeing to eliminate plastic disposal at sea, oceanic sampling indicates that the problem has worsened since MARPOL was signed (Rochman *et al.* 2013b) and formally adopted in 1988. Illegal dumping of plastics, fishing gear, and garbage is difficult to enforce and continues to be a threat to marine life.

Entanglements have been identified as a significant cause of injury or mortality to small cetaceans (*i.e.*, porpoises, dolphins, and toothed species of whales, excluding sperm whales) throughout the world. Entangling materials may cause drowning, lacerations, amputation of appendages, infection, strangulation, increased energy expenditure (especially while dragging large fragments of net or biofouled line), may impact behavior and foraging, and may result in premature death and/or dependent offspring mortality. Common examples of entangling gear that harm small cetaceans include active or derelict fishing gear, rope, and other debris (Wells *et al.* 2008, Barco *et al.* 2010, Stolen *et al.* 2013, Adimey *et al.* 2014). Small cetaceans can also ingest fishing line, hooks and lures leading to injury and death (Barros *et al.* 1990, Gorzelany 1998, Baulch and Perry 2014, McLellan *et al.* 2015).

To address the root of the entanglement problem - primarily plastic debris in the ocean or interactions with fisheries - stakeholders, industry, non-governmental organizations, local, state and federal governments, and Native organizations **must work together to solve the problem.** A number of agencies and organizations have developed methods to respond to entangled small cetaceans. However, entanglement response is limited for many reasons (*e.g.*, inaccessibility of the animal, inability to relocate the animal, inclement weather, lack of experienced and trained personnel, human safety concerns, cost, etc.), with response reaching only a small fraction of entangled animals. **Mitigation** of entanglement in active or derelict fishing gear and **prevention** of debris entering our waterways is essential.

1.2. Legislation Pertinent to Small Cetacean Entanglement Response

There are two key pieces of legislation that govern interactions with marine mammals in the United States, the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). In 1992, the United States Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the MMPA. The MMHSRP coordinates marine mammal stranding response efforts in the U.S. under Title IV of the MMPA as well as a NMFS MMPA/ESA permit. The MMHSRP works to standardize regional network operations and define national stranding response policy.

MMPA: The MMPA, signed into law in 1972, prohibits the “take” of marine mammals. Take, as defined under the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1362). The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS is responsible for the protection and conservation of all cetacean and pinniped species (with the exception of walruses), and their habitat. USFWS oversees the management of walruses, polar bears, sea otters, and manatees, and their habitat. The 1992 amendments to the MMPA, including Title IV, established the MMHSRP under NMFS to collect and disseminate information about the health of marine mammals and health trends of marine mammal populations.

ESA: The ESA, enacted in 1973, provides for the conservation of species listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on "take" (with certain exceptions), which means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. § 1531).

1.3. Best Practices Purpose and Intended Uses

NMFS and the MMHSRP have developed Best Practices for responding to live small cetaceans observed with life-threatening entanglements, or more rarely, that have ingested fishing gear, to ensure the health, welfare, and safety of human responders and the impacted animals. These Best Practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, visit the MMHSRP webpage or see *Marine Mammals Ashore* (Geraci and Lounsbury 2005) and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018). Human and animal safety is the top priority for NMFS and the Marine Mammal Stranding and Entanglement Networks (Network). As each event is unique, NMFS and the Network evaluate several different factors (discussed below) before making the decision to intervene.

These Best Practices highlight general protocols and procedures specific to small cetaceans entangled in fishing gear or marine debris. Protocols and procedures for use with pinnipeds or large cetaceans can be found in the NMFS Best Practice Guides for Pinniped or Large Whale Entanglement Response, respectively. These Best Practices are designed to be paired with more specific regional annexes to address any concerns, including species-specific issues (*e.g.*, endangered species response), more appropriately addressed at regional or state levels. These Best Practices include guidance for entanglement response methods for small cetaceans including remote techniques for free-swimming and anchored animals, physical capture and restraint, and future gaps and research needed.

These Best Practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations. These Best Practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the Best Practices outlined in this document. These Best Practices are a “living document,” and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these Best Practices should prevent or limit advances in technology, techniques, and training.

1.4. Structure of the Document

This document is organized as follows:

- Section 2: Planning for a small cetacean entanglement response;
- Section 3: Small cetacean entanglement response techniques – remote interventions for free-swimming small cetaceans;
- Section 4: Small cetacean entanglement response techniques – remote interventions for anchored small cetaceans;
- Section 5: Small cetacean entanglement response techniques – physical in-water capture and restraint for free-swimming small cetaceans;
- Section 6: Gaps and future research needs;
- Section 7: Conclusions;
- Section 8: Acknowledgements;
- Section 9: References; and
- Section 10: Appendices.

This document is structured so that each section can be used as a stand-alone Best Practices guide for the appropriate entanglement scenario (remote interventions or physical in-water capture). Each section provides a broad overview of Best Practices for each response type. Section 6 provides information about current gaps in our knowledge and future research needs. The appendices provide additional forms, datasheets, checklists, etc. used during small cetacean entanglement response.

1.5. Funding

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for eligible Network members and collaborators through an annual competitive grant process (subject to annual appropriation from Congress). These grants support the rescue and rehabilitation of stranded marine mammals (including small cetacean entanglement response), data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are competitive and there is insufficient funding to cover all costs of the Network, individual

Network members must also support many of the costs for normal operations. Determining whether funding is available for an intervention is an important first consideration, as lack of funds or available in-kind donations (*e.g.*, boat use) may limit available options for certain responses.

Planning for Small Cetacean Entanglement Response

1.6. Authorization

Small cetacean entanglement responses are conducted under MMPA authorization either under a 112(c) agreement issued by NMFS to Network members through a Stranding Agreement (SA), under 109(h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Responses that involve unintentional harassment of non-target marine mammals (*e.g.*, capture of mom with calf when only one of the pair is entangled) must be covered under the NMFS MMPA/ESA research permit. Only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt small cetacean entanglement response. Response efforts may also rely on state and federal agencies (including law enforcement agencies and the United States Coast Guard, USCG), non-governmental organizations, fishermen, and other groups for assistance.

Under the authorization of a MMHSRP MMPA/ESA research and enhancement permit, experienced responders are allowed to disentangle all small cetacean species, including species listed as endangered or threatened under the ESA. NMFS Office of Protected Resources (OPR), including the appropriate Regional Stranding Coordinator (RSC), must be consulted for approval prior to conducting *any* small cetacean entanglement response activities. Additionally, the permit covers the unintentional harassment of other non-target marine mammals during the response attempt (*e.g.*, the calf of an entangled female). All procedures requiring sedation, anesthesia, surgery, or euthanasia must be performed under the direct or indirect supervision of a veterinarian. Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury (see pp 34-35 NMFS Serious Injury Procedure for details).

Responders must be trained in proper techniques for safe capture, restraint, and removal of gear from various marine mammal species. Opportunities for apprenticeships or assistant roles to gain the necessary hands-on expertise can be arranged via the appropriate RSC. Specific training issues or requirements may exist for certain activities (*e.g.*, in-water captures) and are more appropriate to address at regional or state levels by working with the RSC.

1.7. Preparation

Prior to any operation: entanglement response requires extensive logistical preparations, including training of personnel, developing strategies for successful intervention, and identification of appropriate supplies/equipment/vessel support. Once approval from NMFS has been received and prior to any operation, an experienced team should be selected and roles and boat crews assigned. An

Incident Command System (ICS) Incident Action Plan (IAP) type document or similar planning document and safety protocols are recommended to be distributed to the team for review. Contingencies for rehabilitation should be identified in case it is determined that the injury is too severe to warrant immediate release on-site. All equipment (*e.g.*, medical, communication, response, vessels, vehicles, tags, animal transport gear, etc.), should be cleaned, organized, packed, and ready for operations on short notice. Tide and currents, as well as navigational charts should be reviewed to decide the best tide window and potential locations for an appropriate, safe response.

24 – 72 hours prior to operation:

- Check marine weather forecasts.
- Ensure that the animal has been sighted recently (*i.e.*, within 5 days of scheduled disentanglement effort), to confirm that the entanglement is still active (*e.g.*, gear has not moved or fallen off, etc.) and the animal is still alive/in the area.
- Notify appropriate entities (*e.g.*, NMFS RSC, law enforcement, harbormaster, park personnel, lifeguards, etc.).
- Ensure appropriate authorization (*i.e.*, NMFS approval, and other approval if response on park, preserve, private land).
- For human safety, if conducting in-water net activities, personnel trained in emergency medical services (EMS) should be part of the on-water team.
- Keep rehabilitation facilities informed of plans and schedules.
- Develop rehabilitation contingency and necropsy contingency plans.

Immediately prior to operation:

- Conduct safety and operations briefing.
- Re-check marine weather forecasts.
- Consult decision matrix (Appendices F and G) – prior to operations and during operations, determine if conditions allow for safe operations and make a final go/no go decision for response.

1.8. Training

Depending on response type, responders must be trained in either remote entanglement response techniques, and/or safe capture, handling, monitoring under restraint, and in-hand entanglement response techniques. Training requires hands-on experience under the direct supervision of experienced response personnel. If possible, inexperienced personnel should watch the process and participate in low-level aspects of the response to gain more experience. Personnel should document their training and skills so the RSC and response coordinator, who are choosing the team, have a current list of team abilities, if requested. Although there are currently no formal national training programs in place, the MMHSRP or RSC can direct personnel toward resources relevant to the species of interest, whenever available and NMFS is working to develop a training tracking system for future use.

1.9. Human and Animal Safety

Because of the inherent risks encountered during an entanglement response, methods used to remotely disentangle, and to capture and restrain an animal, should minimize risk, stress, and pain to the animal while also ensuring the safety of both the animal and responders (Norman *et al*. 2004). A broad list of human and animal safety procedures can be found below. More detailed lists can be found in each specific entanglement response section (*e.g.*, Sections 3-5)

1.9.1. Human safety

- Create a written safety protocol with emergency services response numbers to be kept with first aid kits.
- Responders should only conduct procedures for which they meet minimum qualifications and training.
- Personnel should wear appropriate personal protective equipment (PPE) such as strong, non-slip, closed-toed footwear without potentially entangling external features (*e.g.*, hard-soled dive boots), PFDs, wetsuits (when temperatures require them), helmet and gloves (if appropriate), and appropriate clothing as necessary for weather conditions.
- A veterinarian or veterinary technician should be present if conducting in-water capture and restraint activities or using sedation.
- Ensure first aid kits are with each response group/vessel.
- Use a hooked/curved/covered blade for cutting (*e.g.*, net, line, debris, etc.) to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the cutting implement safely when finished.
- Do not wrap net or line around hands or fingers, remove entanglement hazards (*e.g.*, earrings, rings, watches), and keep feet clear of lines and nets.
- All anticipated drugs that may be used should be recorded on an emergency response sheet in case of accidental exposure; this allows EMS to quickly evaluate human exposure.

- If drugs will be used, responders should be familiar with drugs and reversals, including symptoms of accidental exposure and if/when/how to treat prior to the arrival of medical personnel.
- Assign buddies to watch over one another.

1.9.2. Animal safety

- Use a decision matrix (see Section 2.12) prior to capture to ensure risks are anticipated and accounted for by all responders and properly mitigated.
- Consider potential effects of response efforts on non-entangled animals and/or species within the response areas and take precautions to minimize disturbance.
- For remote disentanglement, responders should minimize close approaches and take breaks between disentanglement attempts if the animal shows signs of distress or tiring. The number of disentanglement attempts per day and number of consecutive days should be evaluated on a case-by-case basis, taking into account the severity of the animal's injury and the individual animal's response to disentanglement attempts.
- Responders should reduce the unavoidable stress that comes with animal capture by minimizing the duration of restraint and/or captivity, remaining calm and quiet around the animal and limiting manipulation and transport of the animal.
- Responders should only use appropriate, species-specific handling methods with trained personnel to make the capture response as efficient as possible and to minimize negative effects.
- When the animal is in hand, ensure it is secured appropriately so that the blowhole is clear and it is still able to breathe comfortably, and the eyes are not covered or abraded.
- For captured animals, it is important to prevent potential thermoregulatory stress by managing temperature control through consideration of the effects of wind, sun, water and air temperature, and shade. In warm conditions, you can often keep animals cool by pouring water over the dorsal fin and flukes if the animal is out of water, providing shade if possible, and minimizing handling time. If the animal becomes too cold out of the water, emergency blankets can be used.
- When embedded, peel the entangling material out of the wound rather than dragging it or pulling it out from one side when feasible; this can minimize pain and prevent further injury.
- Once done, clean and sterilize any disentangling or sampling tools that were exposed to the animal.

1.10. Incident Command System

The ICS as it applies to an entanglement response is a standardized approach to establish common processes for planning and managing the response. It enables a coordinated effort among all responders, and allows for the integration of equipment, personnel, procedures, and communications among responders. ICS is based on decades of lessons learned, the achievement of response objectives, the efficient use of resources, and helps ensure the safety of responders and the animals. ICS uses standard terminology and common terms to ensure understanding among all responders. ICS establishes a clear chain of command, transfer of command, ensures integrated communications, professionalism, accountability, and organizational structure.

The Incident Commander (IC) is responsible for the overall operation, including the performance of the response, and while usually found onsite with the response team, may not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the response. In some small cetacean responses, the IC may be combined with the Capture Lead (see sections 2.6, 3.4, 4.4 and 5.4 for more details on team roles). By using ICS, each team member knows their exact role in the response, the response plan, and any mitigation measures should there be an emergency during the response. An IAP type document outlines incident goals and objectives, disseminates information about the response, and is revised on a regular basis to maintain consistent, up-to-date guidance. More information about ICS and how to take a free course can be found at: https://training.fema.gov/is/courseoverview.aspx?code=IS-100.c

1.11. Team Member Roles

Responding to entangled small cetaceans either remotely or in-water has inherent risks for both responders and animals. Clarifying team member roles and responsibilities prior to any response, and ensuring that responders meet minimum qualifications for each role, is essential to a safe and successful response. Disentangling small cetaceans should always be conducted by trained personnel. When medications are used for treatment or sedation, extra training and licensing requirements are required, and safety protocols must be in place.

Detailed descriptions of team member roles and responsibilities are described in detail within each of the entanglement response method sections (see 3.4, 4.4 and 5.4). All personnel should be familiar with the MMHSRP MMPA/ESA permit and the minimum qualifications and criteria for each role if the response is conducted under the permit. In general, roles and responsibilities might include but are not limited to:

1. Incident Commander (IC);
2. Capture Lead (CL);
3. Human Safety Officer (HSO);
4. Small Boat Operator(s);
5. Disentanglement Tool Operator;
6. Net Boat Driver (*i.e.*, Catcher) (if in-water net used);
7. Net Lead (if in-water net used);
8. Licensed Doctor of Veterinary Medicine (DVM) or equivalent or Veterinary Technician;
9. Animal Handlers;
10. Data Collector;
11. Photographer and/or Videographer (still and video photography);
12. Crowd/Security control (this could be performed by law enforcement, park personnel, volunteers, etc.);
13. Communications/Public Information Officer;
14. Unmanned Aerial System Operator.

1.12. Communication

Clear communication is essential before, during, and after an entanglement response. There must be clear communication when planning for the response, and among team members during the response (*e.g.*, among vessel operators, between vessel operators and shore personnel, between response team and emergency personnel, members of the public, law enforcement, harbor masters, etc.). Common forms of communication include very high frequency (VHF) handheld or mounted marine radios, satellite phones, cell phones, and two-way radios (*e.g.*, walkie-talkies). Some applications for phones (*e.g.*, Zello) allow a cell phone to be used as a walkie-talkie. Non-verbal communication may also be required while approaching an animal. Responders should ensure all non-verbal communication gestures are understood by the entire response team and practiced prior to each response.

The IC and CL must coordinate with the MMHSRP, RSC, and Regional NMFS Communications staff concerning media contacts relating to high-profile entanglement response events, as necessary. Responses are generally not advertised and most media interviews or social meeting postings are conducted after the response has taken place. If responders are contacted by the media for an interview, they should notify the Regional NMFS Communications Specialist before responding. If a Communications Specialist cannot be contacted prior to a response to the media, the responders should coordinate with the RSC and provide an email summary of the interview (including name and contact information of the reporter, and media outlet). It is best to work with communications staff for news media, such as news releases, news conferences, media interviews *as well as social media posts*. All media interviews should be considered "on the record". Always remember that human safety comes first, followed by the entanglement response. **Responders are NOT required to speak to the news media.** Examples of frequently asked questions regarding small cetacean entanglement response can be found in Appendix A.

1.13. Environmental Conditions

Responders should consider weather, environmental conditions, and features of the response area prior to any entanglement response effort. These considerations should include wind, precipitation, fog, sea state, incoming storm systems or any other changes in weather, tides, currents including subsurface currents, submerged hazards (*e.g.*, crab pots, derelict gear, oyster beds, etc.), and surf. The air and water temperatures should also be considered. If it is too hot, the responders or animals could become overheated; if too cold, it could be a safety risk for responders and the animal.

1.14. Equipment

Each type of response (remote techniques, physical capture and restraint in-water) requires specific equipment. Small boats generally fall within the range of 16-26 feet in length and operate in near-shore environments, although the size and type of vessels may vary depending upon the response needs. It is essential that the proper equipment be clean, tested, packed, and immediately available before a response. Typical equipment required for all responses includes data sheets, camera, disentanglement tools, etc. Physical capture and restraint in water also includes capture and restraint equipment (e.g., nets, floating mats), tags, and medication administration equipment (e.g., antibiotics and sedation). Specific equipment is outlined in individual sections later in this document (see Sections 3.6, 4.6 and 5.6).

Table 2-1. Overview of general equipment that may be used for remote techniques and physical capture and restraint in-water methods.

General Equipment	Remote techniques – free-swimming	Remote techniques – anchored	Physical capture restraint in-water
Communications (*e.g.*, marine radio, cell phone, satellite phone)	X	X	X

Data supplies (*e.g.*, clipboard, data sheets) and recording equipment [*e.g.*, camera (with backup), video, dorsal fin board]	X	X	X
Safety equipment/Protective clothing and shoes/PFDs	X	X	X
Medical equipment for humans and animals (*e.g.*, human first aid, dolphin 'crash' kit, stingray kit)	X	X	X
Small boats/vessels	X	X	X
Disentangling equipment/tools	X	X	X
Capture/Restraint equipment (*e.g.*, nets-hoop, seine, floating mats)		X	X
Sampling, Marking, Tagging [*e.g.*, blood collection, processing, storage supplies, freeze-branding system, and tagging equipment *(e.g.*, roto tag or satellite-linked)]		X	X
Medication administration equipment (*i.e.*, antibiotics, sedation)		X	X
Cleaning/disinfectant supplies	X	X	X

1.15. Data Collection

Response and sampling data needs must be well thought out prior to the start of any entanglement response effort. Instructions should be followed and data forms completed during a response. Capture and sampling equipment checklists should be developed and used. Important data forms for preparation prior to response may include: applicable permits, Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), gear checklists (*e.g.*, Appendix C - Gear Checklist), disentanglement forms (*e.g.*, Appendix D – Disentanglement form), respiration rate form (*e.g.*, Appendix E - Respiration rate form), priority sample sheet (will vary with each response). All entangling gear should be photographed prior to removal and retained after removal (if possible), documented on the Level A and Human Interaction Form, and stored in a centralized location or sent to a gear repository, please consult with the RSC on appropriate repositories by region.

1.16. Risks and Mitigation

To minimize risks to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria (Appendices F and G) should be established to guide responders in making safe decisions regarding the response to entangled small cetaceans. Responders should prepare, plan, and practice for possible risks and identify mitigation measures (Table 2-2) for these risks prior to any response. After each response, the team should conduct a thorough de-brief and summarize lessons learned that can be applied to future responses. When responding to entangled small cetaceans, the list of risks and mitigations is never complete. ***There is always room for improvement and documents should be updated continually.***

Table 2-2. A general risk and mitigation checklist to use for an entanglement response.

General Risk and Mitigation Checklist	√
Approval for response from NMFS	
Approval for response from NMFS permit holder (if applicable, *e.g.*, ESA species, unintentional harassment)	
Assign an Incident Commander, Capture Lead, and Human Safety Officer	

Arrange for a NMFS-approved dolphin Catcher, if necessary	
Veterinary support (if in-water net capture or medications administered)	
Make arrangements for possible transfer to rehabilitation facility	
Alert law enforcement (and harbormaster, land owners etc., if applicable)	
Depending upon response type, have EMS contact information readily available or have EMS personnel (can serve as Human Safety Officer) as part of the team if conducting in-water net capture activities	
File a float plan with designated Point of Contact	
Check vessel, trailer, vehicle, and equipment operation	
Prepare for follow-up monitoring (*e.g.,* obtain and program tags)	
Assign and explain team member roles	
Review authorization/permit and decision matrix or Go/No Go	
Check marine weather forecasts and tides	
Review safety plans	

Risk Management Assessment

Assessment of risks and mitigation starts long before initiating a response. Risks to humans and animals should be identified, and mitigation measures established. Specific risk and mitigation measures will be listed under individual sections later in the document (see Sections 3.8, 4.8 and 5.8). Some examples of general risk and mitigation measures are listed below.

RISKS TO HUMANS

Risks:

- Injury or death as a result of drowning; slips, trips, or falls; propeller wounds when working around vessels, dolphin, and net; human entanglement in net (such as hands, fingers, arms resulting in breaks and amputations); trauma associated with animal restraint (*e.g.*, bites, scratches, bruises, breaks); changeable environmental conditions; injuries from other marine organisms (*e.g.*, stingrays, oysters, sharks).

- Accidental injection, ingestion, spray, or absorption of drugs during capture, or ingestion of drugs as a result of future subsistence use.
- Exposure to pollutants, biotoxins, etc.

***Mitigation*:**

  - Preparation, planning, practice, proper training, and use of decision matrices.
  - Licensed Doctor of Veterinary Medicine (DVM) or equivalent, or Veterinary Technician present if sedation drugs will be used during the response.
  - IC, CL, and HSO to oversee operations.
  - Wear appropriate PPE.
  - Use luer lock syringes with hand injectable drugs (to reduce likelihood of spray back).
  - If working in Alaska, native communities should be notified prior to any captures using medications or sedatives, and animals that have been given drugs should be well marked and the markings communicated to the native communities so they can identify the animal prior to possible subsistence use.

RISKS TO ANIMALS

Risks:

- Injury or death to an entangled animal from remote disentanglement tools, net, drowning, or other animals.
- Injury to surrounding non-entangled animals from unintentional capture during net operations or from vessel operations during response.
- Possible separation of social unit (*e.g.,* mom and calf).

***Mitigation*:**

  - Preparation, planning, practice, and use of decision matrices.
  - Captures only performed by highly trained and a sufficient number of personnel.
  - Adequate survey of capture area to ensure minimal risk to any nearby non-entangled animals.
  - Adequate amount of appropriate reversal agents to be administered by licensed DVM or equivalent, or veterinary technician, if sedation drugs will be used during the response.
  - Animal emergency medications available (*e.g.,* doxapram, epinephrine, steroids, etc.)

1.17. Intervention Criteria/Decision Matrix

The first and most important question that will be asked by NMFS prior to authorizing an entanglement response is: **Is the entanglement life threatening?** Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury, and that the potential risks of capture are necessary for the survival of the animal, due to the serious nature of the entanglement (*e.g.*, see pp 34-35 NMFS Serious Injury Procedure for details).

For entangled small cetaceans, NMFS, in consultation with experts and veterinarians, will determine if an entanglement is considered life threatening. This is achieved through field observations by biologists, researchers, and veterinarians, analysis of photos and/or videos, the animal's behavior and appearance, and prior experience with similar entanglements (*e.g.,* Wells *et al.* 2013). Table 2-3 outlines some of the evidence, levels of severity, and response methods that may be considered when assessing interventions.

If the entanglement is determined to be life threatening, the next step is to determine the most appropriate method of intervention. If intervention is not an option or the entanglement is not considered life threatening, the animal may be monitored, usually by local researchers, stranding network partners, or trained biologists, to determine whether an intervention may be possible at a later date (*e.g.*, the animal moves to a more suitable area for rescue, the animal live strands, the animal becomes lethargic and more approachable, weather improves, the animal's condition deteriorates (if the entanglement was not originally considered life threatening).

Table 2-3 Small Cetacean Entanglement Intervention (Evidence, Levels of Severity, and Methods)

Evidence	Visible entangling material present; encircling lesions with likelihood of embedded gear around/through mouth, body, dorsal fin, flippers, flukes; animal anchored by gear. May also include lesions and abrasions from contact with trailing gear. Entangling material may include fishing gear (*e.g.*, monofilament, net, rope) and marine debris.
Level of Severity	**Conditions**
Serious Outcome (Life threatening)	Entanglement gear interfering with breathing and/or feeding; circumferential wraps around or gear embedded in head, mouth, flippers, peduncle, body; gear severely limiting mobility or animal is anchored; hooks in eyes or head; ingested fishing gear protruding from the mouth

	(https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations#distinguishing-serious-from-non-serious-injury-of-marine-mammals)
Unlikely Serious Outcome	No restrictions of breathing and/or eating; fishing gear not embedded; gear only impacting the dorsal fin; minor superficial lesions; strength of animal exceeds that of the gear (Moore *et al.* 2013); hooks externally except for eyes or head; line only affecting distal portions of dorsal fin or flukes (Wells *et al.* 2008)
Intervention Method	Remote disentanglement; in-water capture for free swimming animals
Disposition Options	Released at site; translocated and released; rehabilitation; euthanasia

Additionally, if the decision to intervene is made, then there are two main tools to aid in determining if a response should occur: 1) The Risk Factor Model, and 2) The Go/No Go decision matrix:

1) **The Risk Factor or GAR (Green-Amber-Red) Model** (Table 2-4). The GAR model allows for time critical risk assessment and generates communication concerning the response risks. This communication then helps identify the risk and leads to the appropriate mitigation. This model is not a strict Go/No Go because it is focused on identifying risks and mitigations. If the cumulative risk levels across multiple areas (*e.g.*, team composition, mission complexity, etc.) are above a certain threshold, teams must work with the IC, CL, RSC, and/or contact the permit principal investigator (*i.e.*, the MMHSRP) if acting under the permit, prior to conducting activities to discuss mitigation measures or the team must stand down.

Table 2-4. The GAR (Green-Amber-Red) General Model Table based on a table provided by The Hawaiian monk seal research program, NMFS, also see Appendix F.

Risk Factor	Risk Factor Category						Risk Level
	Very Low - 1	Low - 2	Medium - 3	Medium High - 4	High - 5	Very High - 6	

Environment	**Very Acceptable**	**Acceptable**	**Moderately Acceptable**	**Moderately Dangerous**	**Dangerous**	**Very Dangerous**
Team Composition and Fitness	**Excellent Team**	**Good Team**	**Appropriate Team**	**Marginal Team**	**Poor Team**	**Very Poor Team**
Animal Condition	**Healthy (besides entanglement)**	**Healthy (besides entanglement)**	**Mildly Compromised Health**	**Moderately Compromised Health**	**Highly Compromised Health**	**Highly Compromised Health**
Permits & Authorization	**Excellent**		**Good**		**Poor**	
Resources: Equipment, PPE, Communication, etc.	**Excellent**		**Good**		**Not Prepared**	
Mission Complexity: New or Experimental, Time Sensitive, etc.	**Simple**	**Standard**	**Moderately Complex**		**Very Complex**	**Extremely Complex**
If any risk level equals:	**Medium-High**	**Discuss with capture lead or immediate supervisor before proceeding.**				
	High – Very High	**Contact NMFS**				

Key considerations or questions to be asked in the risk factor analyses (GAR):

- ***Health and behavior assessment:*** Ideally, previous observations via photos or video will have allowed for an initial assessment of health prior to the response, including evidence of malnutrition/emaciation, active infection or abscesses, etc. During the response, observe current body condition, responsiveness (responds normally to natural stimuli), or if there are any external or behavioral abnormalities including abnormal breathing patterns.
- ***Weather and tide concerns:*** Does weather pose a threat to the animal or responders (*i.e.*, heat stress, hypothermia, large waves, or threatening storms)? If so, is there a way to mitigate it?

Consider the animal's body temperature before, during, and after handling. Is the tide coming in or going out, how high/low is it and how can it impact the event?

- ***Habitat concerns:*** Habitat (*i.e.*, geographic location, substrate type, navigational hazards, water depth, currents) should be assessed for hazards to animals and responders.
- ***Equipment:*** Is all necessary gear functional, available, and ready? This includes, but is not limited to: vessels, capture net, tagging, sampling, instrumentation, disentanglement tools, emergency equipment, temperature mitigation gear (*e.g.*, shade, bucket and sponges for water), and transport gear (*e.g.*, truck, vessel, foam mats).
- ***Presence of other animals of concern:*** Are there other small cetaceans, or other wildlife in the area that may be disturbed by the response (*e.g.,* manatees inhabiting the same area in which an entangled dolphin is located)? Is there a potential for other small cetaceans to approach and disrupt the target animal or responders during capture? Are there other large predators of safety concern for rescue personnel (*e.g.,* sharks, alligators, etc.)? Consider other natural and cultural resources nearby.
- ***Egress****:* Has the team assessed all possible hazards in the capture zone? Is there a safe place for the non-entangled animals to egress? What hazards are in the capture zone that could potentially cause additional injury to the entangled animal and surrounding animals?
- ***Team composition:*** Are there adequate responders with the appropriate level of expertise and experience to safely complete the mission and address unforeseen situations? If a veterinarian or veterinary technician is necessary, are there sufficient personnel to assist with the entanglement response so the veterinary staff can monitor/treat the animal. Ensure that all involved fully understand their roles and everyone understands what warning signs to look for. Designate a human safety officer to monitor fatigue, injury, and personnel throughout the response.
- ***Public presence:*** Is the response going to be in a public area? Ensure adequate crowd control and outreach. Consider a public briefing after the event. Expect to be recorded or live streamed and ensure that all involved look and behave appropriately. Carefully consider clothing/logos that will be seen by the public, to help the public to recognize the professionalism of the team.

2) The Go/No Go decision matrix. Example matrix modified from one used for pinniped entanglement response.

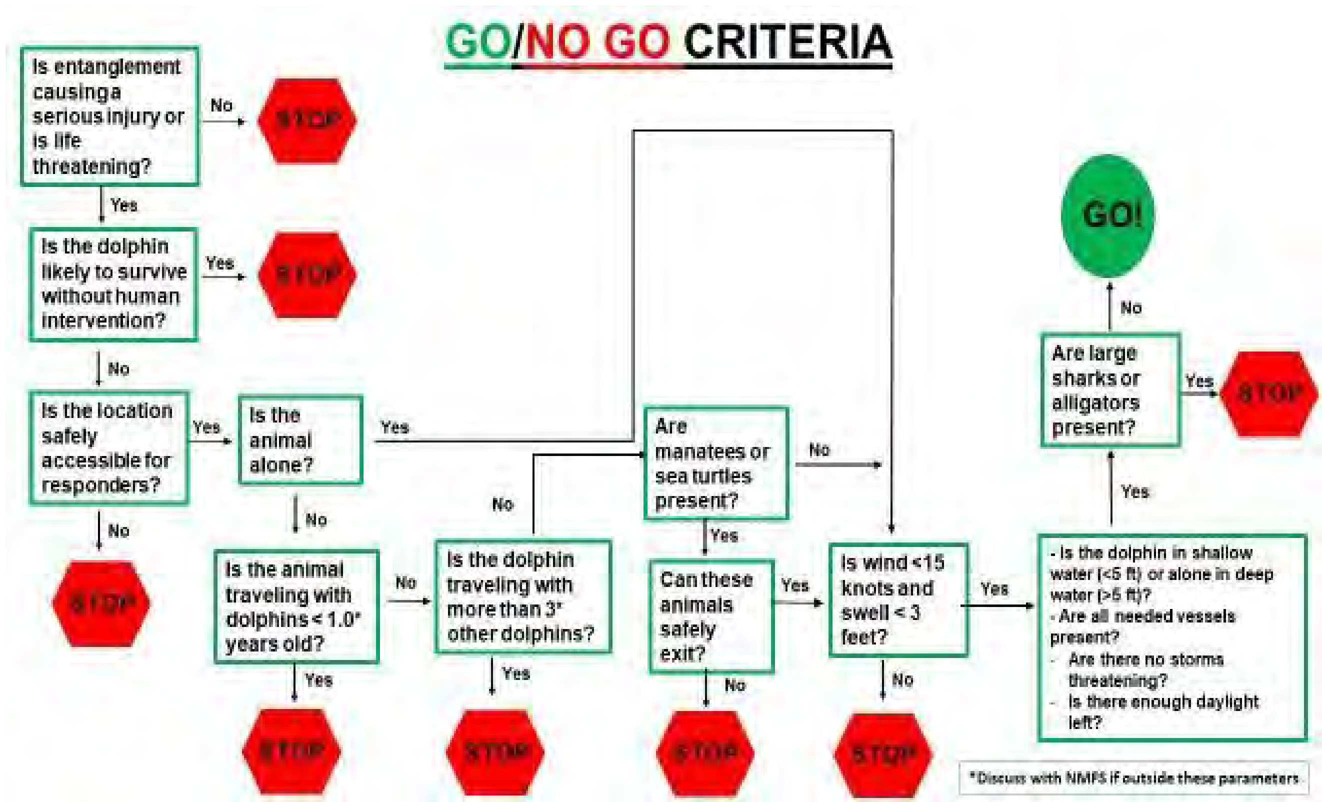


Figure 2-1. General example of a Go/No Go decision matrix based on permit requirements (created based on flowchart provided by the Alaska Department of Fish and Game Steller sea lion program), also see Appendix G.

1.18. Procedure

Procedures will vary depending on the type of entanglement response and will be presented in detail in each specific response type section (see Sections 3.10, 4.10 and 5.10). Across all types of responses, the general sequence of events include:

1. Hold a team briefing before the response occurs so team members know their duties.
2. Ensure there is adequate security and crowd control in place, if necessary.
3. The IC and CL will ensure all personnel and equipment are ready and perform the final Go/No Go determination (if there is ANY question of increased risk, abort).
4. All camera and video monitoring equipment is operational and recording.
5. The team locates the animal and remotely assesses any changes in condition or entanglement.

6. If the animal still needs intervention, IC and CL will assess the environment, animal condition/entanglement, etc. and issue the Go/No Go order for operations (remote or in-water techniques).
7. The team gets into position, approaches, remotely disentangles, or captures the animal.
8. If captured, the animal is immediately monitored and assessed for any signs of respiratory or circulatory distress and treated accordingly.
9. The animal is disentangled, entangling gear/debris are collected, the wound is cleaned and treated, and medications are administered (if needed), photos are obtained of the gear in-place and final photos of the animal without the gear, and of tags in place if used. Additionally, sex is determined, length is measured, it is marked or tagged (if safe to do so), pictures of the dorsal fin are taken for identification purposes, and additional data are recorded. Euthanasia solutions should be kept on hand in case there is a need for euthanasia. Antibiotics or other medications may be used to treat injuries.
10. The animal is released, or if additional care is warranted is, transported to a rehabilitation center, or euthanized if the injury is too severe. If euthanized, the carcass is transported to a necropsy facility for complete necropsy.
11. The team conducts a debrief and completes a fully documented report (*e.g.*, Level A, HI Form, Entanglement Form – see Appendices).
12. The gear is cleaned, packed, and organized for the next response.

Small Cetacean Entanglement Response Techniques – Remote Interventions for Free-swimming Small Cetaceans

This section can be used as a stand-alone overview of how to safely respond to, and remotely disentangle, free-swimming small cetaceans. Remote disentanglement techniques usually involve one to two vessels and several close approaches to the entangled small cetacean using remote disentanglement tools (*e.g.*, cutting pole, cutting grapples) to cut the entangling gear/debris.

1.19. Preparation

Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Consult tide charts, weather forecasts, other environmental parameters.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan (IAP) type document.
- Distribute safety protocols for responders review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vessels (fuel and maintenance, if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal and better control of onlookers in the area.
- Ensure all equipment is clean, organized, packed, and ready for operations.

24 – 72 hours prior to operation:

- Check marine weather forecasts.
- Notify appropriate entities such as NMFS Regional Stranding Coordinator (RSC), and law enforcement.
- Ensure appropriate authorization (*i.e.*, NMFS approval, and other approval if response in park or preserve).

Immediately prior to operation:

- Conduct safety briefing.
- Re-check marine weather forecasts.
- Consult decision matrix – prior to operations, and again once on-scene, determine if conditions allow for safe operations then make a final decision about response.

1.20. Training

Responders must be trained by experienced personnel in safe use of small boats, remote disentanglement tools, monitoring, etc. Advancement in use of remote disentanglement tools requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available and NMFS is working to develop a training tracking system for future use.

1.21. Human/animal safety

Because of the inherent risks encountered during an entanglement response, methods used to disentangle an animal should minimize risk, stress, and pain to the animal while also ensuring the safety of both the animal and responders. A broad list of human and animal safety procedures are below.

1.21.1. Human safety

Equipment and personal protective equipment (PPE)

- Have a written safety protocol with emergency numbers to be kept with first aid kits.
- All personnel must wear appropriate PPE, dress suitably for the weather conditions, and have appropriate footwear for working on a vessel.
- Other recommended protective gear includes eyewear (including sunglasses, preferably polarizing), helmets, and gloves if handling remote cutting tools.

Safety equipment

- Ensure first aid kits are on each vessel.
- Use radio/other communication equipment.
- Vessels should contain safety equipment that conforms to USCG regulations (*e.g.,* PFDs for all crewmembers, fire extinguisher, flares, navigation lights if applicable, etc.) and be appropriate to the role each vessel plays in the response operation.

Operational safety

- Responders must meet minimum qualifications and training prior to conducting procedures.

- Float plans should list an assigned point of contact on land.
- Responses should not be conducted in poor weather, lighting, or sea conditions.
- Designated Human Safety Officer(s) should continually watch over all team members involved and be able to communicate to the IC or CL about human safety risks.
- Assess how to safely reach the animal and egress after the response. Consider tide, weather, time of day, other environmental factors, and other animals in the area.

Report injuries, incidents, or PPE failures to the Human Safety Officer immediately.

- Any significant accident or injury requires that operations cease and the event, person, or injury be immediately addressed.
- Depending on the situation, the decision is made by the IC and/or CL whether to continue or discontinue operations for the day.
- Appropriate response staff are trained in basic first aid and CPR. First aid kits are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal. Stow the implement safely when finished.

Presence of public or bystanders

- If response is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure observing public are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

1.21.2. Animal safety

Environmental hazard assessment

- Use a decision matrix prior to the response to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.
- Prior to the response, survey the surroundings to identify any environmental hazards that might pose a threat to responders or the animal.

Disturbance (other cetaceans and wildlife)

- Reduce all forms of disturbance to the entangled animal and any nearby animals (*e.g.*, if the animal is within a group) as much as possible by keeping noise to a minimum.

Time limits

- For remote disentanglement, responders should minimize close approaches and take breaks between disentanglement attempts if the animal shows disturbance behavior.

- The number of disentanglement attempts per day or over consecutive days should be evaluated on a case-by-case basis, including the severity of the animal's injury and the individual animal's response to disentanglement attempts.
- If the animal shows strong avoidance or aggressive behaviors stop all entanglement response activities and give the animal a cool-down period (10-20 minutes). If these behaviors continue after two cool-down periods abort the entanglement response for that day.

Remote disentanglement tool deployments

- Ensure all equipment is in working order prior to deployment.
- Where possible, approach or maneuver the disentanglement vessel closest to the animal to allow for deployment of remote tools.
- If not possible prior to the response, assess where the entangling material is easiest to access and cut away. Also, identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal.
- Sterilize any sampling or tagging tools that were exposed to the animal.
- Clean and dry all equipment after response and stow securely where it can be accessed for future use.

1.22. Team Member Roles

The remote disentanglement of small cetaceans has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the ICS. This system provides a structure for clarity of communications and roles, and efficient management of resources. ICS is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on ICS. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 3-1).

Table 3-1. Suggested number of personnel required for a remote entanglement response.

Team member role	Number of personnel required
Incident Commander/Capture Lead	1
Human Safety Officer	1

Small Boat Operator(s) (may use anywhere from 1-3 vessels)	1-3
Disentanglement Tool Operator(s)	1-2
Data Collector/Photographer(s)	1-2
Security/Crowd Control	variable
Optional–Veterinarian/Veterinary Technician	1
Optional – Communications Officer	1
Optional – Unmanned Aerial System Operator	1

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*e.g.*, documentation and data collection).

- **Incident Commander (IC)/Capture Lead (CL)** - For remote responses the incident commander (IC) and capture lead (CL) may be combined in one person. In these cases, the IC/CL is responsible for all on-water activities and resources needed to conduct and maintain safe and efficient operations. If more than one vessel is used, the IC/CL coordinates the deployment of the other vessels while searching for the target cetacean(s). The IC/CL makes the final call on when and where to approach the cetacean for remote disentanglement attempts. The IC/CL ensures that the response is as safe as possible for responders, the target animal, other animals, and the public.

  - **Qualifications** – Experience conducting remote disentanglement activities. Experience working around small cetaceans including close approaches and general vessel operations. Experience monitoring and detecting stress reactions in small cetaceans. The ability to remain objective to ensure safe operations and willingness to stop operations if there is a safety concern. Communication skills are important to the role. Ability to brief the response team beforehand, communicate w/ the various vessels on the water, and the veterinary team as needed.

- **Human Safety Officer (SO)** – The HSO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the IC or CL about human safety risks.

- **Qualifications** – Ability to watch over all personnel involved, provide first aid as needed.
- **Small Boat Operator** – For remote entanglement responses, small boat operators are an essential component to a successful operation. Small boat operators are responsible for ensuring that vessels are safely maneuvered around animal(s), and that vessels are safely handled in various conditions, such as inclement weather, sea state, currents, tides, surrounding vessel traffic, etc. Small boat operators should be experienced with animal close approaches.

- **Qualifications** - USCG boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with small cetaceans around the boat. Experience maneuvering in tight spaces, ability to remain calm under pressure, and remain focused under potentially hectic circumstances. Experience driving vessels around cetaceans.
    - **Disentanglement Tool Operator** - The disentanglement tool operator is responsible for using remote cutting tools from a vessel to disentangle the free-swimming small cetacean. Tools may include cutting poles, cutting grapples, or other types of remote cutting equipment. The disentanglement tool operator must know how to use the remote tools safely to minimize injury to the target cetacean, nearby animals, and response personnel.
- **Qualifications** – Experience in using remote disentanglement tools and experience working around free-swimming small cetaceans. The ability to remain calm under pressure.
    - **Data Collector** – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data are complete on the data sheets, the animal is given an identifying number, all marks, dorsal fin features, and satellite-linked tag numbers (PTT and S/N) are recorded, and all samples and gear are properly recorded and labeled.
- **Qualifications** – Familiarity with data sheet and information to be recorded, attention to detail, and ability to accurately record data legibly.
    - **Photographer or Videographer** – This person is responsible for operating still or video photography to document the response. This person may also serve as the data collector.
- **Qualifications** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and video including dorsal fin pictures, and ability to post-process photos/video after the capture.

        - **Security/Crowd Control (Variable)** – The IC/CL should ensure that the proper on-water authorities (*i.e.*, marine patrol, USCG) in the area have been notified of the response and the area is restricted or closed to public access during the response, if necessary.
    - **Qualifications** – Knowledge of proper authorities to notify.
        - **Veterinary Staff (Optional)** – The veterinary staff is responsible for the health and monitoring of the entangled animal during the response and until the animal is safely disentangled and on its own. Based upon the type of remote response, veterinary staff may not be needed for each response. Having veterinary staff available for consultation via cell phone or radio is encouraged.
    - **Qualifications** – A licensed Doctor of Veterinary Medicine (DVM) or equivalent, or veterinary technician experienced in small cetacean medicine.
        - **Communications Officer (Optional)** – The communications officer is responsible for communicating information about entanglement response to the public and media. For high profile cases or cases conducted under the permit, messages should be coordinated with all participating organizations and cleared with NMFS.
        - **Qualifications** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.
- **Unmanned Aerial System Operator (UAS; Optional)** - If permitted to operate an UAS during the remote response, the UAS pilot must have no other duties. The pilot must be in communication with the IC/CL and immediately cease operation if the UAS is in any way negatively impacting the success of the disentanglement or causing any disturbance to the target or other animals.
    - **Qualifications** – A certified pilot's license, a permit to operate during a capture (requires prior approval if under the MMHSRP's MMPA/ESA permit), follow all existing FAA and any other regulations, and experience operating a UAS during previous small cetacean field operations.

1.23. Environmental Conditions

Create a risk assessment tool (Appendix F – Risk Factor Table) or decision matrix (Appendix G – Decision Matrix (Go/No Go) to determine whether an entanglement response is safe for responders and small cetaceans based on environmental conditions. Assess the following environmental conditions prior to small cetacean remote disentanglement response:

- Weather conditions (*i.e.*, rain, snow, fog, wind, sea state, approaching storm systems, heat, cold).
- Submerged hazards (*i.e.*, sand bars, rocks, coral reefs, sunken debris, aquaculture infrastructure, oyster bars, etc.).
- Location of the animal in relation to the surf zone.
- Tide (*i.e.*, incoming or outgoing tide, increased surf, currents).
- Time of day (*e.g.*, response too close to sunset leading to activities occurring at night).

1.24. Equipment

Data and documentation supplies

- Entanglement Response forms (*i.e.*, Level A, Human Interaction Data Sheet, Photo-ID form, Disentanglement form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries

Sampling supplies

- Sampling kit (*e.g.*, forceps, cryovial for skin if present on retrieved gear)

Protective clothing

- Footwear appropriate for vessel
- Protective clothing (*e.g.*, PFD, raingear, helmet, etc.)
- Non-permeable work gloves (if handling cutting tools)
- Optional - eyewear, etc.

Human medical equipment

- First aid kit (optional AED)

Cutting tools (*below*)

Cutting Pole

There are a variety of different cutting tools that can be used to cut entangling material. When using a "hooked fixed pole knife" to cut an entanglement without restraining the animal, a stainless steel knife fabricated into a "V" shape with a threaded fitting that attaches to an aluminum or carbon fiber pole that can be extended by adding sections, works well.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Cutting Grapples

<u>Cleaning/disinfecting supplies</u>

- Antibacterial soap/hand sanitizer
- Disinfectant solution (*e.g.,* chlorhexidine, 70% ethanol, etc.)
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

<u>Miscellaneous supplies</u>

- Cooler/waterproof case/Backpack/Bucket (to carry supplies)

1.25. Data Collection

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response. Data forms and instructions should be readily available during a response. Important forms to have on hand include: applicable permits, Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), gear checklists (*e.g.*, Appendix C- Gear Checklist), and disentanglement forms (*e.g.*, Appendix D – Disentanglement forms), and respiration rate form (*e.g.,* Appendix E - Respiration rate form). All entangling gear should be retained (if possible), documented on the Level A and Human Interaction Forms, and stored in a centralized location or sent to a NMFS gear repository, please consult with the RSC on appropriate repositories by region.

1.26. Risks and Mitigation

To minimize risks to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a risk analysis matrix should be completed to guide responders in making safe decisions regarding the response to entangled small cetaceans. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough debrief with lessons learned that can be applied to the next response. When responding to entangled small cetaceans, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

This section outlines and assesses risks specific to remote disentanglement of free-swimming small cetaceans and how to mitigate these risks.

RISKS TO HUMANS

Risk: *Injury or death to personnel by falling or drowning.*

***Mitigation*:**

- Responders should wear appropriate PPE such as strong, non-slip footwear, PFDs, gloves, protective clothing, and helmets as necessary.
- Designated HSO should be assigned to continually watch over all personnel involved and be able to communicate to the IC or CL about human safety risks.

- Designated personnel should be watching for and warning the team of hazards such as waves and other animals.

Risk*: Injury to personnel from remote tool use (e.g., cuts, punctures, etc.).*

***Mitigation*:**

- Remote tool operators should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Remote tool operators should be mindful of the sharpness of the cutting tools and grapples and handle them accordingly.

RISKS TO ANIMALS

Risk: *Injury to animal from remote cutting tools.*

***Mitigation*:**

- Proper evaluation of existing animal injuries should be conducted before response attempt if possible.
- Use cutting tools that minimize injury to the animal and are designed to cut only the entangling gear/debris. Use cutting tools of appropriate size for the species.

Risk: *Unintentional disturbance of non-target animals.*

***Mitigation*:**

- Possibility of unintentional disturbance of non-target animals should be evaluated before and during remote entanglement response activities.
- Appropriate "take" (harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals should be complete.
- Efforts to minimize disturbance to non-target animals should always be considered.
- Designated personnel should continuously watch for the presence of non-target animals in and around the response area throughout the response, and communicate with the team appropriately.
- Dependent calves often surface unpredictably relative to their mother's location; care must be taken to not injure them inadvertently while trying to disentangle the mother.

Risk: *Animal fatality.*

***Mitigation*:**

- Personnel to be trained in techniques that minimize injury to animals.
- NMFS must be notified immediately. The animal should be recovered, a full necropsy performed, and a final report sent to NMFS. A debrief with NMFS should occur to discuss mitigations.

- Entanglement response activities should immediately cease until a necropsy is completed and new mitigation measures are approved by NMFS.

1.27. Intervention Criteria/Decision Matrix (Go/No Go)

A risk assessment tool (Appendix F – Risk Factor Table) or decision matrix (Appendix G – Decision Matrix (Go/No Go) should always be used prior to any response. For remote responses, factors that should be considered include environmental conditions, team selection and fitness, small cetacean selection and condition, type of entanglement and location on the body, permission, resources, and mission complexity.

1.28. Procedure

Optimal remote entanglement response situation

- Water location without any marine hazards
- Clear, calm water
- Solitary animal
- Animal is traveling in a consistent pattern and speed
- Close approach by the vessel is being accepted by animal
- Gear is trailing and/or loosely wrapped around the animal

Animal close approach and remote disentanglement attempts

1. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe remote entanglement response is feasible. Criteria will be based on authorization requirements and decision matrices.
2. **Assign team roles and review plan:** Before responding to any animal, be sure everything is ready. Double-check all the equipment and supplies. Identify the IC/CL, review the response scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a response should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the response, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. Discuss ideal cuts to be attempted to remove entangling gear/debris. The IC/CL will ensure all personnel and equipment are ready and perform the final Go/No Go determination.
3. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals noted.
4. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.

5. **Modify protective clothing and personal effects to minimize injury during the response event:** Remove rings from fingers or wear gloves, remove jewelry, tie hair back, check clothing for buttons or entangling points and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The documentation person will ensure all photo and video equipment is on and recording.
7. **Time limits:** Record the time of day, time of each close approach and remote attempt, and beginning and ending of cutting time (from when the remote tool actually first cuts the line and when it finishes). Record number of remote attempts per hour and per response day.
8. **Close approach:** The remote entanglement response vessel will approach quietly and calmly, and position itself in the best position for the remote cutting tools to be deployed (cutting pool, cutting grapple, etc. – *see tool section above*).
9. **Monitoring and assessment:** Throughout the effort the animal should be assessed for any signs of avoidance or abnormal behavior. Monitor the breathing, swimming speed, and diving behavior of the animal during the deployment of the remote cutting tools. If the animal shows strong avoidance or aggressive behaviors stop all entanglement response activities and give the animal a cool-down period of (10-20 minutes). If these behaviors continue after two cool-down periods reassess the entanglement response for that day.
10. **Data collection:** Record appropriate response data completely on Level A and Human Interaction Forms, and any other necessary response forms.
11. **Disentanglement:** The entangling material should be cut using an appropriate remote cutting tool (*e.g.*, pole, grapple, etc.). Ideally, the gear will shed during the disentanglement operation or later over several days. Occasionally a cutting tool may become entangled in the gear impeding the animal's ability to swim and the animal then becomes anchored. At this point, anchored animal techniques as described in Section 4 may be used to disentangle the animal. Whenever possible entangling gear should be retained, documented, and archived or sent to a gear repository for analysis, please consult with the RSC on appropriate repositories by region.
12. **Monitoring post-disentanglement:** After the entanglement is removed, continue to monitor the animal from a safe distance for ~15 minutes to assess respiration rate, swimming, diving and general behavior prior to leaving the animal. Ideally, additional post-entanglement monitoring and photo-documentation of the animal will be conducted over the following days to weeks.

13. **Post-response debrief:** The entire team discusses the response, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
14. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, coveralls, footwear, PFDs) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including cutting tools, specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.).
15. **Submit reports:** Ensure all datasheets and reports are complete, appropriately reviewed by team members, and submitted where appropriate.
16. **Prepare again:** Clean and organize gear so it is ready for future use.

Small Cetacean Entanglement Response Techniques – Remote Interventions for Anchored Small Cetaceans

This section has been prepared to be used as a stand-alone overview of how to safely respond to and remotely disentangle small cetaceans that are anchored. Entanglement response techniques for anchored small cetaceans usually involve one to two vessels and close approaches to the entangled and anchored small cetacean, either using remote disentanglement tools to cut the entangling line, or by briefly restraining the small cetacean alongside the vessel and disentangling by hand. Occasionally anchored animals may be in shallow water, and an in-water response may be possible if handlers are able to stand and disentangled the dolphin safely. The remote disentanglement of small cetaceans that are anchored has inherent risk for both the responders and the animals. Anchored animals generally need to be responded to within < 24 hours; consequently there will be less time for planning and preparation and increased risks to the animal of drowning and death.

1.29. Preparation

Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Consult tide charts, weather forecasts, other environmental parameters.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan (IAP)-type document.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vessels (fuel and perform maintenance, if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If available and using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

24– 72 hours prior to operation:

- Check marine weather forecasts.
- Notify appropriate entities such as NMFS Regional Stranding Coordinator (RSC), enforcement, and rehabilitation facility to inquire about available space.

- Ensure appropriate authorization (*i.e.*, NMFS approval and other approval if response in park or preserve).

Immediately prior to operation:

- Conduct safety briefing.
- Re-check marine weather forecasts.
- Consult decision matrix – prior to operations, and again once on-scene, determine if conditions allow for safe operations and make a final decision about response.

1.30. Training

Responders must be trained by experienced personnel in safe use of vessels, remote disentanglement tools, handling, monitoring, etc. Advancement in use of remote disentanglement tools and response to anchored small cetaceans requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in low-level aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has an up-to-date list of team abilities. Although there are currently no formal national training programs in place, the MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available and NMFS is working to develop a training tracking system for future use.

1.31. Human/animal safety

Because of the inherent risks encountered during an entanglement response, methods used to disentangle an animal should minimize risk, stress, and pain to the animal while ensuring the safety of both the animal and responders. A broad list of human and animal safety procedures can be found below.

1.31.1. Human safety

Equipment and personal protective equipment (PPE)

- Have a written safety protocol with emergency numbers to be kept with first aid kits.
- All personnel must wear appropriate PPE, including PFD's, dress suitably for the weather conditions, and have appropriate footwear for working on a vessel.
- Other recommended protective gear includes eyewear (including sunglasses, preferably polarizing), helmets, and gloves if handling remote cutting tools. Masks should be available for use at handler discretion if they will be interacting closely with the animal, based on risk and environment.

Safety equipment

- Ensure first aid kits are with each response group.
- Use radio/other communication equipment.
- Knives, restraint equipment (if the animal is restrained against the vessel).
- Vessels should contain safety equipment for vessels that conform to USCG regulations (*e.g.*, PFD, fire extinguisher, flares, navigation lights if applicable, etc.) and be appropriate to the role each vessel plays in the response operation.

Operational safety

- Responders must meet minimum qualifications and training prior to conducting procedures.
- Float plans should list an assigned point of contact on land.
- Responses should not be conducted in poor weather, lighting, or sea conditions.
- Designated Human Safety Officer(s) should continually watch over all team members involved and be able to communicate to the Incident Commander (IC) or Capture Lead (CL) of human safety risks.
- Do not wrap net or line around hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear.
- Assess how to safely reach the animal and egress after the response. Consider tide, weather, time of day, other environmental factors, and other animals in the area.

Report injuries, incidents, or PPE failures to the Safety Officer immediately.

- Any significant human accident or injury requires that operations cease and the event, person, or injury immediately addressed.
- Depending on the situation, the decision is made by the IC and/or CL whether to continue or discontinue operations for the day.
- Appropriate response staff are trained in basic first aid and CPR. First aid kits are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal, and cut away from yourself. Stow the implement safely when finished.

Presence of public or bystanders

- If response is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure observing public are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

1.31.2. Animal safety

Environmental hazard assessment

- Use a decision matrix prior to the response to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

- Prior to the response, survey the surroundings to identify any environmental hazards that might pose a threat to responders or the animal.

Disturbance (other cetaceans and wildlife)

- Reduce all forms of disturbance to the entangled animal and any nearby animals (*e.g.*, if the animal is within a group) as much as possible by keeping noise to a minimum.

Remote disentanglement tool deployments

- Ensure all equipment is in working order and that all cutting instruments are honed to a fine edge prior to deployment.
- Where possible, approach or maneuver the disentanglement vessel closest to the animal to allow for deployment of remote tools.
- If not possible prior to the response, assess where the entangling material is easiest to access and cut away. Also, identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

Restraint devices and restraining anchored animals

- When the animal is restrained, ensure it is secured appropriately so that it is still able to breathe comfortably and protected from injury from the vessel if it spins, rolls or flukes (*e.g.*, have padding between hard-sided vessels and the animal's head).
- Once restrained, if not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also, identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal. Peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and act as appropriate.
- Ensure transport method is safe and secure for the size and strength of the animal if being transported to rehabilitation.

- Sterilize any sampling tools that were exposed to the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

1.32. Team Member Roles

The remote disentanglement of small cetaceans that are anchored has inherent risk for both the responders and the animals. Anchored animals generally need to be responded to within 24 hours; therefore there will be less time for planning and increased risks to the animal of drowning and death. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the ICS. This system provides a structure for clarity of communications and roles, and efficient management of resources. ICS is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on ICS. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 4-1).

Table 4-1. Suggested number of personnel required for a remote entanglement response of an anchored small cetacean.

Team member role	Number of personnel required
Incident Commander/Capture Lead	1-2
Human Safety Officer	1
Small Boat Operator(s) (may use anywhere from 1-3 vessels)	1-3
Disentanglement Tool Operator	1-2
Data Collection/Photographer	1-2
Security/Crowd control	variable
Optional - Animal Handler (if anchored animal is restrained alongside vessel or in-water)	3-5

Optional–Veterinarian/Veterinary Technician	1
Optional – Communication Officer	1
Optional – Unmanned Aerial System Operator	1

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.*, documentation and data collection).

- **Incident Commander (IC)/Capture Lead (CL)** - For anchored animals, the IC and CL may be combined in one person. The IC or CL is responsible for all on-water activities and resources needed to conduct and maintain safe and efficient operations. If more than one vessel is used, the IC/CL coordinates the deployment of the other vessels while searching for the target small cetacean(s). The IC/CL makes the final call on when, how, and where to approach the cetacean for remote disentanglement attempts. For an anchored small cetacean, the IC/CL will make decisions and direct the most experienced people to restrain the animal alongside the vessel, if appropriate. The IC/CL ensures that the response is safe for responders, the public, and animals.
- **Qualifications** – Experience conducting remote disentanglement activities. Experience working around small cetaceans include close approaches and vessel operations. Experience monitoring and detecting stress behavior in small cetaceans. The ability to remain objective to ensure safe operations and willingness to stop operations if there is a human or animal safety concern. Communication skills are important to the role. Ability to brief the response team beforehand, communicate w/ the various vessels on the water, and the veterinary team as needed.
- **Human Safety Officer (SO)** – The HSO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the IC or CL about human safety risks.
  - **Qualifications** – Ability to watch over all personnel involved, provide first aid as needed.
  - **Small Boat Operator** – For anchored entanglement responses, the small boat operators are an essential component to a successful operation. The small boat operators are responsible for ensuring that vessels are safely maneuvered around animal(s) in the water, and that they are safely handled in all types of weather and sea state conditions

including currents, tides, wind, etc. Small boat operators should be experienced with animal close approaches, and restraint of animals alongside the boat.

- **Qualifications** - U.S. Coast Guard boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with small cetaceans in or around the boat. Experience maneuvering in tight spaces, ability to remain calm under pressure. Experience driving vessels around cetaceans.
  - **Disentanglement Tool Operator** - The disentanglement tool operator is responsible for using cutting tools from a vessel to disentangle the anchored small cetacean. Tools may include knives (*e.g.,* strap cutters), cutting poles, cutting grapples or other types of remote cutting equipment. The disentanglement tool operator must know how to use the tools safely to minimize injury to the target cetacean and response personnel.
- **Qualifications** – Experience in using remote disentanglement tools and experience working around free-swimming small cetaceans. The ability to remain calm under pressure.
  - **Data Collector** – The data collector is essential for recording all aspects of the entanglement response. This person is responsible for ensuring all data are complete on the data sheets, the animal is given an identifying number, all marks, freeze-brand and other tag numbers if used (*e.g.*, roto tag, satellite-linked tag PTT and S/N numbers) are recorded, and all samples are properly recorded and labeled.
- **Qualifications** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.
  - **Photographer or Videographer** – This person is responsible for operating still or video photography to document the response. This person may also serve as the data collector.
- **Qualifications** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos and video including dorsal fin pictures for identification purposes, and ability to post-process photos/video after the capture.
  - **Security/Crowd Control (Variable)** – The IC/CL should ensure that the proper on-water authorities (marine patrol, USCG) in the area have been notified of the response and the area is restricted to close public access during the response if needed.
- **Qualifications** – Knowledge of proper authorities to notify.
  - **Animal Handlers (Optional)** – If needed for an anchored animal, the animal handlers are responsible for safely restraining the animal against the side of the boa, on the floating mat or in the water (if shallow), and all personnel around the animal are safe from potential injury such as animal bites, blows from head or tail, and scratches. The

animal handler holding the head would also be responsible for monitoring the head of the dolphin to ensure it is breathing appropriately while restrained.

- **Qualifications** - Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement requires hands-on experience under the direct supervision of experienced response staff. This handling experience may occur in a rehabilitation hospital or field research setting. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
  - **Veterinary Staff (Optional)** – The veterinary staff is responsible for monitoring the condition of the entangled animal during the response and until the animal is safely disentangled and released. Based upon the type of remote response, veterinary staff may not be needed for each response. For anchored animals, veterinary staff would be desirable to aid with assessment but may not be feasible with the need for a quick response. If veterinary staff are not on-site, they should be available for consultation via cell phone or radio.
- **Qualifications** – A licensed Doctor of Veterinary Medicine (DVM) or equivalent or veterinary technician who is experienced in small cetacean medicine.
  - **Communications Officer (Optional)** – The communications officer is responsible for communicating information about entanglement response to the public and media. For high profile cases or cases conducted under the permit, messages should be coordinated with all participating organizations, and cleared with NMFS.
  - **Qualifications** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

- **Unmanned Aerial System Operator (UAS; Optional)** - If permitted to operate a UAS during the remote response, the UAS pilot must have no other duties. The pilot must be in communication with the IC/CL and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing any disturbance to the target or other animals.
  - **Qualifications** – A certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous small cetacean field operations.

1.33. Environmental Conditions

Create a risk assessment tool (Appendix F – Risk Factor Table) or decision matrix (Appendix G – Decision Matrix (Go/No Go) to determine whether an entanglement response is safe for responders and small cetaceans based on environmental conditions. Assess the following environmental conditions prior to small cetacean remote disentanglement response:

- Weather conditions (*i.e.*, rain, snow, fog, wind, sea state, approaching storm systems, heat, cold).
- Submerged (*i.e.*, sand bars, rocks, oyster bars, coral reefs, sunken debris, etc.) or emergent (channel markers, pilings, docks, anchored vessels, etc.) hazards.
- Location of the animal in relation to the surf zone.
- Tide (*i.e.*, incoming or outgoing tide, increased surf).
- Time of day (*e.g.*, response too close to sunset leading to activities occurring at night).

1.34. Equipment

Data and documentation supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, Respiration form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro)

Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, ruler)
- Tagging kit (*e.g.*, plastic fin tags, fin notcher, grease pencils, satellite-linked tags, tagging equipment)
- Freeze-branding supplies (*e.g.,* brands as pre-assigned by NMFS, gloves, liquid nitrogen, container for numeral cooling)
- Sampling kit (*e.g.*, cryovial for skin)

Protective clothing

- Footwear appropriate for vessel
- Protective clothing, suitable to the expected environment (*e.g.*, PFD, raingear, helmet, etc.)
- Work gloves (if handling cutting tools)
- Optional - eyewear, etc.

Human medical equipment

- First aid kits for each boat (optional AED)

Animal medical equipment (if anchored and restrained along boat)

- Disentanglement instruments (*e.g.*, hand-held cutting tools, knife, scalpel, wire cutters, hemostats, etc.)
- Wound care kit

Cutting tools (*below*)

There are a variety of different cutting tools that can be used to cut entangling material. When using a "hooked fixed pole knife" to cut an entanglement without restraining the animal, a stainless steel knife fabricated into a "V" shape with a threaded fitting that attaches to an aluminum or carbon fiber pole that can be extended by adding sections, works well.


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Cutting Grapples

__**Capture/restraining gear**__

The equipment used for physical restraint of small cetaceans alongside a vessel may consist of the following but is not limited to: 1) hoop net, 2) restraining straps or rope, or 3) other restraint methods.

__**Break-away hoop nets (if needed to help control the animal)**__ – A hoop net made from aluminum rod, tubing, and a soft knotless net is placed in front of the animal as it surfaces, with the animals’ forward movement in combination with the net handler's skill the animal is enveloped in the net (Asper 1975; Loughlin et al. 2010). The net releases from the frame leaving the animal in the tethered net. The animal can still swim, surface, and breathe during this process. Once in a hoop net the animal can be maneuvered alongside the vessel and restrained.

Restraining straps – Restraining straps or ropes can be used to restrain an anchored dolphin alongside the vessel. Straps and ropes should be placed around the animal between the pectoral flippers and dorsal fin *(e.g.,* the maximum girth) and around the tailstock to help restrain the dolphin. If the dolphin will be restrained against the boat, a small amount of padding (*e.g.*, PFD) should be used between the cetacean's head and the boat.

Other restraint methods - Under some circumstances it may be beneficial to bring the animal onboard a floating mat alongside the boat, where it can be more easily disentangled, its wounds can be examined and documented more thoroughly, and it is easier to treat wounds, collect data, and mark or tag the animal. In some cases, anchored animals may be in shallow water (or moved to shallow water via a floating mat), in such cases, handlers may be able to enter the water and support and disentangle the animal while standing.

Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant solution (*e.g.,* chlorhexidine, 70% ethanol, etc.)
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

Miscellaneous supplies

- Cooler/waterproof case/Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

1.35. Data Collection

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response. Data forms and instructions should be readily available during a response. Important forms to have on hand include applicable permits, and potentially Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), gear checklists (*e.g.*, Appendix C - Gear Checklist), and disentanglement forms (*e.g.*, Appendix D – Disentanglement form). respiration rate form (*e.g.,* Appendix E - Respiration rate form), and priority sample sheet (will vary with each response). All entangling gear should be retained (if possible), documented on the

Level A and Human Interaction Forms, and stored in a centralized location or sent to a gear repository for analysis, please consult with the RSC on appropriate repositories by region.

1.36. Risks and Mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to setting out on an entanglement response. In addition, a risk analysis matrix should be completed to guide responders in making safe decisions regarding the response to entangled small cetaceans. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough debrief focusing on lessons learned that can in turn be applied to subsequent responses. When responding to entangled small cetaceans, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

This section outlines and assesses risks specific to remote disentanglement of anchored small cetaceans and how to mitigate these risks.

RISKS TO HUMANS

Risk: *Injury or death to personnel by falling, blunt impact, entrapment, or drowning.*

***Mitigation*:**

- Responders should wear appropriate PPE such as strong, non-slip footwear, PFDs, gloves, protective clothing, and helmets as necessary.
- Designated human safety officer should watch over all personnel involved and be able to communicate to the IC or CL about human safety risks.
- Designated personnel should be watching for and warning the team of hazards such as waves, wakes (from passing vessels) and other animals.

Risk*: Injury to personnel from remote tool use (e.g., cuts, punctures, etc.).*

***Mitigation*:**

- Remote tool operators should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Remote tool operators should be mindful of the sharpness of the cutting tools and grapples and handle them accordingly.

RISKS TO ANIMALS

Risk: *Injury to animals from remote cutting tools or from restraint.*

***Mitigation*:**

- Conduct proper evaluation of existing animal injuries before response attempt if possible.
- Use cutting tools that minimize injury to the animal and are designed to cut only the entangling line. Use cutting tools of appropriate size for the species.
- When the animal is restrained, ensure it is secured appropriately so that it is still able to breathe comfortably and it is protected from vessel injury if it spins, rolls or slaps its flukes (*e.g.*, have padding between hard-sided vessels and the animal's head).

Risk: *Unintentional disturbance of non-target animals.*

***Mitigation*:**

- Evaluate the possibility of unintentional disturbance of non-target animals before and during remote entanglement response activities.
- Complete appropriate "take" (harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals
- Always consider efforts to minimize disturbance to non-target animals.
- Designated personnel should continuously watch for the presence of non-target animals in and around the response area throughout the response, and communicate with the team appropriately.

Risk: *Animal fatality.*

***Mitigation*:**

- Personnel should be trained in techniques that minimize injury to animals.
- NMFS must be notified immediately. The animal should be recovered, a full necropsy performed, and a final report sent to NMFS.
- Entanglement response activities should immediately cease until a necropsy is completed and new mitigation measures are approved by NMFS.

1.37. Intervention Criteria/Decision Matrix (Go/No Go)

A risk assessment tool (Appendix F – Risk Factor Table) or decision matrix (Appendix G – Decision Matrix (Go/No Go) should always be used prior to any response. For a remote response, factors that should be considered include environmental conditions, team selection and fitness, small cetacean condition, permission, resources, and mission complexity.

1.38. Procedure

Optimal remote entanglement response situation for anchored animal

- Water location without any marine hazards (environmental and physical)

- Solitary animal
- Anchored by fishing gear or marine debris
- Animal tolerates close approach by vessel
- Animal is fatigued or otherwise tired out from entanglement

Animal close approach and remote disentanglement attempts

1. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe remote entanglement response is feasible. Criteria based on authorization requirements and decision matrices.
2. **Assign team roles and review plan:** Before responding or handling any animal, be sure everything is ready. Double-check necessary equipment and supplies. Review the response scenario and all procedures, any emergency response, and the sequence of activities. Discuss when a response should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the response, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. The IC/CL will ensure all personnel and equipment are ready and perform the final Go/No Go determination.
3. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals will be noted.
4. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
5. **Modify protective clothing and personal effects to minimize injury during the response event:** Remove rings from fingers or wear gloves, remove jewelry, tie hair back, check clothing for buttons or entangling points and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The data recorder will ensure all photo and video equipment is on and recording.
7. **Time limits:** Record the start time, time of remote attempts, time of restraint (if applicable), and beginning and ending cutting time (from when the remote or hand tool actually first cuts the line and when it finishes). Record number of remote attempts per hour and per response day (if applicable).
8. **Close Approach:** The remote entanglement response vessel will get into position, approach quietly and calmly, and position itself in the best position for the remote cutting tools to be deployed (cutting pool, cutting grapple, etc. – *see tool section below*).
9. **If animal is anchored (*e.g.*, crab trap, anchored net, other anchored line) and needs to be captured and restrained beside the vessel:**

a. **Capture:** Upon capture, controlling the animal's head is the most critical part of the restraint. Once the animal is restrained, make sure the animal's head is upright and the blowhole is clear and above the water's surface.

b. **Restraint:** Confirm handlers have control over the animal before conducting any procedures. Typically, an animal will struggle, sometimes violently, when initially handled, but will then settle down. The handler at the head of the dolphin should monitor the animal's breathing and responsiveness. When disentangling, sampling, tagging, etc., the person performing these activities should quietly tell the handlers what procedure is next so they can prepare for the animal's potential reaction.

c. <u>Restraining an animal with straps alongside the boat:</u> Restraining straps or ropes can be used to restrain an anchored dolphin alongside the vessel. Straps and ropes should be placed around the animal between the pectoral flippers and dorsal fin *(e.g.,* the maximum girth) and around the tailstock to help restrain the dolphin. Closed cell foam, a PFD or other floatation device (*i.e.*, throwable cushion) can be used to protect the animal's head from hitting the side of the vessel.

d. <u>Restraining with an animal in net (if hoop net used)</u>: When restraining with an animal in a net, watch that the animal's eyes, teeth, and pectoral flippers are not caught in the mesh and that the head is not at an unnatural angle. Ensure that netting is not caught in the animal's mouth. Adjust as necessary. Once the net is alongside the vessel, ideally get control lines through the netting so handlers can handle the lines and not use their hands in the netting. Animals may still roll while in a net, but the net and control lines do provide some control over the animal.

10. **Monitoring and assessment:** Once restrained, the animal should be immediately assessed for any signs of respiratory or circulatory distress and treated accordingly. Ensure the animal's blowhole is free and the animal can breathe normally. For most restraints, the front handlers are responsible for monitoring the animal's level of alertness and quality and frequency of respirations throughout the restraint period. It is important to make sure that chest expansion is occurring with each breath. The entire team should be notified if the animal's vitals start to change. The animal's breathing pattern may be somewhat irregular, and it may breath-hold, so vigilance is key. Either a sudden change in breathing pattern, whether an increase or decrease, or a decrease in responsiveness to stimuli raises concern. Check the animal's eyes to see if they are responsive (*i.e.*, is the animal looking around, does it respond to your hand or something that you move into its field of view). Tap its head gently

behind the eye with your finger. Check the jaw tone by opening the mouth. Vocalizations are desirable. If the animal does not show some response or its response is slow and the animal does not appear to be attentive, remove the entanglement (if not done already) and abandon other sampling, stimulate the animal, and release the animal and monitor it. Responders should be conservative in decision-making and err on the side of caution.

11. **Data collection:** Record appropriate response data completely on Level A and Human Interaction Forms, and any other necessary response forms. If animal is restrained, and if time and animal condition allow, also record morphometrics (at least total straight-line length and maximum girth), sex, and collect other samples as necessary.
12. **Disentanglement:** If remote techniques are used, the entangling material should be cut using an appropriate remote cutting tool (*e.g.,* pole, grapple, etc.). Ideally, the gear will shed during the disentanglement operation or later over several days. Once the gear is cut away, it should be retained (if possible) and later documented and archived or sent to a NMFS gear repository for analysis. If the animal is restrained, the entangling material should be removed using an appropriate cutting tool (*e.g.,* knife, scalpel, wire cutters, etc.). The material should then be removed by peeling it out of the wound, rather than dragging it out from one side, to minimize pain and prevent further injury.
13. **Wound care:** If the animal is restrained, the wound should be investigated to assess the extent of tissue damage and to ensure all foreign material has been removed. The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However, if needed, and if the animal is calm enough, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine or chlorhexidine may be used to flush deep wounds or areas not likely to be easily flushed on their own. Euthanasia solutions should be kept on hand in case there is a need for euthanasia. In the case of a severe wound and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.
14. **Marking and tagging:** If the animal is restrained, temporary identifying marks (*e.g.*, paint stick), longer-term identifying marks (*e.g.,* fin notching, freeze-brands) or dorsal fin tags (*e.g.,* roto tag and/or satellite-linked) can be applied for more visible and long-term identification and follow-up monitoring (Wells 2018).

15. **Releasing the animal:** Confirm that the animal has a clear exit upon release. The CL or the handler that is holding the head of the animal should direct the release and all handlers should release at the same time, typically after a countdown. Be sure to record the time of release. If possible, monitor the animal post-release from a distance for ~15 minutes, while keeping a low profile. Ideally, additional post-entanglement monitoring and photo-documentation of the animal will be conducted over the next days to weeks to determine if further intervention is warranted, to identify complications from the intervention, or to confirm the success of the operation (Wells *et al.* 2013).
16. **Post-response debrief:** The entire team should discuss the response, provide constructive feedback, and brainstorm on areas that could be improved. It is important to discuss the response as a team as soon as possible and within 24 hours of the response while memories of the event are fresh. Debrief notes should be added to the final report.
17. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, coveralls, footwear) are soiled, they should be cleaned and disinfected before storage or reuse. All contaminated reusable equipment and gear must be treated including restraining nets, measuring gear (*e.g.*, tape measure and scales), tagging supplies (*e.g.*, tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a "SHARPS" container (do not recap needles).
18. **Submit reports:** Ensure all datasheets, reports are completed properly, and submitted where appropriate.
19. **Prepare again:** Clean and organize gear so it is ready for future use.

Small Cetacean Entanglement Response Techniques - In-water Capture and Restraint for Free-swimming Small Cetaceans

This section can be used as a stand-alone overview of small cetacean entanglement response for free-swimming small cetaceans that require in-water net capture and restraint. This section is for animals not disentangled using remote techniques or where the entanglement does not lend itself to remote interventions (*e.g.,* tightly wrapped line, unapproachable animal).

1.39. Preparation

Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Determine the location where the capture is likely to take place, and identify any concerns.
- Consult tide charts for optimal tide windows.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan (IAP) type document.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles and vessels (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal and better control of onlookers in the area.
- If using satellite-linked transmitters, obtain appropriate tags, and ensure transmitters are programmed and ready to deploy.
- Arrange with rehabilitation facilities for possible transport and admission should the animal require extended care.
- Ensure all equipment is clean, organized, packed, and ready for operations.

24– 72 hours prior to operation:

- Check marine weather forecasts.
- Notify appropriate entities such as NMFS Regional Stranding Coordinator (RSC), enforcement, EMS or local hospital.
- Keep rehabilitation facilities informed about plans.
- Ensure appropriate authorization (*i.e.*, NMFS approval and other approval if response on park, preserve, private land).

Immediately prior to operation:

- Conduct safety briefing.
- Re-check marine weather forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions and time of day allow for safe operations and make a final decision about response.

1.40. Training

Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Additionally, personnel must be trained in small boat operations and have experience handling and tending nets in the water. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in low-level aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available and NMFS is working to develop a training tracking system for future use.

1.41. Human/animal safety

See Appendix H for detailed safety concerns for in-water cetacean capture-release operations.

1.41.1. Human safety

Equipment and Personal Protective Equipment (PPE)

- Have a written safety protocol with emergency numbers kept with first aid kits.
- All personnel must be wearing appropriate PPE including appropriate closed-toed footwear for in-water deployment, PFDs, and dress suitable for the weather conditions.
- Other recommended protective gear includes eyewear (including sunglasses, ideally polarizing), etc.
- Masks should be available for use at handler discretion if they will be interacting closely with the animal, based on risk and environment.

Safety equipment

- Ensure first aid kits are on each vessel.
- Use radio/other communication equipment.

- Vessels should contain safety equipment that conforms to USCG requirements (*e.g.,* PFD, fire extinguisher, flares, navigation lights, etc.) and be appropriate to the expected role in the response operation.

Operational safety

- Responders must meet minimum qualifications and training prior to conducting procedures.
- Float plans should list an assigned point of contact on land.
- Responses should not be conducted in poor weather, lighting, or sea conditions.
- Ensure that there are enough personnel to lift nets or animals.
- Have appropriate two-way marine radios or other communication devices.
- Designated Human Safety Officer(s) should continually watch over all team members involved and be able to communicate to the IC or CL of human safety risks.
- Assess how to safely reach the animal and egress after the response. Consider tide, weather, time of day, other environmental factors, and other animals in the area.

Net handling

- Do not wrap net or line around hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear.
- Communicate with the boat operator and other net handlers.
- While all participants should be observing the deployed net as much as possible, have dedicated net observers in case target animal or incidental animal(s) are entangled in the net.
- Remove the net from the water as quickly as possible after animals are restrained.

Predators/other wildlife

- When operating in waters where manatees are found, a designated manatee observer is required on each vessel.
- Check for predators (*e.g.,* sharks, killer whales, alligators) and other hazardous wildlife *(e.g.,* stingrays, jellyfish) before operations and have a spotter during water operations, including checking the net for incidentally entangled sharks, or other marine wildlife (*e.g.,* sea turtles, manatees).

Report injuries, incidents, or PPE failures to the Human Safety Officer (HSO) immediately

- Any significant accident or injury requires that operations cease and the event, person, or injury be immediately addressed.

- If treatment is needed or the person(s) involved need to be transported to a medical facility, a boat with a team member and often times the HSO should be detailed for transport and assistance.
- For human safety, when conducting in-water net activities, personnel trained in emergency medical services (EMS) must be part of the on-water team including basic first aid and CPR an generally will serve as the HSO. First aid kits must be readily available.
- Depending on the situation, the decision will be made by the IC and/or CL (in consultation with the RSC or permit PI) whether to continue operations for the day.

Presence of public or bystanders

- If capture is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure observing public are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

1.41.2. Animal safety

Environmental hazard assessment

- Use a decision matrix prior to capture to ensure risks are understood and appropriate mitigation measures are planned and accounted for by all responders.
- Prior to capture, survey the surroundings to identify any environmental hazards or predators (sharks, aggressive conspecifics) that might pose a threat to the animal.

Temperature/weather

- Prevent potential thermoregulatory stress by considering factors and managing temperature.

Minimize stress/time limits

- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of pursuit (if any), restraint and/or captivity, remaining calm and quiet around the animal, and minimize manipulations and transport of the animal. Minimize restraint time with priority given to documenting and removing the entangling material.
- The number of disentanglement attempts per day and consecutive days should be evaluated on a case-by-case basis, including the severity of the animal’s injury and the individual animal’s response to disentanglement attempts.
- If the animal is showing strong avoidance or aggressive behaviors stop all entanglement response activities and give the animal a cool-down period of (10-20 minutes) while still observing the animal’s whereabouts and movements from a farther distance. If these

behaviors continue after two cool-down periods reassess the entanglement response for that day.

Disturbance (other small cetaceans or wildlife)

- Consider potential effects of response to non-entangled conspecifics as well as other species within the response areas and strive to minimize disturbance as much as possible.
- Reduce all forms of disturbance to the entangled animal and any others close by (*e.g.*, if it is within a group) as much as possible by keeping noise and movement to a minimum.

Restraint devices and capturing/restraining animals

- When the animal is captured, ensure it is secured appropriately so that it is able to breathe comfortably.
- Once captured, and if not previously understood, assess where the entangling material is easiest to access and cut away. Also, make the fewest cuts needed to release the animal to reduce handling time and stress to the animal. Peel the entangling material out of the wound rather than drag or pull it from one side; this will minimize pain and lessen the chance of further injury.
- Determine whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and then act as appropriate.
- Ensure transport method is safe and secure for the size and strength of the animal if being moved to rehabilitation.
- Sterilize any sampling tools that were exposed to the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

1.42. Team Member Roles

The capture and handling of small cetaceans has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential for a safe and successful response. The recommended roles (see below) are based, in part, on implementation of the ICS. This system provides a structure for clarity of communications and roles, and efficient management of resources. The ICS is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on ICS. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 5-1).

Table 5-1. Suggested number of personnel required for a physical restraint - in water entanglement response.

Team member role	**Number of personnel required** (ranges from 20-50 depending up response)
Incident Commander	1
Capture Lead	1
Human Safety Officer/EMS Staff	1
Net Boat Operator (*i.e.*, Catcher)	1
Net Lead	1-2
Small boat operator(s)	4-6
Veterinarian/Veterinary Technician	1-2
Sample Collection Technician	1
Animal Handlers	20-30
Data Collection/Photographer	1-2
Security/Crowd control	variable
Communication Officer	1
Optional – Unmanned Aerial System Operator	1

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.*, documentation and data collection).

- **Incident Commander (IC) -** The IC is responsible for the overall operation, including the performance of the response, and does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the event and objectively ensure that the response is safe for participants, the public, and animals. In some small cetacean responses, the IC may be combined with the Capture Lead position.

- **Qualifications (recommended)** – Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.

- **Capture Lead (CL)** - In some small cetacean responses, the IC may be combined with the CL position. The CL is responsible for all on-water activities as well as the resources needed to conduct and maintain safe and efficient operations. The CL coordinates the deployment of all vessels while searching for the target cetacean(s) as well as the positioning of vessels around the deployed net. The CL makes the final call on when and where to approach the cetacean for in-water capture attempts and when and where the Catcher sets the net. The CL strives to make the response as safe as possible for responders, animals, and the public.
  - **Qualifications** – Experience conducting in-water small cetacean capture and release activities. Experience working around small cetaceans include close approaches and vessel operations. Experience monitoring and detecting stress behavior in small cetaceans. The ability to remain objective to ensure safe operations and willingness to stop operations if there is a safety concern. Communication skills are important to the role. Ability to brief the response team beforehand, communicate w/ the various vessels on the water, and the veterinary team as needed.
  - **Human Safety Officer (SO)** – The HSO is responsible for the safety of personnel involved in a response.
  - **Qualifications** – Ability to watch over all personnel involved, communicate to the IC or CL about human safety risks. Trained in emergency medical services (EMS) including basic first aid and CPR. First aid kits and other human medical gear must be readily available.
- **Net Boat Operator (Catcher)** – For in-water captures, the Net Boat Operator (Catcher), is an essential component to a successful operation, and is carefully supervised by the CL. The Catcher drives the net boat, deploys and adjusts the net (*e.g.*, seine net) used to encircle and capture small cetaceans or uses a net to close off a constrained area (*e.g.,* canal). After the CL gives permission to proceed to the Catcher to set the net, the Catcher determines precisely when to execute this directive based on water depth, conditions, presence of conspecifics, vessel traffic, and animal heading and behavior. Depending on circumstances, conditions, and number of animals, attempts may be made by the Catcher (under the direction of the CL) to maneuver the net with the boat to split, isolate or crowd animals to a particular area. The Catcher also directs the pulling, cleaning, and stacking of the net once all animals are safely restrained and secured.

- **Qualifications** - USCG boat training or equivalent. The Catcher should be experienced with close animal approaches, capture methods, and transport of animals in the boat. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with small cetaceans in or around the boat. Experience working with nets and encircling marine animals, ideally cetaceans. Experience driving vessels around cetaceans. Experience maneuvering in tight spaces, ability to remain calm under pressure.
    - **Net Lead (NL)** – In some smaller responses, the CL may be combined with the NL. For in-water captures, the NL is an essential component to a successful operation. The NL is in charge of directing the capture and restraint of the animal(s) once the net is set. The NL works closely with the CL to direct the team members around the net. When animals are in the compass in shallow water, the NL will enter the water and direct other handlers on the safest means in which to secure the animal. This may involve manipulating the compass to split a group of cetaceans. If the cetacean(s) are caught in deep water, they will eventually hit the net and a vessel will respond. The vessel will keep all handlers in the boat to secure the animal against the side of the vessel. Once the animal is secured along side the boat, the NL will work with the CL to deploy a few handlers from other boats into the water with PFDs to assist the original vessel's team in the process of transferring the animal to a floating mat for further work-up.
- **Qualifications** - Experience conducting in-water small cetacean capture and release activities. Experience working around nets and with animals captured in nets. Experience working around small cetaceans include close approaches and vessel operations. Experience monitoring and detecting stress behavior in small cetaceans. The ability to remain objective to ensure safe operations.

- **Small Boat Operator(s)** – For in-water captures, the small boat operators are an essential component to a successful operation. The small boat operators are foremost responsible for ensuring the safety of their crew. They are also responsible for ensuring that the small boats are in the proper place while the entangled animal is followed prior to intervening, while the net is being set, and during the actual capture. The small boat operator ensures the small boat is safely maneuvered around animal(s) and people in the water, and that the small boat is safely handled in all types of weather and sea state conditions such as currents, tides, kelp, wind, etc. Small boat operators should be experienced with animal approaches, capture methods, and transportation of animals in the boat, if needed.
    - **Qualifications** - USCG boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with small

cetaceans in or around the boat. Experience driving vessels around cetaceans, maneuvering in tight spaces, and ability to remain calm under pressure.

- **Veterinary Staff** – The licensed, experienced veterinarian or veterinary technician is responsible for monitoring the health of the entangled animal and any incidentally entangled or injured animals during capture operations until the animal is safely released and on its own. They are also responsible for overseeing the removal of the entanglement especially if deeply embedded.
  - **Qualifications** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent, or veterinary technician who is experienced in small cetacean medicine.
    - **Sample Collection Technician**– The sample collection technician is responsible for assisting the veterinarian in collecting any animal samples during the entanglement response.
  - **Qualifications** - A veterinary technician or personnel trained in veterinary sample collection.
- **Animal Handlers** – The animal handlers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential injury such as animal bites.
  - **Qualifications** – Responders must be trained by experienced personnel in safe capture, working with animals in nets, handling, monitoring under restraint, etc. Advancement requires hands-on experience under the direct supervision of experienced response staff. This handling experience may occur in a captive display or rehabilitation hospital setting or research field setting. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.
- **Data Collector** – The data collector is essential in recording data on all aspects of the entanglement response. This person is responsible for ensuring data sheets are complete, the animal is given an identifying number, all marks, dorsal fin features and freeze-brand numbers are recorded, roto tag and/or satellite-linked tag numbers (PTT and S/N) are recorded, and all samples are properly recorded and labeled.
  - **Qualifications** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.
- **Photographer or Videographer** – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.
  - **Qualifications** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, take clear and meaningful photos

and video including dorsal fin identification pictures, and ability to post-process photos/video after the capture.

- **Security/Crowd control** – The IC should ensure that the proper authorities in the area have been notified of the response and, if possible, the area is closed to public access during the response.
  - **Qualifications** – Knowledge of proper authorities to notify.
- **Communications Officer (Optional)** – The communications officer is responsible for communicating information about entanglement response to the public and media. For high profile cases or cases conducted under the permit, messages should be coordinated with all participating organizations and cleared with NMFS.
  - **Qualifications** – Effective oral and written communicator. Ability to be clear, concise, accurate, coherent, and courteous.
- **Unmanned Aerial System Operator (UAS; Optional)** - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot should be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing disturbance to the target or other animals.
  - **Qualifications** – A certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous small cetacean field operations.

1.43. Environmental Conditions

Create a risk assessment tool (Appendix F – Risk Factor Table) or decision matrix (Appendix G – Decision Matrix (Go/No Go) to determine whether an entanglement response is safe for responders and small cetaceans based on environmental conditions. Assess the following environmental conditions prior to small cetacean in-water capture:

- Weather conditions (*i.e.*, rain, snow, fog, visibility, wind, sea state, approaching storm systems, lightning in the area, heat, cold).
- Submerged (*i.e.*, sand bars, rocks, oyster bars, coral reefs, sunken debris, etc.) and emergent (pilings, docks, jetties, etc.) hazards.
- Location of the animal in relation to the surf zone or shallow water.
- Tide (*i.e.*, incoming or outgoing tide, tidal amplitude, increased surf, currents)
- Time of day (*i.e.*, close to sunset).
- Conspecifics (*e.g.*, other animals of the same species in the area) and other wildlife that could impact operations (*e.g.*, manatees, sea turtles).

- Predators (*e.g.*, sharks, alligators, killer whales, etc.) and other hazardous wildlife (*e.g.*, stingrays, jellyfish, etc.),

1.44. Equipment

Data supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, Respiration form, Priority samples list, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro)

Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging and marking kit (*e.g.*, fin notcher, plastic fin tags, satellite-linked tags, tagging equipment, freeze-branding equipment, markers, dorsal fin board)
- Sampling kit (*e.g.*, cryovials for skin, blood tubes, swabs)

Protective clothing

- Footwear appropriate for vessels and footwear appropriate for entering the water and moving about.
- Protective clothing (*e.g.*, PFD, raingear, etc.)
- Optional - eyewear, masks, etc.

Human medical equipment

- First aid kit (optional AED)
- Additional medical equipment if EMS personnel present

Animal medical equipment

- Disentanglement instruments (*e.g.*, hand-held cutting tools, knife, scalpel, wire cutters, hemostats, etc.)
- Wound care kit
- Medications [*e.g.,* emergency medications (crash kit), antibiotics, euthanasia solution, etc.]

Capture and restraining gear

Equipment used for physical restraint of small cetaceans in water varies by species and location. Equipment may include, but is not limited to: 1) seine net, 2) hand nets or net panels, 3) hoop nets, 4) floating mats, and 5) small boat transport. Capture techniques are described in detail in Asper (1975) and Loughlin *et al.* (2010).

Seine net (*below; reviewed in Barratclough et al. 2019*) – The standard approach to capture small (1–5) numbers of small cetaceans in shallow waters is by encirclement with a seine net up to ~500 meters long and ~7 meters deep. The seine net is typically deployed from a specially designed boat at high speed around the target animal(s), creating a compass, with well-trained handlers distributed around the circumference (in shallow water only) to provide support and restraint when the cetacean(s) contact the net.

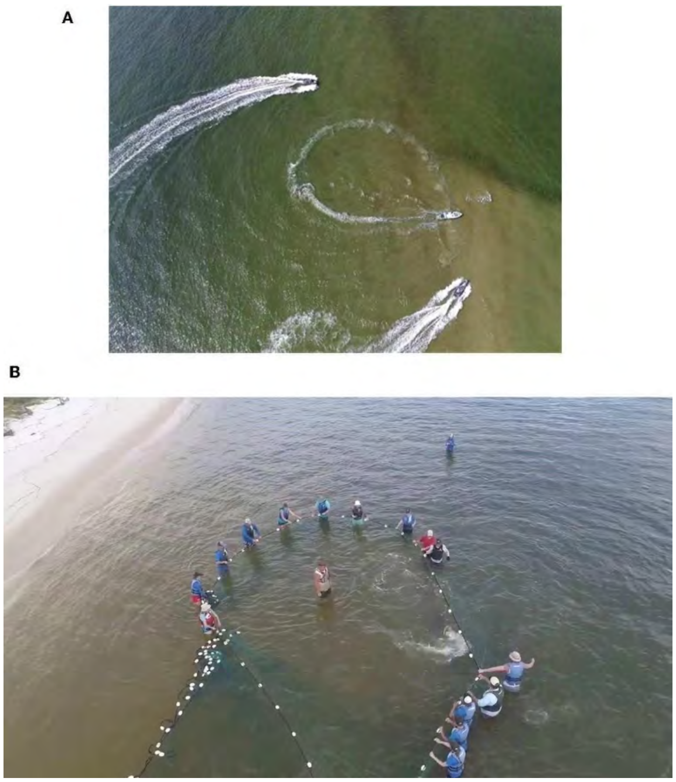

Figure 5-1 from Barratclough et al. 2019 - | Capture methodology with (A) seine net deployed from a specially designed boat creating a compass in the center of the image, with chase boats circling outside to help contain the animals before completion of the compass and to deliver handlers to the net (two dolphins are visible inside the compass on the left side). (B) Shallow water set, well-trained handlers distributed around the circumference of the compass to provide aid and restraint when the dolphins contact the net. All photos taken under NMFS MMPA/EAS permit No. 18786-03.

Hand net/net panels – A hand net or net panels can be used in certain circumstances when a dolphin is in a small area that can be cordoned off with a net (*e.g.,* a canal). In this process, the net is either pulled by a boat or by hand across the canal opening. The dolphin is herded toward the shallows and caught by handlers similar to the purse seine technique above.

Breakaway Hoop Nets –A hoop net made from aluminum rod, tubing, and a soft knotless net is placed in front of the animal as it surfaces, with the animals' forward movement in combination with the net handler's skills the animal is captured in the net. The net releases from the frame leaving the animal in the tethered net. The animal can still swim, surface, and breathe during this process.

Soft Tail Line - This method has been used with killer whales. The soft tail line would be placed around the peduncle of the animal and the animal would then be guided into the stretcher, potentially with divers in the water, and secured next to the capture vessel.

Floating Mat – If capture occurs in deep water (greater than 1.5 meters), the animal can be handled from the side of response vessels and moved onto specially designed floating mats that are either towed to shallow water, directly to a processing vessel, or alongside the responding vessel for examination, disentanglement, and possibly sample collection. Standard mats can float an animal and 3-6 persons.

C

Figure 5-2 from Barratclough et al. 2019 - Capture methodology with (C) Deep water set, dolphin is placed onto a floating mat and disentangled from the net for transport to the processing vessel. All photos taken under NMFS MMPA/EAS permit No. 18786-03.

Small Boat Transport – Small boats including rigid hull inflatable boats, inflatables, net skiffs with removable transoms, and whalers/skiffs are useful in transporting animals. In the boat, animals should be transported on a closed-foam mat, shaded, and wetted down throughout the transport.

<u>Cleaning/disinfecting supplies</u>

- Antibacterial soap/hand sanitizer

- Disinfectant solution (*e.g.*, chlorhexidine, 70% ethanol, etc.)
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

Miscellaneous supplies

- Cooler/waterproof case/Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

1.45. Data Collection

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response program and data forms and instructions are accessible during a response. Important forms to have on hand could include: applicable permits, Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), gear checklists (Appendix C - Gear Checklist), and disentanglement forms (Appendix D – Disentanglement form), respiration rate form (*e.g.,* Appendix E - Respiration rate form), and priority sample sheet (will vary with each response). All entangling gear should be retained (if possible), documented on the Level A and Human Interaction Form, and stored in a centralized location or sent to a gear repository for analysis, please consult with the RSC on appropriate repositories by region.

1.46. Risks and Mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled small cetaceans. Responders should prepare, plan, and practice for possible risks and identify mitigation measures prior to any response. After each response, the team should conduct a thorough de-brief and come up with lessons learned that can be applied to future responses. When responding to entangled small cetaceans, the list of risks and mitigations is never complete. There is always room for improvement and documents should be regularly assessed and updated when necessary.

RISKS TO HUMANS

Risk: *Injury or death to personnel by drowning, falling, blunt force trauma, entrapment, or stepping on hazards.*

***Mitigation*:**

- Responders should wear appropriate PPE such as strong, non-slip, close-toed footwear, PFDs, and other protective clothing as necessary.
- Designated HSO should be assigned to watch over all personnel involved and be able to communicate to the IC or CL about human safety risks.

Risk: *Injury to personnel from nets.*

***Mitigation*:**

- Animal handlers should wear appropriate PPE such as strong, non-slip, close-toed footwear, and PFDs and other protective clothing as necessary.
- Handlers should be trained in techniques that minimize the chance of injury to themselves and others during in-water capture including instruction on avoidance of entanglement in netting. Potentially entangling jewelry (*e.g.,* rings, earrings, piercings) should be removed before participating in the operation.
- All nets should be inspected prior to reuse and for entangled animals during operations (*e.g.*, stingrays, sharks).

Risk: *Injury to personnel from cetacean bites or strikes from heads or tails.*

***Mitigation*:**

- Personnel should wear appropriate PPE such as strong, non-slip close-toed footwear, protective clothing, and PFDs.
- Personnel should be aware of animal induced injuries from being hit by a rostrum, fin, tail, or other body part. Never try to restrain a small cetacean alone, always restrain animals in concert with at least 3-4 persons and with additional handlers available nearby to assist with restraint.

RISKS TO ANIMALS

Risk: *Injury to an animal from nets.*

***Mitigation*:**

- Personnel should be trained in techniques that minimize injury to the animal.
- Use an adequate number of personnel to increase safety, including trained personnel and vessels to respond to both deep-water and shallow-water sets.
- Emergency medications (*e.g.,* euthanasia solutions, and treatment drugs), treatment, and resuscitation equipment should be available for each capture response.
- Medical care capacity (*e.g.,* rehabilitation) should be evaluated and arranged for well prior to capture.

Risk: *Unintentional capture, vessel strike, or disturbance of non-entangled animals.*

***Mitigation*:**

- Evaluate the possibility of unintentional take of non-target animals before and during capture.
- Complete appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals.
- Always consider efforts to minimize disturbance to non-entangled animals.
- Designated personnel should continuously watch for the presence of non-entangled protected species in and around the capture area, and communicate with the CL appropriately.

Risk: *Animal fatality.*

***Mitigation*:**

- Personnel should be trained in techniques that minimize injury to an animal.
- Capture should not be attempted if the environment, equipment, or personnel are not adequate for the response.
- NMFS must be notified immediately. The animal should be recovered, a full necropsy performed, and a final report sent to NMFS.
- Entanglement response activities should immediately cease and the permit holder should be notified immediately. Small cetacean entanglement response activities under the permit cannot resume after a fatality until a necropsy is completed and new mitigation measures are approved by NMFS.

1.47. Intervention Criteria/Decision Matrix (Go/No Go)

A risk intervention tool (Appendix F – Risk Factor Table) or decision matrix (Appendix G – Decision Matrix (Go/No Go) should always be consulted prior to any response by the command staff and/or full team, depending upon size of the response. For an in-water physical capture and restraint response, factors that should be considered include environmental, team selection and fitness, small cetacean condition, permission, resources, and mission complexity. Additionally, a specific Decision/Process Matrix for In-Water Capture is below.

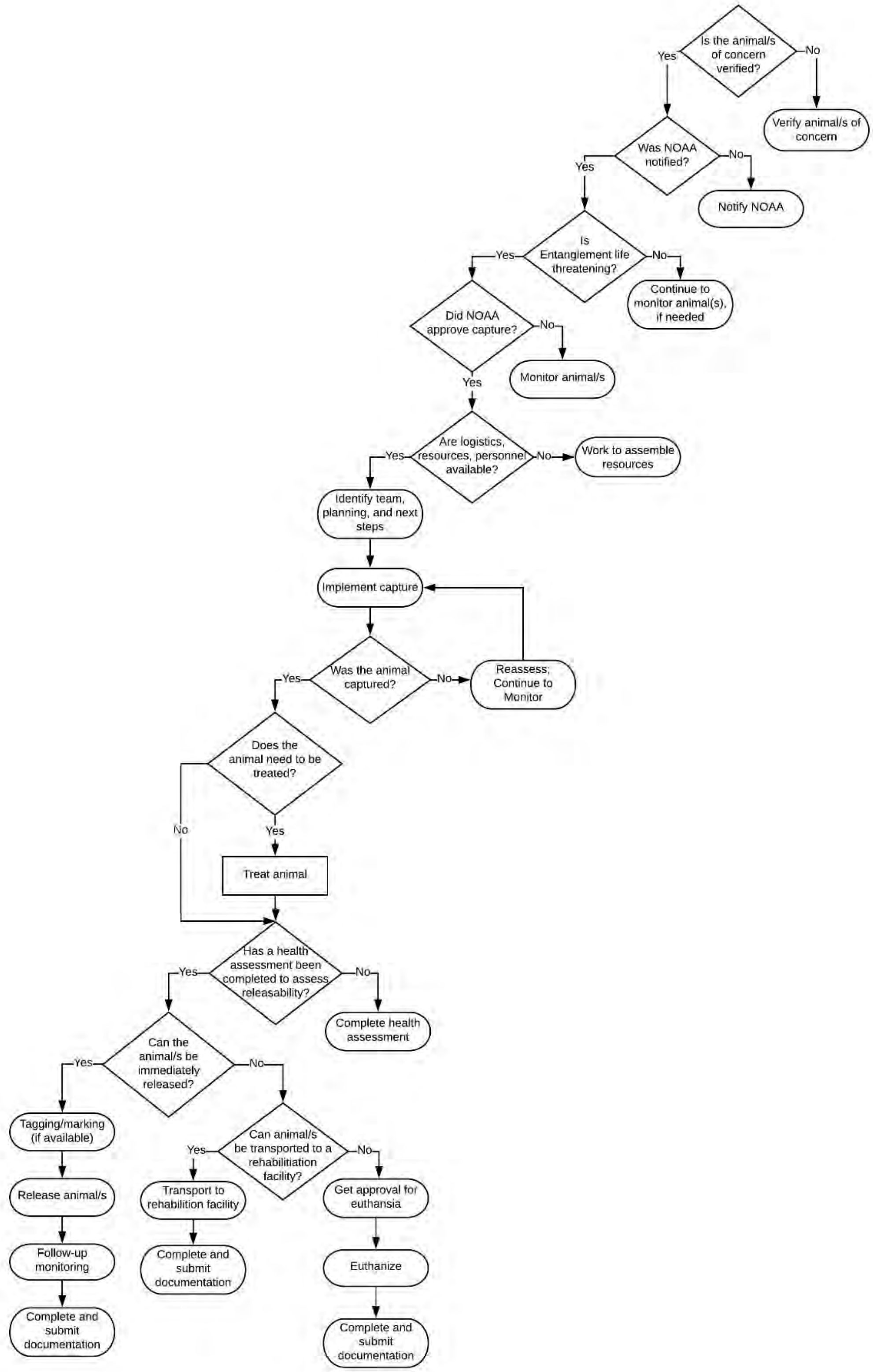

Figure 5-1: Decision/Process Matrix for In-Water Capture

1.48. Procedure

Optimal capture situation

- Solitary
- Milling or traveling slowly
- Easily relocated/resident animal
- Located in shallow water
- Clear, calm water
- Minimal currents
- Seafloor free of obstructions
- Other environmental conditions favorable

Animal capture and restraint

1. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices.
2. **Assign team roles and review capture plan (this should be done prior to leaving the dock and again on each individual vessel):** Before handling any animal, be sure everything is ready. Double-check all the equipment and supplies. Identify the IC and CL, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a capture should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm team members fully understand, are capable, and are mentally prepared. Review animal warning signs and the appropriate emergency response actions. The IC and CL should ensure all personnel and equipment are ready and perform the final Go/No Go determination.
3. **Locate and identify candidate animal:** The entangled animal should be identified, and its position, size, age, and sex (if possible to determine), and placement among other animals noted.
4. **Secure the area:** If necessary, onlookers should be notified and asked to clear the area.
5. **Modify protective clothing to minimize being caught in a net during a handling event:** Remove all jewelry including watches, rings, earrings, and piercings, tie hair back, check clothing for buttons (even pant cuffs), check foot coverings for potentially entangling buckles, snaps, or straps, and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The data recorder and the photographer should ensure all photo and video equipment is on and recording.

7. **Time limits:** Record the time of day, record each time the net is set, record time animal hits the net, record time when animal is first under restraint, record release time, and total capture and restraint time (from when the animal is first touched until released).
8. **Approach:** The team should get into position, approach, and capture the entangled animal.
9. **Capture**:

Purse Seine Net -The standard approach to capture small (1–2) numbers of small cetaceans in shallow waters is by encirclement with a seine net up to ~500 meters long and ~7 meters deep. Shallow water (less than 1.5 meters) where handlers can safely stand, minimal currents, and a solid seafloor are optimum for safe capture and restraint. The seine net typically is deployed from a specially designed boat at high speed around the target animal(s), creating a compass, with well-trained handlers distributed around the circumference to provide support and restraint when the animals contact the net. If capture occurs in deep water (greater than ~1.5 meters), the net compass, with the animals swimming inside, can be pulled into nearby shallow water, or the animals can be handled from the side of response vessels and moved onto specially designed floating mats that can in turn be towed to shallow water, directly to a processing vessel, or alongside a response vessel for examination, disentanglement, and sample collection (if conditions allow).

Hand Net/Net Panels - A hand net or net panels can be used in certain circumstances when a dolphin is in a confined area that can be cordoned off with a net (*e.g.*, a canal). In this process, the net is either pulled by a boat or by hand across the canal opening. The dolphin can then be moved to the selected capture location or handled in place (if it hits soon after the net is set).

Breakaway Hoop Nets – For use on free-swimming animals. A hoop net made from aluminum rod, tubing, and a soft knotless net is placed in front of the animal as it surfaces, with the animals' forward movement in combination with the net handler's skills the animal is captured in the net. The tethered net releases from the frame leaving the animal in the net. A nylon tether line is secured to the capture vessel in advance, which can be used to pull the animal towards the capture vessel, where it can be maneuvered by handlers into a stretcher. The animal can still swim, surface, and breathe during this process.

Soft Tail Line - Primarily used if the animal is accessible at the surface, such as a lethargic or logging animal, but it can also be used in combination with the hoop net. This method has been used with killer whales. The soft tail line would be placed around the peduncle of the animal and the animal would then be guided into a stretcher, potentially with divers in the water, and secured next to the capture vessel.

Floating Mat – If capture occurs in deep water (greater than ~1.5 meters), small cetaceans can be handled from the side of a response vessel and moved onto specially designed floating mats that are either towed to shallow water or directly to a processing vessel for examination and sample collection. Standard mats can float an animal and 3-6 persons.

10. **Restraint:** Once the animal has been captured and brought to shallow water (if applicable) or brought onto a mat, the entangling material should be photo-documented and removed. Confirm that the handlers have control of the animal before conducting any procedures. Controlling the animal’s head and tail is the most critical part of the restraint. When sampling, tagging, etc., the person performing these activities quietly states what procedure is next so the restrainers can prepare for the animal’s potential reaction.

<u>Small boat transport</u>: Small boats such as rigid hull inflatable boats (RhIBs), inflatables, net skiffs with removable transoms, and whalers are useful in transporting animals if the animal needs to be taken into rehabilitation. Inside the boat, the animal should be placed on foam on a shaded deck, supported by 3-4 handlers, and kept wet, using buckets and sponges, wet towels, or sprayers. With any transport, one person, usually the veterinarian or veterinary technician, should devote their attention to the animal and monitor it constantly. If an animal cannot be lifted into a boat, it may be necessary to rig it so that it can be safely towed slowly behind or alongside with the animal contained within a net or stretcher in the water.

11. **Monitoring and assessment:** The animal should be immediately assessed for signs of respiratory or circulatory distress and treated accordingly. Ensure the animal’s blowhole is free from any obstructions and that the animal can breathe normally. The use of a Respiration Rate Data Sheet is useful to keep an objective record of frequency and quality of respirations. For most captures, a veterinarian and the front handlers will be responsible for monitoring the animal’s level of alertness, heart rate, and respirations throughout the restraint period. It is important to make sure that chest expansion is occurring with each breath. The entire team should be notified if the animal’s vitals start to change. The animal's breathing pattern may be somewhat irregular, and it may breath-hold, so vigilance is key. Either a sudden change in breathing pattern (whether an increase or decrease), or a decrease in responsiveness to stimuli raises concern. Check the animal's eyes to see if they are responsive (*i.e.*, is the animal looking around, does it respond to stimuli). Tap its head gently behind the eye with your finger. Check the jaw tone by opening the mouth. Vocalizations by the animal are typically a good sign. If it does not show some response or its response is slow and the animal does not appear to be attentive, remove the entanglement (if not already completed), abandon all other

sampling, stimulate the animal, release the animal, and monitor it. When feasible, the animal should be tagged prior to release, to facilitate post-release monitoring, if this can be done without compromising its well-being. Responders should be conservative in decision-making and err on the side of caution.

12. **Data collection:** Morphometrics (at least total straight-line length and maximum girth), sex, and if appropriate, samples, should be taken and all data recorded completely on Level A and Human Interaction Forms, and any other necessary capture forms.
13. **Disentanglement:** The entangling material should be removed using an appropriate cutting tool (*e.g.,* knife, scalpel, wire cutters, etc.) by peeling the material out of the wound, rather than dragging it out from one side, to minimize pain and prevent further injury. All entangling gear should be retained (if possible), documented, and archived.
14. **Wound care:** The wound (if any) should be assessed to determine the extent of tissue damage and to ensure all foreign material has been removed. The wound may be cleaned with antiseptic and treated topically, though this should be balanced against animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However, if needed, responders can do wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine or chlorhexidine may be used to flush deep wounds or areas not likely to be easily flushed on their own. Euthanasia solutions should be kept on hand in case there is a need for euthanasia. In the case of a severe wound, and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.
15. **Marking and tagging:** Temporary (*e.g.*, paint stick, zinc oxide) or longer-term markings (*e.g.*, trailing edge dorsal fin notching, freeze-brands), or tags (*e.g.*, dorsal fin mounted roto tag, radio, or satellite-linked tag) can be applied for more visible and long-term identification as well as post-release follow-up (Wells *et al.* 2018).
16. **Releasing the animal:** Confirm that the animal has a clear means of exit. The CL or other designated person will direct the release. All handlers should release the animal at the same time usually after a countdown. If conditions allow, monitor the animal post-release from a distance for ~15 minutes, while keeping a low profile. Ideally, additional post-entanglement monitoring and photo-documentation of the animal should be conducted over the next days to weeks to determine if further intervention is warranted, to identify possible complications from the intervention, or to confirm the success of the operation (Wells *et al*. 2013).

17. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
18. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, wetsuits, footwear) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be cleaned and disinfected including restraining nets, measuring gear (*e.g.*, tape measure and scales), tagging supplies (*e.g.*, tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a "SHARPS" container (do not recap needles).
19. **Submit reports:** Ensure all datasheets, reports are complete, and submitted where appropriate.
20. **Prepare again:** Clean and organize gear so that it is ready for future use.

Gaps and Future Research Needs

1.49. Training and Sharing of Protocols

One of the biggest gaps in the ability to respond to entangled small cetaceans is the lack of quick response to entangled animals. In many regions, lack of personnel in remote areas prevents immediate assessment of entangled individuals. There is a need to build network capacity in both remote and in-water scenarios, especially for responses to species in addition to bottlenose dolphins. There is also an ongoing and essential need to identify and train more net boat operators and persons for the CL role for in-water captures. Even if groups do not routinely use in-water, vessel-based capture techniques, or seine nets, they should be included as part of regular training exercises or hands-on training opportunities. Additionally development by NMFS of system to track training and responder qualifications would be useful. Responders that have developed effective protocols should share these with other small cetacean entanglement response groups.

1.50. Equipment Needs/Tool & Technique Development

As techniques and protocols improve, these should be shared with network members via the MMHSRP and RSCs. NMFS should encourage formal training in both remote and in-water techniques. There is a need to improve and refine remote cutting tools available for response to small cetacean entanglements. Teams working with small cetaceans could work with existing large whale teams to scale down some of the most effective remote tools used in large whale entanglement responses. Certain regions may want to invest is caching appropriate remote and in-water capture tools and equipment depending upon need.

1.51. Future Directions

One specific area to develop includes adapting existing remote sedation techniques used for pinniped and large whale entanglement responses for use in small cetaceans. This could include development and testing of appropriate drug combinations on surrogate or managed care species, as well as remote sedation hands-on training through wildlife capture courses and cross training of responders across taxa. Annual or biennial darting and sedation classes, including the proper methods to load darts, the best sedation methods, and lessons learned would be beneficial to all responders. Continued research into effective sedation protocols for different species and methods for best practice should be encouraged including collaborating with the global marine mammal community. Once remote sedation techniques are developed and validated for use in small cetacean, we would update the Best Practices to reflect this new technique.

In addition, several groups are working on new technologies and methods to remotely attach single-pin satellite-linked tags to free-swimming small cetaceans. Once this technology is developed, we would update the Best Practices to include using remote tags for monitoring small cetaceans prior to or after being disentangled.

1.52. Lessons Learned

Included below are lessons learned from entanglement response personnel:

- Safety of personnel is the top priority with the safety of the animal second.
- Be prepared, PRACTICE regularly to be ready for a response, and have an experienced team that works well together.
- Establish methods for clear communication prior to a capture event. Ensure all participants understand how communications will be conducted.
- The option to stand down should always be considered if conditions for humans or animals deteriorate.
- Always conduct a team debrief (in-person or virtually) shortly after each capture to discuss what went well and where improvements could be made.
- Never stop striving to improve safety and handling protocols. Share lessons learned with other teams nationally and internationally.

1.53. Outreach and Education

All NMFS stranding networks in the United States provide stranding hotline numbers to report entangled or injured marine mammals (see https://www.fisheries.noaa.gov/report). It is important to get this information out to all regions of the country so entangled small cetaceans can be reported, documented, and, ultimately, ideally helped.

NMFS and network members should continue outreach and education and work together with the public, industry, and stakeholders to mitigate the problem of entangling fishing gear and debris in the ocean. For more information about how we can all help reduce the amount of marine debris that enters the environment, see https://marinedebris.noaa.gov/.

There are many opportunities to get involved in primary and secondary schools. NOAA has a very successful Ocean Guardian School Program. An Ocean Guardian School makes a commitment to the protection and conservation of its local watersheds, the world's oceans, and special ocean areas, such as National Marine Sanctuaries. The school makes this commitment by proposing and then implementing a school- or community-based conservation project. Project pathways include: 1)

Restoration; 2) Rethink/Refuse/Reduce/Reuse/Rot/Recycle; 3) Reducing marine debris and single-use plastics; 4) Creating schoolyard habitats or gardens using native plants and reducing water use; and 5) Energy and ocean health. As part of this program, the schools produce measurable data so progress can be tracked.

Conclusion

There have been many advances in small cetacean entanglement response in the last several years. However, our ability to disentangle animals is small compared to the large problem of fishing gear, plastics, and marine debris in the oceans that threaten all marine life. It is important to collectively work together to find solutions to prevent fishing gear and marine debris from entering our waterways. By educating through outreach and working together on prevention, we can help to mitigate the impacts of fishing gear and marine debris on small cetaceans and all marine species, while still responding to entanglements when necessary. Ultimately, however, prevention is the key to solving this global problem.

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Appendices

1.54. Appendix A – Example Frequently Asked Questions

Small Cetaceans Entanglements – Southeast Region Example

What are small cetaceans?

Small cetaceans include the toothed species of whales, dolphins, and porpoises, excluding sperm whales. Small cetaceans live their entire lives in the water, they are a highly intelligent species, and use sound both for communication and to hunt for food. All small cetaceans are protected under the Marine Mammal Protection Act (MMPA) while some are also listed under the Endangered Species Act. Under the MMPA, NOAA Fisheries has jurisdiction over all small cetaceans. The Southeast Small Cetacean Entanglement Team focuses on responding to small cetaceans in North Carolina through Texas.

What is small cetacean entanglement?

Common examples of items that may harm small cetaceans include fishing gear, including recreational and commercial gear, rope, and other types of plastic debris. Small cetaceans commonly become entangled around their tail flukes, flippers, dorsal fin, or head. Small cetaceans can also ingest fishing line, hooks, and lures. Entanglement in and ingestion of marine debris and fishing gear can cause decreased swimming ability, disruption in feeding, life-threatening injuries, infection, and death.

What is the Small Cetacean Entanglement Team?

The Small Cetacean Entanglement Team is part of NOAA Fisheries Southeast Region Marine Mammal Stranding Network. The team is highly trained and includes veterinarians, veterinary technicians, marine mammal biologists, researchers, and support staff. The team responds to entangled small cetaceans from North Carolina through Texas when staff availability, resources, location, and situation support an effort to disentangle an animal. This work is generally done under a permit held by NOAA Fisheries Marine Mammal Health and Stranding Response Program or under MMPA Section 109h authority.

Why disentangle small cetaceans?

Entanglements are a human-caused threat, which can lead to significant injury and frequently death. By disentangling small cetaceans, the Team is able to identify the entangling material so retrospective measures can be taken to prevent similar materials from entering the marine environment. Our goal is to work with industry to modify the materials used so that they do not persist in the marine environment. While the Small Cetacean Entanglement Team is not able to respond to every entanglement, it is important to document as many entanglements as is possible, to better understand how they are impacting small cetacean populations.

What are the risks to the Team?

Small cetaceans are large, powerful, wild animals that can pose risks to human health and safety. Team members may be exposed to diseases that can be transmitted from small cetaceans to humans, may sustain injuries or bite wounds, and usually conduct work in small vessels. There are different techniques to disentangle small cetaceans to reduce these risks including using remote tools to cut away the entanglement, and catching individuals using nets so that they can be more safely approached and disentangled. With the development of newer, safer training protocols and techniques there are fewer risks to both the animals and the Team.

When is a disentanglement attempt made?

Disentanglement attempts are reserved for situations that are determined to be life threatening and in areas that are safe for the Team to work and where animals are likely to be resighted. Sightings are provided by the stranding network, researchers, and concerned members of the public. It is important to remember this work is done by trained professionals and that most of this work is authorized and done under a permit issued by NOAA Fisheries.

How can I report an entangled small cetacean?

Please report entangled small cetaceans to the Southeast Marine Mammal Stranding Network at 1-877-WHALE-HELP (877-942-5343). The hotline is operated 24/7. The local Network will ask you for the date, location (including latitude and longitude), species, and for detailed information about the entanglement. Photographs are extremely helpful in confirming the species and type of entanglement. Please do not approach within 100 yards of small cetaceans, these animals are protected by law under the Marine Mammal Protection Act and disturbance should be minimized at all times.

What can I do to help?

We can all work together to reduce the amount of marine debris that enters the marine environment. Host a beach cleanup in your community and keep marine debris out of the ocean and off the beach. Support recycling of fishing gear and monofilament line in your community as well as the development of biodegradable fishing gear. Educate your family, friends and community about this issue. To learn more about marine debris please visit: https://marinedebris.noaa.gov/

1.55. Appendix B – Level A and Human Interaction Form

Level A forms, Human Interaction forms, and a complete and detailed examiners guide can be found online here.

Level A. Form – Page 1.

MARINE MAMMAL STRANDING REPORT - LEVEL A DATA

FIELD #: ______ NMFS REGIONAL #: ______ (NMFS USE) NATIONAL DATABASE#: ______ (NMFS USE)

COMMON NAME: ______ GENUS: ______ SPECIES: ______

EXAMINER Name: ______ Affiliation: ______

Address: ______ Phone: ______

Stranding Agreement or Authority: ______

CONFIDENCE CODE (Check ONE): ☐ Unconfirmed - Low ☐ Confirmed - Minimum ☐ Confirmed - Medium ☐ Confirmed – High

INITIAL OBSERVATION ☐ Same information for Level A Examination

DATE: Year: ____ Month: ____ Day: ____

First Observed: ☐ Beach/Land/Ice ☐ Floating ☐ Swimming

LOCATION: State: ____ County: ____ City: ____

Body of Water: ____

Locality Details: ____

Lat (DD): ____ N

Long (DD): ____ W

☐ Actual ☐ Estimated

How Determined: (check ONE)

☐ GPS ☐ Map ☐ Internet/Software ☐ Other ____

CONDITION AT INITIAL OBSERVATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh Dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate Decomposition ☐ 6. Condition Unknown

LEVEL A EXAMINATION Examined? ☐ YES ☐ NO

DATE: Year: ____ Month: ____ Day: ____

First Examined: ☐ Beach/Land/Ice ☐ Floating ☐ Swimming

LOCATION: State: ____ County: ____ City: ____

Body of Water: ____

Locality Details: ____

Lat (DD): ____ N

Long (DD): ____ W

☐ Actual ☐ Estimated

How Determined: (check ONE)

☐ GPS ☐ Map ☐ Internet/Software ☐ Other ____

CONDITION AT EXAMINATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh Dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate Decomposition

LIVE ANIMAL INFORMATION

INITIAL LIVE ANIMAL DISPOSITION (Check one or more)

☐ 1. Left at Site ☐ 5. Died at Site

☐ 2. Immediate Release at Site ☐ 6. Died During Transport

☐ 3. Relocated and Released ☐ 7. Euthanized

4. Disentangled ☐ 8. Transferred to Rehabilitation:

☐ a. Partially Date: Year: ____ Month: ____ Day: ____

☐ b. Completely Facility: ____

☐ 9. Other: ____

CONDITION/DETERMINATION (Check one or more)

☐ 1. Sick 7. Location Hazardous

☐ 2. Injured ☐ a. To animal

☐ 3. Out of Habitat ☐ b. To public

☐ 4. Deemed Releasable ☐ 8. Unknown/CBD

☐ 5. Abandoned/Orphaned ☐ 9. No Rehabilitation Options

☐ 6. Inaccessible ☐ 10. Other: ____

DEAD ANIMAL INFORMATION

CARCASS STATUS (Check one or more)

☐ 1. Frozen for Later Examination/Necropsy Pending

☐ 2. Left at Site ☐ 5. Landfill ☐ 8. Towed: Lat ____ Long ____

☐ 3. Buried ☐ 6. Incinerated ☐ 9. Sunk: Lat ____ Long ____

☐ 4. Rendered ☐ 7. Composted ☐ 10. Unknown/Other ____

NECROPSIED ☐ YES ☐ NO ☐ Limited ☐ Complete

☐ Carcass Fresh ☐ Carcass Frozen/Thawed

CARCASS CODE AT NECROPSY ☐ Code 2 ☐ Code 3 ☐ Code 4

NECROPSIED BY: ____

Date: Year: ____ Month: ____ Day: ____

PHOTOS/VIDEOS TAKEN: ☐ YES ☐ NO

Photo/Video Disposition: ____

MORPHOLOGICAL INFORMATION

SEX (Check ONE) ESTIMATED AGE CLASS (Check ONE)

☐ 1. Male ☐ 1. Adult ☐ 4. Pup/Calf

☐ 2. Female ☐ 2. Subadult ☐ 5. Unknown

☐ 3. Unknown ☐ 3. Yearling

☐ Whole Animal ☐ Partial Animal

Straight Length: ____ ☐ cm ☐ in

☐ Actual ☐ Estimated ☐ Not Measured

Weight: ____ ☐ kg ☐ lb

☐ Actual ☐ Estimated ☐ Not Weighed

SAMPLES COLLECTED (Check one or more)

☐ 1. Histology ☐ 2. Other Diagnostics ☐ 3. Life History

☐ 4. Skeletal ☐ 5. Other ____

PARTS TRACKING (Check one or more)

☐ 1. Scientific Collection ☐ 2. Educational Collection

☐ 3. Other: ____

OCCURRENCE DETAILS ☐ Restrand GE#: ____ (NMFS Use)

Group Event: ☐ YES ☐ NO

If Yes, Type: ☐ Cow/Calf Pair ☐ Mass Stranding ☐ UME # Animals: ____ ☐ Actual ☐ Estimated

Was the Marine Mammal Human Interaction Report completed? ☐ YES ☐ NO

Findings of Human Interaction: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

If YES evidence of: 1. Vessel Interaction ☐ YES ☐ NO ☐ CBD

2. Shot ☐ YES ☐ NO ☐ CBD

3. Fishery Interaction ☐ YES ☐ NO ☐ CBD

4. Other Human Interaction: ____

If YES, what was the likelihood that the human interaction contributed to the stranding event?

☐ Uncertain (CBD) ☐ Improbable ☐ Suspect ☐ Probable

Gear/HI Items Collected? ☐ YES ☐ NO Gear Disposition: ____

Other Findings Upon Level A: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

If Yes, Choose one or more: ☐ 1. Illness ☐ 2. Injury ☐ 3. Pregnant ☐ 4. Other: ____

How Determined (Check one or more): ☐ External Exam ☐ Internal Exam ☐ Necropsy

☐ Other: ____

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Level A. Form – Page 2.

TAG DATA		ID#	Color	Type	Placement*	Applied	Present	Removed
					(Circle ONE)			
Tags Were:					D DF L R LF LR RF RR	☐	☐	☐
Present at Time of Stranding (Pre-existing):	☐ YES ☐ NO							
Applied during Stranding Response/Release:	☐ YES ☐ NO				D DF L R LF LR RF RR	☐	☐	☐
Applied during Rehabilitation/Release:	☐ YES ☐ NO							
Absent but Suspect Prior Tag:	☐ YES ☐ NO				D DF L R LF LR RF RR	☐	☐	☐

* D= Dorsal; DF= Dorsal Fin; L= Left Lateral Body R= Right Lateral Body LF= Left Front; LR= Left Rear; RF= Right Front; RR= Right Rear

ADDITIONAL IDENTIFIER: ______________________ (If animal is restranded, please indicate any previous field numbers here)

ADDITIONAL REMARKS:

DISCLAIMER

THESE DATA SHOULD NOT BE USED OUT OF CONTEXT OR WITHOUT VERIFICATION. THIS SHOULD BE STRICTLY ENFORCED WHEN REPORTING SIGNS OF HUMAN INTERACTION DATA.

DATA ACCESS FOR LEVEL A DATA

UPON WRITTEN REQUEST, CERTAIN FIELDS OF THE LEVEL A DATA SHEET WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR CREDIT THE STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE. THE NATIONAL MARINE FISHERIES SERVICE WILL NOTIFY THE CONTRIBUTING STRANDING NETWORK MEMBERS THAT THESE DATA HAVE BEEN REQUESTED AND THE INTENT OF USE. ALL OTHER DATA WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR OBTAIN PERMISSION FROM THE CONTRIBUTING STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE.

PAPERWORK REDUCTION ACT INFORMATION

PUBLIC REPORTING BURDEN FOR THE COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 30 MINUTES PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTIONS, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THE COLLECTION INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THE BURDEN TO: CHIEF, MARINE MAMMAL AND SEA TURTLE CONSERVATION DIVISION, OFFICE OF PROTECTED RESOURCES, NOAA FISHERIES, 1315 EAST-WEST HIGHWAY, SILVER SPRING, MARYLAND 20910. NOT WITHSTANDING ANY OTHER PROVISION OF THE LAW, NO PERSON IS REQUIRED TO RESPOND, NOR SHALL ANY PERSON BE SUBJECTED TO A PENALTY FOR FAILURE TO COMPLY WITH, A COLLECTION OF INFORMATION SUBJECT TO THE REQUIREMENTS OF THE PAPERWORK REDUCTION ACT, UNLESS THE COLLECTION OF INFORMATION DISPLAYS A CURRENTLY VALID OFFICE OF MANAGEMENT AND BUDGET (OMB) CONTROL NUMBER.

Human Interaction Form – Page 1.

OMB Control No. 0648-0178; Expiration Date 3/31/2020

MARINE MAMMAL HUMAN INTERACTION REPORT

Exam Information *(fill in or circle most appropriate)*

1 Field #: ______ Species: ______
2 Examiner: ______ Recorder: ______
3 Date of exam: ______ Condition code (at exam): 1 2 3 CBD
4 Preservation: alive fresh frozen frozen/thawed Body condition: emaciated not emaciated CBD
5 Documentation: digital print slide video Image disposition: ______
6 Integument: normal abnormal decomposed % Skin missing: <10% 10-25% 25-50% >50%
7 Explanation of terms:
YES = I have examined the area and/or found signs of this pathology, natural marking, or human interaction
NO = I have examined the area and/or did not find signs of this pathology, natural marking, or human interaction
CBD = I have examined the area and could not determine whether there were signs of human interaction (*i.e.* the part was missing, degraded, or signs were ambiguous)
NE = I did not examine the area
NA = this animal doesn't normally have that part (*i.e.* seals have no dorsal, dolphins have no rear flippers)

	WHOLE BODY EXAM	YES	NO	CBD	NE	NA	Image taken
8	External pathology *(pox, tattoo lesion, abscess, fungal patches)*						
9	Natural markings *(scars, tooth rakes, unusual pigmentation)*						
10	Appendage(s) removed / Mutilation *(with instrument)*						
11	Pelt removed / Mutilation *(with instrument)*						
12	Body sliced / Mutilation *(with instrument)*						
13	Gear / Debris present on animal *(including tags)*						
14	Gear / Debris retained *(name & contact info in Comments)*						
15	HI lesions *(fishery, gunshot, propeller, healed HI scar, brand)*						

16 Predation / scavenger damage *(circle all anatomical areas where damage hinders evaluation; numbers coincide with anatomical areas below)*: 17 18 19 20 21 22 23 24 25 26 27 28 29 NONE

FILL IN TABLE FOR ALL POSSIBLE FINDINGS OF HI
Do not use for natural markings/pathology.

						Type of Lesion					Origin of Lesion: Gear- Line			Gear/Debris			Other			
	DETAILED EXAM OF ANATOMICAL AREAS	YES	NO	CBD	NE/NA	Impression/ Laceration	Penetrating wound	Healed HI scar	Abrasion	Other / CBD	Twine / line	Net	MO/MU/CBD*	Hook	Packing Band	Other / CBD	Propeller	Gunshot	Other / CBD	Image taken?
17	Rostrum/snout																			
18	Mandible																			
19	Head and/or neck																			
20	L Front appendage																			
21	R Front appendage																			
22	L Body																			
23	R Body																			
24	Dorsum/dorsal fin																			
25	Ventrum																			
26	Peduncle																			
27	L Rear appendage																			
28	R Rear appendage																			
29	Flukes/tail																			

* If Gear-Line is the lesion origin, mark the MO/MU/CBD column: "MO" for monofilament, "MU" for multifilament, and "CBD" if the type of line cannot be determined.

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Human Interaction Form – Page 2.

Field #:

	INTERNAL EXAM Date	YES	NO	Partial	CBD	Image taken	Detailed Info *(circle all that apply)*
30	Internal exam conducted						*Details in Comments section -use line number*
31	Bruising/blunt trauma						*Details in Comments section -use line number*
32	Skeleton examined						*Details in Comments section -use line number*
33	Broken bones present						*Associated tissue reaction:* YES NO CBD
34	Mouth/GI tract examined *(circle contents)*						intact prey partially digested hard parts only debris/gear empty other
35	Lungs/bronchi examined						*Details in Comments section -use line number*
36	Lung/bronchi contents						froth fluid air (color:)
37	Bullet/projectile found						*found using:* CT X-ray dissection *(collected?* Y N *)*
38	Other lesions noted						*Details in Comments section -use line number*

39 **Comments** *(note line number from left margin before each comment)*:

40 **Findings of Human Interaction:** ☐YES ☐NO ☐CBD (Exam Type: external__ internal___ both ___)
(transfer to Level A Datasheet)

41 Type of HI: (provide details in comments)

- ☐ Entanglement (gear__ debris__ CBD__)
- ☐ Hooking (recreational__ commercial__ CBD__)
- ☐ Ingestion (gear__ debris__ CBD__)
- ☐ Vessel trauma (sharp__ blunt__ both__)
- ☐ Gunshot
- ☐ Harassment
- ☐ Mutilation
- ☐ CBD/Other

42 **Stranding Event History/Circumstances:**

43 **INITIAL HUMAN INTERACTION EVALUATION:** If you marked YES above (line 40) evaluate the external exam, necropsy, carcass condition and circumstances surrounding the stranding event to answer the question below. *Remember to be conservative in your subjective evaluation.*
What is the likelihood that the finding of human interaction (line 40), contributed to the stranding event?

0: Uncertain (CBD) 1: Improbable 2: Suspect 3: Probable

44 **Justification:**

Final human interaction evaluation requires additional data from level B and C analyses as well as review by experts (e.g. a veterinary pathologist)

1.56. Appendix C - Gear Checklist

Example of a *Field Response Checklist* (provided by The Marine Mammal Center).

Field Response Checklist

Latest Edit: Dave Zahniser Mar 23, 2019

Other Supplies

Tracking:
- ☐ Hydrophone - VR100
- ☐ Hydrophone Mic
- ☐ Hydrophone pole
- ☐ Hydrophone Charger
- ☐ Pingers - Asst. Frequencies

Misc:
- ☐ Leather Gloves
- ☐ Duck Tape
- ☐ Multi-tool
- ☐ Helmets
- ☐ PFDs
- ☐ Binoculars

Video/Photograpy

GoPro:
- ☐ Cams
- ☐ Batteries
- ☐ Chargers
- ☐ Flash Memory
- ☐ Mounts

Field Anesthesia

- ☐ Anesthesia Machine
- ☐ O_2 Canister
- ☐ Wrench for O_2 tank
- ☐ Mask - Small
- ☐ Mask - Large
- ☐ Reservoir Bags: 3, 4, 5 Liter
- ☐ Isoflurane (2 bottles)
- ☐ Isoflurane Bottle Adapter
- ☐ Tubing (2)
- ☐ Sodasorb

Medical Kit

Needles:
- ☐ 16G x 1.5"
- ☐ 18G x 3.5"
- ☐ 18G x 1.5"
- ☐ 18G x 1.0"
- ☐ 20G x 3.5"
- ☐ 20G x 1.5"
- ☐ 20G x 1.0"

Syringes:
- ☐ 1.0 mL (40)
- ☐ 3.0 mL (20)
- ☐ 6.0 mL (10)
- ☐ 12.0 mL (10)
- ☐ 20.0 mL (10)

Ventilation:
- ☐ Ambu Bag
- ☐ ET Tubes: 6,7,8,9,10,12,14
- ☐ ET Tube Stylet
- ☐ Laryngoscope
- ☐ Scope Batteries
- ☐ Jaw Ropes
- ☐ ET tube ties
- ☐ Sterile Lube

Instruments & Supplies:
- ☐ Eye Lube
- ☐ Sterile H_2O (5)
- ☐ Saline
- ☐ Chlorhexidine Scrub
- ☐ Small Surgery Pack
- ☐ Scalpels (10 and 11)
- ☐ Disentanglement Scissors
- ☐ Hemostats (2)
- ☐ Sharps Container
- ☐ Blood Tubes
- ☐ Vacutainer & Adapter

Medical Kit

Misc:
- ☐ Stethoscope
- ☐ Safety Glasses (2)
- ☐ Exam Gloves
- ☐ Darting Worksheet
- ☐ Field Logs
- ☐ Pens, Sharpies
- ☐ Clipboard
- ☐ Tape Measure (cm)
- ☐ Flipper Tags
- ☐ Flipper Tag Gun
- ☐ Labeling Tapen
- ☐ Duck Tape
- ☐ Zip Lock Bags
- ☐ Grease Markers
- ☐ Calculator
- ☐ Long Nose Pliers
- ☐ Pelican Cases (3)

Drugs

Sedatives:
- ☐ Medetomidine (20 mg/mL)
- ☐ Butorphanol (10 mg/mL)
- ☐ Butorphanol (50 mg/mL)
- ☐ Midazolam (5 mg/mL)
- ☐ Midazolam (50 mg/mL)

Reversals:
- ☐ Atipamezole (3 full bottles)
- ☐ Naltrexone (1 full bottle)
- ☐ Flumazenil (10 bottles)

Emergency Drugs:
- ☐ Doxapram
- ☐ Epinephrine
- ☐ Atropine
- ☐ Pentobarbital (Euthasol)

Darting Supplies

Projector:
- ☐ Dart Projector
- ☐ CO2 Cartridges
- ☐ CO_2 Adapter
- ☐ Range Finder
- ☐ Extra Battery (RF)
- ☐ Pressure Reference
- ☐ Extra Breach Pin
- ☐ Bore Cleaner
- ☐ Anemometer

Darts:
- ☐ Dart Bodies
- ☐ Dart Tailpieces
- ☐ Stabilizers
- ☐ Caps
- ☐ Red Sleeves
- ☐ Green Sleeves
- ☐ Pin
- ☐ Coupler
- ☐ 20mL Syringes
- ☐ Long Paperclips
- ☐ Dart Needle Covers
- ☐ Silicone Dart Lube
- ☐ Hemostats

Needles - Barbed:
- ☐ 25 mm
- ☐ 30 mm
- ☐ 40 mm
- ☐ 60 mm

Needles - Plain:
- ☐ 25 mm
- ☐ 30 mm
- ☐ 40 mm
- ☐ 60 mm
- ☐ Practice

The Marine Mammal Center

1.57. Appendix D – Disentanglement Form

Example of a *Steller sea lion disentanglement form* (provided by Protected Resources Division, NMFS Alaska Region and Alaska Department of Fish and Game Steller sea lion program).

STELLER SEA LION DISENTANGLEMENT FORM

Date: ADF&G No: NMFS No:

RESPONDERS:
1. Name of vessels and responders in each during darting:
2. Responders on shore:
3. Veterinarian:

CONDITIONS
1. Sea state: 2. Wind direction and speed: 3. Other:

ENTANGLEMENT
1. Location of haulout/rookery: 2. Location of animal: 3. Distance of animal to water: 4. Other:
5. Type of entanglement:
- Description of entanglement:
- Entangling material:

DARTING
1. Age and gender estimation:
2. Initial size estimate kg: lbs:

Drug	Dose range for size(mg)	mg given	ml given
Medetomidine			
Butorphanol			
Midazolam			
0.9 % NaCl			

3. Darter: Stalk time:
4. Time drugs mixed: Time drugs into dart:
5. Size of dart: Size of needle:
6. Time dart pressurized and loaded into gun: 7. Distance to animal: Pressure loaded:
8. Location of darter (underline): *on shore* *on water*
9. Orientation of darter's line of sight to animal:
10. Time of shot:
11. Dart placement (underline): *right side* *left side* *neck* *shoulder* *thorax* *abdomen* *flank* *hip*
12. Other:
13. Reaction to dart (underline): *startled* *looked* *moved* *none* *stayed on haulout* *went into water and tracked* *went into water and lost*
14. Additional behaviors:
15. Number animals in immediate vicinity: Number animals alerted: Number animals flushed into water:
17. Time of capture: Behavior:

DISENTANGLEMENT PROCEDURES
1. Entanglement (underline): *flasher removed* *neck entanglement removed*
2. Description of event:
3. Other: A. Morphometrics: B. flipper tags applied/location/number: C. hair dye applied/location:
D. sat tag applied/location: E. skin sample/location: F. hair sample/location:
G. whisker/location: H. antibiotic/location/volume: I. hot branding:

MONITORING
1. Start time: End time:
2. Beginning RR: Ending RR:
3. Beginning CRT: Ending CRT:
4. Beginning temp: Ending temp:
5. Other:

Time	BPM	CRT (sec)

REVERSAL AND RECOVERY
1. Time of reversal: 2. Location of injection:
3. Reversal drug dosage:
Atipamezole mg: ml:
Naltrexone mg: ml:
Flumazenil mg: ml:
4. Time to full recovery:
5. Behavior:
6. Dart (underline): *retrieved* *lost* Remaining volume of drugs in dart:
7. Other:

DOCUMENTATION:

FOLLOW UP:

10.5 Appendix E – Respiration Rate Form

RESPIRATION RATE DATA FORM

DATE:	OBSERVER NAME:

NOTIFY VETERINARY STAFF IF:

1. Animal holds breath one min or longer.
2. Respiration rate is greater than 8 breaths/minute.
3. Breathing sounds "unusual" (not full, deep, smooth) or if breathing is only "partial" (*i.e.* exhalation only)

HOUR	MIN	SEC	START/END OF ALL PROCEDURES/COMMENTS

1.59. Appendix F – Risk Factor Table

Risk factor table based on table provided by The Hawaiian monk seal research program, NMFS.

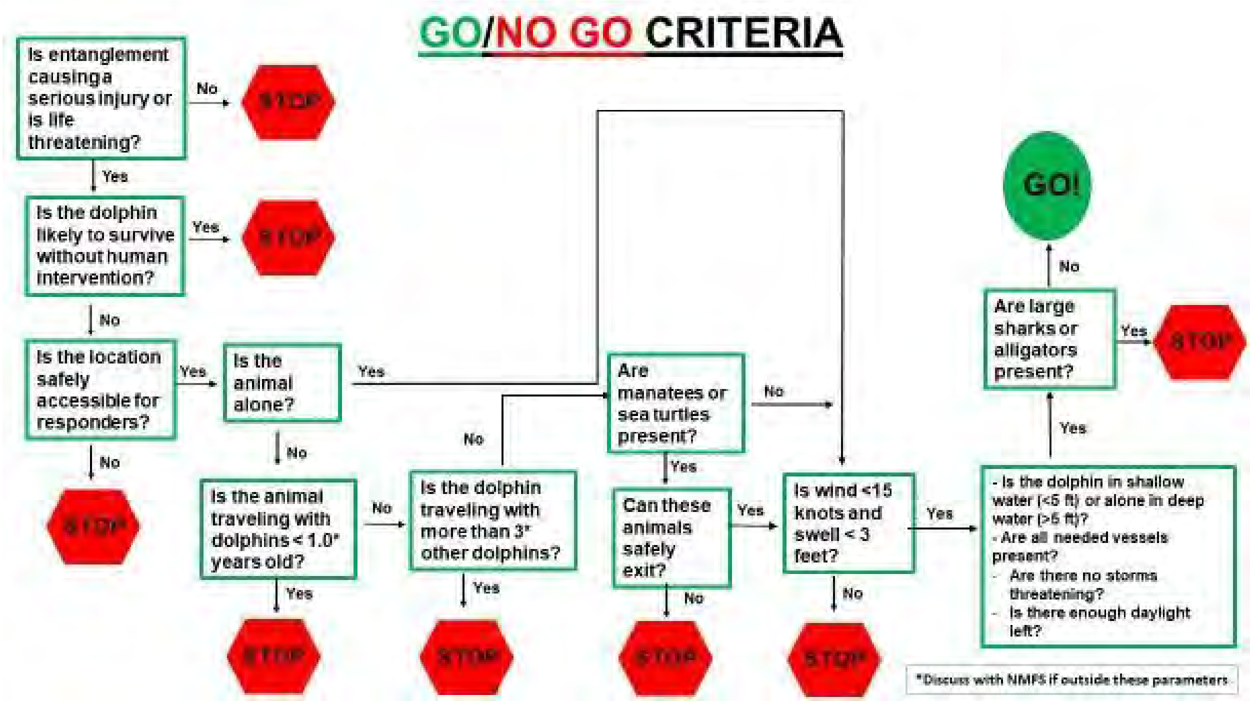
Risk Factor	Risk Factor Category						Risk Level
	Very Low - 1	Low - 2	Medium - 3	Medium High - 4	High - 5	Very High - 6	
Environment	Very Acceptable	Acceptable	Moderately Acceptable	Moderately Dangerous	Dangerous	Very Dangerous	
Team Selection and Fitness	Excellent Team	Good Team	Appropriate Team	Marginal Team	Poor Team	Very Poor Team	
Animal selection and condition	Healthy (besides entanglement)	Healthy (besides entanglement)	Mildly Compromised Health	Moderately Compromised Health	Highly Compromised Health	Highly Compromised Health	
Permits & Authorization	Excellent		Good		Poor		
Resources: Equipment, PPE, communication, etc.	Excellent		Good		Not Prepared		
Mission Complexity: New or experimental, time sensitive, etc.	Simple	Standard	Moderately Complex		Very Complex	Extremely Complex	
If any risk level equals:	Medium-High	Discuss with capture lead or immediate supervisor before proceeding.					
	High – Very High	Contact NMFS					

Key considerations or questions to be asked in the risk factor analyses (GAR):

- ***Health and behavior assessment:*** All animals will have pre-existing entanglement injuries. Ideally, previous observations via photos or video will have allowed for an initial assessment of health prior to the response, including evidence of malnutrition/emaciation, active infection or abscesses, etc. During the response, observe current body condition, responsiveness (responds normally to natural stimuli), or if there are any external or behavioral abnormalities including abnormal breathing patterns.
- ***Weather and tide concerns:*** Does weather pose a threat to the animal or responders (*i.e.*, heat stress, hypothermia, large waves, or threatening storms)? If so, is there a way to mitigate it? Consider the animal's body temperature before, during, and after handling. Is the tide coming in or going out, how high/low is it and how can it impact the event?
- ***Habitat concerns:*** Habitat (*i.e.*, location, water depth) should be assessed for hazards to animals and responders.
- ***Equipment:*** Is all necessary gear functional, available, and ready? This includes, but is not limited to, vessels, capture net, tagging, sampling, instrumentation, disentanglement tools, emergency equipment, temperature mitigation gear (*e.g.*, shade, bucket for water), and transport gear (*e.g.*, truck, boat).
- ***Presence of other small cetaceans:*** Are there other small cetaceans, or other wildlife in the area that may be disturbed by the handling? Is there a potential for other small cetaceans to approach and disrupt the target animal or responders during capture? Consider other natural and cultural resources nearby.
- ***Egress:*** Has the team assessed all possible hazards in the capture zone? Is there a safe place for non-entangled animals to egress? What hazards are in the capture zone that could potentially cause additional injury to the entangled animal and surrounding animals?
- ***Team composition:*** Are there adequate responders to safely complete the mission and address unforeseen situations; is the team experienced or new? If a veterinarian or veterinary technician is necessary, there should be sufficient personnel to assist with the entanglement response so the veterinary staff can monitor/treat the animal. Ensure that all involved fully understand their roles and everyone understands what warning signs to look for. Designate a human safety officer to monitor fatigue, injury, the animal, and personnel throughout the response.
- ***Public presence:*** Is the response going to be in a public area? Ensure adequate crowd control and outreach. Consider a public briefing before and after the event. Expect to be recorded or live streamed and ensure that all involved look and behave appropriately.

1.60. Appendix G – Decision Matrix (Go/No Go)

Example of a *Go/No Go decision matrix* (adapted from information provided by Alaska Department of Fish and Game Steller sea lion program).



1.61. Appendix H – Safety Concerns and Protocols for Dolphin Capture-Release

Based on protocols developed by the Chicago Zoological Society's Sarasota Dolphin Research Program, Harbor Branch Oceanographic Institution, NOAA/NOS Charleston and National Marine Mammal Foundation

INTRODUCTION

The following information is meant to serve as a description of safety protocols and their rationale for conducting bottlenose dolphin capture-release rescue efforts. In this work, we will be operating in a potentially hazardous environment, which requires the capture, sampling, and release of wild dolphins in open waters. These operations will involve activities that include coordinated use of several vessels, sometimes at high speed, and a team of people to deploy a large net to handle and restrain large, wild, inexperienced, compromised marine animals. Safety for people and dolphins must be the highest project priorities and safety is everyone's responsibility.

MEDICAL CONSIDERATIONS

It is the responsibility of each participant to make NMFS and the Capture Lead (CL) aware of any pre-existing medical condition, severe medical allergies, or dependencies on prescription drugs prior to commencement of capture operations. If you are allergic to bee stings, then you should also carry your own personal first aid (epi-pen) as an added precaution. Due to physical demands and the potential for injury and/or disease transmissions, pregnant women must notify NMFS and the CL of their condition, and are strongly advised to limit their participation to boat-based activities that minimize risk. Along similar lines, if you are deemed to have a health risk that could endanger yourself or others, you will not be authorized to participate in these operations. If you have active certification in first aid or CPR, please notify both NMFS and the CL. We may not have a paramedic or EMT with the fleet on some days, but we will be prepared to transfer injured personnel to shore expeditiously. If required, assistance may be provided from staff veterinarians and other team members who have certification in first aid and/or CPR.

In Case of any Serious Injury or Medical Emergency

1.Immediately notify NMFS/CL who will direct response efforts.

2. Without risk to you, work to stabilize and support the victim being careful to limit any movement of the neck and spine.
3. Help secure the area and notify proper authorities for emergency transportation (Notify 911 for shore-based ambulance response or USCG via VHF Ch. #16 for airlift). Alert other boats and direct shore-based emergency response to the nearest point of pick-up.
4. Make ready a first aid platform with all necessary medical treatment kits.
5. Depending on the situation, the CL will decide on the best/safest course of action regarding any dolphins that may be in the net corral or on board the veterinary examination boat.

FIELD COMMUNICATION

Only authorized cell phones and VHF radios (on assigned channel, probably 18) will be utilized for ship-to-ship and ship-to-shore communication. Boat skippers should limit VHF radio conversations in order to allow necessary communications between the CL, NMFS, and the Catcher to take precedence. All crew members should be briefed by skippers on operation of the radios and protocols for emergency transmissions (Channel 16 for the Coast Guard).

SAFETY EQUIPMENT

In order to maximize safety in our working environment, each vessel is equipped with approved USCG safety equipment, personal flotation devices (PFDs), throw cushions, fire extinguishers, and first aid kits. A kit for first-response to stingray strikes is also available.

RESEARCH VESSELS/OPERATION AND SAFETY GUIDELINES

- **Before boarding the boats:** Bracelets, watches, necklaces, piercings, earrings, and rings can cause injury to both people and animals. They can get tangled in the net. Remove and secure ALL such personal belongings and items BEFORE boarding each morning. Make sure that you have hard-soled shoes (not open-toed sandals) to wear in the water.
- **General Boat Operations/Boat Skipper Responsibilities**: Assigned 'boat skippers' are responsible for the safety of their crew and for the safe operation, maintenance, docking and cleanliness of their respective vessels. Skippers should familiarize themselves with the operational characteristics of their boat and safety equipment. If any skipper is unfamiliar with the region, then they should consult charts, exercise great caution, and reduce speed in shallow areas where shoals and sandbars may be present. Use depth poles to confirm depth readings of on-board electronic sensors. Be aware of all markers, channel markers and speed zones (including

designated manatee protection areas). If you are unsure of depth, raise (trim up) the outboard motor and slowly make your way to the main channel before resuming on-plane speed. Be careful not to disturb sea grasses, pole the boat through the shallows if necessary. Each boat skipper is responsible for checking to make sure sufficient life vests are on board at all times for their crew.

- **Life Vests/Personal Flotation Devices (PFDs)**: Before departing the dock make sure you are wearing or have quick and ready access to your PFD (make sure that it will fit you). If you are a poor swimmer, then you must wear the PFD while the vessel is underway. ALWAYS WEAR a PFD when you enter the water – do not remove it until all of the animals are restrained in shallow water. Make sure that your PFD returns to your boat at the end of the set.
- **Stay with your buddy**: Each boat skipper will assign pairs of handlers as buddies. You should enter the water together and keep track of one another, working as a team. Always enter the water in the field of view of the skipper – generally this means from the bow (front) of the boat. Enter the water ONLY when your skipper tells you to. **NO ONE SHOULD APPROACH THE NET ALONE – ALWAYS WORK AS A TEAM – NO SINGLE PERSON CAN CONTROL A THRASHING WILD DOLPHIN – PEOPLE HAVE BEEN SERIOUSLY INJURED.**
- **Commands are 'NO' or 'JUMP NOW'**: The call for anyone to go overboard, for any reason, from any vessel is given ONLY by the boat skipper. To avoid ANY possible confusion during times of rapid deployment in the net setting process, skippers will call "No" to hold fast and "Jump now" to indicate it is safe to go overboard. This helps eliminate the potential for confusing the commands "no" and "go".
- **Stay away from boat propellers**: In or out of the water; boat propellers can cause serious injuries and mutilation. Skippers will be responsible for operating boats in a safe manner and remain aware of any swimmers and/or animals in their operating zone. Before restarting a boat engine and placing it in gear, each boat skipper should look and call "Clear"; to make certain nobody is near the propeller. Never use the propeller of an outboard to return (climb) aboard any vessel. Remember, on shore, exposed boat propellers can be equally dangerous. Give boats on trailers a wide berth in order to prevent injury.
- **Do not place hands, arms, legs, or fingers in-between boats**: Boats may be 'rafted' alongside each other (beam to beam). All boats SHOULD have protective rubber fenders placed between them to avoid damage to both people and boats. Do not place your hands and fingers over the side of the boat when near potential hazards such as other boats, docks and pilings.
- **Watch for boat wakes**: Be alert to other boat traffic and alert others as necessary. Vessels operating in/or near the capture-release sites can produce large wakes, especially when they approach shorelines. Skippers can notify approaching vessels by VHF (Ch. 16) or by visual

means (flag) to request a "slow pass." Even small wakes can cause rafted boats to slam against each other. Prevent serious injuries; NEVER place yourself between two vessels – crushing from extreme forces is a strong possibility.

- **Boat anchors, lines and fenders**: Each boat should be equipped with a primary (bow = front) and secondary (stern = rear) anchor, as well as rafting lines and fenders. It is important for in-water staff to be aware that these outstretched lines and ground anchors can be an unseen hazard. Exercise caution when deploying and retrieving anchors. Note the position of extended anchor lines and safely stow anchors and all lines before getting underway. Each boat should also have dedicated net anchors. These should be recovered and stowed at the end of a set.
- **Boat towing (on water):** Will be done under the advice of the CL. Use a balanced towing harness. Place the engine in neutral and center the steering. Take any unessential equipment and people off disabled craft. Stay well away from the towline trajectory and be aware that heavy boat lines (and metal boat cleats) can unexpectedly break and become high-speed flying projectiles when they give way under the strain of towing a heavy load. Drive/Tow slowly.
- **Boat docks and ramps**: Use caution in/around marinas, boat ramps and dock areas. These can have slippery and uneven surfaces. Use added caution when boarding or disembarking from any boat, or when transferring equipment and personal gear. All loose items or items of value should be secured before entering the dock area. Make sure all boats are secure with lines fore and aft, including spring lines and boat fenders to provide safe access and prevent damage. Wear shoes with non-skid soles or booties on boats. Boat ramps are notoriously slippery at the tide lines.
- **Boat launching and recovery:** Will be done only under the supervision of the boat skipper, CL, or boat owner. Use caution. Be respectful of others. Keep off the active ramp when staging or breaking down.

POTENTIAL VESSEL EMERGENCY SCENARIOS

- **In case of fire:** The boat skipper should verify that all personnel are wearing PFD's and begin immediate evacuation of non-essential personnel. The skipper should call for help and without risk to their own personal safety, work to contain the fire with on-board fire extinguishers. Cut all lines and isolate the burning vessel from all other vessels and personnel in the water to prevent the fire from spreading, recognizing the possibility of the fuel tank exploding. Notify 911 by cell phone if at or near a dock and USCG on VHF marine radio (Ch 16) if at sea. Bring all necessary resources and fire extinguishers to bear and attempt to contain the flame source. If possible and without risk, safely tow the burning craft into an open area down-wind from other vessels and people and secure with an anchor. If such attempts are unsuccessful, or deemed too dangerous, then abandon the boat and allow it to drift and burn in an open area.

- **Inclement weather/Lightning:** Under some circumstances, it may be advisable for NMFS and the CL to decide to release all animals and have staff return to their boats. Crew will secure the vessels for foul weather. Skippers will move boats to the closest safe refuge until conditions improve.
- **Sinking vessel:** If for any reason any boat begins to take on excess water and/or is in danger of capsizing, immediately distribute PFD's and flare signaling kit to crew. Attempt to bail water and stop the source of incoming water. If our own vessels are unable to provide adequate assistance, then call USCG VHF Ch. 16 for help. Provide vessel name, location, # of passengers and status. Signal any nearby vessels. Abandon the boat only as a last resort. The skipper may attempt to slowly ground the boat in shallow water outside the channel.
- **Vessel aground:** Running aground, especially in unfamiliar waters, is a possibility. Skippers and crew should note distinct color changes of water indicating water depth. If the vessel begins to ground, immediately bring the boat to neutral, simultaneously kill the engine, and lift motor. Check the crew for any injuries. Safely disembark crew up-wind from the boat and attempt to refloat it to shallow water. Check the propeller for damage and ensure that the water pump is operating properly before getting underway. Notify other boats if further assistance is required.

SAFETY AROUND THE NET

The net is the primary responsibility of the Catcher. The net measures about 500 yards in length x 16 feet in depth, has a float-line at the surface and a lead line on the bottom.

- **Setting the net**: After the CL gives the go-ahead signal to the Catcher to set the net, the Catcher determines precisely when to execute this instruction based on water depth and conditions. All efforts will be made to limit capture-release activities to waters 5 feet deep or less, with minimal currents, to ensure the safety of the dolphins and capture team. Everyone on board the catch (net) boat must stand clear as the 'Let-go' (large orange ball attached to the end of the net) is thrown off the stern and the net rapidly pays-out. Failure to do so can result in entanglement and can cause severe injury or can pull you off the boat. If entangled with the net, do not attempt to stop or hold fast. If you feel the net coming tight on any part of your body, let go immediately and yell to the Catcher to 'STOP'. It is EVERYONE'S responsibility to concentrate on the net and the area enclosed by the net to monitor the dolphins and make sure that all of the dolphins are accounted for on each surfacing. Any indication of a dolphin striking the net should be reported immediately.

- **Hang on**! The net boat and other boats will accelerate quickly once the set begins. We mean it!
- **Entering the water: Do not enter the water until so instructed by your skipper.** Before entering the water, make sure that you are not wearing anything that could become entangled in the net or cut the skin of the dolphin (jewelry, watches, buckles, etc.). Usually, every effort will be made to set in shallow water (3 feet -5 feet). WEAR YOUR PFD WHEN YOU ENTER THE WATER, REGARDLESS OF WATER DEPTH, AND DO NOT REMOVE IT UNTIL ALL ANIMALS ARE SECURELY RESTRAINED IN SHALLOW WATER. If a 'deep-water' set occurs, the CL will direct staff to deploy a special floatation mat to support the dolphins. Use a buddy system – always know where your buddy is! Remain on the outside of the net corral until instructed otherwise by the CL.
- **Handling the net:** Follow the CL's instructions and those of the **Net Lead (NL)**. Typically, this will involve spacing the team members evenly around the outside of the perimeter (compass) of the net corral. You should remain close enough to the net to be able to lift and splash the cork line quickly should the animals approach your position, but otherwise do not touch the net unless otherwise instructed by the CL or NL. Be careful to not get your feet entangled in the webbing, and do not stand on the lead line. Slide your feet under the lead line and shuffle the lead line ahead of you with your feet. Never lock your fingers around the net twine or allow yourself to become entangled. If you feel the net becoming tight on any part of your body, free yourself immediately – request help if necessary.
- **Animals in the corral**: Once the net corral is set, listen to the instructions of the CL, and boat skippers. DO NOT APPROACH THE NET OR ENTANGLED DOLPHINS BY YOURSELF – WORK AS PART OF A TEAM ONLY!!! The CL will direct the other boats to strategically deploy and dispatch personnel around the perimeter of the net. Ideally, animals will remain in the center of the compass, giving personnel sufficient time to deploy around the float line. If necessary, handlers can "splash the float line" when animals approach their position to help avoid their charging or probing the net. Keep 'eyes-on' all animals and note their number and position. Depending on circumstances, conditions and number of animals, attempts may be made by the Catcher and CL to maneuver the net with the boats to split, isolate or crowd animals to a particular area. This may also be done manually by team members under the direction of the NLs.

- **Animals in the net**: Naïve dolphins are likely to strike the net soon after the set is completed, whereas experienced dolphins will often continue to circle inside the net corral. Typically (but not always) they will strike in the deepest part of the compass. A boat will immediately be sent to any area where an animal hits the net and pulls the float line down. If the water at the point where a dolphin entangles is too deep to handle safely with swimmers in PFDs, then a nearby boat will be deployed and efforts will be made to lift and support the net and dolphin from the boat. At the discretion of the skipper and CL, personnel will be deployed into the water with PFDs to begin the process of untangling the dolphin and transferring it to a floating pad. In shallower water, handlers working in teams should pull the cork line in both directions away from an entangled dolphin to minimize the entanglement, while other handlers move to the animal and support and restrain the animal and net from outside the net (do not get between the dolphin and the net, as you can become wrapped in the net with the animal – this has happened and caused serious injuries). The dolphin should be secured by reaching first around the body between the pectoral flippers and the dorsal fin to lift the head/blowhole above the water's surface as soon as possible (and, at the same time, avoiding the risk of being hit by the fluke or head). Additional handlers should secure first the animal's mid-section and then the tailstock (peduncle) and the head anterior to the pectoral flippers. Extreme care to avoid entanglement should be exercised if the dolphin rolls or spins in the net. Avoid both ends of the dolphin -- dolphin beaks and flukes are very hard and the animals are very strong. Be careful with your hands– do not touch the eyes, blowhole, or genital region. "Check the pecs" – make sure that the pectoral flippers are not entangled and that they lie back flat against the body of the dolphin and are not pulled forward or out.
- **Animal in distress**: If a dolphin exhibits signs of injury, extreme stress or shock (severe arching, unusual respiratory patterns), call for the veterinarian immediately. The vet will evaluate and treat the animal as appropriate. Special 'Dolphin Emergency Meds" kits are carried by the vet.
- **Cutting the net**: This is a last resort used to free a person or animal and will only be done in an emergency by the CL, NLs, or Catcher. Specially designed net knives are available and can be employed as needed. If an animal or person is severely entangled in the net, attempt to gather slack from both sides of the net and alert the CL, NL, and Catcher, who will assess and advise.
- **Retrieving the net**: After each net set, decisions will be made as animals are secured, held stationary and moved from the net to the sampling and examination vessel. Listen carefully for instructions when you are called to help maneuver and/or secure points on the net

compass. Pulling, cleaning and stacking the net can be done once all animals are safely restrained and secured. When it comes time to pull, clean and stack the net back aboard the catch boat you will be instructed to do so by the Catcher. Many people are sometimes needed in the water behind the net boat to shake the net and clean the algae from it before it comes aboard the boat.

GENERAL SAFETY AND PRACTICAL CONSIDERATIONS

Common sense should prevail. Use good judgment and remain alert and aware of your surroundings at all times. Ask questions if you are unsure of what is happening or what you should be doing.

- **Call loudly if you are in distress or need help**: If you are hurt or need assistance make sure to call out to alert those around you that you need help.
- **Use of disinfectants and special handling of animals with suspected zoonotics:** Some animals may have potentially zoonotic (transmissible) diseases. In such cases, contact should be limited as directed by the veterinarian. People with open wounds, cuts, or sores should refrain from direct contact with these animals. All other animal handling staff should take added precautions of protective clothing, gloves and surgical masks if deemed necessary. Following the handling of animals suspected of having a potentially transmissible condition, any/all persons (and equipment) who may have had contact with that animal, should isolate themselves to an area away from others and begin disinfecting with approved disinfectants, under the guidance of the senior veterinarian, being careful to avoid contact with the eyes and/or other sensitive areas of the body. Any/all clothing (rash guards, shirts, etc.) should also be removed and soaked for a minimum of 5 minutes in a disinfecting solution.
- **No Diving**: Under NO circumstances shall anyone dive into the water headfirst. Water visibility is often poor with a varied hard sand to soft mud bottom and can pose dangerous hazards. Use a boat ladder or ease yourself gently overboard in order to avoid the risk of serious head, neck and/or spinal injury and the risk of suddenly frightening the dolphins.
- **Noise and talking**: Boat skippers should always take added precautions in operation of boats in areas around the net and/or where animals are being restrained. Whenever possible turn engines off to avoid unnecessary noise that might agitate or alarm animals or interfere with communication among team members, and caution crew against jumping, splashing or banging equipment on the boat hull while around the boat. Please refrain from excessive talking and noise while capture-release operations are underway. Do not distract boat skippers and keep a watchful eye, especially while boats are underway and while working in-water with restrained animals.

Boat skippers, in-water animal care staff, and especially those in close proximity to the veterinary examination boat, should speak quietly and softly while procedures are underway. Boat skippers also need to consider the underwater noise of propellers and the adverse effects that may have on dolphins that are being restrained nearby.

- **No smoking**: A no-smoking rule will be in effect aboard all vessels, around fuel docks and in any/all areas that are in close proximity to others.
- **No bare feet**: Anyone entering the water does so at his or her own risk. Hard-sole diving booties or other similar binding footwear is required (Kevlar boots are available in stores, providing good protection to mid-calf – some staff members have these). Do not wear swim fins or shoes with buckles as these can easily tangle in the net. The seafloor has hazards from oyster shells to broken glass, derelict crab traps and debris. In this environment, it is advisable to walk slowly and shuffle one's feet in order to avoid stepping on stingrays. If stung or injured, notify the paramedic immediately. A stingray treatment kit consisting of hot water and a boot is available. In addition, in some areas jellyfish and sea-lice pose risks. People who are allergic to bee stings are at a higher risk and need to advise NMFS, the CL and the boat skipper if any such allergic reactions are possible.
- **No cell phones or cameras**: No unauthorized use of cell phones or cameras will be allowed. Cell phones should be turned off during on-water operations and any/all images taken are subject to review and approval of NMFS before they can be shown to anyone outside of the project.
- **Personal comfort**:
  - *Temperature concerns*: Bring warm clothing and it is suggested that you have a wet suit, booties, hat and gloves. Monitor your own signs of dropping internal temperature, including minor to moderate shaking and problems speaking and inform your skipper, CL, and NMFS immediately. In the event that you exhibit signs of hypothermia, you should get out of the water and dry off to start re-warming.
  - *Sun protection*: Use ample sunscreen (waterproof SPF 15 or higher) and protective clothing (hats/long sleeves, polarized sunglasses) to protect against sunburn and discomfort. Re-apply sunscreen during the day.
  - *Hydration*: Rehydrate often. Prolonged exposure to the elements and exhausting work efforts involved in the capture-release process require special considerations and personal caution. Water coolers are placed on-board assigned vessels and everyone is encouraged to drink plenty of fluids.
  - *General considerations:* Long days in the hot sun are exhausting. Stay alert and get plenty of sleep the night before. In cool weather, hypothermia can occur at any time, from leaving the

dock in the morning and running to the capture site, to standing for long periods in moderately cold water, to running wet back to the dock. There are no restrooms aboard the boats; efforts will be made to have at least one shore-side stop at public restroom facilities during the day. Plan your food/drink intake accordingly.

- **Personal responsibility**: Participants are expected to exhibit responsible behavior and a professional attitude. You represent your institution or agency, and NMFS.

Appendix XXII

Pinniped Entanglement Response Best Practices

Executive Summary

Entanglement in, hooking by, and ingestion of, marine debris and fishing gear is a global problem affecting hundreds of marine species. Pinnipeds can become entangled in active and derelict fishing gear and marine debris (*e.g.*, plastic packing bands, large rubber bands, garbage), as well as ingest fishing gear and marine debris, causing injury and death. Responding to entangled animals is often difficult or impossible due to the inaccessibility of the animal, inability to relocate the animal, inclement weather, lack of experienced and trained personnel, human safety concerns, and more. **PREVENTION** is key to reducing entanglements and should be uppermost in the minds of all those involved in entanglement response. Until the influx of debris and entangling materials into the marine environment is reduced, responders must do their best, within the constraints of human safety and logistical concerns, to disentangle pinnipeds that are injured as a result of human behavior. This document provides pinniped entanglement response Best Practices based on currently used methods. Best Practices include preparation and planning for a response, necessary authorization and qualifications, human and animal safety, and risk assessment and mitigation. *Although this document includes Best Practices, responders should never stop striving for innovative and new methods and training to increase the safety and success of an entanglement response. These protocols are meant as overall Best Practices and should not limit advances in techniques or animal welfare responses.*

Table of Contents

Introduction

Background

Marine debris, which is defined by the National Oceanic and Atmospheric Administration (NOAA) as any persistent solid material that is manufactured or processed and directly or indirectly disposed of, or abandoned into the marine environment, is a significant global stressor on the marine and coastal environment. Marine debris injures and kills marine life, interferes with navigational safety, and poses a threat to human health and safety. The majority of marine debris is composed of various forms of plastic that are highly persistent, and chemically harmful either because they are themselves potentially toxic (Lithner *et al.* 2011) or because they absorb other pollutants from the surrounding seawater (Teuten *et al.* 2009, Rochman *et al.* 2013a). The impact of marine debris is of global concern, affecting at least 914 species through entanglement and/or ingestion (Kuhn and van Franeker 2020). The number of species impacted by marine debris has substantially increased from the first overview reported in 1997 by Laist (1997) with 267 species and second overview reported in 2015 by Gall and Thompson (2015) with 693 species.

Increasing concern over plastics in the ocean led to the introduction of Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which prohibits the at-sea disposal of plastic wastes. Annex V was signed in 1973, although a complete ban on the disposal of plastics at sea was not enacted until the end of 1988. However, despite 134 nations agreeing to eliminate plastic disposal at sea, oceanic sampling indicates that the problem has worsened since MARPOL was signed (Rochman *et al.* 2013b) and formally adopted in 1988. Illegal dumping of plastics, fishing gear, and garbage is difficult to enforce and continues to be a threat to marine life.

Entanglements have been identified as a significant cause of injury or mortality to pinnipeds (*i.e.*, seals and sea lions) throughout the world. Entangling materials may cause drowning, lacerations, infection, asphyxiation, increased energy expenditure (especially while dragging large fragments of net), and may result in premature death and/or dependent offspring mortality. Common examples of marine debris that harm pinnipeds include plastic packing bands/straps, fishing gear, rope, and large rubber bands used on crab and other fishery pots (Harcourt *et al.* 1994, Hanni and Pyle 2000, Page *et al.* 2004, Raum-Suryan *et al.* 2009, Franco-Trecu *et al.* 2017). Ingestion of microplastics (small plastic pieces less than five millimeters) is also of concern as it could provide a pathway for transport of harmful chemicals (Teuten *et al.* 2009, Rochman *et al.* 2013a).

Bycatch in active fishing gear (*e.g.*, commercial trawl, purse seine, longline, gillnet, troll) is one of the largest threats to marine mammal populations (including pinnipeds) worldwide (Woodley and Lavigne 1991, Read 2008, Reeves *et al.* 2013, Hamilton and Baker 2019). Pinnipeds may interact with fisheries while pursuing the same fishery target species, while being attracted to fishery discards by being fed intentionally or unintentionally, or when encountering fishing gear and bait in the water (Hamer and Goldsworthy 2006, Raum-Suryan *et al.* 2009, Hamer *et al.* 2013, Reeves *et al.* 2013, Hamilton and Baker 2019). These interactions may result in the animal being caught in active fishing gear (*e.g.*, hooks), or entangled in nets and lines (Hamilton and Baker 2019). Pinniped depredation at aquaculture facilities also can result in fatal entanglements (Kemper *et al.* 2003, Price *et al.* 2016).

To address the root of the entanglement problem - primarily plastic debris in the ocean or interactions with fisheries - stakeholders, industry, non-governmental organizations, local, state and federal governments, and Native organizations must **work together to solve the problem.** A number of agencies and organizations have developed various methods to respond to entangled pinnipeds. However, responding to entanglements is limited for many reasons, with response reaching only a small fraction of entangled animals. Although there have been successful changes in fishing practices and fishing gear modifications (*e.g.*, seal and sea lion exclusion devices) (Hamer and Goldworthy 2006, Hamilton and Baker 2015, Königson *et al.* 2015), acoustic deterrent devices that elicit a startle reflex (*e.g.*, Götz and Janik 2010, 2011, 2013, 2015, 2016) and other fishing techniques used to reduce the threat and impacts to pinnipeds and the fishing industry (Werner *et al.* 2006), pinniped injury and mortality as a result of marine debris and fishery interactions continues. We must continue to explore innovative and effective methods to reduce pinniped entanglements. **Prevention** of debris entering our waterways is essential.

Legislation pertinent to pinniped entanglement response

There are two key pieces of legislation that govern interactions with marine mammals in the United States, the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). In 1992, the Marine Mammal Health and Stranding Response Program (MMHSRP), under the National Marine Fisheries Service (NMFS), was established by Congress under Title IV of the MMPA. The MMHSRP coordinates marine mammal stranding response efforts in the United States (U.S.) under Title IV of the MMPA as well as a NMFS MMPA/ESA permit. The MMHSRP works to standardize regional network operations and define national stranding response policy.

MMPA: The MMPA, signed into law in 1972, prohibits the “take” of marine mammals. Take, as defined under the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1362). The MMPA divides responsibility for marine mammal species between the Secretary of Commerce, who oversees NMFS, and the Secretary of the Interior, who oversees the U.S. Fish and Wildlife Service (USFWS). NMFS is responsible for the protection and conservation of all cetacean and pinniped species (with the exception of walruses), and their habitat and USFWS oversees the management of walruses, polar bears, sea otters, and manatees, and their habitat. The 1992 amendments to the MMPA included Title IV of the MMPA, which established the MMHSRP under NMFS to collect and disseminate information about the health of marine mammals and health trends of marine mammal populations.

ESA: The ESA, enacted in 1973, provides for the conservation of species listed as endangered (in danger of extinction) or threatened (at risk of becoming endangered in the foreseeable future). The ESA also contains a prohibition on “take” with certain exceptions, which means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (16 U.S.C. § 1531).

Best Practices purpose and intended uses

These best practices have been developed to serve as guidance and recommendations. This document is not intended for independent use as a training manual, and does not by itself qualify the reader for any actions or authorizations. These best practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. In some situations, responders may choose a course of action not outlined in these documents, but consultation with NMFS is encouraged if the course of action will vary greatly from the best practices outlined in this document. These best practices are a “living document,” and as such, we plan to periodically review and update them as new information becomes available. Responders should never stop striving for innovative and new methods and training to increase the safety and success, and nothing in these best practices should prevent or limit advances in technology, techniques, and training.

NMFS and the MMHSRP have developed Best Practices for responding to live pinnipeds observed with life-threatening entanglements or that have ingested fishing gear, to ensure the health, welfare, and safety of both human responders and the impacted animals. These Best Practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances. For more information on general stranded marine mammal rescue and rehabilitation, visit the MMHSRP website or see *Marine Mammals Ashore* (Geraci and Lounsbury 2005) and the *CRC Handbook of Marine Mammal Medicine* (Gulland *et al.* 2018). Human and animal safety is the top priority for NMFS and the Marine Mammal Stranding and Entanglement Networks (Network). As each event is unique, NMFS and the Network evaluate several factors before making the decision to intervene.

These Best Practices highlight general procedures specific to pinnipeds that have either become entangled in or ingested marine debris or fishing gear. These Best Practice protocols and procedures should only be used for pinnipeds. Protocols and procedures for use with small and large cetaceans can be found in the NMFS Small Cetacean or Large Whale Entanglement Response Best Practices Guides, respectively. Practices may vary between phocids (earless or true seals) and otariids (eared seals such as sea lions and fur seals). Additionally, these practices are designed to be paired with more specific regional annexes to address any concerns, including species-specific issues (*e.g.*, endangered species response), more appropriately addressed at regional or state levels. These practices represent the culmination of years of evaluating response efforts and providing information that has been deemed safe (*i.e.*, tools and procedures that reduce risk to animals and responders). However, risks still exist. These protocols are meant as overall Best Practices and should not limit advances in techniques or animal welfare.

These Best Practices include guidance for entanglement response techniques using physical restraint and sedation. Although physical restraint has been used successfully to capture many species of entangled free-ranging pinnipeds, safe capture and restraint of large, unpredictable animals, such as Steller sea lions (*Eumetopias jubatus*; up to 900 kg) greater than four years of age and adult California sea lions (*Zalophus californianus*; up to 600 kg) is difficult and, in some cases, impossible. Remote sedation (darting) using a zolazepam-tiletamine combination ("Telazol") has been effective, except for the possibility of drowning should the darted animal enter the water (Heath *et al.* 1996). Recently, remote sedation techniques using a combination of medetomidine, midazolam, and butorphanol have greatly improved capture success of some individual otariids (Melin *et al.* 2013, Haulena 2014, Baylis *et al.* 2015, Frankfurter *et al.* 2016). This combination has been shown to provide effective sedation of otariids without inhibiting normal respiratory functions (Melin *et al.* 2013, Haulena 2014). A variation of this drug combination using midazolam and medetomidine also has been successfully used to capture and disentangle gray seals (*Halichoerus grypus*) (Sharp *et al.* 2016). These remote sedation techniques are explained in greater detail in section six of the document.

To ensure that this Best Practices document incorporates the most current, safe, and relevant entanglement response protocols, a questionnaire was sent to the MMHSRP stranding coordinators and their network members, to members of the international Pinniped Entanglement Group (PEG), and to other veterinarians and entanglement response personnel. The questionnaire included questions about 1) preparation, 2) equipment and drugs, 3) procedures, 4) risk and mitigation, 5) gaps and future research needs, and 6) any relevant protocols, data forms, or Best Practices currently in use. Responses were received from personnel working in Alaska, Hawaii, the west and east coasts of the U.S., Canada, and the United Kingdom. All responses were compiled, summarized, and incorporated into this document.

Structure of the document

This document is organized as follows: Planning for a pinniped entanglement response (Section 2); Pinniped entanglement response techniques – physical on land (Section 3); Pinniped entanglement response techniques – physical in-water (Section 4); Pinniped entanglement response techniques – local/hand sedation (Section 5); Pinniped entanglement response techniques – remote sedation (Section 6); Gaps and future research needs (Section 7); Conclusions (Section 8); Acknowledgements (Section 9); References (Section 10); and Appendices (Section 11).

This document is structured so that each section can be used as a stand-alone Best Practices guide for the appropriate entanglement scenario (*e.g.*, physical on land, remote sedation, etc.). Each section provides a broad overview of Best Practices for each response type. The appendices provide additional forms, datasheets, checklists, etc. that have been used during entanglement response.

Funding

The John H. Prescott Marine Mammal Rescue Assistance Grant Program provides funding for eligible Network members and collaborators through an annual competitive grant process (subject to annual appropriation from Congress). These grants support the rescue and rehabilitation of stranded marine mammals (including pinniped entanglement response), data collection from living or dead stranded marine mammals for health research, and facility operation costs. However, as these grants are competitive and there is insufficient funding to cover all costs of the Network, individual Network members must also support many of the costs for normal operations. Determining whether funding is available for an intervention is an important first consideration, as lack of funds or available in-kind donations (*e.g.*, boat use) may limit available options for responses.

Planning for pinniped entanglement response

Authorization

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Response efforts may also rely on state and federal agencies (including law enforcement agencies and the U.S. Coast Guard), non-governmental organizations, fishermen, and other groups to respond to needed interventions.

Under the authorization of an MMHSRP MMPA/ESA research permit, responders are allowed to disentangle all pinniped species, including species listed as endangered or threatened under the ESA, and use remote sedation techniques for entanglement response. NMFS Office of Protected Resources (OPR) must be consulted for approval prior to conducting entanglement response activities, release, euthanasia, or necropsy of an ESA-listed pinniped; however, if working in remote locations where ESA-listed pinnipeds may be encountered, prior approval may be granted for entanglement response by contacting the Principal Investigator (PI) and/or Regional Stranding Coordinator (RSC) before departure to the field. All procedures requiring sedation, anesthesia, surgery, or euthanasia must be performed under the direct or indirect supervision of a veterinarian. Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury (see pp 34-35 NMFS Serious Injury Procedure for details).

Responders are trained in proper techniques for safe capture, restraint, and removal of gear from various marine mammal species. Training workshops (*e.g.*, Safe Capture, Canadian Association of Zoo and Wildlife Veterinarians, Alaska Department of Fish and Game Chemical Immobilization of Wildlife) have been offered to members of the Network. Additionally, opportunities for apprenticeships or assistant roles to gain the necessary hands on expertise can be arranged. Specific training issues or requirements may exist for certain activities (*e.g.*, in-water captures) and are more appropriate to address at regional or state levels by working with the RSC.

Preparation

Prior to any operation: Entanglement response requires extensive logistical preparation, including training of personnel, development of strategies for successful mitigation, and identification of appropriate supplies, equipment, and vessel support. Once approval from NMFS has been received and prior to any operation, an experienced team should be selected and roles and if applicable, boat crews assigned. An Incident Command System (ICS) Incident Action Plan (IAP) and safety protocols should be distributed to the team for review. Contingencies for rehabilitation should be identified in case it is determined that the injury is too severe to warrant immediate release on-site. All equipment (*e.g.*, medical, communication, response, vessels, vehicles, tags, animal transport gear, etc.), should be cleaned, organized, packed, and ready for operations on short notice. Tide, current, and navigational charts should be reviewed to decide the best tide window and potential locations for an appropriate, safe response.

24 – 72 hours prior to operation:

- Check weather forecasts
- Notify appropriate entities (*e.g.*, NMFS RSC, law enforcement, harbor master, park personnel, lifeguards, etc.)
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, private land)
- For human safety, have a permanent point of contact (POC) familiar with the drugs used, and/or notify local hospital or emergency medical services (EMS) and describe drugs to be used, including reversals available
- If applicable, contact rehabilitation facilities to inquire if there is space available

Immediately prior to operation:

- Conduct safety briefing
- Re-check weather forecasts
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations and make a final decision about response

Training

Responders must be trained in safe capture, handling, monitoring under restraint, etc. by experienced personnel. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct personnel toward resources relevant to the species of interest, whenever available.

Human and Animal Safety

Because of the inherent risks encountered during an entanglement response, methods used to capture and restrain an animal should minimize risk, stress, and pain to the animal while also ensuring the safety of responders and animals. A broad list of human and animal safety procedures can be found below.

Human safety

- Human safety always comes before animal rescue.
- Create a written risk assessment and safety protocol with emergency numbers to be kept with first aid kits.
- All anticipated drugs should be recorded on an emergency response sheet in case of accidental exposure, so EMS can quickly evaluate human exposure. Local hospitals should be notified prior to response.
- Conduct an appropriate assessment of the entanglement and impact to animal and operational assessment to mitigate any risk to responders.
- Responders should only conduct procedures for which they meet minimum qualifications and training.
- Personnel should wear appropriate personal protective equipment (PPE) such as strong, non-slip footwear, gloves, and protective clothing as necessary and all persons handling delivery devices or drugs should be wearing proper PPE (*e.g.*, non-permeable gloves, safety glasses, and masks when loading darts or syringes).
- A veterinarian should always be present if sedation is used.
- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the cutting implement safely when finished.

- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to ensure they are clear of line and net.
- If drugs will be used, all responders should be familiar with drugs and reversals, including symptoms of accidental exposure and if/when/how to treat prior to the arrival of medical personnel.
- Never initiate an action that has not been thoroughly discussed and thought through, and if warranted, authorized.
- When in doubt, stand down, and/or regroup (*i.e.*, attempt on another day with better support, conditions, and/or resources).
- Do not be pressured into an action by weather, time of day, onlookers, media, or the need to "just do something". There is no obligation to respond.
- Once a response is mounted, there are obligations (*e.g.*, standard operating procedures) to be met.

Animal safety

- Use a decision matrix (see Section 2.12) prior to capture to ensure risks and mitigation are anticipated and accounted for by all responders and properly mitigated.
- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target and target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint or darting of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.

- Responders should only use appropriate, species-specific handling and sedation methods with trained personnel to make the capture response as efficient as possible and to minimize negative effects.
- When the animal is in hand, ensure it is secured appropriately so that it is still able to breathe comfortably with the jaw held shut (*e.g.*, hoop net, towel) to reduce the risk of bite. Pinnipeds cannot breathe through a wet towel so ensure any towel used does not restrict breathing. A kinked neck or constricted airway can cause mortality, and all animal handlers should be briefed about this hazard prior to response.
- Prevent potential thermoregulatory stress by considering and managing temperature, wind, sun, and shade. In warm conditions, preventatively keep animals cool by pouring water over flippers and minimizing handling time. If the animal becomes too cold, hot water bottles, emergency blankets, or hot pads can be used to warm the animal.
- The animal's eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal. For sedated animals, a gel-based solution of artificial tears can be applied to protect the eyes if physical eye protection is not feasible (*e.g.*, in-water).
- When embedded, peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this should minimize pain and prevent further injury.
- Once incident is complete, clean and sterilize any sampling tools that came into contact with the animal.

Incident Command System

The ICS as it applies to an entanglement response is a standardized approach to establish common processes for planning and managing the response. ICS enables a coordinated effort among all responders, and allows for the integration of equipment, personnel, procedures, and communications among responders. ICS is based on decades of lessons learned, the achievement of response objectives, the efficient use of resources, and helps ensure the safety of responders and the animals. ICS uses standard terminology and common terms to ensure understanding among all responders. ICS establishes a clear chain of command, transfer of command, ensures integrated communications, professionalism, accountability, and organizational structure.

The Incident Commander (IC) is responsible for the overall operation, including the performance of the response, and while usually found onsite with the response team, does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the response.

By using ICS, each team member knows their exact role in the response, the response plan, and any mitigation measures should there be an emergency during the response. An Incident Action Plan (IAP) documents incident goals and objectives, disseminates information about the response, and is revised on a regular basis to maintain consistent, up-to-date guidance. For more information about ICS and how to take a free course, see https://training.fema.gov/emiweb/is/icsresource/TrainingMaterials.htm.

Team member roles

The capture and handling of pinnipeds has inherent risk for both responders and animals. Clarifying team member roles and responsibilities prior to any response, and ensuring that responders meet minimum qualifications for each role, is essential to a safe and successful response. Disentangling pinnipeds should always be conducted by trained personnel. When controlled substances are used for local or remote sedation, extra training and licensing requirements are required, and safety protocols should always be in place.

Detailed descriptions of team member roles and responsibilities are described in greater detail within each of the entanglement response method sections below. All personnel should be familiar with the MMHSRP permit and the minimum qualifications for each role if handling ESA species or using remote sedation techniques. In general, roles and responsibilities might include but are not limited to:

1. Incident Commander (IC)
2. Safety Officer (SO) – if short on responders, this role can be combined with the IC
3. Licensed Doctor of Veterinary Medicine (DVM) or equivalent or Veterinary Technician
4. Animal herders
5. Animal restrainers
6. Boat operators
7. Marksman if darting
8. Spotters if darting
9. Monitors
10. Data collection
11. Documentation (still and video photography)
12. Unmanned aerial system (UAS) pilot
13. Crowd/Security control (this could be performed by law enforcement, park personnel, volunteers, etc.)
14. Communication Officer

Communication

Clear communication is essential before, during, and after an entanglement response. Roles should be clearly defined and understood by everyone prior to the response. The IC should go over the plan just prior to implementation and give each responder a chance to respond to any safety or other concerns at this time. There must be clear communication when planning for the response, and among team members during the response (*e.g.*, among boat operators, between boat operators and shore personnel, between response team and emergency personnel, members of the public, law enforcement, harbormasters, Native communities, etc.). To reduce stress to the animals and responders during the response, talking should be kept to a minimum unless there is a safety concern, and these concerns should be communicated directly to the IC and/or SO.

Common forms of verbal communication include using very high frequency (VHF) marine radios, satellite phones, cell phones, and two-way radios (*e.g.*, walkie talkies). Some applications for phones (*e.g.*, Zello) allow a cell phone to be used as a walkie talkie. Non-verbal communication may also be required while approaching an animal. Responders should ensure all non-verbal communication gestures are understood by the entire response team and practiced prior to each response.

The IC must coordinate with the MMHSRP, RSC, and the NMFS Office of Communications concerning media contacts relating to high-profile entanglement response events, as necessary. If responders are contacted by the media for an interview, they should notify a NOAA Office of Public Affairs Communications Specialist before responding if possible, or soon after the event. If a Communications Specialist cannot be contacted prior to a response to the media, an email summary of the interview (including name and contact information of the reporter, and media outlet) should be provided. It is best to work through public affairs for news media, such as news releases, news conferences, and media interviews. All media interviews should be considered "on the record". Human safety always comes first, followed by the entanglement response. The response team should never feel pressured by anyone, including the media, to respond. **Responders are NOT required to speak to the news media**. (See examples of frequently asked questions regarding pinniped entanglement response in Appendix A).

Environmental conditions

Consideration of weather forecasts, the features of the response area, the entangled animal and conspecifics, and other wildlife in the area are essential prior to response. Responders should consider:

wind, precipitation, fog, sea state, and incoming storm systems or any other changes in weather. Environmental conditions that should be assessed include: tides, currents, substrate (*e.g.*, rocks, slippery kelp, coral, cultural resources at risk), submerged hazards (*e.g.*, sunken debris, aquaculture, oysters, crab pots), emergent hazards (*e.g.*, pilings, docks, jetties, etc.), land hazards (*e.g.*, bears, snakes, etc.), predators (*e.g.*, sharks, killer whales, alligators, etc.), other marine organisms (*e.g.*, stingrays, jellies, etc.), and surf. The temperature should also be considered. If it is too hot, the responders or animals could become overheated. If too cold, it could be a safety risk for responders and the animal.

Equipment

Each type of response (physical restraint on land, physical restraint in the water, local sedation, and remote sedation) requires specific equipment. It is essential that the proper equipment be clean, tested, charged, packed, and immediately available before response. Table 2-1 summarizes general equipment used for the various types of responses. Specific equipment is outlined in individual sections later in this document.

Table 2-1. Overview of general equipment used for physical restraint on land and water, and hand and remote sedation methods.

General Equipment	Physical restraint - land	Physical restraint - water	Local (hand) sedation	Remote sedation
Communications (*e.g.*, marine radio, cell phone, satellite phone)	X	X	X	X
Data supplies (*e.g.*, datasheets, pencils, etc.)	X	X	X	X
Safety equipment/Protective clothing/PFD	X	X	X	X
Medical equipment for humans (*e.g.*, First Aid)	X	X	X	X
Medical equipment for animals (*e.g.*, sedation, antibiotics, ‘crash kit’)	X	X	X	X

Sampling (*e.g.*, blood, skin, swab, etc. collection), marking (*e.g.*, hair dye, hot branding), and tagging (*e.g.*, roto, Allflex, or satellite-linked) equipment	X	X	X	X
Crowding/herding boards	X		X	possible
Capture/Restraint equipment (*e.g.*, nets, poles, etc.)	X	X	X	X
Vehicles	X	X	X	X
Vessels	possible	possible	X	X
Local sedation equipment (*e.g.*, hand inject, pole syringe, etc.)			X	
Remote sedation equipment (*e.g.*, dart projector, darts, etc.)				X
Recording equipment (*e.g.*, cameras, Go Pros, etc.)	X	X	X	X
Cleaning/disinfectant supplies	X	X	X	X
UAS	possible	possible	possible	possible

Data collection

Capture and sampling equipment and data needs must be well thought out prior to the start of any entanglement response program. Instructions should be followed and data forms completed during a response. Capture and sampling equipment checklists should be developed and used. Important forms for preparation prior to response may include: applicable permits; Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form); gear checklists (*e.g.*, Appendix E - Gear Checklist); disentanglement forms (*e.g.*, Appendix F – Disentanglement form); remote sedation worksheets (*e.g.*, Appendix G - Remote Sedation Worksheet); drug interaction forms (*e.g.*, Appendix

H – Drug interaction Form); and sedation worksheets for otariids (*e.g.*, Appendix I – Otariid sedation worksheets) or phocids (*e.g.*, Appendix J – Phocid sedation worksheet). All entangling gear should be retained if possible, documented on the Level A and Human Interaction Form, and stored in a centralized location.

Risks and mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures (Table 2-2) for these risks prior to any response. After each response, the team should conduct a thorough de-brief and summarize lessons learned that can be applied to future responses. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. ***There is always room for improvement and documents should be updated continually.***

Table 2-2. A general risk and mitigation checklist to use for an entanglement response.

General Risk and Mitigation Checklist	✓
Approval for response from NMFS	

Approval for response from NMFS permit holder (if applicable, *e.g.*, ESA species, unintentional harassment)	
Assign an IC and SO	
Veterinary support if sedation is required	
Make arrangements for possible transfer to rehabilitation facility	
Alert NOAA/permit holder	
Alert harbormaster, land owners, and Native organizations (if applicable)	
Alert area Emergency Medical Services (EMS) especially of use of drugs and darts	
File a float plan with designated Point of Contact (POC)	
Check vessel, trailer, and vehicle operation	
Prepare for follow-up monitoring (*e.g.*, obtain and program tags)	
Assign and explain team member roles	
Review authorization/permit and decision matrix or Go/No Go	
Check weather forecasts and tides	
Review safety plans	

Risk Management Assessment

Assessment of risks and mitigation starts long before initiating a response. Risks to humans and animals should be identified, and mitigation measures established. Specific risk and mitigation measures will be listed under individual sections later in the document. Some examples of general risk and mitigation measures are listed below.

RISKS TO HUMANS

Risks:

- Injury or death as a result of drowning; slips, trips, or falls; entanglement in capture equipment; trauma associated with animal restraint (*e.g.*, bites, scratches, bruises, breaks); changeable environmental conditions; injuries from other organisms (*e.g.*, stingrays, sharks, coral, oysters, etc.)
- Accidental injection, ingestion, or absorption of drugs during capture or at a later date if the animal is harvested for consumption as part of Alaska Native subsistence harvest activities
- Exposure to pollutants, biotoxins, etc.

Mitigation:

- o Preparation, planning, practice, proper training, and use of decision matrices
- o Licensed Doctor of Veterinary Medicine (DVM) or equivalent if sedation drugs will be used during the response
- o IC and SO to oversee operations
- o Wear appropriate PPE
- o Use luer lock syringes with hand injectable drugs (to reduce likelihood of spray back)
- o If working in Alaska, native communities should be notified prior to any captures using sedatives and animals that have been given sedatives should be well marked (on the flipper tag, use a permanent marker to write "***Do not eat if harvested before xxx date***", which is past the withdrawal time of 45 days) so that the Native community can identify the animal prior to possible subsistence use
- o Do not wrap line around any body part and keep feet clear. Practice shuffling feet near line when possible to minimize entanglement risk

RISKS TO ANIMALS

Risks:

- Injury or death to an entangled animal from responders, capture equipment, drug overdose, other animals, falls, or drowning
- Injury to surrounding non-entangled animals (including pups) from stampeding, trampling, accidental darting

Mitigation:

- Preparation, planning, practice, and use of decision matrices
- Captures only performed by highly trained and sufficient number of personnel
- Adequate survey of capture area to ensure no risk to pups or non-entangled animals in the area
- Adequate amount of appropriate reversal agents to be administered by licensed DVM or equivalent, if sedation drugs will be used during the response

Intervention criteria/decision matrix

The most important question to ask prior to an entanglement response is: **Is the entanglement life threatening?** Entanglement response should only be attempted if the entanglement is deemed to be causing, or has the potential to cause, a life-threatening injury, and that the potential risks of capture are necessary for the survival of the animal, due to the serious nature of the entanglement (*e.g.*, see pp 34-35 NMFS Serious Injury Procedure for details).

For entangled pinnipeds, NMFS, in consultation with experts and veterinarians, will determine if the entanglement is a serious injury and life-threatening. This is achieved through field observations by biologists/researchers/veterinarians, analysis of photos and/or videos, the animal's behavior and appearance, and prior experience with similar entanglements.

If the entanglement is determined to be life threatening, the next step is to determine the most appropriate method of intervention. If intervention is not an option, the animal may be monitored, usually by local researchers or NMFS biologists, to determine whether an intervention may be possible at a later date (*e.g.*, the animal moves to a more suitable area for rescue, the animal live strands, the animal becomes lethargic and more approachable, weather improves, etc.).

If the decision to intervene is made, then there are two main tools to aid in determining if a response should occur: 1) The Risk Factor Model (Table 2-3), and 2) The Go/No Go Decision Matrix (Figure 2-1):

1) **The Risk Factor or GAR (Green-Amber-Red) Model** (Table 2-3). The GAR model allows for time critical risk assessment and generates communication concerning the response risks. This communication then helps identify the risk and leads to the appropriate mitigation. This model is not a strict Go/No Go because it is focused on identifying risks and mitigations. If the cumulative risk levels across multiple areas (*i.e.*, team composition, mission complexity) are above a certain threshold, teams must work with the IC and/or contact the permit principal

investigator (*i.e.*, the MMHSRP) if acting under the permit, prior to acting to discuss mitigation measures or to stand down.

Table 2-3. The GAR (Green-Amber-Red) General Model Table based on table provided by The Hawaiian monk seal research program, NMFS.

Risk Factor	Risk Factor Category						Risk Level
	Very Low - 1	Low - 2	Medium - 3	Medium High - 4	High - 5	Very High - 6	
Environment	Very Acceptable	Acceptable	Moderately Acceptable	Moderately Dangerous	Dangerous	Very Dangerous	
Team Selection and Fitness	Excellent Team	Good Team	Appropriate Team	Marginal Team	Poor Team	Very Poor Team	
Animal selection and condition	Healthy	Healthy	Injured/Compromised		Highly Compromised		
Permits & Authorization	Excellent		Good		Poor		
Resources: Equipment, PPE, communication, etc.	Excellent		Good		Not Prepared		
Mission Complexity: New or experimental, time sensitive, etc.	Simple	Standard	Moderately Complex		Very Complex	Extremely Complex	
If any risk level equals:	Any medium-high	Contact project lead or immediate supervisor before proceeding					

	Any high – very high	**Contact project lead or veterinarian before proceeding**

Key considerations or questions to be asked in the Risk factor analyses (GAR):

- ***Molt*:** Molt stage should be considered for some species, as it is highly energetically costly and may make individuals less capable of withstanding the stress of capture.
- ***Pregnancy*:** Adult females require additional consideration. Adult females are likely to be pregnant during part of the year and some drugs (or stress) could lead to late term abortions. Pregnant females should only be captured if their survival, and the survival of their unborn pup, is in eminent danger due to the entanglement.
- ***Health and behavior assessment*:** Observe body condition, responsiveness (responds normally to natural stimuli), or if there are any external or behavioral abnormalities.
- ***Weather and tide concerns*:** Does weather pose a threat to the animal or responders (*i.e.*, heat stress or hypothermia or threatening storms)? If so, is there a way to mitigate it? Depending upon climate/season, captures during the middle of the day should be avoided unless overcast/cool. Consider the animal's body temperature before, during, and after handling. Is the tide coming in or going out, how high/low is it and how can it impact the event?
- ***Habitat concerns*:** Habitat (*i.e.*, geographic location, substrate type, navigation hazards, water depth, currents, etc.) should be assessed for hazards to animals and responders.
- ***Equipment*:** Is all necessary gear functional, available, and ready? This includes, but is not limited to, crowding, capture, tagging, sampling, instrumentation, disentanglement, emergency equipment, temperature mitigation gear (*e.g.*, shade, bucket for water), and transport gear (*e.g.*, cage, truck, boat).
- ***Presence of other animals*:** Are there other pinnipeds, pups, or other wildlife in the area that may be disturbed by the handling? Is there a potential for other pinnipeds to approach and disrupt the target animal or responders during capture? Consider other natural and cultural resources nearby.
- ***Egress*:** Has the team assessed all possible hazards in the capture zone? Is there a safe place for the non-entangled animals to egress? Is the entangled animal in a safe location if remotely sedated? What hazards are in the capture zone that could potentially cause injury to the entangled and surrounding animals?

- ***Team composition*****:** Are there adequate responders with the appropriate level of expertise and experience to safely complete the mission and address unforeseen situations? If a veterinarian or veterinary technician is necessary, there should be sufficient personnel to assist the entanglement response so the veterinarian can monitor the animal. Ensure that all involved fully understand their roles and everyone understands warning signs to look for. Designate a safety officer to monitor fatigue, injury, the animal, and personnel throughout the response.
- ***Public presence*****:** Is the capture going to be in a public area? Ensure adequate crowd control and outreach. If in a crowded public area, consider a public briefing before and after the event. Expect to be recorded or live streamed and ensure that all involved behave appropriately. Carefully consider clothing/logos that will be seen by the public, to help the public recognize the professionalism of the team.

2) **The Go/No Go Decision Matrix** (Figure 2-1). The Go/No Go Decision Matrix is a flow chart based on permit requirements. This flow chart enables responders to think through the current response scenario to determine if the response is feasible based on a risk assessment.

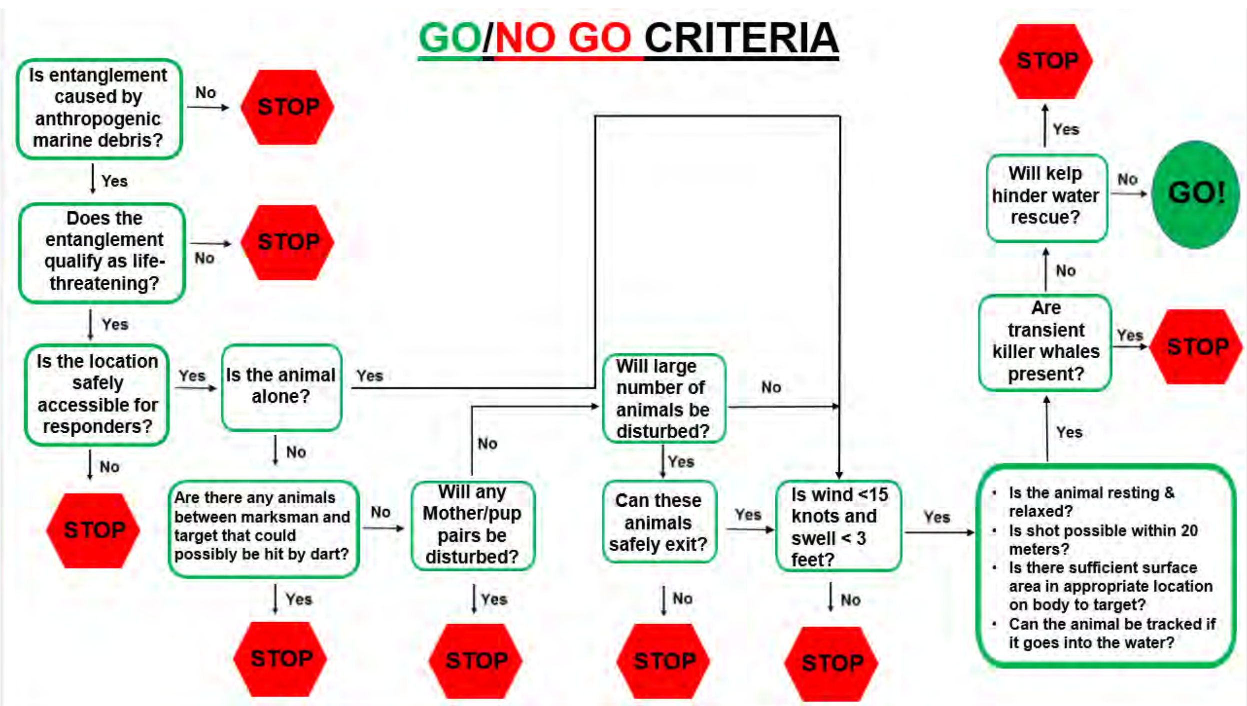


Figure 2-1. General example of a Go/No Go decision matrix based on permit requirements (created based on flowchart provided by the Alaska Department of Fish and Game Steller sea lion program). This flowchart can be modified to best fit individuals regions.

Procedure

Procedures will vary depending on the type of entanglement response and will be presented in greater detail in each section below. Across all types of responses, the general sequence of events include:

1. Use a decision matrix to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed.
2. Hold a team briefing prior to the response so team members know their duties (include a practice run).
3. If responding in areas with a large number of entangled animals, survey the area and select the animal(s) based on NMFS authorization.
4. Estimate the weight of the animal if sedatives will be used and select the appropriate dosage. Be consistent in method of estimation, verify method if possible.
5. Ensure there is adequate security and crowd control in place if necessary.
6. The IC will ensure all personnel and equipment is ready and perform the final Go/No Go determination (if there is ANY question of safety, abort).
7. All camera and video monitoring equipment is operational and recording; photos of the gear in place are taken.
8. The team gets into position, approaches and captures the animal.
9. The animal is immediately monitored and assessed for any signs of respiratory or circulatory distress and treated accordingly.
10. The animal is disentangled, marked or tagged (if safe to do so), sex and morphometrics are determined, data are recorded, the wound is cleaned and treated, and sedative reversals are administered if drugs are used. Euthanasia solutions should be kept nearby in case there is a need for euthanasia. Antibiotics may be used to treat injuries.
11. The animal is released, or if additional care is warranted, transported to a rehabilitation center or euthanized if the injury is too severe. If euthanized, the carcass is either necropsied on-site or transported to a necropsy facility for complete necropsy.
12. The entangling material should be retained (if possible), documented, and archived or sent to a NMFS gear repository.

13. The team conducts a thorough debrief and completes a thorough and fully documented report, which includes the required Level A and Human Interaction forms (*e.g.*, Appendix B – Level A and Human Interaction Form).
14. The gear is cleaned, packed, and organized for the next response.

Pinniped Entanglement Response Techniques – Physical On land

This section can to be used as a **stand-alone overview of how to safely respond and physically restrain entangled pinnipeds that are on land**.

Preparation

Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select a location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

24 - 72 hours prior to operation:

- Check weather forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, EMS or local hospital, Native communities (in Alaska), and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

Immediately prior to operation:

- Conduct safety briefing.
- Re-check weather forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations then make a final decision about response.

Training

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available.

Human/animal safety

Because of the inherent risks encountered during an entanglement response, methods used to capture and restrain an animal should minimize risk, stress, and pain to the animal while also ensuring the safety of both the animal and responders. A broad list of human and animal safety procedures can be found below.

Human safety

Equipment and personal protective equipment (PPE)

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All personnel must wear appropriate PPE and dress suitably for the weather conditions and have appropriate footwear.
- Pinniped restrainers, samplers, taggers, and others who may have physical contact with the animal should wear protective clothing and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.

- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing) and kneepads. Masks should be available for use at handler discretion, based on risk and environment.

Safety equipment

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- If vessels will be used to access animals on land, vessels should contain safety equipment that conforms to U.S. Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
    - A personal flotation device for each person on the vessel
    - Fire extinguisher(s)
    - Distress signals (flares, horn, etc.)
    - Navigation lights as appropriate

Operational safety

- Responders must meet minimum qualifications and training prior to conducting procedures.
- Assess the size, weight, and strength of the animal to determine how many people and what equipment would be needed to safely capture and secure it.
- Designated safety persons should be assigned to continually watch over all personnel involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated personnel should be watching for and warning team of hazards such as waves and other animals.
- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, unstable cliffs, ledges, working at height, working near water), and other animals in the area.

Predators/other wildlife

- Check for predators (*e.g.,* bears) or other organisms (*e.g.,* snakes) before operations and have a spotter during operations.

Report injuries, incidents, or PPE failures to the Safety Officer immediately.

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- Depending on the situation, the decision is made by the Incident Commander (IC) whether to continue or discontinue operations for the day.
- Appropriate response staff are trained in basic first aid and CPR. First aid kits, including tourniquets, water and saline for flushing, are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the implement safely when finished.

Presence of public or bystanders

- If capture is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure observing public are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

Animal safety

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

Temperature/weather

- Prevent potential thermoregulatory stress by considering and managing temperature, wind, sun, and shade. If animals become overheated, cool flippers and substrate under/around the animal with water. If the animal becomes too cold, hot water bottles, emergency blankets, or hot pads can be used to warm the animal.
- Limit handling of larger (and fatter) animals to periods of cooler ambient temperatures (*i.e.*, early morning, late afternoon, or when skies are overcast).

Minimize stress

- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.

- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal.

Environmental hazard assessment

- Prior to capture, survey the surroundings to identify any environmental hazards that might pose a threat to the animal.
- Consider the potential hazards to animals that may flush into the water, such as high surf, shark predation, or aggressive conspecifics.
- Ensure a safe and easy release path for the animal to transit once released from restraint.

Disturbance (other seals and wildlife)

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target and target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Reduce all forms of disturbance to the entangled animal and any nearby animals (*e.g.*, if animal is within a group) as much as possible by keeping noise and movement to a minimum, and avoiding bright colors that can be spotted easily and spook the animals into the sea.

Time limits

- Minimize herding and restraint time (for most handlings of unsedated Hawaiian monk seals, a maximum herding/restraint time of ≤10 minutes is recommended).

Restraint devices and capturing/restraining animals

- Where possible, approach or maneuver the capture team so that they will be closest to the animal and also able to cut off the quickest escape route(s) of the animal to the water.
- Beware of the animal’s proximity to the water and the potential of becoming submerged while held in the net.

- Never hold on to the entangling material as a form of capture or to slow the animal down, as the animal is likely to roll and spin, causing further injury and pain.
- When the animal is in hand, ensure it is secured suitably so that it is still able to breathe comfortably with the jaw held shut (*e.g.*, hoop net, towel) to reduce the risk of bite. Pinnipeds cannot breathe through a wet towel so ensure any towel used does not restrict breathing. A kinked neck or constricted airway can cause mortality during captures, and all animal handlers should clearly understand this hazard prior to the response.
- If not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal.
- Peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury. Double check to ensure all entangling material is removed.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

Team member roles

The capture and handling of pinnipeds has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the ICS as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this System. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 3-1).

Table 3-4. Suggested number of personnel needed to perform pinniped physical restraint – on land entanglement response. Responders can fulfil multiple roles and some roles are *optional.

Team member role	Number of suggested personnel
Incident Commander/Safety Officer	1-2
Animal herder(s)	1-12
Animal handler(s)/restrainer(s)	1-5
Data collection/documentation	1-2
Security/crowd control	variable
*Optional – Veterinarian/Veterinary Technician	1
*Optional - Communication Officer	1
*Optional – UAS pilot	1

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.*, IC and SO; documentation and data collection).

Incident Commander (IC) - The IC is responsible for the overall operation and the performance of the response and usually does not participate directly in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, the public, and animals.

- ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.

Safety Officer (SO) – The SO is responsible to continually watch over all personnel involved in a response and have the ability to communicate to the team and adjust the strategy of the response as needed.

- ***Qualifications*** – Experience in previous pinniped response, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, waves, other animals). Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.

Animal herders - The animal herders are responsible for safely herding the animal to a safe location for capture, ensuring responders are safe from animal bites and scratches and minimizing disturbance to other animals.

- ***Qualifications*** – Experience in previous pinniped response and safely herding pinnipeds.

Animal handlers/restrainers – The animal handlers/restrainers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential injury such as animal bites and scratches.

- ***Qualifications*** - Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement requires hands-on experience under the direct supervision of experienced response staff. This handling experience may occur in a rehabilitation hospital setting. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.

Data collector – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all marks, flipper and satellite-linked tag numbers are recorded, and all samples are properly recorded and labeled.

- ***Qualifications*** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.

Documentation – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.

- ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.

Security/crowd control – The IC should ensure that the proper authorities in the area have been notified of the response and the area is closed to public access during the response.

- ***Qualifications*** – Knowledge of proper authorities to notify.

Veterinarian (*optional) – The veterinarian is responsible for the health and monitoring of the entangled animal during capture and until the animal is safely released and on its own.

- ***Qualifications*** – A licensed Doctor of Veterinary Medicine (DVM) or equivalent who is EXPERIENCED in pinniped medicine.

Unmanned aerial system (UAS; *optional) - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing any disturbance to the target or other animals.

- ***Qualifications*** – a certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous pinniped field operations.

Communication Officer (*optional) – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response.

- ***Qualifications*** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

Environmental conditions

Create a risk assessment tool (Appendix C – Risk Factor Table) or decision matrix (Appendix D – Decision Matrix (Go/No Go)) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess the following environmental conditions prior to pinniped restraint on land:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold)
- Substrate (*e.g.*, slippery or sharp rocks, kelp, barnacles, coral, tide pools, cultural resources at risk)
- Location of the animal in relation to the surf zone
- Tide (*i.e.*, incoming tide, increased surf)
- Time of day (*i.e.*, response too close to sunset leading to activities occurring at night)
- Presence of other animals (*e.g.*, conspecifics or otherwise – brown bears, snakes, alligators, etc.)

Equipment

Data and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)

- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Binoculars

Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

Protective clothing

- Footwear appropriate for substrate
- Protective clothing (*e.g.*, coveralls, raingear, etc.)
- Non-permeable gloves (*e.g.*, nitrile or latex)
- Optional - eyewear, knee pads, cotton gloves, helmets

Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

Animal medical equipment

- Disentanglement instruments (*e.g.*, hemostats)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed

Cutting tools (*below*)

There are a variety of different cutting tools that can be used to cut entangling material. Always cut away from the body, the animal, and always peel the entanglement off of the neck. NEVER pull or slide the entanglement as it could cause further injury. When using a "hooked fixed pole knife" to cut an entanglement without restraining the animal, a stainless steel knife fabricated into a "V" shape with a threaded fitting that attaches to an aluminum or carbon fiber pole that can be extended by adding


Jim Rice, Oregon State University


Jim Rice, Oregon State University

sections, works well.

Capture/restraining gear and herding equipment

The equipment used for physical restraint of pinnipeds on land varies by species. Equipment may include but is not limited to: 1) crowding/herding boards, 2) kennels, 3) towels and/or blankets, 4) restraint boards, 5) hoop nets, 6) capture nets, 7) stretcher nets, 8) cages, and 9) shore pens.

Crowding/herding boards (*below*) – Used as a barrier to safely herd pinnipeds. Handles should be used to prevent injury. Boards can be constructed from plywood with integrated handles in the wood

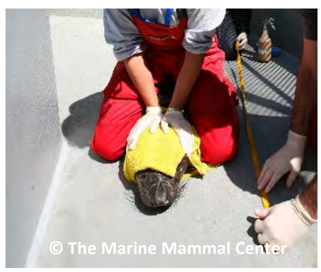

Oregon State University


Hawaiian monk seal research program, NOAA Fisheries

or handles on the back of the board. “Hog” herding boards also can be used and may be lighter and easier to maneuver.

Kennels (*below*) – For smaller pinnipeds up to ~ 5 feet. Kennels are appropriate for transport in small spaces such as helicopters, small airplanes, and small skiffs.

Towels/blankets (*below*) – Towels or blankets can be wrapped over the animal’s eyes and head to reduce stress. Do not “sit” on the animal. Provide gentle restraint with your knees and hands while



allowing the animal to breath. Keep the towel off of the nose or mouth.

Restraint boards (*below*) – Restraint boards are used to safely restrain a pinniped to remove an entanglement, take samples, etc. For example, the dimensions used for the restraint board for northern fur seals (shown below) is 50”L by 29” W by 11” H.

Hoop net (*right*) – To capture small seals or juvenile or adult female sea lions for safe handling on land. Fiberglass poles hold the net open and can be easily removed once an animal is inside the net. (*Note: do not use duct tape to secure hoop net poles together between uses; tape damages the poles*).

Capture net (*right*) – Custom designed pinniped capture nets such as those designed and made by Telaio (https://www.telaioclothing.com/sea-lion-capture-nets) are durable and lightweight, and can be custom-sized.

Stretcher nets (*right*) - Used to capture, restrain, and transport small animals. They have been used by the Hawaiian monk seal research program (HMSRP) for shallow water captures and can assist with controlling an animal that may be struggling in another type of net. Stretcher nets also are very useful for restraining small animals in boats.

Cages (*below*) – Cages are used to contain and transport seals and sea lions. Doors lift completely out and can be used as crowding/herding boards. The cage can be lifted by a team or by forklift and has bridle attachment points to be lifted by crane or helicopter. Placing a cage in shallow (<2 feet) water may aid a compromised animal with entry/ exit in conjunction with other tools such as crowding/herding boards. Three different cage sizes are pictured below.

Squeeze cage (*right*) – Larger pinnipeds can be herded into a squeeze cage to safely restrain them. They can then be manually sedated. *(Note: squeeze cages can cause injury and should only be used by personnel trained in their use*).

Capture cage (*below*) – The capture cage depicted below is a modified floating dock enclosed on four sides by a 2.8 m wide by 4 m long by 2.15 m high galvanized steel structure, with sliding doors on two sides. Once an entangled sea lion hauls out inside the cage, responders can use a boat to approach the open door of the cage, block, then securely close the door to keep the entangled animal inside. The sea lion can be sedated with a jab stick, the entanglement removed, and the sea lion released out through the door. For additional information see Wright *et al.* (2010).

Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant solution
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

Miscellaneous supplies

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)
- Line, bungie cords

Data Collection

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response. Data forms and instructions should be accessible during a response. Important forms to have accessible could include: applicable permits; Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form); gear checklists (Appendix E - Gear Checklist); and disentanglement forms (Appendix F – Disentanglement form). All entangling gear should be retained, documented on the Level A and Human Interaction Forms, and stored in a centralized location or sent to a NMFS gear repository.

Risks and Mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a risk analysis matrix should be completed to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough debrief with lessons learned that can be applied to the next response. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

This section outlines and assesses risks specific to physical restraint of pinnipeds on land and how to mitigate these risks.

RISKS TO HUMANS

Risk: *Injury or death to personnel by falling or stepping on hazards*

Mitigation:

- Appropriate personnel should investigate and decide if location is safe for herding.
- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Designated safety persons should be assigned to continually watch over all personnel involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated personnel should be watching for and warning the team of hazards such as waves and other animals.

Risk: *Injury to personnel from crowding/herding boards, pen panels, or nets*

Mitigation:

- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Herders should use crowding/herding boards with appropriate handles to avoid pinch points.
- Herders and net handlers should be trained to minimize injury to themselves and others and maintain an impenetrable barrier when near the animal and actively herding.
- All herding materials and nets should be inspected for hazards prior to use.

Risk: *Injury to personnel from pinniped bite or scratch*

Mitigation:

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as necessary.
- Personnel should be trained to minimize injury to themselves and to maintain an impenetrable barrier when near the animal and actively herding.
- Personnel should consider connecting panels together as necessary before approaching an animal.
- Personnel should be trained in proper restraint techniques to minimize bite risk.

RISKS TO ANIMALS

Risk: *Injury to animal from crowding/herding boards, pen panels, nets, and/or from animal having to haul itself out, especially if the animal is trailing fishing gear*

Mitigation:

- Conduct proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Consider cutting any foreign attachments to the animal before or during crowding to reduce injury to the animal.
- Herders should be trained in the use of crowding/herding boards and the animal should be herded in a slow and controlled manner towards a good capture/holding area using the safest route possible.
- The designated SO should continually communicate to the team to adjust strategy or call off the effort as necessary.
- Use an adequate number of personnel to increase safety.
- Evaluate medical care capacity (*i.e.,* emergency resuscitation, rehabilitation, euthanasia) prior to capture.

Risk: *Injury to animal from nearby objects*

Mitigation:

- Hazards in the area should be identified and removed or mitigated by experienced personnel.
- If a hazard cannot be removed, it may be mitigated by assigning someone to guard it with a crowding board or pad.
- Conduct proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.,* emergency resuscitation, rehabilitation, euthanasia) prior to capture.

Risk: *Unintentional capture or disturbance of non-target animals*

Mitigation:

- Evaluate the possibility of unintentional capture of non-target animals before and during capture.
- Complete appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals.
- Always consider efforts to minimize disturbance to non-target animals.
- Designated personnel should continuously watch for the presence of non-target animals in and around the capture area throughout the response, and communicate with the team appropriately.

Risk: *Animal fatality*

Mitigation:

- Personnel should be trained in techniques that minimize injury to animals.
- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.
- Entanglement response activities should immediately cease until necropsy is completed and new mitigation measures are approved by NMFS.

Intervention Criteria/Decision Matrix (go/no go)

A risk assessment tool (Appendix C – Risk Factor Table) or decision matrix (Appendix D – Decision Matrix (Go/No Go)) should always be used prior to any response. For a land response, factors that should be considered include environmental conditions, team selection and fitness, pinniped selection and condition, permission, resources, and mission complexity.

Procedure

Optimal capture situation

- Animal is on the beach without any hazards nearby
- Solitary
- Sleeping – the element of surprise can be advantageous
- Animal is lying on its ventrum
- Away from the water's edge – animals will attempt to flee into the water, become slippery to handle when wet, and the water may pose a drowning risk
- Facing inland and uphill if beach is sloped – it is more difficult for a seal to move uphill than downhill

Animal capture and restraint

1. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals will be noted.
2. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should

be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.

3. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a capture should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure all personnel and equipment are ready and perform the final Go/No Go determination.
5. **Modify protective clothing and personal effects to minimize getting caught in net during handling event:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons (even pant cuffs) and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The photographer/videographer will ensure all photo and video equipment is operational and recording.
7. **Time limits:** Record the time of day, herding, and restraint time (from when the animal is first touched until released).
8. **Approach:** The team will get into position, approach quietly and calmly, and capture the entangled animal using appropriate equipment (hoop net, etc. – see restraint section below). To improve capture success, care should be taken to quietly approach the target animal from downwind and out of the animal's field of view. Some or all of the capture team should be between the animal and the water, to block its escape route.

9. **Capture:** Upon capture, controlling the animal's head is the most critical part of the restraint. Once the animal is in a hoop net, the best way to control the head is by holding the net on either side of the head at the base of the skull. When there is more than one restrainer, the order of restrainers getting on the animal is from the head to the tail, and in reverse order when the animal is released. **Use minimum amount of body weight, never your full weight, to restrain the animal.** Do not stand or kneel on the animal's flippers.

10. **Restraint:** Confirm that the restrainers have control over the animal before conducting any procedures on the animal. Typically an animal does not struggle the entire time under restraint, and will often take a deep breath just prior to struggling.

The head restrainer monitors the animal's breathing and response level. Animals may lift their heads abruptly so beware. When sampling, tagging, etc., the person performing these activities quietly states what procedure is next so the restrainers can prepare for the animal's reaction. Restraining with a net: When restraining with a net, watch that the animal's foreflippers and teeth are not caught in the mesh and that the head is not at an unnatural angle. Adjust as necessary. Use care that the handling team's fingers do not get caught in the netting. Animals may still roll while in a net, but the net does provide some control over the animal.

Stretcher net: Stretcher nets can be used for restraining and/or moving smaller animals. To capture, one restrainer holds the poles at each end of the net, then both restrainers simultaneously lay the net over the animal so the end of the netting is a minimum of 1-1.5' past the nose of the animal. This provides a buffer in case the animal moves forward in the net. Typically the person closest to the animal's head will then straddle the animal, holding the animal's head and using her/his knees and lower legs to hold the side poles of the net against the animal's body. Check that the foreflippers do not get bent along the net poles. Once the animal is under control, the net may then be moved up towards the animal's head so the hindflippers and more posterior body can more easily be accessed for tagging or other procedures.

To move an animal in a stretcher net, two people hold the ends of the poles and place it over the animal as described above and in one motion the animal is rolled onto its side and the poles brought together. The lines of rope woven through each end of the netting are then cinched so the animal's head and hindflippers are held in the net. The ends of these lines can then be wrapped around the poles to secure the poles together. The animal can then be carried by two people.

Hoop net restraint: One person, typically the head restrainer, holds the large open end of the net and pulls the net over the animal's head and down its body. To facilitate capture, another person may assist by stretching out the end of the net so it does not collapse closed and assist in pulling the net over the animal. Once inside the net the handling team restrains the animal (the head restrainer on first), the two fiberglass poles that hold open the net can be pulled out of the net to avoid injury to the animal and the team if the animal struggles. To prevent the animal's muzzle from being tight against the end of the net, either manually restrain the animal before it reaches the end of the net, or tie off about one foot of the narrow end of the net with

a quick release knot so that once the animal is in the net, the line can be removed and the net will become longer, giving the animal's muzzle more space. To release the animal from the net, one to two people pull the net forward towards the animal's head and off its body.

11. **Monitoring and assessment:** The animal should be immediately assessed for any signs of respiratory or circulatory distress and treated accordingly. Ensure the animal's muzzle is not tight against the end of the net or buried in the sand or its flippers are bent out of alignment. For most restraints, the front restrainers are responsible for monitoring the animal's level of alertness and respirations throughout the restraint period. It is important to make sure that chest expansion is occurring with each breath. The entire team should be notified if the animal's vitals start to change. The animal's breathing pattern will probably be somewhat irregular, and it may breath-hold or only breathe through one nostril, so vigilance is key. Either a sudden change in breathing pattern, whether an increase or decrease, or a decrease in responsiveness to stimuli raises concern. Check the animal's eyes to see if they are responsive (*i.e.*, is the animal looking around, does it respond to your hand or something that you move into its field of view?). Tap its head gently behind the eye with your finger. If it doesn't show some response or its response is slow and the animal does not appear to be attentive, then abandon the procedure, stimulate the animal and/or add cool water and immediately, release the animal and monitor it. Responders should be conservative in decision-making and err on the side of caution.

12. **Data collection:** Morphometrics, sex, and if appropriate, samples, should be taken and all data recorded completely on Level A and Human Interaction Forms, and any other necessary capture forms.

13. **Disentanglement:** Using an appropriate cutting tool (*e.g.*, knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.

14. **Wound care:** The wound is investigated to assess the extent of tissue damage and to ensure that all foreign material has been removed. The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept nearby in case there is a need for euthanasia. In the case of a severe wound and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.

15. **Marking and tagging:** Temporary (*e.g.*, hair dye, paint stick) identifying marks or tags (flipper and/or satellite-linked) can be applied for more visible and long-term identification.

16. **Releasing the animal:** If appropriate, pour water on the animal's hindflippers to cool it down just prior to release. Confirm that the animal has a safe and clear escape route. The head restrainer directs the release, and the restrainer closest to the animal's tail is the first off after the head restrainer gives the okay, followed in order up to the head restrainer who is last off. During release, each restrainer quietly says when they are off the animal, so the next restrainer knows when to get off. All handling and other gear is collected, and the team quickly leaves the area. Always monitor the animal post-release from a distance for at least 10 minutes (or until the animal swims away), while keeping a low profile, particularly for non-pups, as older

animals may become more easily stressed from handling. (*Note: weaned Hawaiian monk seal pups may approach the team post-release, so quickly leave the area*). Most animals go into the water shortly after release.

17. **Post-recovery:** After recovery, the animal should be either released or if additional monitoring or rehabilitation is required, transported to a rehabilitation center.

18. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.

19. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, coveralls, footwear, kneepads, cloth cloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including restraining nets, measuring gear (*e.g.*, tape measures and scales), tagging supplies (*e.g.*, tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a “SHARPS” container (do not recap needles).

20. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.

21. **Prepare again:** Clean and organize gear so it is ready for future use.

Pinniped Entanglement Response Techniques - Physical In-water

Preparation

This section can to be used as a **stand-alone overview of how to safely respond and physically restrain entangled pinnipeds that are in the water**.

Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select a location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles and vessels (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

24– 72 hours prior to operation:

- Check weather forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, Emergency Medical Services (EMS) or local hospital, and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

Immediately prior to operation:

- Conduct safety briefing.
- Re-check weather forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions and time of day allow for safe operations and make a final decision about response.

Training

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. All in-water entanglement response must be conducted under a MMHSRP or research permit. Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Additionally, personnel must be trained in small boat operations, have experience operating boats while pinnipeds and nets are in the water, and have experience handling and tending nets in the water. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available.

Human/animal safety

Human safety

Equipment and Personal Protective Equipment (PPE)

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All personnel must be wearing appropriate PPE, dress suitably for the weather conditions, carry a line cutter, and personnel handling the net should wear protective gloves when feasible.
- Pinniped restrainers, taggers, and others who may have physical contact with the animal should wear protective clothing and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.

- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing), kneepads, and helmets as necessary. Masks should be available for use at handler discretion, based on risk and environment.

Safety equipment

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- Safety equipment for vessels should conform to U.S. Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
  - A personal flotation device for each person on the vessel
  - Fire extinguisher(s)
  - Distress signals (flares, horn, etc.)
  - Navigation lights as appropriate

Operational safety

- Float plans should list an assigned point of contact (POC) on land and boat logs should be filled out for each vessel.
- Responses should not be conducted in poor weather or sea conditions.
- Ensure that there are enough personnel to lift nets or animals. Use mechanical lifts when possible. Rotate personnel if needed.
- If vessels are used for in-water captures, a minimum of two boats is required.
- Have appropriate two-way marine radios or other communication devices so boats and the shore team can coordinate in real-time.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, currents, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, surf, submerged hazards), and other animals in the area.

Net or capture pole handling

- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Communicate with the boat operator and other net/pole handlers.
- Have dedicated net observers in case target animal or incidental animal(s) get entangled in the net.

Predators/other wildlife

- Check for predators (*e.g.,* sharks, killer whales, alligators) or other marine organisms (*e.g.,* stingrays, jellies) before operations and have a spotter during water operations, including checking the net for incidentally entangled sharks, or other marine wildlife.

Report injuries, incidents, or PPE failures to the Safety Officer immediately

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- If treatment is needed or the person(s) involved need to be transported to land or mother ship, a boat with a team member should break away for transport and assistance.
- Appropriate responders should be trained in basic first aid and CPR. First aid kits, including tourniquets, water and saline for flushing, should be readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the implement safely when finished.
- Depending on the situation, the decision is made by the Incident Commander (IC) whether to continue or discontinue operations for the day.

Presence of public or bystanders

- If the capture is in a public area, ensure that there is sufficient crowd control and outreach.
- Ensure observing public are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

Animal safety

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

Temperature/weather

- Prevent potential thermoregulatory stress by considering and managing temperature.

Minimize stress/time limits

- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of pursuit (if any), restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.
- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal.

Environmental hazard assessment

- Prior to capture, survey the surroundings to identify any environmental hazards or predators (sharks, aggressive conspecifics, killer whales) that might pose a threat to the animal.

Disturbance (other pinnipeds or wildlife)

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint or darting of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Consider the potential effects of response to non-entangled animals and/or species within the response areas and take precautions to minimize disturbance.
- Reduce all forms of disturbance to the entangled animal and any others close by (*e.g.*, if it is within a group) as much as possible by keeping noise and movement to a minimum.

Restraint devices and capturing/restraining animals

- Never hold on to the entangling material as a form of capture or to slow the animal down, as the animal is likely to roll and spin, causing further injury and pain.
- When the animal is captured, ensure it is secured appropriately so that it is still able to breathe comfortably. A kinked neck or constricted airway can cause mortality during captures, and all animal handlers should clearly understand this hazard prior to the response.

- Once captured, if not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal. Always cut away from the animal and peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

Team member roles

The capture and handling of pinnipeds has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the Incident Command System as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this System. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 4-1).

Table 4-5. Suggested number of personnel needed for a physical restraint – in water entanglement response. Responders can fulfill multiple roles and some roles are *optional.

Team member role	Number of suggested personnel
Incident Commander/Safety Officer	1-2
*Optional – Veterinarian/Veterinary Technician	1-2
Animal herders	2-12
Net handlers	3-6

Animal handler(s)/restrainer(s)	1-5
Boat or jet ski operator(s)	2-3
Data collection/documentation	1-2
Security/crowd control	variable
*Optional - Communication Officer	1
*Optional – UAS pilot	1

Specific team member roles and qualifications for each role are listed below. In some circumstances, roles can be combined (*i.e.*, IC and SO; documentation and data collection).

Incident Commander (IC) - The IC is responsible for the overall operation and the performance of the response and does not generally participate directly in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, the public, and animals.

- ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.

Safety Officer (SO) – The SO is responsible to continually watch over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed. The role of IC and SO can be performed by one person if necessary.

- ***Qualifications*** – Experience in previous pinniped responses, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, waves, other animals). Willingness to stop operations if there is a safety concern, despite momentum (or pressure) to move forward.

Veterinarian (*optional) – The licensed veterinarian is responsible for the health and monitoring of the entangled animal and any unintentionally entangled or injured animals during capture operations until the animal is safely released and on its own.

- ***Qualifications*** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent who is EXPERIENCED in pinniped medicine.

Animal herders - The animal herders are responsible for herding the animal to a safe location for capture, ensuring responders are safe from animal bites and scratches.

- ***Qualifications*** – Experience in previous pinniped response and safely herding pinnipeds.

Net handlers – The net handlers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential injury such as animal bites and scratches.

- ***Qualifications*** – Net handlers must be trained in safe capture by experienced personnel. Advancement requires hands-on experience under the direct supervision of experienced response staff. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.

Animal handlers/restrainers – The animal handlers/restrainers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential injury such as animal bites and scratches.

- ***Qualifications*** – Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement requires hands-on experience under the direct supervision of experienced response staff. This handling experience may occur in a rehabilitation hospital setting. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.

Boat, kayak, or Jet Ski operator – For water captures, the boat operators are an essential component to a successful operation. The boat operators are responsible for ensuring that the boats are in the proper placement for capture, that the boat can be safely maneuvered around animal(s) in the water, and that the vessel can be safely handled in all types of weather and sea state conditions such as inclement weather, currents, tides, kelp, wind, surrounding vessel traffic, etc. Boat operators should be experienced with animal approaches, capture methods, and translocation of animals in the boat and alongside the boat.

- ***Qualifications*** - U.S. Coast Guard boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with pinnipeds in or around the boat. Experience maneuvering in tight spaces, ability to remain calm under pressure, and remain focused under potentially hectic circumstances.

Data collector – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all marks, flipper and satellite-linked tag numbers are recorded, and all samples are properly recorded and labeled.

- ***Qualifications*** – Familiarity with data sheet and information to be recorded, attention to detail, and ability to accurately record data legibly.

Documentation – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.

- ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.

Security/crowd control – The IC should ensure that the proper authorities in the area have been notified of the response and, if possible, the area is closed to public access during the response.

- ***Qualifications*** – Knowledge of proper authorities to notify.

Unmanned aerial system (UAS; *optional) - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing disturbance to the target or other animals.

- ***Qualifications*** – A certified pilot's license, a permit to operate during a capture, follow all existing FAA and other regulations, and experience operating a UAS during previous pinniped field operations.

Communication Officer (*optional) – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response. For high profile cases or cases conducted under the permit, messages should be coordinated with all participating organizations and cleared with NMFS.

- ***Qualifications*** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

Environmental conditions

Create a risk assessment tool (Appendix C – Risk Factor Table) or decision matrix (Appendix D – Decision Matrix (Go/No Go)) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess the following environmental conditions prior to pinniped in-water capture:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold)
- Substrate (*e.g.*, slippery or sharp rocks, kelp, barnacles, coral, tide pools, cultural resources at risk, rocks or reef near haul-out that could affect ability to maneuver capture vessel, ice)
- Submerged hazards (*e.g.*, sand bars, coral reefs, sunken debris, crab pots, aquaculture, oyster bars, etc.) and emergent (*e.g.*, pilings, docks, jetties, etc.) hazards
- Location of the animal in relation to the surf zone
- Tide (*i.e.*, incoming tide, increased surf)
- Time of day (*i.e.*, response too close to sunset leading to activities occurring at night)
- Conspecifics (*i.e.*, other animals in the area)
- Predators (*e.g.*, sharks, killer whales, alligators) and other hazardous wildlife (*e.g.*, stingrays, jellies, etc.)

Equipment

Data and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Binoculars

Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

Protective clothing

- Footwear appropriate for substrate
- Protective clothing (*e.g.*, wetsuits, coveralls, etc.)
- Non-permeable gloves (*e.g.*, nitrile or latex)
- Optional - eyewear, knee pads, cotton or Kevlar gloves, helmet as necessary

Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

Animal medical equipment

- Disentanglement instruments (*e.g.*, hemostats)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed.

Cutting tools (*below*)

There are a variety of different cutting tools that can be used to cut entangling material. Always cut away from the body and always peel the entanglement off of the neck. NEVER pull the entanglement as it could cause further injury. When using a "hooked fixed pole knife" to cut an entanglement without restraining the animal, a stainless steel knife fabricated into a "V" shape with a threaded fitting that

attaches to an aluminum or carbon fiber pole that can be extended by adding sections works well (see photo below).

Capture/restraining gear and herding equipment

Equipment used for physical restraint of pinnipeds in water varies by species. Equipment may include, but is not limited to: 1) crowding/herding boards, 2) kennels, 3) floating mats, 4) stretcher nets, 5) beach or seine net, 6) hoop nets, 7) cargo nets, 8) scoop net, 9) nearshore shark net, and 10) small boat transport, 11) Jet Ski, and more.

Crowding/herding boards (*right*) – Used as a barrier to safely herd animals in shallow water. Handles should be used to prevent injuries. Playpen panels should be considered as they move through water easier.

Kennels (*right*) – For smaller pinnipeds up to ~ 5 feet. Kennels are appropriate for transport in small spaces such as helicopters, small airplanes, and small skiffs.

Floating haulout mat (*right*) – Can be used as a flat surface or closed to contain an animal. Can be paddled by a person in good conditions or towed by boat. Adding material to close ends may be considered. When opened, the mat can float an animal in a stretcher or other net and 3-4 persons.

Stretcher nets (*below*) - Used to capture, restrain, and transport small animals. They have been used by the *Hawaiian monk seal research program* (HMSRP) for shallow water captures and can assist with controlling an animal that may be struggling in another type of net. Stretcher nets also are very useful f[illegible]ts.

Beach seine net for harbor seal captures (*below*) – Capture net is approximately 120 m to 170 m in length, formed of five to seven panels, each approximately 24 m long by 8 m deep. Netting can be

either 20 cm or 30 cm stretch mesh #36 nylon, dyed green. Paired floats are spaced every 1 m on the floatline, and the leadline contains 454 g of lead every 2 m (Jeffries *et al.* 1993). Two boats are used for this method, the lead boat carries the capture net on a platform set above the transom and the outboard motor (Jeffries *et al.* 1993). **Tools – seine net, knives, two open deck boats, hoop nets.** *Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require specialized training.*

<u>Hoop nets</u> (*right*) – Hoop nets consist of 5-cm diameter rubber hose formed into a 1 m diameter circle to which is attached a 2 m long bag formed of 2.5 cm stretch knotless nylon mesh. The nylon mesh is drawn together at the end to form a bag, but could be untied if the animal needs to be released through the closed end. The flexible hose of the hoop net can be bent backward to expose the posterior portion of the harbor seal.

Beach or seine net (*below*) – May be appropriate for use in shallow, near shore waters, an approximately 36 m by 6 m beach seine net creates a barrier around an animal while bringing it towards the shore for capture. For in-water capture, the net, with a weighted bottom and floating top, should be deployed via wading or by vessel around the ocean side of the animal and pulled in toward the shoreline from the ends (Jeffries *et al.* 1993). Attaching a containment boom, or similar, to a beach seine net may improve its effectiveness in keeping an animal from breaching over the top of the net. Avoid one-inch mesh because it is heavy and catches current. Beach sets may require people in the water to remove substrate snags and keep an animal from jumping over the top or diving under the net (HMSRP). **Tools**

– seine net, snorkel gear, knives, crowding/herding boards, Jet Ski, kayak, two small boats. *Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require specialized training.*

Cargo net (*not pictured*) – An approximately 8 m by 5 m lightweight polyethylene net composed of 5 cm mesh works well for a "scoop net" application (*Note: 10 cm mesh size may be too big and cause injury to animal*). Small weights may be needed to offset positive buoyancy of the net.

Scoop net (*below*) – The scoop net is a 3 m by 4.5 m flat, circle, square or similar net with minimal attachments meant to be handled at the perimeter by a team and placed under an animal on or near the substrate for the animal to swim over it before the edges are lifted and the animal is contained

(HMSRP). **Tools - scoop net, clip-on weights and floats, extra line, snorkel gear, knives, Jet Ski, kayak, small boat, fenders.**

Nearshore Shark Net (*below*) – Set as a compact tube prior to an animal being in position, the shark net sits weighted on the substrate inconspicuously until deployed via scuba tank releasing the floating tube and capturing the animal. This has not been used in recent efforts to disentangle pinnipeds, but may be an option for further expansion in the future.



Small Boat Transport (*right*) – Small boats including rigid hull inflatable boats, inflatables, and Whalers are useful in transporting animals. Animals must be contained in a net or a carrier.

Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant solution
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

Miscellaneous supplies

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

Data collection

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response program and data forms and instructions are accessible during a response. Important forms to have accessible could include: applicable permits; Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form); gear checklists (Appendix E - Gear Checklist); and disentanglement forms (Appendix F – Disentanglement form); All entangling gear should be retained, documented on the Level A and Human Interaction Form, and stored in a centralized location or sent to a NMFS gear repository.

Risks and Mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough de-brief and come up with lessons learned that can be applied to the next response. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

RISKS TO HUMANS

Risk: *Injury or death to personnel by drowning, falling or stepping on hazards*

***Mitigation*:**

- Appropriate personnel should investigate and decide if location is safe for herding.
- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, PFDs, and helmets as necessary.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards.

Risk: *Injury to personnel from crowding/herding boards, pen panels, or nets*

***Mitigation*:**

- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, PFDs and helmets as necessary.
- Herders should use crowding/herding boards with appropriate handles to avoid pinch points.
- Herders and net handlers should be trained in techniques that minimize injury to themselves and others during in-water capture and herders should maintain an impenetrable barrier when near an animal and actively herding.
- All herding materials and nets should be inspected for hazards prior to use.

Risk: *Injury to personnel from pinniped bite or scratch*

***Mitigation*:**

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and PFDs.
- Personnel should be trained and maintain an impenetrable barrier when near an animal and actively herding.
- Personnel should use crowding/herding boards and pen panels in a manner that the animal cannot reach through gaps.
- Personnel should consider connecting panels together as necessary before approaching an animal.

RISKS TO ANIMALS

Risk: *Injury to an animal from crowding/herding boards, pen panels, nets, and/or from an animal having to haul itself out, especially if the animal is trailing fishing gear*

***Mitigation*:**

- Conduct proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Consider cutting any foreign attachments to the animal before or during crowding to reduce injury to the animal.
- Herders should be trained to use crowding/herding boards, and the animal should be herded in a slow and controlled manner towards a good capture/holding area using the safest route possible.

- Personnel should be trained in techniques that minimize injury to the animal.
- Use an adequate number of personnel to increase safety.
- Evaluate medical care capacity (*i.e.,* emergency resuscitation, rehabilitation, euthanasia) should be evaluated prior to capture.

Risk: *Injury to animals from nearby objects*

***Mitigation*:**

- Hazards in the area should be identified and removed or mitigated by experienced personnel.
- If a hazard cannot be removed, it should be mitigated by assigning someone to guard it with a crowding board or pad.
- Conduct proper evaluation of existing animal injuries, and potential for further injuries before any capture attempt.
- Evaluate medical care capacity (*i.e.,* emergency resuscitation, rehabilitation, euthanasia) prior to capture.

Risk: *Unintentional capture or disturbance of non-entangled animals*

***Mitigation*:**

- Evaluate the possibility of unintentional take of non-entangled animals before and during capture.
- Complete appropriate take approval and documentation.
- Always consider efforts to minimize disturbance to non-entangled animals.
- Designated personnel should continuously watch for the presence of non-entangled protected species in and around the capture area, and communicate with the team appropriately.

Risk: *Animal fatality*

***Mitigation*:**

- Personnel should be trained in techniques that minimize injury to an animal.
- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.
- Entanglement response activities should immediately cease until the necropsy is completed and new mitigation measures are approved by NMFS.

Intervention Criteria/Decision Matrix (Go/No Go)

A risk intervention tool (*e.g.*, Appendix C – Risk Factor Table) or decision matrix (*e.g.*, Appendix D – Decision Matrix (Go/No Go)) should always be used prior to any response. For an in-water physical restraint response, factors that should be considered include environmental, team selection and fitness, pinniped selection and condition, permission, resources, and mission complexity.

Procedure

Optimal capture situation

- Solitary
- Calm or resting

Animal capture and restraint

1. **Identify candidate animal:** The entangled animal should be identified, and its position, size, age and sex (if possible to determine), and placement among other animals should be noted.
2. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
3. **Secure the area:** If necessary, onlookers should be notified and asked to clear the area.
4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a capture should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm team members fully understand, are capable, and are mentally prepared. Review animal warning signs and the appropriate emergency response actions. The IC should ensure all personnel and equipment are ready and perform the final Go/No Go determination.
5. **Modify protective clothing to minimize getting caught in a net during a handling event:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons (even pant cuffs) and modify as appropriate to reduce entanglement/tripping risks.

6. **Documentation:** The photographer/videographer should ensure all photo and video equipment is operational and recording.
7. **Time limits:** Record the time of day, and total capture and restraint time (from when the animal is first touched until released).
8. **Approach:** The team should get into position, approach and capture the entangled animal.
9. **Capture (see below):**

<u>Herding to shore</u>

A barrier should be deployed on the ocean side of an animal and drawn in, bringing the animal to the beach. Crowding/herding boards are normally used for herding. Other options are playpen panels, fencing material or large objects such as plywood, kayaks, or other types of boards or small nets. Deployment of the barrier may be easiest by wading if the water depth, conditions, and substrate are suitable. (*Note: crowding/herding boards will require constant communication and teamwork among responders to create a barrier without gaps*). A capture technique analysis matrix (Table 4-2) can help guide decisions about which capture technique to employ when used in conjunction with the risk factor table.

Tools - crowding/herding boards, playpen panels, cage, stretcher net, beach seine net, kayak, other boards.

<u>Beach Seine Net</u>

Beach seine nets are meant for use in shallow, nearshore waters. Sections of approximately 15-30 m could be connected to increase length if necessary. Similar to shallow water herding, beach seine nets create a barrier around the animal while bringing it towards the shore for capture.

Example - Seal in-water capture: (*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training*). The net should be deployed via wading or vessel around the ocean side of the seal similar to that described in Jeffries et al (1993) and pulled in to the shoreline from the ends. A weighted bottom and floating top are usually helpful. Vertical poles/bars may be attached to the net at intervals to keep it open. Straps, Velcro, or bungees may be used during deployment to hold the net together to keep the weighted bottom from snagging substrate. Using many people spaced out along the net should help to deal with snags on the substrate and hold the top of the net above the surface to keep the animal from breaching the top. People comfortable in the water should be considered for these tasks. They should be equipped with masks and knives to be able to untangle or cut the net from the substrate if caught. Attaching a containment boom or similar to a beach seine net may improve its effectiveness in keeping a seal from breaching over the top of the net.

Tools – beach seine net, snorkel gear, knives, crowding/herding boards, Jet Ski, kayak, small boat.

Example - harbor seal beach seine net capture (based on Jeffries *et al.* 1993): (*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training*). The lead boat, carrying the capture net on a platform set above the transom and the outboard motor, slowly approaches the seals resting onshore, eventually attaining a maximum speed of approximately 20 knots as the seals start to enter the water. Within 20 m of the haulout site and 10 m offshore, a 0.5 m diameter float attached to one end of the capture net is thrown toward shore, then makes an arc in front of the haulout. (*Note: Careful stacking of the capture net allows for rapid deployment*). The first boat lands ashore with approximate 7-10 m of net remaining on the platform. The team members in the second boat recover the float, and pull it to shore on the opposite side of the haulout. Both ends of the capture net should be onshore within two minutes. Each end is then pulled along shore keeping the lead line on the bottom, until the net with the seal(s) is ashore. Seals are individually removed from the capture net, placed headfirst in individual hoop nets, then physically restrained.

Tools – beach seine net, buoy, knives, hoop nets, two boats.

<u>Scoop Net</u>

(*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training*). The scoop net is a flat, circle, square, or similar net with minimal attachments handled at the perimeter by a team. The scoop net is placed under an animal or set on or near the substrate for the animal to swim over it before the edges are lifted and the animal is contained. It can be used in conjunction with herding an animal over the scoop net, or with a large containment net set around the area first. Due to its simplicity, it can be adapted to be set by divers or from a vessel or a combination. Weights, floats, carabineers or line can be added anywhere on the net to increase the chance of success. The scoop net can be used delicately on an injured animal by controlling net tautness and how high the perimeter is lifted. It can be used to contain and then safely transport the animal to the shore or a boat while supporting the animal at the surface and allowing it some freedom of movement. It could be used to lift or parbuckle an animal into a boat by itself or in conjunction with a floating mat, straps, tarp, backboard, stretcher net, or similar tool. This technique requires a sufficient number of people distributed around the perimeter of the net to keep it from dipping below the surface and allowing an animal to escape. If the animal is relatively alert and wary of the net, and the people manipulating the net, a smaller team of 3-6 people could attempt the initial approach while other net handlers stand by. Efforts to avoid scaring the animal should be made by all net handlers. A scoop net may be handled from boats controlling the perimeter and eventually lifting an animal into a boat or driving/floating an animal to the shore. This makes it easier for handlers to keep the net perimeter above the animal and pull the net in with control.

Tools – scoop net, clip-on weights and floats, extra line, snorkel gear, knives, Jet Ski, kayak, small boat, fenders.

Nearshore Shark Net (*i.e.*, surprise net)

(*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training*). The surprise net is approximately 30 m long by 3.6 m deep with a floating top and a chain weighted bottom. It is designed to be set while contained in a nylon strip fastened with Velcro that releases when an air tube is inflated via scuba tank. The air tube is connected to the top of the net and the chain and nylon strip are connected to the bottom of the net. Its main advantage is its ability to be set prior to an animal entering an area. Once an animal enters the area, the net can be fully deployed in ~12 seconds.

Tools – Surprise net, full scuba tank, regulator, extra line, snorkel gear, knives, Jet Ski, kayak, small boat, fenders.

Purse Seine Net

(*Note: All in-water entanglement responses must be conducted under a MMHSRP or research permit and boat drivers and net handlers require special training*). For use in deep water, the purse seine net should be deployed off the side of a boat circling the animal. Once the circle is complete and the ends of the net are connected, the bottom can be cinched closed. The net and animal can then be hauled onto a boat. If large enough, a purse seine net can be deployed without the animal's awareness, or at least while maintaining a distance from the animal so as not to scare it. The net should be cinched shut while the animal is at the surface to avoid alarming the animal and having it escape out of the open bottom. It could also be used to set around an animal as an initial containment net before attempting other techniques and tools.

Tools – purse seine net, snorkel gear, knives, crowding/herding boards, Jet Ski, kayak.

Parbuckle animal onto boat or haul-out mat

The parbuckle technique could be used to roll a heavy animal into a boat. The animal must be secured alongside a small boat with a low gunwale. Lines, straps, or net (possibly the capture net itself) should be secured to the boat and wrapped under the animal then pulled up and towards the boat while rolling the animal into the boat. If this is not possible, a floating haul out mat could be employed along with the parbuckle technique to achieve similar results. Once the animal is secure on the mat, it can be towed to shore. This is most likely to be used after the animal is contained and under control with another technique. Sliding an animal head or tail first onto the mat may also be considered, depending on the size and mobility of the animal. It is important to consider the boat platform when attempting this technique. The uneven weight distribution of the animal and responders in the vessel may make the boat unstable and proper precautions should be taken to avoid capsizing.

Table 4-6. Capture technique analysis matrix – This guide can be used to aid in a decision about which capture technique to employ when used in conjunction with the risk factor table.

Capture technique	Animal's condition
1 = Ideal 5 = No-go	**Entangled**
Herding to shore	1
Beach Seine Net	1
Snare Net	2
Parbuckle	4

Purse Seine Net	3

10. **Restraint:** Once the animal has been captured in the water and brought to shore, it should be restrained to remove the entangling material. First, confirm that the restrainers have control of the animal before conducting any procedures. Controlling the animal's head is the most critical part of the restraint. Once the animal is in a hoop net, the best way to control the head is by holding the net on either side of the head at the base of the skull. When there is more than one restrainer, the order of restrainers getting on the animal is from the head to the tail, and in reverse order when the animal is released. Use minimum amount of body weight, never your full weight, to restrain the animal. Do not stand or kneel on the animal's flippers. When sampling, tagging, etc., the person performing these activities quietly states what procedure is next so the restrainers can prepare for the animal's reaction.

<u>Restraining with a net</u>: When restraining with a net, watch that the animal's foreflippers and teeth are not caught in the mesh and that the head is not at an unnatural angle. Adjust as necessary. Use care that the handling team's fingers do not get caught in the netting. Animals may still roll while in a net, but the net does provide some control over the animal.

<u>Small boat transport</u>: Small boats such as rigid hull inflatable boats (RHIBs), inflatables, and whalers are useful in transporting animals. Once an animal is secure in a net, backboard, mat, or kennel, it can be secured on a small boat and driven to shore for treatment or transport. Inside the boat animals may be secured against the gunwale or other object to avoid excess movement. As with any transport, one person, usually the veterinarian or veterinary technician, should devote their attention to the animal and monitor it constantly. Animals should not be transported in any vessel through a surf zone or in rough conditions where there is a possibility of capsizing because of the risk of the animal drowning if contained in a net or cage. If an animal cannot be lifted into a boat, it may be necessary to rig it so that it can be safely towed slowly alongside. Two boats can be used together to transport an animal contained within a net in the water. Fenders or ridged poles may be used to maintain a safe space between the boats.

11. **Monitoring and assessment:** The animal is immediately assessed for any signs of respiratory or circulatory distress and if found, treated accordingly. The respiration rate, heart rate, and body temperature should be continually monitored. The animal's breathing pattern may be somewhat irregular, and it may only breathe through one nostril. However, if there is a sudden change in breathing pattern, either a rapid increase or sudden decrease, this raises concern. Check the animal's eyes to see if they are responsive (*i.e.*, is the animal looking around, does it respond to your hand or something that you move into its field of view?) Tap its head gently behind the eye with your finger. If it does not show some response or its response is slow and the animal does not appear to be attentive, then abandon the procedure, stimulate the animal and/or add cool water, and immediately, release the animal and monitor it. Be conservative in your decision-making and err on the side of caution.
12. **Data collection:** Morphometrics, sex, and if appropriate, samples, should be taken and all data recorded completely on Level A and Human Interaction Forms, and any other necessary capture forms.
13. **Disentanglement:** Using an appropriate cutting tool (*e.g.*, knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.
14. **Wound care:** The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept nearby in case there is a need for euthanasia.
15. **Marking/tagging:** Temporary (*e.g.*, hair dye, paint stick) identifying marks or tags (*i.e.*, flipper and/or satellite-linked) should be applied for more visible and long-term identification.
16. **Releasing the animal:** If the animal is brought to shore to disentangle and if appropriate, pour water on the animal's hindflippers to cool it down just prior to release. Confirm the animal has a safe and clear escape route. The head restrainer directs the release, and the restrainer closest

to the animal's tail is the first off the animal after the head restrainer gives the okay, followed in order up to the head restrainer who is the last off the animal. During release, each restrainer quietly says when they are off the animal, so that the next restrainer knows when to get off. All handling and other gear is collected, and the team quickly leaves the area. Always monitor the animal post-release from a distance, for at least 10 minutes (or until the animal swims away), while keeping a low profile, particularly for non-pups, as older animals may become more easily stressed from handling. (*Note: weaned Hawaiian monk seal pups may approach the team post-release, so quickly leave the area*). Most pinnipeds go into the water shortly after release.

17. **Post-recovery:** After recovery, the animal should be released or, if additional monitoring or rehabilitation is required, transported to a rehabilitation center.
18. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
19. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, coveralls, footwear, kneepads, cloth gloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (*e.g.*, tape measures and scales), tagging supplies (*e.g.*, tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a "SHARPS" container (do not recap needles).
20. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.
21. **Prepare again:** Clean and organize gear so that it is ready for future use.

Pinniped Entanglement Response Techniques - Local/hand sedation

This section can to be used as a **stand-alone overview of how to safely respond and capture entangled pinnipeds using local/hand sedation techniques.**

Preparation

This section will provide an overview of pinniped entanglement response using hand or pole syringe to sedate the animal.

Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select an appropriate location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.
- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

24– 72 hours prior to operation:

- Check weather forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, EMS or local hospital, Native communities (in Alaska), and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

Immediately prior to operation:

- Conduct safety briefing.

- Re-check weather forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations and make a final decision about response.

Training

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available.

Human/animal safety

Human safety

Drugs, equipment, and personal protective equipment (PPE)

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All drugs to be used should be recorded on an emergency response sheet in case of accidental exposure, so EMS can quickly evaluate human exposure. Local hospitals should be notified prior to response.
- Human reversal drugs should be drawn and readily available prior to sedatives being drawn. All responders should have a general understanding of drugs and reversals being used, where to immediately access human reversals, understand the symptoms of accidental exposure, and field treatment if EMS is not an immediate option.
- All personnel must wear appropriate PPE, helmets as necessary, and dress suitably for the weather conditions.

- Pinniped restrainers, taggers, and others who may have physical contact with the animal should wear protective clothing and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.
- Personnel that may come into contact with drugs must wear non-permeable gloves, and safety goggles, splash guard mask, splash box, or safety screen when handling drugs.
- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing) and kneepads. Masks should be available for use at handler discretion, based on risk and environment.

Safety equipment

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- Safety equipment for vessels should conform to U.S. Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
  - A personal flotation device for each person on the vessel
  - Fire extinguisher(s)
  - Distress signals (flares, horn, etc.)
  - Navigation lights as appropriate

Operational safety

- If using vessels, float plans should list an assigned point of contact (POC) on land and boat logs should be filled out for each vessel.
- Responders must meet minimum qualifications and training prior to conducting procedures.
- Assess the size, weight, and strength of the animal to determine how many people, and what equipment, should be needed to safely capture and secure it.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.

- Designated Safety Officer(s) should be watching for and warning the team of hazards such as waves and other animals.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, unstable cliffs, ledges, working at height, working near water), and other animals in the area.

Net or capture pole handling

- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Communicate with other net/pole handlers.

Predators/other wildlife

- Check for predators (*e.g.,* bears) or other organisms (*e.g.,* snakes) before operations and have a spotter during operations.

Report injuries, incidents, or PPE failures to the Safety Officer immediately.

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- If treatment is needed, or person(s) involved need to be transported to land or mother ship, a boat with a team member should break away for transport and assistance.
- Appropriate response staff should be trained in basic first aid and CPR. First aid kits, including tourniquets, water and saline for flushing, are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal, and cut away from yourself. Stow the implement safely when finished.
- Depending on the situation, the decision is made by the IC whether to continue or discontinue operations for the day.

Presence of public or bystanders

- If capture is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure public onlookers are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

Animal safety

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

Temperature/weather

- Prevent potential thermoregulatory stress by considering and managing temperature, wind, sun, and shade. If animals become overheated, cool flippers and substrate under/around the animal with water. If the animal becomes too cold, hot water bottles, emergency blankets, or hot pads can be used to warm the animal.
- Limit handling of larger (and fatter) animals to periods of cooler ambient temperatures (*i.e.*, early morning, late afternoon, or when skies are overcast).

Minimize stress

- Responders should minimize the unavoidable stress that comes with animal capture by minimizing the duration of restraint and/or captivity, remaining calm and quiet around the animal, and minimizing manipulations and transport of the animal.
- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to both protect the eyes and to reduce stimulus to the animal. For sedated animals, a gel-based solution of artificial tears can be applied to protect the eyes.

Environmental hazard assessment

- Prior to capture, survey the surroundings to identify any environmental hazards that might pose a threat to the animal or responders.
- Consider the potential hazards to animals that may flush into the water, such as high surf, shark predation, or aggressive conspecifics.
- Ensure there is a safe and clear path for the animal following restraint and release.

Disturbance (other animals)

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.

- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Reduce all forms of disturbance to the entangled animal and any nearby animals (*e.g.*, if the animal is within a group) as much as possible by keeping noise and movement to a minimum, and avoiding bright colors that can be spotted easily and spook the animals into the sea.

Time limits

- Minimize handling and sedation time as much as possible.

Restrain devices and capturing/restraining animals

- If not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal.
- Peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury.
- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- When releasing, make sure the animal has recovered fully from sedation prior to releasing, especially on rocky shorelines or shorelines with cliffs.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

Team member roles

The capture and handling of pinnipeds has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The recommended roles that follow are based, in part, on implementation of the Incident Command System as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this

System. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 5-1).

Table 5-7. Suggested number of personnel needed for a local hand sedation entanglement response. Responders can fulfil multiple roles and some roles are *optional.

Team member role	Number of suggested personnel
Incident Commander/Safety Officer	1-2
Veterinarian/Veterinary Technician	1
Animal herders	2-12
Animal handler/restrainer	1-5
Boat operators (if applicable)	2
Data collection/documentation	1-2
Security/crowd control	variable
*Optional - Communication Officer	1
*Optional – UAS pilot	1

Drug handling and licensing

- The veterinarian must have a Doctor of Veterinary Medicine (DVM) or equivalent degree. This individual maintains the proper registration to purchase, store, and administer controlled substances, experimental drugs, and other drugs required for remote sedation, including ensuring that the appropriate reversal agents are available in sufficient quantity. Any licensed practitioner who distributes, prescribes, or dispenses any controlled substances (narcotics and dangerous drugs that fall under the jurisdiction of the Controlled Substance Act) must be registered with the Drug Enforcement Administration (DEA).
- All personnel that handle controlled substances must receive training on safe handling of drugs.

- New personnel should be required to receive training on immobilization and anesthesia of pinnipeds prior to working on projects involving the use of these drugs on pinnipeds.
- All personnel must be currently certified in first aid and CPR training.
- Wildlife Immobilization courses such as those taught by the Canadian Association of Zoo and Wildlife Veterinarians, American Association of Wildlife Veterinarians, various veterinary schools, SafeCapture or Global Wildlife Resources are acceptable introductory or refresher immobilization training. However, additional supervised training in the field with experienced personnel should be required prior to administration of chemical capture of pinnipeds. A refresher course is recommended every five years especially if field responses have been limited, but may be taken more frequently as methods and procedures evolve or personnel work with different species.

Specific roles

All personnel should be familiar with the permit and the minimum qualifications for each role. In general, roles and responsibilities include:

Incident Commander (IC) - The IC is responsible for the overall operation and the performance of the response and usually does not participate directly in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, public, and animals.

- ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.

Safety Officer (SO) – The SO is responsible to continually watch over all personnel involved in a response and have the ability to communicate to the team and adjust the strategy of the response as needed.

- ***Qualifications*** – Experience in previous pinniped response, ability to continually watch over all personnel involved, communicate to the team to adjust strategy or call off the effort as necessary, and watch for hazards (*i.e.*, waves, other animals). Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.

Veterinarian/Veterinary Technician – The veterinarian/veterinary technician is responsible for the health and monitoring of the entangled animal during capture and until the animal is safely released and on its own.

- ***Qualifications*** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent, or Veterinary Technician (RVT) who is EXPERIENCED in pinniped medicine.

Animal herders - The animal herders are responsible for safely herding the animal to a safe location for capture, ensuring responders are safe from animal bites and scratches.

- ***Qualifications*** – Experience in previous pinniped response and safely herding pinnipeds.

Animal Handlers/Restrainers – The animal handlers/restrainers are responsible for handing the animal to ensure it is safely restrained and all personnel around the animal are safe from potential harm such as biting.

- ***Qualifications*** - Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.

Pole syringe/hand injection – The person operating the pole or hand syringe is responsible for safely handling the syringes at all times, cleaning the equipment, and ultimately safely sedating the entangled animal.

- ***Qualifications*** – This is either performed by or under the direction of a veterinarian or veterinary technician.

Data collector – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all satellite-linked tag numbers are recorded, and all samples are properly recorded and labeled.

- ***Qualifications*** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.

Documentation – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.

- ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.

Security/crowd control – The IC should ensure that the proper authorities in the area have been notified of the response and the area is closed to public access during the response.

- ***Qualifications*** – Knowledge of proper authorities to notify.

Communication Officer (*optional) – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response.

- ***Qualifications*** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

Unmanned aerial system (UAS; *optional) - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing any disturbance to the target or other animals.

- ***Qualifications*** – a certified pilot's license, a permit to operate during a capture, and experience operating a UAS during previous pinniped field operations.

Environmental conditions

Create a risk analysis tool (*e.g.*, Appendix C – Risk Factor Table) or decision matrix (*e.g.*, Appendix D – Decision Matrix (Go/No Go)) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess the following environmental conditions prior to response:

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold)
- Substrate (*i.e.*, kelp that could obscure the animal in the water, rocks or reef near haul-out that could affect ability to maneuver capture vessel, ice)
- Location of the animal in relation to the surf zone
- Tide (*i.e.*, incoming tide, increased surf) and currents
- Time of day (*i.e.*, length of response time in relation to sunset, etc.)

Equipment

Data and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Binoculars

Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

Protective clothing

- Footwear appropriate for substrate
- Protective clothing as appropriate for conditions, PFD
- Non-permeable gloves
- Eye protection
- Optional - knee pads, cotton or Kevlar gloves

Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

Animal medical equipment and drugs (see example in Appendix E - Gear Checklist for field response)

- Controlled drug kit including sedatives, reversals and euthanasia solution
- Crash kit (*e.g.*, dopram, atropine, epinephrine)
- Medical kit (*e.g.*, injectable antibiotics, pain medications, IV fluids)
- Disentanglement instruments (*e.g.*, hemostats)
- Oxygen and Airway kit
- Field anesthesia machine
- Monitoring equipment (*e.g.*, temperature, heart rate, PO_2 monitor)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed.

Sedation/capture/restraining equipment

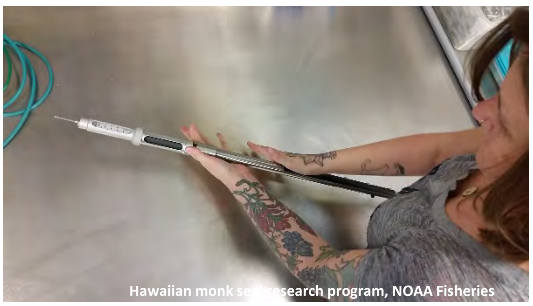
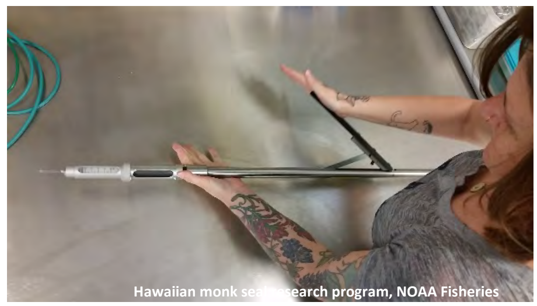
Equipment used for sedation by hand/pole injection varies. Equipment may include, but is not limited to pole syringe, crowding/herding boards, capture nets, etc.

Sedation

There are two main methods of drug administration**: 1) hand injection** and **2) pole syringe injection**. Hand injecting a drug requires capture and restraint. Pole syringes can be used for situations in which capture is not necessary or feasible. The preferred pole syringe is spring loaded (*e.g.*, Dan Inject Jab Stick). The other type of pole syringe uses a plunger (*e.g.*, SafeTFlex pole syringe), and is best used as backup equipment.

Hand injection - Sedatives may be injected by hand delivery if the animal is already safely restrained.

Spring loaded pole syringe (*below*) **-** A spring-loaded pole syringe may be used to deliver sedatives for approachable, isolated, animals on land that require sedation for safe-handling.

Plunger pole syringe (*not pictured*) – A pole syringe provides a safe, fast, and simple means of injecting animals in situations where adequate restraint facilities, or space, are not available.

Cutting tools (*right*) - There are a variety of different cutting tools (*e.g.*, knives, scissors, diagonal pliers, wire cutters, etc.) that can be used to cut entangling material. Always cut away from the body and always peel the entanglement off of the neck. NEVER pull the entanglement as it could cause further injury.

Crowding/herding boards *(below)* – Used as a barrier to safely herd pinnipeds to a safe location for sedation if necessary. Handles should be used to prevent injury. Boards can be constructed from plywood with integrated handles in the wood or handles on the back of the board. "Hog" herding boards can also be used and may be lighter and easier to maneuver.

Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant solution
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

Miscellaneous supplies

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

Data collection

It is important that supply checklists and data needs are well thought out prior to the start of any entanglement response program and data forms and instructions are accessible during a response. Important forms to have readily available could include: applicable permits; Level A and Human Interaction Forms (*e.g.*, Appendix B – Level A and Human Interaction Form); gear checklists (*e.g.*, Appendix E - Gear Checklist); and disentanglement forms (*e.g.*, Appendix F – Disentanglement form). All entangling gear should be retained (if possible), documented on the Level A and Human Interaction Forms, and stored in a centralized location or sent to a NMFS gear repository.

Risks and Mitigation

To minimize risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough de-brief and come up with lessons learned that can be applied to future responses. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

RISKS TO HUMANS

Risk: *Human exposure to drugs by injection, absorption, or ingestion*

The doses of immobilization and sedative drugs required to achieve an adequate response in large pinnipeds are all potentially lethal if accidentally injected into a human. Therefore, drug safety procedures must be carefully followed at all times.

Mitigation:

- Prior to using a particular chemical immobilizer or tranquilizer, it is each project leader's responsibility to determine and document that all personnel are familiar with the human safety aspects of the drug. These instructions should include knowledge of the symptoms following accidental injection; emergency treatment procedures, including cardiopulmonary resuscitation (CPR); and name, location, and dosage of a reversal agent (if any). Written instruction should be close by and easily accessible at all times during a response.
- PPE: Basic safety precautions must be taken by all personnel to prevent exposure to drugs. These include wearing non-permeable gloves, safety goggles, splash guard mask, splash box, or safety screen when handling drugs/darts/wounds with drugs that can be absorbed across intact skin.
- OSHA Universal Standards for handling sharps are used https://www.osha.gov/SLTC/etools/hospital/hazards/sharps/sharps.html.
- Marine radios and cell phones ensure that emergency rescue personnel can be alerted should a team member be exposed to a drug. Local EMS should be notified prior to operations and informed of drug types and concentration, work locations, number of personnel, and safety equipment on board.
- All response staff are CPR certified.

- Reversal drugs are kept readily available.

Risk: *Human exposure through subsistence uses*

Mitigation:

- Inform Native communities in the region that a pinniped entanglement response may occur in their area.
- On the flipper tag, use a permanent marker to write "***Do not eat if harvested before xxx date***", which is past the withdrawal time of 45 days.
- Provide identifying details (tag number, dye-mark number, etc.) about chemically immobilized sea lions or seals in the area.
- Provide a "safe to consume" date to Alaska Native organizations.

Risk: *Injury or death to personnel by drowning, falling or stepping on hazards*

Mitigation:

- Appropriate personnel should investigate and decide if location is safe for herding.
- Wear appropriate PPE such as strong, non-slip footwear, gloves, and helmets and protective equipment as necessary.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards.

Risk: *Injury to personnel from crowding/herding boards, pen panels, or capture nets*

Mitigation:

- Herders should wear appropriate PPE such as strong, non-slip footwear, gloves, protective clothing, and helmets as necessary.
- Herders should use crowding/herding boards with appropriate handles to avoid pinch points.
- Herders and handlers should be trained to minimize injury to themselves and others and maintain an impenetrable barrier when near the animal and actively herding.
- All herding and net materials should be inspected for hazards prior to use.

Risk: *Injury to personnel from pinniped bite or scratch*

Mitigation:

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as necessary.
- Personnel should be trained to minimize injury to themselves and to maintain an impenetrable barrier when near the animal and actively herding.
- Personnel should be trained in proper restraint techniques to minimize bite risk.

RISKS TO ANIMALS

Risk: *Injury to animal from capture equipment*

Mitigation:

- Personnel should be trained in techniques that minimize injury to the animal.
- Use an adequate number of capture net/pole handlers to increase safety.
- Conduct a proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

Risk: *Unintentional capture or disturbance of non-entangled animals*

Mitigation:

- Evaluate the possibility of unintentional take of non-entangled animals before and during capture evolution.
- Complete appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals.
- Always consider efforts to minimize disturbance to non-entangled animals.
- Designated personnel should continuously watch for the presence of non-entangled protected species in and around the capture area throughout the evolution, and communicate with the team appropriately.

Risk: *Animal fatality*

Mitigation:

- Personnel should be trained in techniques that minimize injury to the animal.
- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.

- Entanglement response activities should immediately cease until necropsy is completed and new mitigation measures are approved by NMFS.

Intervention Criteria/Decision Matrix (Go/No Go)

A risk analysis tool (*e.g.*, Appendix C – Risk Factor Table) or decision matrix (*e.g.*, Appendix D – Decision Matrix (Go/No Go)) should always be used prior to any response. For a local hand/pole syringe sedation response, factors that should be considered include environmental, team selection including availability of veterinarian and drugs, pinniped selection and condition, permission, resources, and mission complexity.

Procedure

Optimal capture situation

- Animal is on the beach without any hazards
- Solitary
- Sleeping – the element of surprise can be advantageous
- Animal is lying on its ventrum
- Away from the water's edge – animals will attempt to flee into the water, become slippery to handle when wet, and the water may pose a drowning risk
- Facing inland and uphill if beach is sloped – it is more difficult for a seal to move uphill than downhill

Animal capture and restraint

1. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals will be noted.
2. **Risk Assessment Tool or Go/No Go Determination**: Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
3. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC for the capture, review the capture scenario and all procedures, any emergency response, and the sequence of the activities.

Discuss when a handling should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the handling event, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure all personnel and equipment are ready and perform the final Go/No Go determination. Only trained personnel are authorized to administer medications to pinnipeds.

5. **Modify protective clothing and personal effects to minimize getting caught in nets during handling events:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons (even pant cuffs) and modify as appropriate to reduce entanglement/tripping risks.
6. **Weight estimate:** Weight of the animal is estimated individually by each team member without discussion and the median weight is used. The veterinarian has discretion to modify the weight estimation if necessary.
7. **Drug selection:** The veterinarian will select the appropriate drug combination and dosage. Final sedative selection is at the discretion of the veterinarian within the confines of the approved protocols (*i.e.*, Institutional Animal Care and Use Committee [IACUC], permit) or with special permission from NOAA for novel drugs. A listing of common pinniped sedatives can be found in the CRC Handbook (Gulland *et al.* 2018). Euthanasia solutions should be kept on hand in case there is a need for euthanasia. Antibiotics may be used to treat injuries.

Important notes

- The type, dose, method, and route will only be determined by a veterinarian.
- Double check all labels before drawing up medications. Also check expiration dates.
- Avoid contaminating needles or the top of the medication vial. Always inject animals with a fresh needle (not the one used to draw up medications or vaccines).
- Follow-up doses: May be authorized by the veterinarian for some medications.

Injections

IM: Intramuscular – either the gluteal region (behind the hips but in front of the hindflippers, or the epaxial muscle on either side of the spine.

Needle size

Select needle size based on viscosity of drug and size of animal.

Syringe size

Pole syringes have standard sizes. To draw up and measure drug volumes accurately, use a syringe that is slightly larger than the amount of medication you will be giving (ex: 8 ml of drug in a 10 ml syringe, 1.5 ml of drug in a 3 ml syringe). For rapidly administering hand injections, it may be desirable to transfer the drug to an even larger syringe (*e.g.*, 5 mL of drug in a 20 mL syringe).

Methods of administration

There are two main methods of drug administration:

1) Hand injection - hand injecting a medication requires capture and restraint.

2) Pole syringe injection - Pole syringes can be used for situations when capture is not necessary or feasible.

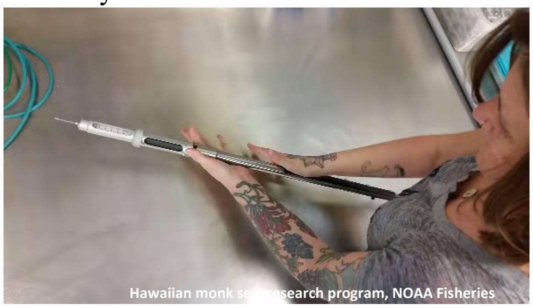
Hand injection:

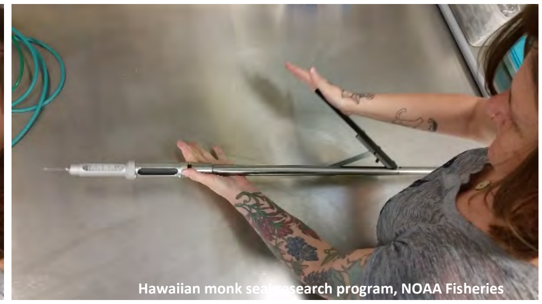
IM: Keep the needle at a 90 degree angle to the animal. Insert needle at full length. Pull back on the syringe to confirm no blood comes up. If no blood, administer medication. If blood appears, pull the needle out and re-stick with a new needle.

Pole syringe:

Drugs are administered through the pole syringe by manual pressure applied by the person giving the injection. The pressure applied to the handle will push the syringe contents into the animal. If possible, wait until the animal is sleeping and sneak up behind the animal to give the injection. Follow through with a forward motion until you are certain the full dose of drug is given. Let the motion of the animal as it moves away from you withdraw the needle.

Spring loaded pole syringe: *REMINDER* NEVER discharge the pole syringe without having the syringe attached and filled with a fluid. Doing so will damage the mechanisms internally and could render the unit useless.

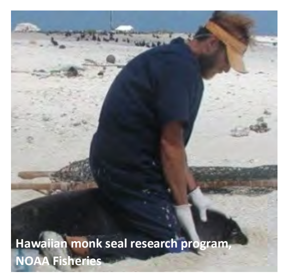




8. **Documentation:** The photographer/videographer should ensure all photo and video equipment is on and recording. This role can be combined with data collection.

9. **Approach:** – hand inject: Hand injecting a medication requires capture and restraint. The team will get into position, approach quietly and calmly, and capture the entangled animal using appropriate equipment (hoop net, etc.). To improve capture success, care should be taken to quietly approach the target animal from downwind and out of the animal's field of view. Some or all of the capture team should be between the animal and the water, to block its escape route.

10. **Restraint:** Confirm that the restrainers have control over the animal before conducting any procedures on the animal. Typically an animal does not struggle the entire time under restraint, and will often take a deep breath just prior to struggling. The head restrainer monitors the animal's breathing and response level. Animals may lift their heads abruptly so beware. When sampling, tagging, etc., the person performing these activities quietly states what procedure is next so the restrainers can prepare for the animal's reaction.



<u>Restraining with a Net</u>

When using a net for restraint, watch that the animal's foreflippers and teeth are not caught in the mesh and that the head is not at an unnatural angle. Adjust as necessary. Use care that the handling team's fingers do not get caught in the netting as well. Animals may still roll while in a net, but the net does provide some control over the animal.

11. **Approach – pole syringe:**
    - Move safety of spring loaded pole syringe to OFF position.
    - Approach the animal quietly from behind to avoid detection.
    - The pole syringe is triggered when pressure is applied to the aluminum tip. It's essential to use enough force to trigger the syringe (practicing on inanimate objects with water before using the pole syringe on a live animal is required).
    - Aim to administer the drug IM in the flank (see below) of the animal if possible.

    - The animal will immediately pull away from the syringe once the needle goes into the skin. To anticipate that movement, imagine pressing the pole syringe several feet PAST the animal. That way you move with the animal. (Be aware that the natural instinct is to immediately pull pole syringe away from the animal but it is important to continue forward).
    - Quietly and slowly walk away so as to not disturb the animal further. Give the animal space and allow the sedative time to take effect.
    - Dispose of all used needles in a "SHARPS" container.
12. **Monitoring and assessment:** The animal is immediately assessed for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate, body temperature, and O_2 saturation should be continually monitored (O_2 saturation and heart rate are monitored continuously when the pulse oximeter is connected).

13. **Data collection:** Morphometrics, sex, and if appropriate, samples, will be taken and all data recorded completely on Level A and Human Interaction Forms, and any other necessary capture forms.
14. **Disentanglement:** Using an appropriate cutting tool (*e.g.*, knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.
15. **Wound care:** The wound is investigated to assess the extent of tissue damage and to ensure that all foreign material has been removed. The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept on hand in case there is a need for euthanasia. In the case of a severe wound and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.
16. **Antibiotics and fluids:** At the discretion of the veterinarian, antibiotics or fluids may be given.
17. **Marking and tagging:** Temporary (hair dye, paint stick) identifying marks or tags (flipper and/or satellite-linked) should be applied for more visible and long-term identification.
18. **Sedative reversals:** Reversal administration can occur at any time during the procedure at the discretion of the veterinarian and depending on the animal's condition. Syringes are pre-loaded with appropriate reversals, and should be kept readily available should an emergency situation occur.
19. **Releasing the animal:** All responders should move out of sight of the animal before it wakes up. The veterinarian will monitor the animal until it is fully awake and responsive. Responders will ensure there is a clear and hazard-free path between the animal and the water and that there are no predators in the vicinity prior to release.

20. **Post-recovery:** After recovery, the animal should be released, or if additional monitoring or rehabilitation is required, transported to a rehabilitation center or euthanized if the injury is severe.
21. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
22. **Disinfecting/disposal:** If protective reusable clothing (*e.g.*, coveralls, footwear, kneepads, cloth gloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (*e.g.*, tape measures and scales), tagging supplies (*e.g.*, tagging pliers/hole punches, etc.), specimen supplies, and other miscellaneous items (*e.g.*, buckets, clipboards, writing implements, etc.). Dispose of used non-permeable gloves in the trash. Place used needles/scalpels in a “SHARPS” container (do not recap needles).
23. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.
24. **Prepare again:** Clean and organize gear so it is ready for future use.

Pinniped Entanglement Response Techniques - Remote Sedation

This section can to be used as a **stand-alone overview of how to safely respond and capture entangled pinnipeds using remote sedation techniques.**

One of the primary advantages of using remote sedation is that capture stress can be reduced or even eliminated if done properly and no direct pre-sedation contact is made with the animal. Champagne *et al.* (2012) reported that animals chemically immobilized without physical restraint did not show a significant increase in stress (cortisol) levels compared to those that were physically restrained, which showed a nearly 3-4 fold increase in stress levels. Remote sedation can reduce physical risk to both responders and pinnipeds if the initial capture and restraint is avoided. There is less risk of responders being bitten by the animal, one of the biggest concerns of any method that involves physical restraint (Lynch *et al.* 1999), and less chance of the animal being injured. Remote sedation provides access to specific entangled individuals and certain species and age classes (*e.g.*, large, adult male Steller sea lions) that previously were nearly impossible to safely capture. Remote sedation can also be safer for surrounding animals as well. Remote sedation can lead to smaller and more controlled flushing of adjacent animals compared to rushing a group to get a net or pole syringe to the target animal.

Preparation

This section will provide an overview of a pinniped entanglement response using remote sedation.

Prior to any operation:

- Practice, practice, practice! The more the team practices ahead of time, the better prepared they will be for the unexpected.
- Select an appropriate location for operations.
- Consult tide charts for optimal tide windows and determine cut off time due to tides or darkness.
- Choose experienced team members and assign roles.
- Create and distribute an Incident Command System (ICS) Incident Action Plan.
- Distribute safety protocols for responder review.
- Check equipment, communication, and medical supplies.
- Confirm the operation of all vehicles (fuel and maintenance if needed).
- When necessary, arrange for additional personnel, better visualization of the entangled animal, and better control of onlookers in the area.

- If using satellite-linked transmitters, ensure transmitters are programmed and ready to deploy.
- Ensure all equipment is clean, organized, packed, and ready for operations.

24– 72 hours prior to operation:

- The marksman should practice with the equipment to be used for the upcoming incident. Practice should include ensuring the accuracy and precision of the projector and darts, the effective and consistent deployment of the dart contents, and any predicted shot scenarios for the outing (distance of shot, uphill/downhill shots, wind and wave conditions, etc.).
- All critical sedation gear should be tested for function, including the projector, darts to be deployed, animal location aids if used (*e.g.*, hydrophone and transmitters, drones), field anesthesia machine, etc.
- Check predicted marine conditions, weather and wind forecasts.
- Notify appropriate entities such as: NOAA Regional Stranding Coordinator (RSC), law enforcement, EMS or local hospital, Native communities (in Alaska), and rehabilitation facility to inquire about available space.
- Ensure appropriate authorization (*i.e.*, if response on park, preserve, or private land).

Immediately prior to operation:

- Conduct safety briefing.
- Re-check weather and marine forecasts.
- Consult decision matrix – prior to operations and on scene, determine if conditions allow for safe operations and make a final decision about response.

Training

Pinniped entanglement responses are conducted under MMPA authorization either under a 112c agreement issued by NMFS to Network members through a Stranding Agreement, under 109 (h) authority exercised by local, state, federal or tribal entities, or under a NMFS MMPA/ESA research permit. Therefore, only responders who have been authorized by NMFS and who have the appropriate training, experience, equipment, and support should attempt pinniped entanglement response. Responders must be trained by experienced personnel in safe capture, handling, animal health monitoring, safe and effective restraint, etc. All remote sedation entanglement responses must be conducted under a MMHSRP or research permit. Responders must be trained in safe capture, handling, monitoring under restraint, etc. by experienced personnel. Additionally, personnel must be trained in small boat operations and have experience operating boats while pinnipeds are in the water near the boat. Remote delivery via the dart projector requires additional training and practice. Advancement in animal handling requires hands-on experience under the direct supervision of experienced response staff. If possible, inexperienced personnel should watch the process and participate in secondary aspects of the response to gain more experience. Personnel should document their training and skills so the response coordinator who is choosing the team has a current list of team abilities. Although there are currently no formal national training programs in place, the NOAA MMHSRP or RSC can direct responders toward resources relevant to the species of interest, whenever available.

Human/animal safety

Human safety

Drugs, equipment, and personal protective equipment (PPE)

- Keep a written safety protocol, including emergency numbers, with first aid kits.
- All drugs should be recorded on an emergency response sheet in case of accidental exposure, so EMS can quickly evaluate human exposure. Local hospitals should be notified prior to response.
- Human reversal drugs should be drawn and readily available prior to sedatives being drawn. All responders should have a general understanding of drugs and reversals being used, where to immediately access human reversals, understand the symptoms of accidental exposure, and field treatment if EMS is not an immediate option.
- All personnel must wear appropriate PPE, helmets as necessary, and dress suitably for the weather conditions.
- Pinniped restrainers, taggers, and others who may have physical contact with the animal should wear protective clothing, PFDs, and appropriate footwear.
- Handlers who may come into contact with bodily fluids must wear non-permeable gloves such as nitrile or latex exam gloves. Cloth gloves may be worn over non-permeable gloves if added grip or protection is needed.
- Other recommended protective gear includes eyewear (including sunglasses – preferably polarizing) and kneepads. Masks should be available for use at handler discretion, based on risk and environment.

Safety equipment

- Ensure first aid kits are available and located with each response group. If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.
- Radio/other communication equipment are charged and operational.
- Knives and restraint equipment (*e.g.*, capture pole, net, etc.) are clean, functional, and ready for use.
- Safety equipment for vessels should conform to U.S. Coast Guard regulations and be appropriate to the role each vessel plays in the response operation. Safety items should include:
  - A personal flotation device for each person on the vessel
  - Fire extinguisher(s)
  - Distress signals (flares, horn, etc.)
  - Navigation lights as appropriate

Operational safety

- Float plans should list an assigned point of contact (POC) on land and boat logs should be filled out for each vessel.
- Responders must meet minimum qualifications and training prior to conducting procedures.
- Assess the size, weight, and strength of the animal to determine how many people, and what equipment, should be needed to safely capture and secure it.
- Designated Safety Officer(s) should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated Safety Officer(s) should be watching for and warning the team of hazards such as waves and other animals.
- Assess how to safely reach the animal and egress after capture. Consider terrain, substrate, tide, currents, weather, time of day, distance from access point to animal, other environmental factors (*e.g.*, unstable cliffs, ledges, working at height, working near water, thick kelp beds), and other animals in the area.

Net or capture pole handling

- Do not wrap net or line around arms, hands or fingers, remove entanglement hazards (rings, watches), and keep feet clear of lines and nets. Watch other people when possible to make sure they are clear of line and net.
- Communicate with other net/pole handlers.

Predators/other wildlife

- Check for predators (*e.g.,* bears) or other organisms (*e.g.,* snakes) before operations and have a spotter during operations.

Report injuries, incidents, or PPE failures to the Safety Officer immediately

- Any significant accident or injury requires that operations cease and the event, person, or injury is immediately addressed.
- If treatment is needed, or person(s) involved need to be transported to land or mother ship, a boat with a team member should break away for transport and assistance.
- Appropriate responders should be trained in basic first aid and CPR. First aid kits, including tourniquets, water and saline for flushing, are readily available.
- Use a hooked/curved/covered blade for cutting to minimize accidental injury to handlers and the animal and cut away from yourself. Stow the implement safely when finished.
- Depending on the situation, the decision is made by the IC whether to continue or discontinue operations for the day.

Presence of public or bystanders

- If capture is in a public area, ensure there is sufficient crowd control and outreach.
- Ensure public onlookers are informed where possible/practical and ensure they stay a safe distance away from the rescue operation.

Animal safety

- Use a decision matrix prior to capture to ensure risks and mitigation are planned and accounted for by all responders and properly mitigated.

Temperature/weather

- Prevent potential thermoregulatory stress by considering and managing temperature.

Minimize stress/time limits

- Responders should minimize the stress that comes with animal capture by minimizing the duration of pursuit (if any), restraint and/or captivity, remaining calm and quiet around the animal, and by minimizing manipulations and transport of the animal.

- Eyes should be covered with a UV-resistant and non-abrasive material during restraint to protect the eyes, and to reduce stimulus to the animal. For sedated animals, a gel-based solution of artificial tears can be applied to protect the eyes.

Environmental hazard assessment

- Prior to capture, survey the surroundings to identify any environmental hazards or predators (sharks, aggressive conspecifics, killer whales) that might pose a threat to the animal.

Disturbance (other pinnipeds or wildlife)

- Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Every effort should be made to lessen the chance of flushing non-target and target animals into the water. If the response is likely to flush more than 50 seals/sea lions, responders should consult with the Regional Stranding Coordinator before proceeding or discuss prior to departure if response will be conducted in a remote location.
- Entanglement response should not be attempted in locations that are likely to disturb mother/pup pairs.
- Prior to restraint or darting of the target animal, personnel will cease efforts if significant injury to target or non-target animals appears imminent.
- Reduce all forms of disturbance to the entangled animal and any others close by (*e.g.*, if it is within a group) as much as possible by keeping noise and movement to a minimum.

Restraint devices and capturing/restraining animals

- Never hold on to the entangling material as a form of capture or to slow the animal down, as the animal is likely to roll and spin, causing further injury and pain.
- When the animal is captured, ensure it is secured appropriately so that it is still able to breathe comfortably. A kinked neck or constricted airway can cause mortality during captures, and all animal handlers should clearly understand this hazard prior to the response.
- Once captured, if not possible prior to capture, assess where the entangling material is easiest to access and cut away. Also identify the fewest cuts needed to release the animal to reduce handling time and stress to the animal. Peel the entangling material out of the wound rather than dragging it or pulling it out from one side; this will minimize pain and prevent further injury. Every entanglement should be carefully examined to ensure all of the entangling

material is removed. Consider that some animals have been sighted with two separate plastic packing bands around their necks.

- Assess whether the animal is suitable for immediate release, requires transport to rehabilitation, or requires euthanasia, and act as appropriate.
- Ensure the transport container is safe and secure for the size and strength of the animal.
- Sterilize any sampling tools that came into contact with the animal.
- Clean and dry all equipment afterwards and stow securely again ready for future use.

Team member roles

The capture and handling of pinnipeds has inherent risk for both the responders and the animals. Clarifying team member roles and responsibilities ahead of time, and ensuring that responders meet minimum qualifications for each role is essential to a safe and successful response. The number of responders needed for a response varies widely depending on the size, strength, and location of the animal (Table 6-1).

Table 6-8. Suggested number of personnel needed for a remote sedation entanglement response. Responders can fulfil multiple roles and some roles are *optional.

Team member role	Number of suggested personnel
Incident Commander/Safety Officer	1-2
Veterinarian	1-2
Animal handler/restrainer	2-5
Netter (phocids only)	2
Marksman	1
Spotter	1
Monitor	3-6
Boat operator	2-3

Data collection/documentation	1-2
*Optional – UAS pilot	1
*Optional - Communication Officer	1

Drug handling and licensing

- The veterinarian must have a Doctor of Veterinary Medicine (DVM) or equivalent degree. This individual maintains the proper registration to purchase, store, and administer controlled substances, experimental drugs, and other drugs required for remote sedation, including ensuring that the appropriate reversal agents are available in sufficient quantity. Any licensed practitioner who distributes, prescribes, or dispenses any controlled substances (narcotics and dangerous drugs that fall under the jurisdiction of the Controlled Substance Act) must be registered with the Drug Enforcement Administration (DEA).
- All personnel that handle controlled substances must receive training on safe handling of drugs.
- New personnel should be required to receive training on immobilization and anesthesia of pinnipeds prior to working on projects involving the use of these drugs on pinnipeds.
- All personnel must be currently certified in first aid and CPR training.
- Wildlife Immobilization courses such as those taught by the Canadian Association of Zoo and Wildlife Veterinarians, American Association of Wildlife Veterinarians, various veterinary schools, SafeCapture or Global Wildlife Resources are acceptable introductory or refresher immobilization training. However, additional supervised training in the field with experienced personnel should be required prior to administration of chemical capture of pinnipeds. A refresher course is recommended every five years especially if field responses have been limited, but may be taken more frequently as methods and procedures evolve or personnel work with different species.

Specific roles

The recommended roles that follow are based, in part, on implementation of the Incident Command System as defined by the Federal Emergency Management Agency. This system provides a structure for clarity of communications and roles, and efficient management of resources. The System is scalable and can be modified to fit the needs of the operation. Safety is always at the center of any plan based on this System.

Incident Commander (IC) - The IC is responsible for the overall operation and the performance of the response and does not participate directly in the operation. This enables the IC to remain focused on the larger picture of the response and objectively ensure that the response is safe for responders, bystanders, and animals.

- ***Qualifications*** – Experience in previous pinniped response, ability to oversee all operations, communicate with the team to adjust strategy or call off the effort as necessary. Completion of the ICS free or paid courses, and the ability to remain objective to ensure safe operations.

Safety Officer (SO) – The SO is responsible for continually watching over all personnel involved in a response and has the ability to communicate to the team and adjust the strategy of the response as needed.

- ***Qualifications*** – Experience in previous pinniped response, ability to continually watch over all personnel involved, communicate with the team to adjust strategy or call off the effort as necessary, and watch for hazards. Willingness to stop operations if there is a safety concern, despite momentum (and pressure) to move forward.

Veterinarian – The veterinarian is responsible for the health and monitoring of the entangled animal during capture and until the animal is safely released and on its own.

- ***Qualifications*** - A licensed Doctor of Veterinary Medicine (DVM) or equivalent who is EXPERIENCED in pinniped medicine.

Animal Handlers/Restrainers – The animal handlers/restrainers are responsible for handling the animal to ensure it is safely restrained and all personnel around the animal are safe from potential harm such as biting.

- ***Qualifications*** - Responders must be trained by experienced personnel in safe capture, handling, monitoring under restraint, etc. Handlers should also be able to remain calm under pressure, respond effectively to rapidly changing conditions, and work well in a team environment.

Boat operator – Boat operators should be experienced with animal approaches, capture methods, and translocation of animals in the boat and alongside the boat. Boat operators should also be comfortable with deploying personnel on and off rocks, operating around many pinnipeds in the water or on shore, and staying calm under pressure.

- ***Qualifications*** – U.S. Coast Guard boat training or equivalent. Because many of these duties are outside the scope of normal boat operations, skills should be practiced prior to working with pinnipeds in or around the boat.

Marksman – The marksman is ultimately responsible for safe and effective functioning of the dart, placement of the dart on the target animal, and follow-up security and cleaning of the darting equipment. The marksman determines the appropriate approach to the target as well as the optimal distance and angle of the shot attempt. Once the Spotter confirms that it is safe to attempt a shot (opens the shot window) and communicates this to the marksman, the marksman may make an attempt at their discretion until the Spotter closes the shot window. The marksman should have extensive practice using the dart projector prior to darting a live animal. Specifically, practice should be organized and methodical, with marksman shooting a target a) from various distances, b) with different pressures, c) in all types of weather conditions (*e.g.*, rain, snow, wind), and d) from different angles. The marksman should be well versed in how to safely handle the dart projector, darts, CO_2 cartridges, pressurizing and depressurizing the projector and be able to demonstrate accuracy in hitting a target under the various conditions described above.

- ***Qualifications*** – Demonstrated proficiency in skills and experience described above. The marksman does not need to be a veterinarian and should work under the direction of a veterinarian regarding the drugs used in the darts. Thorough knowledge of the anatomy of the target species will increase safety and effectiveness of dart placement selection and delivery.

Spotter – This person is paired with the marksman and is in charge of both opening and closing the shot window for the marksman. The Spotter uses a range finder to measure out distances to the target animal, ensures that the area immediately surrounding the target remains clear of non-target animals or other hazards, and communicates with other personnel to direct proper placement of the vessel for the marksman.

- ***Qualifications*** – Ability to use a range finder, experience approaching animals quietly, ability to communicate with marksman using hand signals, communicate with personnel on vessels, and experience around dart projector and drugs.

Monitors – Monitors keep an eye on the animal prior to, during, and after darting. If the animal jumps into the water after darting, monitors use the “man overboard” drill and always keep eyes on where the animal was last seen, pointing to where the animal submerged so the boat operator is constantly informed, and keeps watch of the animal until it is safely restrained.

- ***Qualifications*** – Knowledge of "man overboard" drill, experienced observer with binoculars, and comfortable in boats.

Data collector – The data collector is essential in recording all aspects of the entanglement response. This person is responsible for ensuring all data is complete on data sheets, the animal is given an identifying number, all satellite-linked tag numbers are recorded, and all samples are properly recorded and labeled.

- ***Qualifications*** – Familiarity with data sheet and information to be recorded and ability to accurately record data legibly.

Documentation – This person is responsible for operating still or video photography to document the capture. This person may also serve as the data collector.

- ***Qualifications*** – Experience using photographic equipment. Knowledge of how the equipment operates, how to change settings, troubleshoot, and take clear and meaningful photos and video.

Security/crowd control – The IC should ensure that the proper authorities in the area have been notified of the response and the area is closed to public access during the response.

- ***Qualifications*** – Knowledge of proper authorities to notify.

Unmanned aerial system (UAS; *optional) - If permitted to operate a UAS during the capture, the UAS pilot must have no other duties. The pilot must be in communication with the IC and immediately cease operation if the UAS is in any way negatively impacting the success of the capture or causing any disturbance to the target or other animals.

- ***Qualifications*** – a certified pilot's license, a permit to operate during a capture, and experience operating a UAS during previous pinniped field operations.

Communication Officer (*optional) – If there are an adequate number of responders available, the communication officer can communicate information about pinniped entanglement response.

- ***Qualifications*** – Effective communicator in writing and speaking. Communication should be clear, concise, accurate, coherent, and courteous.

Environmental conditions

Create a risk analysis tool (*e.g.*, Appendix C – Risk Factor Table) or decision matrix (*e.g.*, Go/No Go; see 6.8) to determine whether or not an entanglement response is safe for responders and pinnipeds based on environmental conditions. Assess environmental conditions such as the examples below before executing a remote sedation attempt.

- Weather conditions (*e.g.*, rain, snow, fog, wind, approaching storm systems, heat, cold)
- Marine conditions (*e.g.*, swells, chop, surge)
- Conditions at landing site (*e.g.*, amount of surf – can responders get safely on and off shore)
- Substrate (*e.g.*, kelp that could obscure the animal in the water, rocks or reef near haul-out that could affect ability to maneuver capture vessel, ice, cultural resources at risk)
- Submerged hazards (*e.g.*, sand bars, coral reefs, sunken debris, crab pots, aquaculture, oyster bars, etc.)
- Location of the animal in relation to the surf zone
- Tide (*i.e.*, time and level of high/low tide) and currents
- Time of day (*i.e.*, length of response time in relation to sunset, etc.)
- Conspecifics (*i.e.*, other animals in the area)
- Predators (*e.g.*, sharks, killer whales, alligators) and other hazardous wildlife (*e.g.*, stingrays, jellies, etc.)

Equipment

Equipment needs vary substantially between target species and target size/age, environmental conditions, and operational goals (*e.g.*, immediate patient release versus transport to a rehabilitation facility). Examples of each type of capture are outlined below.

Data, observation, and recording supplies

- Capture/handling forms (*i.e.*, Level A, Human Interaction, Capture form, etc.)
- Pencils/clipboard
- Watch with timer
- Camera and/or video camera (*e.g.*, GoPro), extra batteries
- Rangefinder
- Binoculars

Sampling, tagging, and marking supplies

- Measuring kit (*e.g.*, tape measure, calipers, ruler)
- Tagging kit (*e.g.*, plastic flipper tags, satellite-linked tags, tagging equipment)
- Marking kit (*e.g.*, hair dye, paint stick)

Protective clothing

- Footwear appropriate for substrate
- Protective clothing as appropriate for conditions, PFD
- Non-permeable gloves
- Eye protection
- Optional - knee pads, cotton or Kevlar gloves

Human medical equipment

- First aid kit
- If working in a remote area and emergency services are not readily available, automated external defibrillators (AED) can be included (not required) with kits if responders are experienced in their use.

Medical and sampling equipment (see example in Appendix E - Gear Checklist for field response)

- Controlled drug kit including sedatives, reversals and euthanasia solution
- Crash kit (*e.g.*, dopram, atropine, epinephrine)
- Medical kit (*e.g.*, injectable antibiotics, pain medications, IV fluids)
- Disentanglement instruments (*e.g.*, hemostats)
- Oxygen and Airway kit
- Field anesthesia machine
- Monitoring equipment (*e.g.*, temperature, heart rate, PO_2 monitor)
- Wound care kit
- Blood collection
- Ballistics or trained personnel with ballistics (if you cannot euthanize with drugs); ensure local firearm laws are followed.

Cutting tools *(right)* - There are a variety of different cutting tools (*e.g.*, knives, scissors, diagonal pliers, wire cutters, etc.) that can be used to cut entangling material. Always cut away from the body and always peel the entanglement off of the neck. NEVER pull the entanglement as it could cause further injury.

Cleaning/disinfecting supplies

- Antibacterial soap/hand sanitizer
- Disinfectant
- Spray bottle for disinfectant solution
- Garbage bag(s) or other container(s) to separate gear and clothing

Miscellaneous supplies

- Backpack (to carry supplies)
- Bucket (to carry supplies and/or to hold water to cool animals)

Drugs

- See Appendix I – Otariid sedation worksheets for example of *Steller sea lion* and *California sea lion* sedation worksheets.
- See Appendix J – Phocid sedation worksheet for example of *gray seal* and *Hawaiian monk seal* sedation worksheets.

Delivery system

Projector (*right*) - Remotely delivered drugs may be administered by a CO_2 dart gun (*e.g.*, Daninject JM Standard CO_2 dart projector with 11 mm and 13 mm barrels or Pneu-Dart). CO_2 dart projectors have a smaller gauge needle than a pole syringe, can incorporate telemetry, and seems to cause less stress to the entangled animal than the pole syringe.

Darts - There are two dart options, transmitter and static. Transmitter darts require the use of a barbed needle while static darts do not. The type of dart and needle used will depend on the lead veterinarian's sedation preference and the darting location (*e.g.*, public area).

The dart system is capable of using 1.0, 3.0, 5.0, and 10.0 ml darts. The 3.0 ml is most commonly used for California sea lions (up to ~ 300.0 kg) and the 5.0 ml dart for Steller sea lions (up to ~ 800 kg). The Dan-inject tailpiece that holds the transmitter is listed to fit both the 1.0 ml and 3.0 ml darts. The Marine Mammal Center (TMMC; http://www.marinemammalcenter.org/) tested the tailpiece on the 5.0 ml and 10.0 ml darts and found that this configuration functions effectively as well.

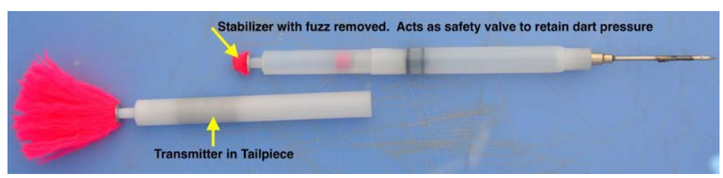
Transmitter dart specifications - Pneu-Dart 3 ml dart with a 1.5 inch or 2 inch single or double barbed needle. A custom tailpiece holds the acoustic transmitter.

Transmitter - VEMCO V9-1H continuous acoustic transmitter, 9 mm diameter by 24 mm length, 3.6 g weight in air, 2.2 g weight in water. Power output is 151 dB re 1uPa@1 m continuously transmits ping every 2000 mg at 69 kHz for up to 14 days.

Static dart specifications: S300 syringe dart 3.0 cc.

Needles – transmitter darts - Daninject barbed needles are used for darts that include transmitters or when it is advisable to have the dart stay in the animal as a visual aid for tracking and capture. Daninject produces barbed darts in 25.0 mm, 30.0 mm, and 40.0 mm lengths. The smallest gauge needed is always preferable. Daninject does not produce a 60.0 mm barbed dart, therefore TMMC custom fabricates a 60.0 mm barbed dart from Daninject's non-barbed 60.0 mm and stainless steel wire.

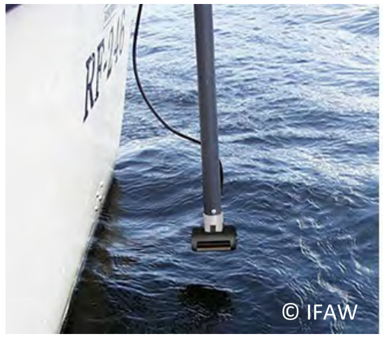
Needles – static darts (*right*): Non-barbed needles in the sizes listed above are used when the dart does not need to stay in the animal. Examples of when to use static darts include:

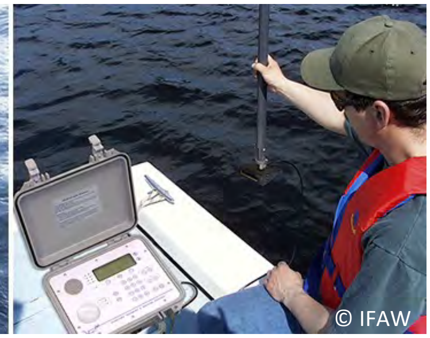


- No transmitter is necessary and visual tracking can be done effectively without the visual cue of the dart.
- If an animal has been injected with a barbed dart and transmitter, but needs additional sedation.
- If an animal is sedated, but has entered an area where responders are unable to capture it, reversals can be administered using a static dart.

Receiver/hydrophone (*right*)

Ultrasonic receivers (*e.g.*, VEMCO VH110, HTI, Sonotronics, etc.) are designed for manual tracking of aquatic animals from small boats. The directional hydrophone is hydro-dynamically shaped so that it can easily move through water while receiving acoustic signals.





- The hydrophone itself is mounted on a custom fabricated, extendable pole. For most small boat applications, a 15-foot cable is preferable to the 30-foot cable provided with the system.
- The Vemco V9 acoustic transmitter is used in several frequencies. This allows responders to track several signals concurrently. This is very convenient if a transmitter ends up on the bottom of the ocean and is still transmitting.
- The Daninject USA transmitter tailpiece for the V9 transmitter has been the most effective. The tailpiece has to be modified to accept the transmitter by using a 5/8” drill bit to increase the diameter of the tailpiece to accommodate the transmitter. With some batches of the tailpieces, it is also possible to bore a 5/64” hole into the end of the tailpiece to allow the use of a push rod to release the transmitter from the tailpiece. The tailpiece should be colored black (*e.g.*, with a permanent pen) so it is less obvious to the animal once it is darted.

- TMMC has found that double “capping” the dart is necessary to have close to 100% deployment of the sedative. Without this modification failure rates can be as high as 25% - 50% because the inner valve would allow premature depressurization of the dart (TMMC, personal communication).

Tracking

Acoustic transmitter and hydrophone

- Transmitter darts are the main method of location and tracking sedated animals when this method is used.

- A sonic fish fisher, live stream underwater camera, and an avalanche pole also may be used to help locate sedated animals below the surface.

Visual

- Human observers with binoculars
- UAS

Capture retrieval tools

Nets and hooks are used to retrieve sedated animals. Nets may also be used for the capture of alert, isolated animals. Additional retrieval options may be added including a noose pole. Current examples of handheld retrieval devices include:

Hoop net (*right*) - (schedule 40, ¾" or 1", PVC): 30" – 36" diameter hoop with five-foot integral handle. The woven 7/8" net is preferable as it is lighter, easier to handle, and does not seem to abrade the patient's cornea as severely as a knotted net.

Landing net (*below*) **-** foldable net with telescoping handle.

Rescue "Shepherd's" hook (*right*) – Can be used with or without a telescoping pole.

Capture pole (*below*; see Appendix L – Capture Pole- for information about how to construct).

Seine net (*not pictured*) - Used specifically for gray seal captures on the east coast – An approximately 91 m by 6 m seine net (12.7 cm square twisted-twine mesh with float line and lead core line) properly packed into the deployment bin, with the buoy and sea anchor.

Vessels

A variety of vessels have been used for remote sedation. The key to a successful in-water capture is using a capture vessel that has a low gunwale so responders can easily hold the animal alongside the vessel. Propeller guards are very helpful.

Soft-bottom inflatable with center console - This is an effective boat for darting, especially around jetties and other hard terrain. The low gunwale allows for safer and more effective handling of the animal. The center console puts the operator in a much better position to visualize the environment and the animal than a vessel with a tiller (crew of up to six).

Rigid-hulled inflatable Buoyancy (RHIB) - A RHIB is a lightweight but high-performance and high-capacity boat constructed with a rigid hull bottom joined to side-forming air tubes that are inflated with air to a high pressure so as to give the sides resilient rigidity along the boat's topsides. The inflated collar acts as a life jacket, ensuring that the vessel retains its buoyancy, even if the boat is taking on water. The RHIB is used as a support and safety platform. Its larger size allows for many functions, but it does not maneuver well in tight quarters. This vessel (holds crew up to ten) is a good platform for the IC, UAS operators, SO, etc.).

Specially designed 6.7 m aluminum capture boat (*right*) – The Alaska Department of Fish and Game (ADF&G) has a capture boat specially designed for Steller sea lion captures. This vessel works well in larger seas, has a specially designed tower to enable responders to gain height for viewing sea lions in the water, has a detachable gunwale, and can hold a crew of up to six comfortably.

SAFE boat – SAFE boats have a self-bailing deck, aluminum hull, and a full-sized 100% foam collar system. The SAFE boat is commonly used as the support and safety platform during a capture. ADF&G uses a 6.7 m SAFE boat during captures (crew of up to five).

Kayaks - When working in tight, protected areas, kayaks can be used to see in blind spots (*e.g.*, opposite side of jetty from entangled animal), assist with crowd control, and aid in visual tracking in areas that are difficult to access with the larger vessels. Tandem kayaks (hold up to two persons) work best, as one person can have their hands free for radio communications, etc.).

Data collection

Supply checklists and data needs are well thought out prior to the start of any entanglement response program and data forms and instructions are available during a response. Important forms to have accessible include: applicable permits; Level A and Human Interaction Forms (*e.g.*, Appendix B – Level A and Human Interaction Form); gear checklists (*e.g.*, Appendix E - Gear Checklist); disentanglement forms (*e.g.*, Appendix F – Disentanglement form); remote sedation worksheets (*e.g.*, Appendix G - Remote Sedation Worksheet); drug interaction form (*e.g.*, Appendix H – Drug interaction Form); and otariid sedation (*e.g.*, Appendix I – Otariid sedation worksheets) or Phocid sedation (*e.g.*, Appendix J – Phocid sedation worksheet) worksheets. All entangling gear should be retained (if possible), documented on the Level A and Human Interaction Forms, and stored in a centralized location or sent to a NMFS gear repository.

Risks and Mitigation

To minimize the risk to human responders, animals, and, in some cases, the general public, a comprehensive entanglement response safety plan should be implemented. A safety briefing should occur prior to each entanglement response. In addition, a decision matrix or Go/No Go criteria should be established to guide responders in making safe decisions regarding the response to entangled pinnipeds. Responders should prepare, plan, and practice for possible risks and identify mitigation measures for these risks prior to any response. After each response, the team should conduct a thorough de-brief that is recorded in the entanglement response report and come up with lessons learned that can be applied to the next response. When responding to entangled pinnipeds, the list of risks and mitigations is never complete. There is always room for improvement and documents should be updated continually.

Additional possible risks and mitigation measures are listed below.

- All remote sedation and in-water disentanglement capture attempts must be approved by the RSC and the PI, on a case-by-case basis, prior to attempting the capture.
- Approved remote sedation capture protocol documents, including a list of drug combinations and a list of trained personnel that must include a veterinarian/veterinary technician, should be on file with the RSC and PI prior to any remote capture attempt. Updated lists of trained personnel should be provided annually to the RSC and PI.
- Situation specific documentation (including general location, specific location including if working off of a specific haul-out, dock, or within a harbor, proposed date and time for remote sedation capture attempt, maximum number of possibly entangled animals including size and species in the area, approach method to be used [by land or boat], number of boats [if used], number of personnel, and a specific personnel list) for remote sedation and in-water disentanglement capture attempts must be provided to the RSC for approval 24 hours prior to the capture or in the case of a real-time emergency situation verbal or text authorization must be obtained from the RSC prior to capture.
- After each remote sedation and in-water disentanglement capture attempt in which sedation is used, an entanglement response written report should be filed with the RSC and PI within 72 hours of the capture attempt when feasible and within two to four weeks if the response was conducted remotely in the field. This written report must include a detailed description of the effects of the drug combination on the pinniped including dose administered, time to effect, duration of effect, reversal agent if used and dosage, time to recovery, and any negative impacts of the drug combination including emergency support procedures needed (see example in Appendix F – Disentanglement form).

- For all procedures and samples, follow all animal handling and collection procedures as outlined in the existing Institutional Animal Care and Use Committee [IACUC] and only take additional samples if appropriate for animal condition and behavior.
- All remote sedation activities performed on phocids must have a seine net available for deployment in case the seal sinks while under sedation.

RISKS TO HUMANS

Risk: *Human exposure to drugs by injection, absorption, or ingestion*

The doses of immobilization and sedative drugs required to achieve an adequate response in large pinnipeds are all potentially lethal if accidentally injected into a human. Therefore, drug safety procedures must be carefully followed at all times.

Mitigation:

- Prior to using a particular chemical immobilizer or tranquilizer, it is each project leader's responsibility to determine and document that all personnel are familiar with the human safety aspects of the drug. These instructions shall include knowledge of the symptoms following accidental injection; emergency treatment procedures, including cardiopulmonary resuscitation (CPR); and name, location, and dosage of a reversal agent (if any). Written instruction should be close by and easily accessible at all times during a response.
- PPE: Basic safety precautions must be taken by all personnel to prevent exposure to drugs. These include wearing gloves when handling drugs/darts/wounds with drugs that can be absorbed across intact skin. Additional safety measures are required to prevent drug exposure across mucous membranes (eyes, mouth) when filing, charging or disassembling darts. Equipment should include at least one of the following in addition to gloves: safety goggles, splash guard mask, splash box or safety screen.
- OSHA Universal Standards for handling sharps are used https://www.osha.gov/SLTC/etools/hospital/hazards/sharps/sharps.html.
- Marine radios and cell phones ensure that emergency rescue personnel can be alerted should a team member be exposed to a drug. Local EMS should be notified prior to operations and informed of drug types and concentration, work locations, number of personnel, and safety equipment on board.
- All response staff are CPR certified.
- Reversal drugs are kept readily available.

Risk: *Human exposure through subsistence uses*

Mitigation:

- Inform Alaska Native or other indigenous communities in the region that a pinniped entanglement response may occur in their area.
- On the flipper tag, use a permanent marker to write "***Do not eat if harvested before xxx date***", which is past the withdrawal time of 45 days.
- Provide identifying details (tag number, dye-mark number, etc.) about chemically immobilized sea lions or phocids in the area.
- Provide a "safe to consume" date to Alaska Native organizations.

Risk: *Injury or death to personnel by drowning, falling or stepping on hazards*

Mitigation:

- Appropriate personnel should investigate and decide if location is safe.
- Wear appropriate PPE such as strong, non-slip footwear, gloves, PFDs, and helmets as necessary.
- Designated SO should be assigned to continually watch over all team members involved and be able to communicate to the team to adjust strategy or call off the effort as necessary.
- Designated SO should be watching for and warning the team of hazards.

Risk: *Injury to personnel during capture*

Mitigation:

- Appropriate PPE (*e.g.*, helmets around poles, gloves, etc.).
- Net and pole handlers should be trained in techniques that minimize injury to themselves and others during in-water capture.
- All nets and poles should be inspected for hazards prior to use.

Risk: *Injury to personnel from pinniped bite or scratch*

Mitigation:

- Personnel should wear appropriate PPE such as strong, non-slip footwear, gloves, and protective clothing as necessary.

- All personnel should be alerted immediately prior to a procedure that may elicit a response from the entangled animal.
- Personnel should be trained in proper restraint techniques to minimize bite risk.

RISKS TO ANIMALS

Risk: *Injury to animal after sedation by rolling into water, being trampled, or being injured by another pinniped*

Mitigation:

- Use a risk assessment tool or decision matrix to assess the capture location from many angles and only attempt capture once the scene is assessed to be safe.
- Ensure there is a plan to safely haze nearby animals away from the sedated animal.

Risk: *Injury to animal from capture equipment*

Mitigation:

- Personnel should be trained in techniques that minimize injury to the animal.
- Use an adequate number of net handlers to increase safety.
- Conduct a proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

Risk: *Injury to animal from nearby objects*

Mitigation:

- Hazards in the area should be identified and removed or mitigated by experienced personnel.
- Conduct a proper evaluation of existing animal injuries and potential for injuries before capture attempt.
- Evaluate medical care capacity (*i.e.*, emergency resuscitation, rehabilitation, euthanasia) prior to capture.

Risk: *Unintentional capture or disturbance of non-entangled protected species*

Mitigation:

- Evaluate the possibility of unintentional take of non-entangled animals before and during capture.
- Complete appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation.
- Always consider efforts to minimize disturbance to non-entangled animals.
- The safety officer(s) should continuously watch for the presence of non-entangled animals in and around the capture area throughout the capture, and communicate with the team appropriately.
- If animals are flushed into the water and haul-out later, a maximum of two attempts per day at the same haul-out should be performed. Animals hauled out toward the margins of the group will be preferred over those in the middle of the group, with the hope of disturbing fewer animals and to take advantage of increased visibility.
- In addition to limiting the number of attempts on a single haul-out, a monitoring plan should be instituted during operations as follows:
    - Prior: Just prior to each operation and between operations, a survey of the haul-out should be conducted. Surveys are conducted to determine where animals are hauling out, how many animals and how many entangled animals are observed on the haul-out, where entangled animals are in relation to the rest of the animals, the nature of the entanglements, the body condition and size of potential entangled animals, and to assess risk to animals and personnel.
    - During: Once the dart is administered, several monitors positioned on each vessel should observe the movements of the entangled animal. If the animal enters the water, monitors should note its location. If the seine net is used, the monitors should observe the entangled animal and the net for any other non-entangled animals. Non-entangled animals should be allowed to swim away from the entangled animal (presumably the entangled animal will be slowed down) before deploying the net. The support vessel should release non-entangled animals from the net as quickly as possible.
    - After: Once the animal has been disentangled, tagged, marked, reversed and released, it should be monitored from a distance at first from the beach haul-out and then from a vessel. Prior to leaving the beach, all personnel should scout the area and remove any response debris, especially darts and, syringes, and drugs. Monitors should observe the entangled animal and other animals in the area for any signs of distress.

Risk: *Animal flees into water before sedative takes effect*

A darted entangled animal fleeing to the water before the sedatives have taken effect is a likely scenario with these species and under these circumstances.

Mitigation:

- Dart when the animal is high on the beach, farther from the water (typically at low tide) to ensure maximum distance between animal and water.
- Get as close to the entangled animal as possible and use the lowest possible pressure so there is less of a startle response.
- If possible, wait until the animal has been asleep or calm for at least 30 minutes – the less active the animal, the better chance it will stay on land.
- All personnel should continuously observe the animal and consider transmitter darts to better track the animal.
- Re-calculated dosage charts for crash drugs and keep reversal nearby for rapid dosing.

Risk: *Animal develops an adverse emergency reaction to sedatives*

Mitigation:

- Reversal agents, and if needed, crash drugs and fluids should be administered per the direction of the veterinarian.
- The decision to intubate should be based on human and animal safety, and necessity. Intubation decisions should be left to the discretion of the veterinarian.
- An Istat- hand-held blood analyzer should be available for detection of metabolic derangement during emergency situations and to facilitate proper treatment.
- Thermoregulatory methods to cool (cold water and ice) or warm (Mylar blankets, self-heating blankets, hot water bottles) the animal should be available if the animal has difficulty thermo-regulating while under sedation.

Risk: *Non-entangled animal is hit with a loaded dart*

- Every effort should be made to track and retrieve the animal, administer a reversal agent, and monitor the animal.
- If retrieval is not possible, an attempt to administer a reversal agent via dart should be made.

Risk: *Non-entangled animal sinks after being hit with a loaded dart*

Mitigation:

- All mitigations listed above should be utilized until the animal is located and recovered.
- All other survey or potential capture operations should cease to focus efforts on the darted animal.
- Use a seine net to retrieve the animal from the bottom and reverse at the surface.

Risk: *Animal fatality*

Mitigation:

- Every effort should be made to recover the carcass for necropsy.
- External documentation should be performed immediately upon carcass recovery.
- The Regional Stranding Coordinator and permit's Principle Investigator should be notified, a full necropsy should be performed as soon as possible, and a final report sent to NOAA.
- Entanglement response activities should immediately cease until necropsy is completed and new mitigation measures are approved by NMFS.

Additional risks for phocids

Risk: *Animal sinks after sedative has taken affect*

This presents the highest level of danger for phocids during these operations. Timely retrieval of these animals is essential.

Mitigation (these are suggestions and may not apply to every situation):

- *Modify* drug dose or combination.
- Attempt early approaches. Use seine net earlier in process if conditions allow.
- Use additional tracking and retrieval equipment (*e.g.*, shepherd crook and underwater pole camera with live feed to locate the animal).
- Seine (or other appropriate) nets should be available when darting phocids so bottom retrieval can be possible, if a seine (or other appropriate) net is not available, then remote sedation of phocids will not be approved.
- Modifications to the seine net set up, and protocol such as adding additional floats and lead line to enlarge the net (situation dependent).
- Use of a fish finder or transmitter darts to locate animals that have sunk.
- Limitations on locations that animals should be darted (*e.g.*, not in areas more than ~4.5 m deep and/or with strong current).

Intervention Criteria/Decision Matrix (Go/No Go)

The Go/No Go Decision Matrix (see Figure 6-1 for an otariid example and Figure 6-2 for a phocid example) is a flow chart based on permit requirements. This flow chart enables responders to think through the current response scenario to determine if the response is feasible based on a risk assessment.

Otariids

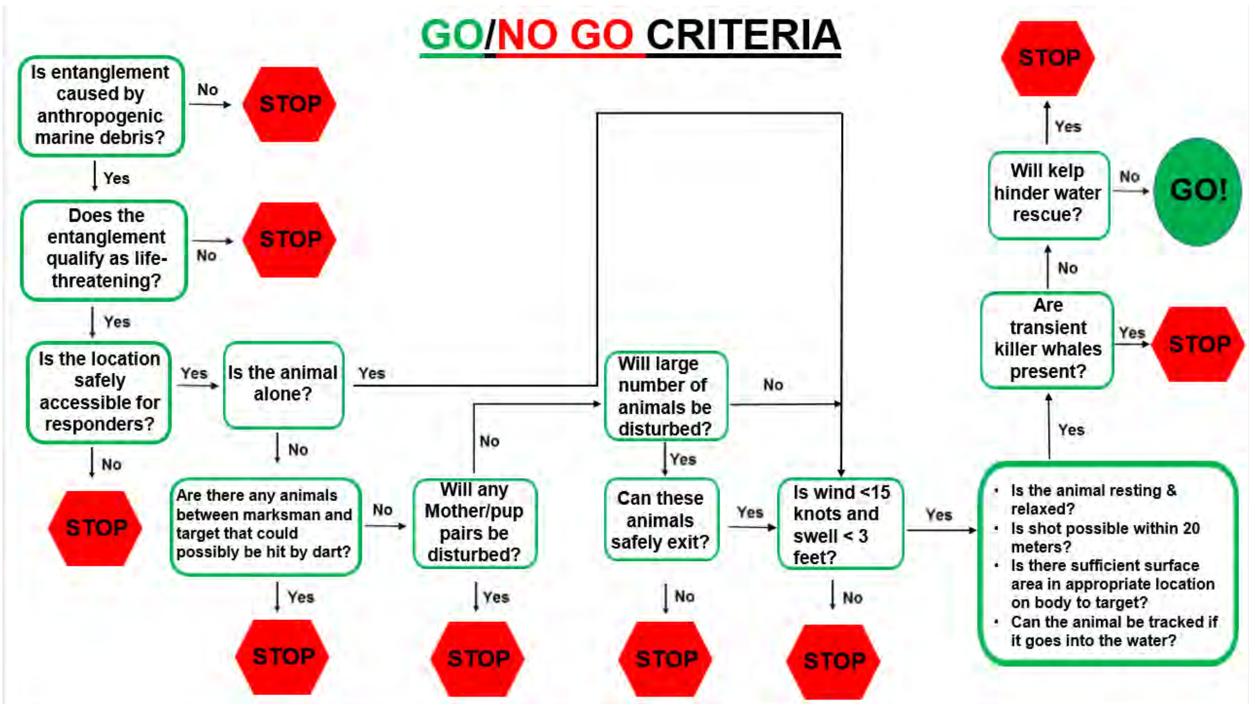


Figure 6-2. Example of a Go/No Go decision matrix used for remote sedation of entangled otariids.

Phocids

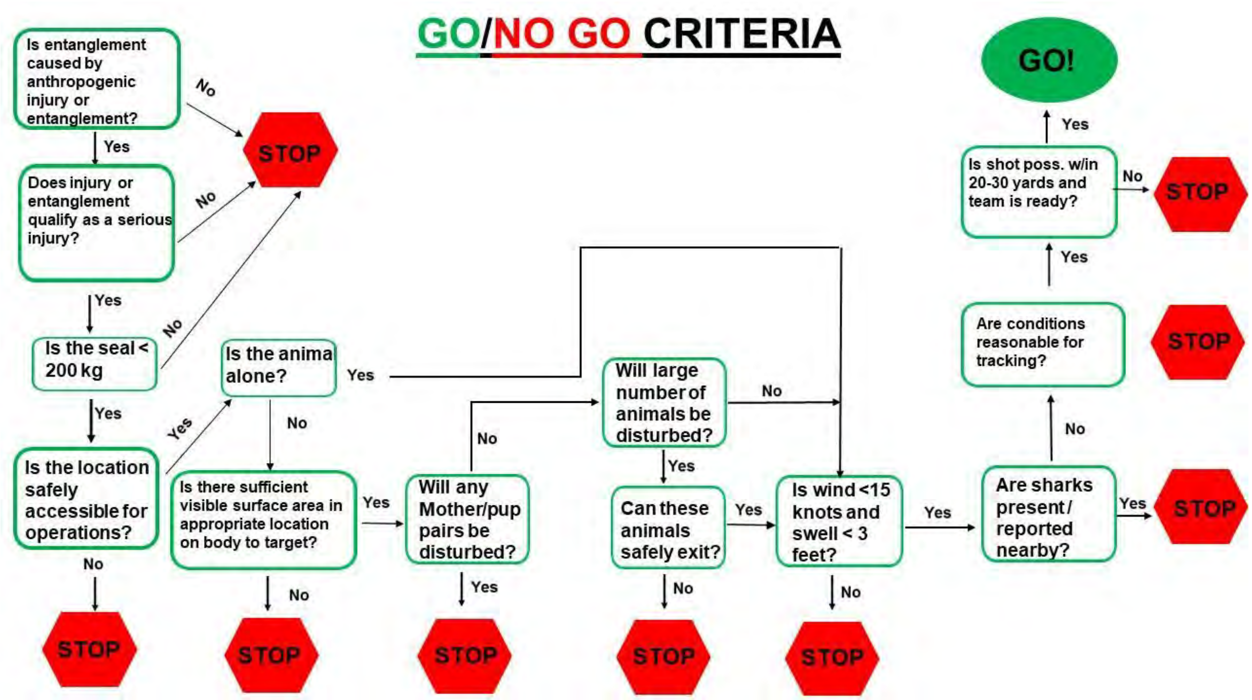


Figure 6-3. Example of a Go/No Go decision matrix used for remote sedation of phocids.

Procedure

Optimal capture situation

- Animal is in a location without any hazards
- Solitary
- Sleeping – there is a chance the animal may stay onshore
- Away from the water's edge – reduces chance that the animal will flee into the water

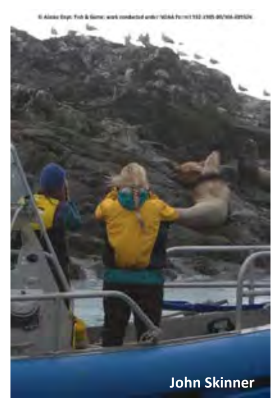
Otariids

Steller sea lion and California remote sedation procedure

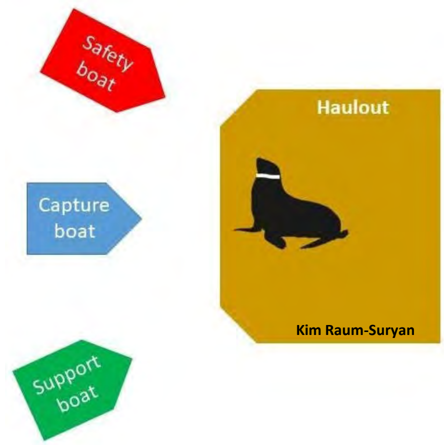
A minimum of six personnel are required for an otariid remote sedation entanglement response. Two personnel (marksman and spotter) can be dropped off on shore, two personnel (boat driver and handler) remain in the capture skiff, and two personnel (boat driver and monitor) remain in the safety boat. A maximum of nine personnel can be involved in the operation if a third boat is available.

Identify candidate animal: The entangled animal will be identified, and its position, size, age and sex (if possible to determine), and placement among other animals will be noted.

1. **Risk Assessment Tool or Go/No Go Determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
2. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
3. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC for the capture, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a handling should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm the team members fully understand, are capable, and are mentally prepared. Review the animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure that all personnel and equipment are ready and determine the final Go/No Go.
4. **Modify protective clothing and personal effects to minimize getting caught in net during handling events:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons and modify as appropriate to reduce entanglement/tripping risks.



5. **Documentation:** The photographer/videographer will ensure all photo and video equipment is operational and recording.
6. **Time limits:** Record the time of day, total capture and restraint time (from when the animal is first touched until it is released).
7. **Weight estimate:** To prevent bias, each team member estimates the weight and establishes a median. The veterinarian has the discretion to modify the weight estimation if necessary.
8. **Positioning:** There are at least two boats used during remote sedation, but three are preferable. One boat is the primary darting/capture boat, the second boat is the safety boat, and the third boat is a support boat to help monitor the animal should it flee into the water.



9. **Sedatives and reversal drugs**: The veterinarian will select the appropriate drug combination and dosage. Darts and or syringes pre-loaded with appropriate reversals will be kept readily available should an emergency situation occur in which reversal would increase the likelihood of the survival of the animal or should a non-target animal be hit with a dart. The veterinarian should select the appropriate drug combination and dosage.
    - Human and animal reversals are drawn into syringes before sedative dart is fired.
    - Euthanasia solutions should be kept nearby in case there is a need for euthanasia.
10. **Procedure to minimize disturbance:**
    - Entanglement response should not be attempted in locations within breeding rookeries that are likely to disturb mother/pup pairs.
11. **Approach:**
    - **Distance -** Using a rangefinder, the spotter calls out the distance from the target so that the marksman can select the ideal distance and correctly set the projector pressure.
    - **Land shot -** If darting from shore, only the marksman and spotter should go ashore. They will stalk carefully, go slow, wear camouflage gear and use natural cover, remain quiet, and approach from downwind. With skill and patience, the marksman and spotter can get within feet of the entangled animal.
    - **Water shot** – If darting from the boat, ensure all personnel on the vessel are quiet, and stay low in the boat. Spend time driving the boat parallel to shore getting closer each time so that the animals become accustomed to the boat. Use a rangefinder to determine distance to the entangled animal. Try to determine where the animal might go once hit by the dart. Wait until the animal is quiet and asleep to maximize the possibility that the animal will stay on shore and not jump in the water.

12. **Darting:**
    - **Wind** - Wind can have a significant effect on the success of darting. With appropriate projector pressure, darting with less than 15 knot head- and cross- winds is successful. Tail winds are to be avoided as they significantly alter the accuracy and precision of the shot.
    - **Currents** – Currents can present an additional challenge when darting from a boat. Make practice approaches prior to taking the actual shot to determine the best angle of attack, speed, etc. to allow the marksman a reasonable chance of success.
    - **Dart preparation** - Use a dart with a drug plunger that moves smoothly and easily to ensure all sedative is released upon impact. Add a drop of lubricant if needed. To ensure maximum safety, the projector should not be pressurized until the marksman is ready to take the shot. If pressurized too soon, there is a chance that the projector could lose pressure.
    - **Angle of shot** – The angle of the shot is important to take into consideration. The only way to know how the dart will react to an upward or downward angle is to practice and record the shot (*i.e.*, if shooting upward from 10 meters away, determine where you should aim to make the correct shot).
    - **Taking the shot** – Ensure the marksman is within 20 m of the target animal. It is best to get as close as possible to minimize the pressure of the dart, thus minimizing the startle response of the animal. If other animals are in the vicinity, there is a greater chance that the target animal will remain on shore. The marksman warns the team “darting” and fires the projector. Aim for the shoulder or flank. Do not aim at the head, thorax, or abdomen.

13. **Surveillance:** At full dose, it may take from approximately five to 25 minutes for an animal to become fully sedated. If the full dose was not injected, the veterinarian has the discretion to give an additional dose via dart or hand injection.

- **Land** – As soon as the animal is darted, have all personnel keep their eyes on the target animal. Vessels should remain a good distance away (50 - 100 m or more), ensuring the boat's presence does not cause the animal to jump in the water, but close enough that personnel with binoculars can keep eyes on the animal. Continue monitoring the animal until it has been asleep for a couple of minutes and the veterinarian informs personnel that it is safe to approach the animal.

- **Water** – Keep an eye on the animal prior to and after darting. If the animal flees into the water, use the "man overboard" method of always having someone with eyes on the animal and pointing to the location it was last observed prior to submerging. It is ideal to have three vessels spread out, one at either end of the haul-out and one in the middle, to have the best chance of observing the animal as it comes up to the surface. The animal is immediately assessed for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate, and body temperature should be continually monitored.

14. **Retrieval:**

Steller sea lion: Once a darted Steller sea lion starts to slow down and swim in a smaller area, the boat approaches closer to the animal. The sea lion may come up to breathe, then slowly sink, blowing bubbles, he may lunge out of the water to take a breath, then slowly go underwater, or he may just swim slowly around in a small area, rolling his head to the side to get a breath. Once the sea lion shows one of these behaviors, the capture boat approaches. Two different members of the team have a capture noose-pole ready to noose the animal (see example in Appendix L – Capture Pole). The responder nooses the sea lion, brings the sea lion alongside the boat, with the head toward the bow and the tail toward the stern. While the first responder holds the head out of the water, the second responder uses a rope to loop around the foreflipper at the surface of the water to help hold the middle of the animal in a horizontal position. A third responder can help hold the animal's rear flippers. Once the animal is secured alongside the boat, it is helpful for the boat operator to put the boat in gear and travel slowly forward. The forward momentum helps keep the animal horizontal in the water, which is safer for the animal and the responders holding up the animal.

California sea lion: Hoop nets are commonly used to contain the animal. If necessary, the hoop nets have a quick release system that allow the responder to detach the hoop from the net and stow the hoop. If the animal is small enough, it is placed in the bow of the boat and crowding/herding boards are used to protect responders from bites. Moving the animal into the boat allows the veterinarian team to better monitor the animal and improves boat handling because the animal is not in the water while underway. When it is necessary to leave the animal in the water while underway, responders ensure that the animal's airway is protected, that the veterinarian team has visual access to the patient, and that all team members are wearing appropriate PPE.

15. **Monitoring and assessment:** If adequately sedated, the animal is immediately assessed visually for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, and if on land, body temperature (rectal thermometer), are continually monitored and the animal is given intranasal oxygen (2-5 L/min) while other procedures occur.

If a static dart was used and has not fallen out, it is removed and placed in a hard-shell case. If a transmitter dart was used, the dart body is removed from the needle to prevent further tissue damage.

16. **Data collection:** Morphometrics, sex, and samples should be taken and all data recorded completely.

17. **Disentanglement:** Using an appropriate cutting tool (*e.g.*, knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed (some animals have been observed with two plastic packing bands). All entangling gear should be retained (if possible), documented under Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.
18. **Wound care:** The wound is investigated to assess the extent of tissue damage and to ensure that all foreign material has been removed. The wound (if any) may be cleaned with antiseptic and treated topically, though this should be balanced with animal handling time and stress. Many entanglement wounds are open and will be easily flushed with seawater, making wound care less critical. However if needed, responders can conduct wound debridement or administer antibiotics. A broad-spectrum, long-acting antibiotic can be used to treat injuries, but the choice to administer this (or other drugs) is at veterinary discretion. Dilute povidone-iodine may be used to flush deep wounds or areas that are not likely to be easily flushed on their own. Euthanasia solutions should be kept nearby in case there is a need for euthanasia. In the case of a severe wound and if the animal is small enough to transport to a rehabilitation center, surgery may be considered.
19. **Antibiotics and fluids:** At the discretion of the veterinarian, antibiotics (*e.g.*, oxytetracycline) or fluids may be given.
20. **Sampling:** Depending on permit approval, samples such as skin, whisker, hair, or blood may be taken.
21. **Marking and tagging:** Temporary (hair dye, paint stick) identifying marks should be applied for more visible identification. Plastic Allflex numbered tags can be attached to foreflippers to identify individuals. If in an area where pinnipeds may be used for subsistence, ensure that tags indicate the "safe to consume" date by writing "***Do not eat if harvested before xxx date***" on tags with a permanent marker. Flipper or head-mount satellite-linked tags can be attached to determine post-capture survival and movement patterns.

22. **Branding:** If permitted, a one or two digit hot brand can be applied to the left shoulder for long-term, permanent identification.

23. **Sedative reversals:** Reversal administration can occur at any time during the procedure at the discretion of the veterinarian and dependent on the animal's condition. All equipment should be removed from the area around the animal and a clear path to the water should be available. Once reversal is administered all personnel except the veterinarian and second person (*e.g.*, finishing sampling) should be out of sight and quietly watching so there is little or no external stimuli once the animal wakes up. If a recently wakened animal is surprised, it may rush into the water before it is ready.
24. **Post-recovery:** After recovery, the animal should be either released or if additional monitoring or rehabilitation is required, placed into a transport carrier and transported to a rehabilitation center for additional treatment. During field disentanglement the animal may be provided supplemental inhalant anesthesia and oxygen using a custom field anesthesia machine and mask. Reversals would then be given prior to release.
25. **Dart retrieval:** wearing gloves, if using a static dart, retrieve and secure inside a protective case until dart can be cleaned.
26. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
27. **Disinfecting/disposal:** If protective reusable clothing (raingear, footwear, kneepads, cloth cloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (tape measures and scales), tagging supplies (tagging pliers/hole punches), specimen supplies, and other miscellaneous items (buckets, clipboards, writing implements, etc.). Dispose of used nitrile gloves in the trash. Place used needles/scalpels in a "SHARPS" container (do not recap needles).
28. **Submit reports:** Ensure all datasheets and reports are complete and submitted where appropriate. Appropriate "take" (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.

29. **Prepare again:** Clean and organize gear so it is ready for the next response.

Phocids

Gray seal remote sedation procedure

A minimum of seven personnel (maximum of eight with four on each of two vessels) are required for seine net operations. No more than 16 personnel should be involved in an operation. Other personnel (additional animal handlers etc.) should be dropped off at an appropriate beach location where the targeted animal should be brought for disentanglement.

1. **Identify candidate animal:** The entangled animal will be identified, and its position, size, age, sex (if possible to determine), and placement among other animals will be noted.
2. **Risk assessment tool or Go/No Go determination:** Consult to determine if a safe capture is feasible. Criteria will be based on authorization requirements and decision matrices. Potential effects of response to non-entangled animals and/or species within the response areas should be considered and precautions taken to minimize disturbance. Ensure no mother/pup pairs will be disturbed and ensure there is a safe egress area for non-target animals.
3. **Secure the area:** If necessary, onlookers will be notified and asked to clear the area.
4. **Assign team roles and review plan:** Before handling any animal, be sure everything is ready. Double check all the equipment and supplies. Identify the IC for the capture, review the capture scenario and all procedures, any emergency response, and the sequence of the activities. Discuss when a handling should be aborted and who makes the decision. Assign roles for each team member (and backups) for every part of the capture, and confirm the team members fully understand, are capable, and are mentally prepared. Review animal warning signs to monitor and the appropriate emergency response actions. The IC will ensure all personnel and equipment are ready and perform the final Go/No Go determination.
5. **Modify protective clothing and personal effects to minimize getting caught in net during handling events:** Remove rings from fingers or wear gloves, tie hair back, check clothing for buttons and modify as appropriate to reduce entanglement/tripping risks.
6. **Documentation:** The photographer/videographer will ensure all photo and video equipment is operational and recording.
7. **Time limits:** Record the time of day, total capture and restraint time (from when the animal is first touched until released).

8. **Drug dosages:** The veterinarian should select the appropriate drug combination and dosage and load the dart (*e.g.*, see Appendix J – Phocid sedation worksheet). Final sedative selection is at the discretion of the veterinarian within the confines of the approved protocol, or with special permission from NOAA.
9. **Approach:** The target animal should be approached either from land, or from a vessel in front of the haul-out. If by vessel, it should be positioned close to the haul-out, taking care to not flush the animals.
    - **Distance** - Using a range finder, the spotter calls out the distance from the target so that the marksman can select the ideal distance and correctly set the projector pressure. A distance of 20 meters is ideal for an accurate shot, a shot should not be attempted if more than 30 meters from the animal.
    - **Land shot** - If darting from shore, only the marksman and spotter should go ashore. They will stalk carefully, go slow, wear camouflage gear and use natural cover, remain quiet, and approach from downwind. With skill and patience, marksman and spotter can get within feet of the entangled animal.
    - **Water shot** – If darting from the boat, ensure all personnel on the vessel are quiet, and stay low in the boat. Spend time driving the boat parallel to shore getting closer each time so that the animals become accustomed to the boat. Try to determine where the animal might go once hit by the dart.
10. **Practice trials:** Vessels transit away from haulout and practice seine net capture procedure.
11. **Positioning:** Boat #1 positions ~ two boat length from the animal at a 90° angle to the animal.
12. **Darting:**
    - **Wind** - Wind can have a significant effect on the success of darting. With appropriate projector pressure, darting with less than 15 knot head- and cross- winds is successful. Tail winds are to be avoided as they significantly alter the accuracy and precision of the shot.
    - **Currents** – Currents can present an additional challenge when darting from a boat. Make practice approaches prior to taking the actual shot to determine the best angle of attack, speed, etc. to allow the marksman a reasonable chance of success.
    - **Dart preparation** - Use a dart with a drug plunger that moves smoothly and easily to ensure all sedative is released upon impact. Add a drop of lubricant if needed. To ensure maximum safety, the projector should not be pressurized until the marksman is ready to take the shot. If pressurized too soon, there is a chance that the projector could lose pressure.

- **Angle of shot** – The angle of the shot is important to take into consideration. The only way to know how the dart will react to an upward or downward angle is to practice and record the shot (*i.e.*, if shooting upward from 10 m away, determine where you should aim to make the correct shot).
- **Taking the shot** – Ensure the marksman is within 20 m of the target animal. It is best to get as close as possible to minimize the pressure of the dart, thus minimizing the startle response of the animal. If other animals are in the vicinity, there is a greater chance that the target animal will remain on shore. The marksman warns the team "darting" and fires the projector. Aim for the shoulder or flank. Stay away from the head, thorax or abdomen.

13. **Surveillance**
    - **Land** – As soon as the animal is darted, have all personnel keep their eyes on the target animal. Vessels should remain a good distance away (50 - 100 m or more), ensuring the boat's presence does not cause the animal to jump in the water, but close enough that personnel with binoculars can keep eyes on the animal. Continue monitoring the animal until it has been asleep for a couple of minutes and the veterinarian informs personnel that it is safe to approach the animal.
    - **Water** – Keep an eye on the animal prior to and after darting. If the animal goes into the water, use the "man overboard" method of always having someone with eyes on the animal and pointing to the location it was last observed prior to going under water. It is ideal to have three vessels spread out, one at either end of the haul-out and one in the middle, to have the best chance of watching for the animal as it comes up to the surface. The animal is immediately assessed for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate, and body temperature should be continually monitored.
14. **Retrieval:**
    - **At surface:** A sedated seal at the surface is retrieved using one or two hoop nets and/or a shepherd crook. Evasive seals at the surface may be captured using a seine net if conditions are appropriate for its use.
    - **Below surface:** A sedated seal below the surface is located with the transmitter dart if used. In addition, a fish finder, live-feed underwater camera and avalanche poles may be utilized. Animals should be retrieved from the bottom using either a long-poled hoop net or lifeguard rescue hook. If conditions are appropriate and it is deemed useful, a seine net may be employed as well.

15. **Net deployment (if necessary):**
    - Once in proper position to the target animal, the boat operator should then instruct the Netter to start deploying the net. The Netter then tosses the sea anchor and buoy over the stern and then quickly pays out the net, being cautious not to get tangled up in the net. As the net starts deploying, the boat operator swiftly drives the boat in a large arc around the target animal maintaining the same approximate distance from the animal throughout the encircling process. All other team members should be positioned toward the middle of the bow of the boat, seated on the deck so as not to obstruct Netter or Boat Operator.
    - Once the Netter has deployed all of the net and the circle is completed, one designated team member on the primary boat uses a boat hook to retrieve the buoy and hands it to the netter to close the gap between the two ends of the net. The boat operator then sets two anchors on the opposite side of where the net is deployed to stabilize the vessel and prevent it from getting pulled into the net.
    - During the encirclement, the secondary boat should be positioned at what should be approximately the six o'clock position once the net is fully deployed. The role of the secondary boat is to monitor/spot animals in the net, check the net for animals entangled in it, and disentangle and release any non-targeted animals. Should the target animal become entangled and the support boat is closest, they should reel in the net to bring the animal close to the boat and keep its head above water. Depending on circumstances and size of the animal, they should either: disentangle from the side of the secondary boat, transfer to the primary boat for disentanglement, or ferry the animal to a nearby shore for disentanglement.
16. **Post retrieval:** Once retrieved, the animal should be brought onto the capture vessel or assessed whether it can be held along-side the vessel and brought to a nearby beach or sand-bar.
17. **Monitoring and assessment:** If adequately sedated, the animal is immediately assessed visually for any signs of respiratory or circulatory distress and if found treated accordingly. The respiration rate, heart rate (stethoscope), and body temperature (rectal thermometer) are continually monitored. If a transmitter dart was used, the dart body is removed from the needle to prevent further tissue damage.
18. **Data collection:** Morphometrics, sex, samples, and documenting photos should be taken and all data recorded completely.

19. **Disentanglement:** Using an appropriate cutting tool (*e.g.*, knife, scissors, wire cutters, etc.), the entangling material should be cut away from the animal and handler and removed by peeling the entangling material out of the wound rather than dragging it out from one side to minimize pain and prevent further injury. Double check to ensure all entangling material has been removed. All entangling gear should be retained (if possible), documented under Level A and Human Interaction Forms (Appendix B – Level A and Human Interaction Form), and archived or sent to a NMFS gear repository.
20. **Wound care:** The wound (if any) should be cleaned with antiseptic and treated topically. If needed, the veterinarian may conduct wound debridement.
21. **Antibiotics and fluids:** At the discretion of the veterinarian, antibiotics and/or fluids may be given.
22. **Marking and tagging:** A flipper tag and paint stick (for applicable species) should be applied. If available, a satellite-linked tag should be attached. Hair dye may also be used for more visible and longer-term identification.
23. **Sedative reversals:** Reversal administration dependent on the animal's condition. If indicated sedation reversals should be given at the prescribed dosage (see Appendix J – Phocid sedation worksheet). Darts and or syringes pre-loaded with appropriate reversals should be kept readily available should an emergency situation occur in which reversal would increase the likelihood of the survival of the animal or should a non-target animal be hit with a dart.
24. **Post-recovery:** After recovery, the animal should either be released or if additional monitoring or rehabilitation is required it should be transported to a rehabilitation facility.
25. **Dart retrieval:** wearing gloves, if using a static dart, retrieve and secure inside a protective case until dart can be cleaned.
26. **Post-capture debrief:** The entire team discusses the capture, gives constructive feedback, and brainstorms on areas that need improvement. It is important to discuss as a team within 24 hours of the capture while memories of the event are fresh. Debrief notes should be added to the final report.
27. **Disinfecting/disposal:** If protective reusable clothing (raingear, footwear, kneepads, cloth cloves) are soiled, they must be cleaned and disinfected before reuse. All contaminated reusable equipment and gear must be treated including retraining nets, measuring gear (tape measures and scales), tagging supplies (tagging pliers/hole punches), specimen supplies (specimen cooler, ice packs), and other miscellaneous items (buckets, clipboards, writing implements, etc.). Dispose of used nitrile gloves in the trash. Place used needles/scalpels in a "SHARPS" container (do not recap needles).

28. **Submit reports:** Ensure all datasheets and report are complete and submitted where appropriate. Appropriate “take” (capture, and/or harassment of any marine mammal; or, the attempt at such) approval and documentation to disturb non-target animals also should be completed.
29. **Prepare again:** Clean and organize gear so it is ready for the next response.

Gaps and Future Research Needs

Training and sharing of protocols

One of the biggest gaps in the ability to respond to entangled pinnipeds is the lack of quick access to entangled animals. In many regions, lack of personnel in remote areas prevents a response to entangled individuals. Many groups are now identifying "hot spots" for entangled animals and targeting these areas at certain times of the year (twice a year or quarterly) and opportunistically disentangling the animals that are present. There also is a need to increase the number of veterinarians that are able to access controlled drugs used in remote sedation of pinnipeds as well as train more personnel in appropriate darting techniques.

Training, specifically remote sedation hands-on training and cross-training of responders should be implemented and continued to ensure responders are fully qualified and experienced to respond. If possible, annual or biennial darting and sedation classes, including the proper methods to load darts, the best sedation methods, and lessons learned would be beneficial to all responders. For groups that may not typically use in-water, vessel based capture techniques, or seine nets, these activities should also be part of regular training exercises. Responders that have developed effective protocols should share with those that are just starting out.

Equipment needs/tool & technique development

As techniques and protocols improve, these should be shared with network members via the MMHSRP. NOAA should encourage formal training in remote sedation and capture techniques. Better methods should be developed for floating a large pinniped alongside a boat efficiently and safely. Continued improvements in refining remote sedation drug combinations for phocids should be encouraged to find a combination that does not result in sinking.

Continued research into effective sedation protocols for different species and methods for best practice should be encouraged including collaborating with the global pinniped community.

Lessons learned

- Included below are lessons learned from entanglement response personnel:
- Safety should always be the top priority.

- Be prepared, PRACTICE regularly to be ready for a response, and have an experienced team that works well together.
- Establish methods for clear communication prior to a capture event. Ensure all participants understand how communications will be conducted.
- When using remote sedation, the most important shot is the one not taken. Only dart after consulting the decision matrix, ensuring there is a safety plan in place, and never let the pressure of others cause you to dart before you are ready or when the risks outweigh the benefits.
- The best response is always to stand down if conditions for animals or humans are not safe.
- Darting pinnipeds in the water increases the risk to both animal and human safety and is not recommended. Darts can bounce off of the water in random directions and increase the risk to responders.
- Always conduct a team debrief shortly after each capture to discuss what went well and where improvements could be made.
- Never stop striving to improve safety and handling protocols. Share lessons learned with other teams nationally and internationally.

Outreach and education

All NOAA stranding networks in the U.S. provide stranding hotline numbers to report entangled or injured marine mammals (see https://www.fisheries.noaa.gov/report). It is important to get this information out to all regions of the country so entangled pinnipeds can be documented and possibly helped. For more information about how we can all help reduce the amount of marine debris that enters the environment, see https://marinedebris.noaa.gov/.

NOAA and network members should continue outreach and education and work together with the public, industry, and stakeholders to mitigate the problem of entangling debris in the ocean. Those working in the pinniped entanglement field should consider becoming members of the global multi-stakeholder Pinniped Entanglement Group (PEG) to stay informed about the latest updates regarding pinniped entanglement response, tools, successes, innovation, deterrents, protocols, outreach, and education.

There are many opportunities to get involved with youth in the schools. NOAA has a very successful Ocean Guardian School Program. An Ocean Guardian School makes a commitment to the protection and conservation of its local watersheds, the world's ocean, and special ocean areas, such as national marine sanctuaries. The school makes this commitment by proposing and then implementing a school-or community-based conservation project. Project pathways include: 1) Restoration; 2) Rethink/Refuse/Reduce/Reuse/Rot/Recycle; 3) Reducing marine debris and single-use plastics; 4) Creating schoolyard habitats or gardens using native plants and reducing water use; 5) Energy and ocean health. As part of this program, the schools produce measurable data so progress can be tracked. Entanglement response personnel should consider partnering with the Ocean Guardian School Program to expand outreach and education related to the impacts of marine debris and plastics on marine mammals.

Conclusion

There have been many advances in pinniped entanglement response in the last several years; notably, remote sedation now allows responders to safely capture and disentangle large pinnipeds that previously were inaccessible. However, our ability to disentangle animals is a small response to the much larger problem of plastics and marine debris in the oceans that threaten all marine life. It is important to collectively work together to proactively find solutions to prevent marine debris from entering our waterways. By working together on outreach and prevention, we can help to mitigate the impacts of marine debris on pinnipeds and all marine species. **Prevention is the key to solving this global problem.**

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Appendices

Appendix A - Pinniped Entanglement Response – Frequently Asked Questions

NOAA FISHERIES

Pinniped Entanglements

Frequently Asked Questions

What are pinnipeds?

Pinnipeds are seals, sea lions, and walruses. The word pinnipedia translates from Latin as "winged foot," referring to the animals' fin-like flippers. Three families of living pinnipeds are recognized: the Phocidae (earless or true seals); the Otariidae (eared seals), and the Odobenidae (walrus). Under the Marine Mammal Protection Act, NOAA Fisheries has jurisdiction over seals and sea lions. Walrus are under the authority of the U.S. Fish and Wildlife Service.

How do pinnipeds become entangled?

Pinnipeds can become entangled in nets or hooks during fishery interactions or in marine debris that has been lost or abandoned in the marine environment. Common examples of marine debris that harm pinnipeds include plastic packing bands/straps, fishing gear, rope, and large rubber bands often used on crab pots. Seals and sea lions become entangled around their head and/or neck and flippers. Entanglement in marine debris, including fishing gear, can cause decreased swimming ability, disruption in feeding, life-threatening injuries, infection and death.

Why disentangle pinnipeds?

Entanglements are a human-caused threat which can lead to significant injury and death. By disentangling pinnipeds, we can identify the entangling material so additional measures can be taken to prevent these materials from entering the marine environment. While we will not be able to respond to all entanglements, it is important for us to document entanglements to understand how they are impacting our pinniped populations.

When is an entanglement response attempt made?

Entanglement response attempts are made when the entanglement is life-threating. Pinnipeds are large wild animals that can pose risks to human health and safety. Response team members may be exposed to diseases that can be transmitted from pinnipeds to humans, may sustain injuries or bite wounds, and are conducting work on dangerous terrain. There are different techniques to capture pinnipeds to reduce these risks including manually restraining smaller animals, catching individuals in a stationary cage, or darting larger animals with sedatives so that they can be safely approached and disentangled.

How can I report an entangled pinniped?

Call the National Marine Fisheries Service statewide 24-hour Stranding Hotline at (xxx) xxx-xxxx (*fill in for your location*). The hotline is operated 24/7. Please indicate the date, location (including latitude and longitude), species, and details about the entanglement. Photographs are extremely helpful in confirming the species and type of entanglement. Please do not approach within 100 yards of pinnipeds, these animals are protected by law under the Marine Mammal Protection Act and disturbance should be minimized at all times.

What can I help reduce entanglements?

"**Lose the Loop!**" and "**Stash the Trash!**" Simple procedures such as cutting entangling loops of synthetic material, eliminating the use of plastic packing bands, and placing all trash in the proper trash receptacle can prevent many entanglements.

Appendix B – Level A and Human Interaction Form

Level A forms, Human Interaction forms, and a complete and detailed examiners guide can be found online here. **Level A. Form – Page 1.**

OMB Control No. 0648-0178; Expiration Date 3/31/2020

MARINE MAMMAL HUMAN INTERACTION REPORT

Exam Information *(fill in or circle most appropriate)*

1 Field #: ____________ Species: ____________

2 Examiner: ____________ Recorder: ____________

3 Date of exam: ____________ Condition code (at exam): 1 2 3 CBD

4 Preservation: alive fresh frozen frozen/thawed Body condition: emaciated not emaciated CBD

5 Documentation: digital print slide video Image disposition: ____________

6 Integument : normal abnormal decomposed % Skin missing: <10% 10-25% 25-50% >50%

7 Explanation of terms:
YES = I have examined the area and/or found signs of this pathology, natural marking, or human interaction
NO = I have examined the area and/or did not find signs of this pathology, natural marking, or human interaction
CBD = I have examined the area and could not determine whether there were signs of human interaction (*i.e.* the part was missing, degraded, or signs were ambiguous)
NE = I did not examine the area
NA = this animal doesn't normally have that part (*i.e.* seals have no dorsal, dolphins have no rear flippers)

	WHOLE BODY EXAM	YES	NO	CBD	NE	NA	Image taken
8	External pathology *(pox, tattoo lesion, abscess, fungal patches)*						
9	Natural markings *(scars, tooth rakes, unusual pigmentation)*						
10	Appendage(s) removed / Mutilation *(with instrument)*						
11	Pelt removed / Mutilation *(with instrument)*						
12	Body sliced / Mutilation *(with instrument)*						
13	Gear / Debris present on animal *(including tags)*						
14	Gear / Debris retained *(name & contact info in Comments)*						
15	HI lesions *(fishery, gunshot, propeller, healed HI scar, brand)*						

16 Predation / scavenger damage *(circle all anatomical areas where damage hinders evaluation; numbers coincide with anatomical areas below)*: 17 18 19 20 21 22 23 24 25 26 27 28 29 NONE

FILL IN TABLE FOR ALL POSSIBLE FINDINGS OF HI
Do not use for natural markings/pathology.

						Type of Lesion					Origin of Lesion: Gear- Line			Origin of Lesion: Gear/Debris			Origin of Lesion: Other			
	DETAILED EXAM OF ANATOMICAL AREAS	YES	NO	CBD	NE/NA	Impression/ Laceration	Penetrating wound	Healed HI scar	Abrasion	Other / CBD	Twine / line	Net	MO/MU/CBD*	Hook	Packing Band	Other / CBD	Propeller	Gunshot	Other / CBD	Image taken?
17	Rostrum/snout																			
18	Mandible																			
19	Head and/or neck																			
20	L Front appendage																			
21	R Front appendage																			
22	L Body																			
23	R Body																			
24	Dorsum/dorsal fin																			
25	Ventrum																			
26	Peduncle																			
27	L Rear appendage																			
28	R Rear appendage																			
29	Flukes/tail																			

* If Gear-Line is the lesion origin, mark the MO/MU/CBD column: "MO" for monofilament, "MU" for multifilament, and "CBD" if the type of line cannot be determined.

NOAA Form 89-864; OMB Control No.0648-0178; Expiration Date 03/31/2020 *IFAW & VAQS (2012)*

Human Interaction Form – Page 2.

Field #:

	INTERNAL EXAM Date	YES	NO	Partial	CBD	Image taken	Detailed Info *(circle all that apply)*
30	Internal exam conducted						*Details in Comments section -use line number*
31	Bruising/blunt trauma						*Details in Comments section -use line number*
32	Skeleton examined						*Details in Comments section -use line number*
33	Broken bones present						*Associated tissue reaction:* YES NO CBD
34	Mouth/GI tract examined *(circle contents)*						intact prey partially digested hard parts only debris/gear empty other
35	Lungs/bronchi examined						*Details in Comments section -use line number*
36	Lung/bronchi contents						froth fluid air (color:)
37	Bullet/projectile found						*found using:* CT X-ray dissection *(collected?* Y N *)*
38	Other lesions noted						*Details in Comments section -use line number*

39 **Comments** *(note line number from left margin before each comment):*

40 **Findings of Human Interaction:** ☐YES ☐NO ☐CBD (Exam Type: external__ internal___ both ___)
(transfer to Level A Datasheet)

41 Type of HI: (provide details in comments)
☐ Entanglement (gear__ debris__ CBD__)
☐ Hooking (recreational__ commercial__ CBD__)
☐ Ingestion (gear__ debris__ CBD__)
☐ Vessel trauma (sharp__ blunt__ both__)
☐ Gunshot
☐ Harassment
☐ Mutilation
☐ CBD/Other

42 **Stranding Event History/Circumstances:**

43 **INITIAL HUMAN INTERACTION EVALUATION:** If you marked YES above (line 40) evaluate the external exam, necropsy, carcass condition and circumstances surrounding the stranding event to answer the question below. *Remember to be conservative in your subjective evaluation.*
What is the likelihood that the finding of human interaction (line 40), contributed to the stranding event?

0: Uncertain (CBD) 1: Improbable 2: Suspect 3: Probable

44 **Justification:**

Final human interaction evaluation requires additional data from level B and C analyses as well as review by experts (e.g. a veterinary pathologist)

Appendix C – Risk Factor Table

Risk factor table based on table provided by The Hawaiian monk seal research program, NMFS.

<table>
<tr><td rowspan="2">Risk Factor</td><td colspan="6">Risk Factor Category</td><td rowspan="2">Risk Level</td></tr>
<tr><td>Very Low - 1</td><td>Low - 2</td><td>Medium - 3</td><td>Medium High - 4</td><td>High - 5</td><td>Very High - 6</td></tr>
<tr><td>Environment</td><td>Very Acceptable</td><td>Acceptable</td><td>Moderately Acceptable</td><td>Moderately Dangerous</td><td>Dangerous</td><td>Very Dangerous</td><td></td></tr>
<tr><td>Team Selection and Fitness</td><td>Excellent Team</td><td>Good Team</td><td>Appropriate Team</td><td>Marginal Team</td><td>Poor Team</td><td>Very Poor Team</td><td></td></tr>
<tr><td>Animal selection and condition</td><td>Healthy</td><td>Healthy</td><td colspan="2">Injured/Compromised</td><td colspan="2">Highly Compromised</td><td></td></tr>
<tr><td>Permits & Authorization</td><td colspan="2">Excellent</td><td colspan="2">Good</td><td colspan="2">Poor</td><td></td></tr>
<tr><td>Resources: Equipment, PPE, communication, etc.</td><td colspan="2">Excellent</td><td colspan="2">Good</td><td colspan="2">Not Prepared</td><td></td></tr>
<tr><td>Mission Complexity: New or experimental, time sensitive, etc.</td><td>Simple</td><td>Standard</td><td colspan="2">Moderately Complex</td><td>Very Complex</td><td>Extremely Complex</td><td></td></tr>
<tr><td rowspan="2">If any risk level equals:</td><td>Any medium-high</td><td colspan="6">Contact project lead or immediate supervisor before proceeding.</td></tr>
<tr><td>Any High – Very High</td><td colspan="6">Contact veterinarian</td></tr>
</table>

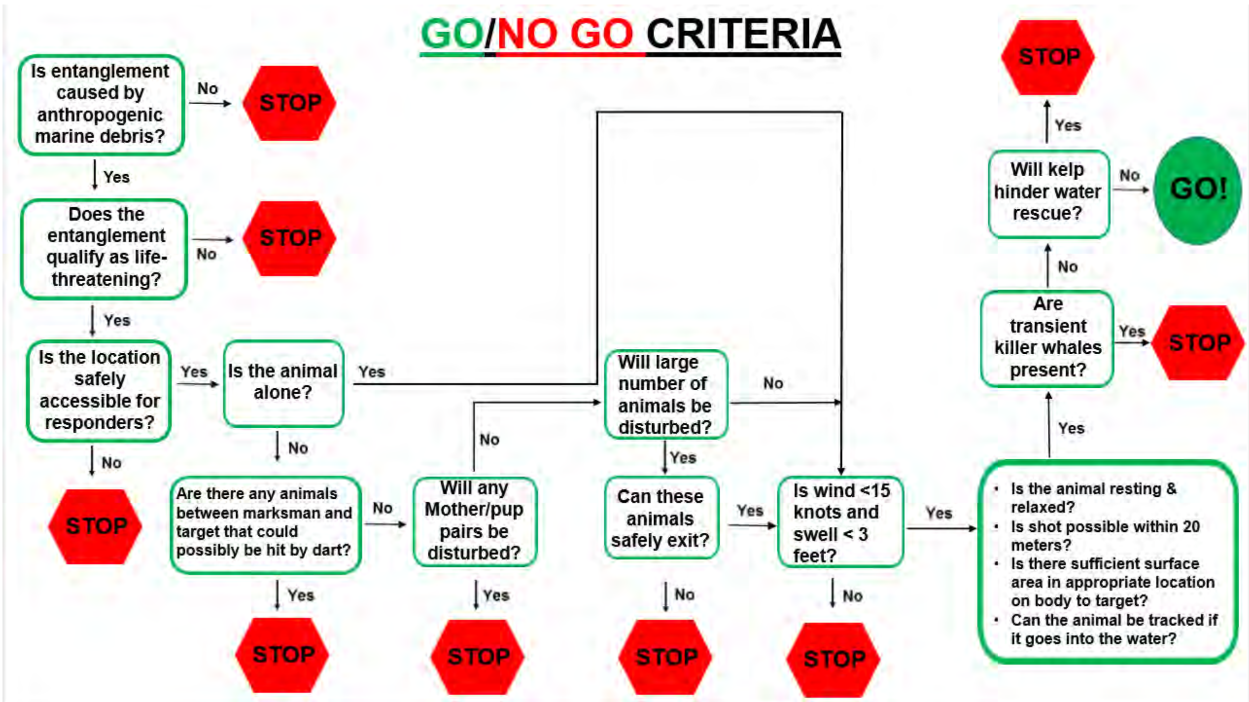
Key considerations or questions to be asked in the Risk factor analyses (Green-Amber-Red; GAR):

- ***Molt*****:** Molt stage should be considered for some species, as it is highly energetically costly and may make individuals less capable of withstanding the stress of capture.
- ***Pregnancy*****:** Adult females require additional consideration. Adult females are likely to be pregnant during part of the year and some drugs (or stress) could lead to late term abortions. Pregnant females should only be captured if their survival, and the survival of their unborn pup, is in eminent danger due to the entanglement.
- ***Health and behavior assessment*****:** Observe body condition, responsiveness (responds normally to natural stimuli), or if there are any external or behavioral abnormalities.
- ***Weather and tide concerns*****:** Does weather pose a threat to the animal or responders (*i.e.*, heat stress or hypothermia or threatening storms)? If so, is there a way to mitigate it? Depending upon climate/season, captures during the middle of the day should be avoided unless overcast/cool. Consider the animal's body temperature before, during, and after handling. Is the tide coming in or going out, how high/low is it and how can it impact the event?
- ***Habitat concerns*****:** Habitat (*i.e.*, geographic location, substrate type, navigation hazards, water depth, currents, etc.) should be assessed for hazards to animals and responders.
- ***Equipment*****:** Is all necessary gear functional, available, and ready? This includes, but is not limited to, crowding, capture, tagging, sampling, instrumentation, disentanglement, emergency equipment, temperature mitigation gear (*e.g.*, shade, bucket for water), and transport gear (*e.g.*, cage, truck, boat).
- ***Presence of other animals*****:** Are there other pinnipeds, pups, or other wildlife in the area that may be disturbed by the handling? Is there a potential for other pinnipeds to approach and disrupt the target animal or responders during capture? Consider other natural and cultural resources nearby.
- ***Egress*****:** Has the team assessed all possible hazards in the capture zone? Is there a safe place for the non-entangled animals to egress? Is the entangled animal in a safe location if remotely sedated? What hazards are in the capture zone that could potentially cause injury to the entangled and surrounding animals?
- ***Team composition*****:** Are there adequate responders with the appropriate level of expertise and experience to safely complete the mission and address unforeseen situations? If a veterinarian or veterinary technician is necessary, there should be sufficient personnel to assist the entanglement response so the veterinarian can monitor the animal. Ensure that all involved fully understand their roles and everyone understands warning signs to look for. Designate a safety officer to monitor fatigue, injury, the animal, and personnel throughout the response.

- ***Public presence*:** Is the capture going to be in a public area? Ensure adequate crowd control and outreach. If in a crowded public area, consider a public briefing before and after the event. Expect to be recorded or live streamed and ensure that all involved behave appropriately. Carefully consider clothing/logos that will be seen by the public, to help the public recognize the professionalism of the team.

Appendix D – Decision Matrix (Go/No Go)

Example of a *Go/No Go decision matrix* (based on information provided by [Alaska Department of Fish and Game Steller sea lion program](#)).



Appendix E - Gear Checklist

Example of a *Field Response Checklist* (provided by The Marine Mammal Center).

Field Response Checklist

Latest Edit: Dave Zahniser Mar 23, 2019

Other Supplies

Tracking:
- ☐ Hydrophone - VR100
- ☐ Hydrophone Mic
- ☐ Hydrophone pole
- ☐ Hydrophone Charger
- ☐ Pingers - Asst. Frequencies

Misc:
- ☐ Leather Gloves
- ☐ Duck Tape
- ☐ Multi-tool
- ☐ Helmets
- ☐ PFDs
- ☐ Binoculars

Video/Photograpy

GoPro:
- ☐ Cams
- ☐ Batteries
- ☐ Chargers
- ☐ Flash Memory
- ☐ Mounts

Field Anesthesia

- ☐ Anesthesia Machine
- ☐ O_2 Canister
- ☐ Wrench for O_2 tank
- ☐ Mask - Small
- ☐ Mask - Large
- ☐ Reservoir Bags: 3, 4, 5 Liter
- ☐ Isoflurane (2 bottles)
- ☐ Isoflurane Bottle Adapter
- ☐ Tubing (2)
- ☐ Sodasorb

Medical Kit

Needles:
- ☐ 16G x 1.5"
- ☐ 18G x 3.5"
- ☐ 18G x 1.5"
- ☐ 18G x 1.0"
- ☐ 20G x 3.5"
- ☐ 20G x 1.5"
- ☐ 20G x 1.0"

Syringes:
- ☐ 1.0 mL (40)
- ☐ 3.0 mL (20)
- ☐ 6.0 mL (10)
- ☐ 12.0 mL (10)
- ☐ 20.0 mL (10)

Ventilation:
- ☐ Ambu Bag
- ☐ ET Tubes: 6,7,8,9,10,12,14
- ☐ ET Tube Stylet
- ☐ Laryngoscope
- ☐ Scope Batteries
- ☐ Jaw Ropes
- ☐ ET tube ties
- ☐ Sterile Lube

Instruments & Supplies:
- ☐ Eye Lube
- ☐ Sterile H_2O (5)
- ☐ Saline
- ☐ Chlorhexidine Scrub
- ☐ Small Surgery Pack
- ☐ Scalpels (10 and 11)
- ☐ Disentanglement Scissors
- ☐ Hemostats (2)
- ☐ Sharps Container
- ☐ Blood Tubes
- ☐ Vacutainer & Adapter

Medical Kit

Misc:
- ☐ Stethoscope
- ☐ Safety Glasses (2)
- ☐ Exam Gloves
- ☐ Darting Worksheet
- ☐ Field Logs
- ☐ Pens, Sharpies
- ☐ Clipboard
- ☐ Tape Measure (cm)
- ☐ Flipper Tags
- ☐ Flipper Tag Gun
- ☐ Labeling Tapen
- ☐ Duck Tape
- ☐ Zip Lock Bags
- ☐ Grease Markers
- ☐ Calculator
- ☐ Long Nose Pliers
- ☐ Pelican Cases (3)

Drugs

Sedatives:
- ☐ Medetomidine (20 mg/mL)
- ☐ Butorphanol (10 mg/mL)
- ☐ Butorphanol (50 mg/mL)
- ☐ Midazolam (5 mg/mL)
- ☐ Midazolam (50 mg/mL)

Reversals:
- ☐ Atipamezole (3 full bottles)
- ☐ Naltrexone (1 full bottle)
- ☐ Flumazenil (10 bottles)

Emergency Drugs:
- ☐ Doxapram
- ☐ Epinephrine
- ☐ Atropine
- ☐ Pentobarbital (Euthasol)

Darting Supplies

Projector:
- ☐ Dart Projector
- ☐ CO2 Cartridges
- ☐ CO_2 Adapter
- ☐ Range Finder
- ☐ Extra Battery (RF)
- ☐ Pressure Reference
- ☐ Extra Breach Pin
- ☐ Bore Cleaner
- ☐ Anemometer

Darts:
- ☐ Dart Bodies
- ☐ Dart Tailpieces
- ☐ Stabilizers
- ☐ Caps
- ☐ Red Sleeves
- ☐ Green Sleeves
- ☐ Pin
- ☐ Coupler
- ☐ 20mL Syringes
- ☐ Long Paperclips
- ☐ Dart Needle Covers
- ☐ Silicone Dart Lube
- ☐ Hemostats

Needles - Barbed:
- ☐ 25 mm
- ☐ 30 mm
- ☐ 40 mm
- ☐ 60 mm

Needles - Plain:
- ☐ 25 mm
- ☐ 30 mm
- ☐ 40 mm
- ☐ 60 mm
- ☐ Practice

The Marine Mammal Center

Example of a *Capture Gear Checklist* (adapted from the Alaska Department of Fish and Game Steller sea lion program).

DISENTANGLEMENT CAPTURE GEAR CHECKLIST

Animal capture/restraint in skiff

Capture Skiff (boat #1)

☐ 1 short capture pole
☐ 1 long capture pole
☐ Flathead screwdriver
☐ 2 Shepherd's hooks
☐ Retractable boat pole
☐ Bent PVC pole
☐ 3-4 flipper loops
☐ dive slate/pencil

Assist Skiff (boat #2)

☐ 1 short capture pole
☐ 1 long capture pole
☐ Flathead screwdriver
☐ 2 Shepherd's hooks
☐ Retractable boat pole
☐ 2 flipper loops
☐ dive slate/pencil

Cutting tools

Capture Skiff (boat #1)

☐ **1 pair dykes**
☐ **1 pair sharp scissors**
☐ 1 net knife and hook
☐ 1 "cat claw" twine cutter
☐ 2 Victorinox knives
☐ 1 fish hook remover

Assist Skiff (boat #2)

☐ **1 pair dykes**
☐ **1 pair sharp scissors**
☐ 1 net knife and hook
☐ 1 "cat claw" twine cutter
☐ 1 Victorinox knife

Miscellaneous

☐ 2 clean towels to cover eyes
☐ Rubber wedge/mouth gag – if hooked
☐ Bucket to cool animal
☐ Emergency blankets
☐ Hot water bottles
☐ Hand warmers
☐ Knee pads
☐ Garbage bags
☐ Spare Ziplocks
☐ Spare reading glasses

Sampling/Data recording

☐ Permit
☐ Rangefinder
☐ Data notebook
☐ 3 pencils/1 sharpie
☐ Waterproof camera; spare batteries
☐ GoPro; spare batteries
☐ 2 pair binoculars
☐ 2 watches – time synced

Measure

☐ Flexible measuring tape
☐ Retractable measuring tape

Tagging and Marking

☐ 2 pair tagging pliers
☐ 4 pair Allflex flipper tags
☐ 2 bottles hair dye
☐ 2 tubes cream developer
☐ Small pair scissors
☐ 4 pair latex gloves
☐ 2 paint sticks

Head- mount satellite tagging

☐ Satellite tag
☐ 2-part 5-minute epoxy
☐ 2 epoxy dispensers
☐ 2 sturdy cups for mixing
☐ 3 tongue depressors (mix glue, apply tag)
☐ Small bottle acetone and rag
☐ 4 pair latex gloves

Flipper satellite tagging

☐ SPOT satellite tags
☐ 2 leather punches
☐ Spare stainless screws
☐ Phillips screwdriver/Leatherman
☐ Spare magnet to turn tag on
☐ Q-tips & alcohol
☐ Tagging cheat sheet w/photos

Appendix F – Disentanglement form

Example of a *Steller sea lion disentanglement form* (provided by Protected Resources Division, NMFS Alaska Region and Alaska Department of Fish and Game Steller sea lion program).

STELLER SEA LION DISENTANGLEMENT FORM

Date: ADF&G No: NMFS No:

RESPONDERS:
1. Name of vessels and responders in each during darting:
2. Responders on shore:
3. Veterinarian:

CONDITIONS
1. Sea state: 2. Wind direction and speed: 3. Other:

ENTANGLEMENT
1. Location of haulout/rookery: 2. Location of animal: 3. Distance of animal to water: 4. Other:
5. Type of entanglement:
- Description of entanglement:
- Entangling material:

DARTING
1. Age and gender estimation:
2. Initial size estimate kg: lbs:

Drug	Dose range for size(mg)	mg given	ml given
Medetomidine			
Butorphanol			
Midazolam			
0.9 % NaCl			

3. Darter: Stalk time:
4. Time drugs mixed: Time drugs into dart:
5. Size of dart: Size of needle:
6. Time dart pressurized and loaded into gun: 7. Distance to animal: Pressure loaded:
8. Location of darter (underline): *on shore* *on water*
9. Orientation of darter's line of sight to animal:
10. Time of shot:
11. Dart placement (underline): *right side* *left side* *neck* *shoulder* *thorax* *abdomen* *flank* *hip*
12. Other:
13. Reaction to dart (underline): *startled* *looked* *moved* *none* *stayed on haulout* *went into water and tracked* *went into water and lost*
14. Additional behaviors:
15. Number animals in immediate vicinity: Number animals alerted: Number animals flushed into water:
17. Time of capture: Behavior:

DISENTANGLEMENT PROCEDURES
1. Entanglement (underline): *flasher removed* *neck entanglement removed*
2. Description of event:
3. Other: A. Morphometrics: B. flipper tags applied/location/number: C. hair dye applied/location:
D. sat tag applied/location: E. skin sample/location: F. hair sample/location:
G. whisker/location: H. antibiotic/location/volume: I. hot branding:

MONITORING
1. Start time: End time:
2. Beginning RR: Ending RR:
3. Beginning CRT: Ending CRT:
4. Beginning temp: Ending temp:
5. Other:

Time	BPM	CRT (sec)

REVERSAL AND RECOVERY
1. Time of reversal: 2. Location of injection:
3. Reversal drug dosage:
Atipamezole mg: ml:
Naltrexone mg: ml:
Flumazenil mg: ml:
4. Time to full recovery:
5. Behavior:
6. Dart (underline): *retrieved* *lost* Remaining volume of drugs in dart:
7. Other:

DOCUMENTATION:

FOLLOW UP:

Appendix G - Remote Sedation Worksheet

Example of a *Remote Sedation Worksheet* (provided by The Marine Mammal Center).

Remote Sedation Worksheet		Date:
Temp ID:	Field#	Previous ID
Estimated Weight (kg):	Actual Weight (kg):	
Veterinarian:	Marksman:	
Dart Size (mL):	Needle Length (mm):	Barbed? Y / N
Projector Pressure (BAR):	Dart Time:	
Transmitter Freq (kHz):	Disposition Time:	

Drug	Drug conc. mg/mL	Amount mg	Volume mL	Bottle #	Time of Admin.	Route	Time to Effect
Midazolam						Dart	
Medetomidine							
Butorphanol							
Atipamezole							
Flumazenil							
Naltrexone							

Dart Placement:		Distance to Animal:	
Level of Sedation: None Mild Moderate Marked | Obs:			
Capture Successful? Yes / No		Dart Disposition:	
Animal Disposition: Recov'd Live Recov'd Dead Seen, Not Captured Not Seen			
Flipper Tag Color:	Left #:		Right #:

Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______
Time: ________ HR:_____ RR: ______

Notes:

Appendix H – Drug interaction Form

Example of an *Accidental Drug Injection Form* (provided by The Marine Mammal Center).

THIS PATIENT MAY HAVE BEEN INJECTED WITH THE FOLLOWING:

Injected at ________________ am/pm

________________ mg **Medetomidine** (20.0 mg/mL) or (50.0 mg/mL)

________________ mg **Midazolam** (5.0 mg/mL) or (50.0 mg/mL)

________________ mg **Butorphanol** (10.0 mg/mL)

________________ mg ________________ (other)

Patient Name:

Emergency Contact:

The Marine Mammal Center

Rescue & Response Dept.

rescue @ tmmc.org

(415)289-7350

Appendix I – Otariid sedation worksheets

Example of an *Otariid sedation worksheet* (provided by The Marine Mammal Center).

Otariid Sedation Worksheet

Optimized for 3.0 mL Dart			Weight in kg											
Drug	Dose (mg/kg)	Conc. (mg/mL)	20 kg	25 kg	30 kg	35 kg	40 kg	45 kg	50 kg	60 kg	70 kg	80 kg	90 kg	100 kg
Sedatives														
Medetomidine	0.03	20.0	0.03 mL	0.04 mL	0.05 mL	0.05 mL	0.06 mL	0.07 mL	0.08 mL	0.09 mL	0.11 mL	0.12 mL	0.14 mL	0.15 mL
Midazolam	0.2	5.0	0.80 mL	1.00 mL	1.20 mL	1.40 mL	1.60 mL	1.80 mL	2.00 mL	2.40 mL	2.80 mL	3.20 mL	3.60 mL	4.00 mL
Butorphanol	0.2	10.0	0.40 mL	0.50 mL	0.60 mL	0.70 mL	0.80 mL	0.90 mL	1.00 mL	1.20 mL	1.40 mL	1.60 mL	1.80 mL	2.00 mL
Midazolam (Concentrated)	0.2	50.0	0.08 mL	0.10 mL	0.12 mL	0.14 mL	0.16 mL	0.18 mL	0.20 mL	0.24 mL	0.28 mL	0.32 mL	0.36 mL	0.40 mL
Butorphanol (Concentrated)	0.2	50.0	0.08 mL	0.10 mL	0.12 mL	0.14 mL	0.16 mL	0.18 mL	0.20 mL	0.24 mL	0.28 mL	0.32 mL	0.36 mL	0.40 mL
Reversals														
Atipamezole	0.15	5.0	0.60 mL	0.75 mL	0.90 mL	1.05 mL	1.20 mL	1.35 mL	1.50 mL	1.80 mL	2.10 mL	2.40 mL	2.70 mL	3.00 mL
Atipamezole (Concentrated)	0.15	25.0	0.12 mL	0.15 mL	0.18 mL	0.21 mL	0.24 mL	0.27 mL	0.30 mL	0.36 mL	0.42 mL	0.48 mL	0.54 mL	0.60 mL
Flumazenil	0.015	0.1	3.00 mL	3.75 mL	4.50 mL	5.25 mL	6.00 mL	6.75 mL	7.50 mL	9.00 mL	10.50 mL	12.00 mL	13.50 mL	15.00 mL
Naltrexone	0.1	50.0	0.04 mL	0.05 mL	0.06 mL	0.07 mL	0.08 mL	0.09 mL	0.10 mL	0.12 mL	0.14 mL	0.16 mL	0.18 mL	0.20 mL
Emergency Drugs														
Doxapram	2.0	20.0	2.00 mL	2.50 mL	3.00 mL	3.50 mL	4.00 mL	4.50 mL	5.00 mL	6.00 mL	7.00 mL	8.00 mL	9.00 mL	10.00 mL
Epinephrine	0.1	1.0	2.00 mL	2.50 mL	3.00 mL	3.50 mL	4.00 mL	4.50 mL	5.00 mL	6.00 mL	7.00 mL	8.00 mL	9.00 mL	10.00 mL
Atropine	0.04	0.54	1.48 mL	1.85 mL	2.22 mL	2.59 mL	2.96 mL	3.33 mL	3.70 mL	4.44 mL	5.19 mL	5.93 mL	6.67 mL	7.41 mL

Example of a *Steller sea lion sedation worksheet* (provided by [Protected Resources Division, NMFS Alaska Region](#)).

Drug	Dose (mg/kg)	Dose range (mg/kg)	Conc. (mg/ml)	Weight														
				kg	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
				lbs	441	551	662	772	882	992	1103	1213	1323	1433	1544	1654	1764	1874	1985
Sedatives																			
Medetomidine	0.03	0.03 - 0.10	40	ml	0.15	0.19	0.23	0.26	0.30	0.34	0.38	0.41	0.45	0.49	0.53	0.56	0.60	0.64	0.68
Butorphanol	0.20	0.2 - 0.4	50	ml	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6
Midazolam	0.20	0.1 - 0.2	50	ml	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6
Reversals																			
Atipamezole	0.15	0.15 - 0.5 (5 x mg med)	25	ml	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4
Naltrexone	0.50	-	50	ml	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
Flumazenil	0.0002	0.0002 - 0.002	0.1	ml	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Emergency Drugs																			
Doxapram	2.00		20	ml	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Epinephrine	0.10		1	ml	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Atropine	0.04		15	ml	0.5	0.7	0.8	0.9	1.1	1.2	1.3	1.5	1.6	1.7	1.9	2.0	2.1	2.3	2.4

Appendix J – Phocid sedation worksheet

Example of a *Gray seal sedation worksheet* provided by the International Fund for Animal Welfare.

Note: Dosages listed below are starting and can be incrementally but cautiously increased should they not elicit an effective sedative plane. Based on response to previous dosage, (*i.e.*, not adequate sedation for capture), the dose should be increased by 25%. Other sedatives such as butorphanol may be used on animals in hand as determined by a veterinarian, but are unlikely to be used in a remote sedation cocktail due to previous adverse effects.

Sedatives - delivered by dart or pole syringe					
Midazolam		Medetomidine		Dexmedetomidine	
Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage (mg/kg)
50	0.3	40	0.02	0.5	0.0075 - 0.015

Reversals - hand injected, if needed						
Flumazenil		Naltrexone		Atipamezole		
Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage (mg/kg)	Conc. (mg/ml)	Dosage to reverse Medetomidine (mg/kg)	Dosage to reverse Dexmedetomidine (ml)
0.1	0.015	50	0.2	5	5x (Medetomidine dosage)	Equal to volume of Dexmedetomidine

Example of a *Hawaiian monk seal sedation worksheet* provided by The Hawaiian Monk Seal Research Program.

Sedatives - delivered by pole syringe or hand inject		
Diazepam	Midazolam	Butorphanol (rarely used)
Dosage (mg/kg)	Dosage (mg/kg)	Dosage (mg/kg)
0.1 - 0.3	0.2-0.3	0.05-0.2

Appendix K – Weight/dose card

Example of a *Steller sea lion weight/dose card* (provided by Protected Resources Division, NMFS Alaska Region and Alaska Department of Fish and Game Steller sea lion program). After each capture, a photo, summary of age, sex, estimated weight, drugs and dosages use, and darting distance and pressure are created, laminated, and added to a binder to have as reference for the next entanglement response.

Work conducted under NOAA Permit #18786

PEJ, Graves, June 30, 2018

Age/Sex: Subadult/Male (5 yr. old)
Estimated weight: ~ 400 kg/ 840 lbs

Meditomidine: 19.6 mg (.05 mg/kg) (.03-.05 mg/kg)
Midazolam: 85 mg (.2 mg/kg) (.1 - .3 mg/kg)
Butorphanol: 85 mg (.2 mg/kg) (.1 - .3 mg/kg)

Darting distance/pressure: 17 yds/5 bars

Atipamazole: 80 (.2 mg/kg)
Naltrexone: 200 (0.5 mg/kg)

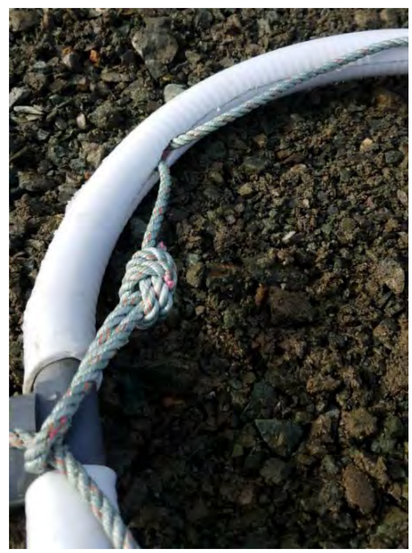
Appendix L – Capture Pole

Example of a *capture pole used for in-water Steller sea lion entanglement responses* (provided by Alaska Department of Fish and Game Steller sea lion program).

SPECIFICATIONS:

- ¾" Polyvinyl chloride (PVC) handle (length of your choice) with end cap to keep afloat
- ¾" tee with 2 barbs attached to the opposite end for holding hose
- PVC primer & cement
- ¾" sanitation hose- any hose that is quite rigid, but best avoid wire reinforced hose as it's difficult to cut
- ¼" to 5/16" rope (recommend the 3-strand polypropylene long-liner line that is greenish) for wrapping through device





- The tee and cap are glued to the main pole with the appropriate PVC cement; note that you may not find a PVC tee that has a female end (for fitting over the main handle) with two hose barbs. If you can't find one, use a threaded tee that attaches to another threaded fitting that is then glued to the handle.
- You then slice the hose (length of choice to form a good-sized loop) lengthwise down the middle- LEAVE ABOUT 6" ON EITHER END SO YOU CAN ATTACH TO THE BARBED FITTING. Attach the hose to the barb fitting (*see note below about planned modification*) - you may want some to apply grease or dish soap to help get the hose on. You may need to heat the hose to reduce the rigidity. You

then have to push the line into the cut you've made in the hose (until the hose becomes more pliable, using a flat-end screwdriver works well, to feed the line into the slit).

- The line (which is formed into a cinching loop by tying a bowline in one end, then running the other end through the bowline) is then run out along the handle so the operator can easily grab it. We recommend taping the rope to the handle in a few places - don't over tape as you want it to come off once you have rope around the animal.

- **New modifications:** We plan on sanding down one of the barbs (the right amount should take some experimenting so best to buy a few extra tees) to allow the hose to somewhat easily come off should the animal swim off. We may also add a corrodible link, by slicing the hose across the width and using the link to join the two ends – it could be tied on.

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