Revised 5/30/2023 (New SAR)

Humpback Whale (*Megaptera novaeangliae kuzira*)
Mainland Mexico - California-Oregon-Washington Stock

Stock Definition and Geographic Range

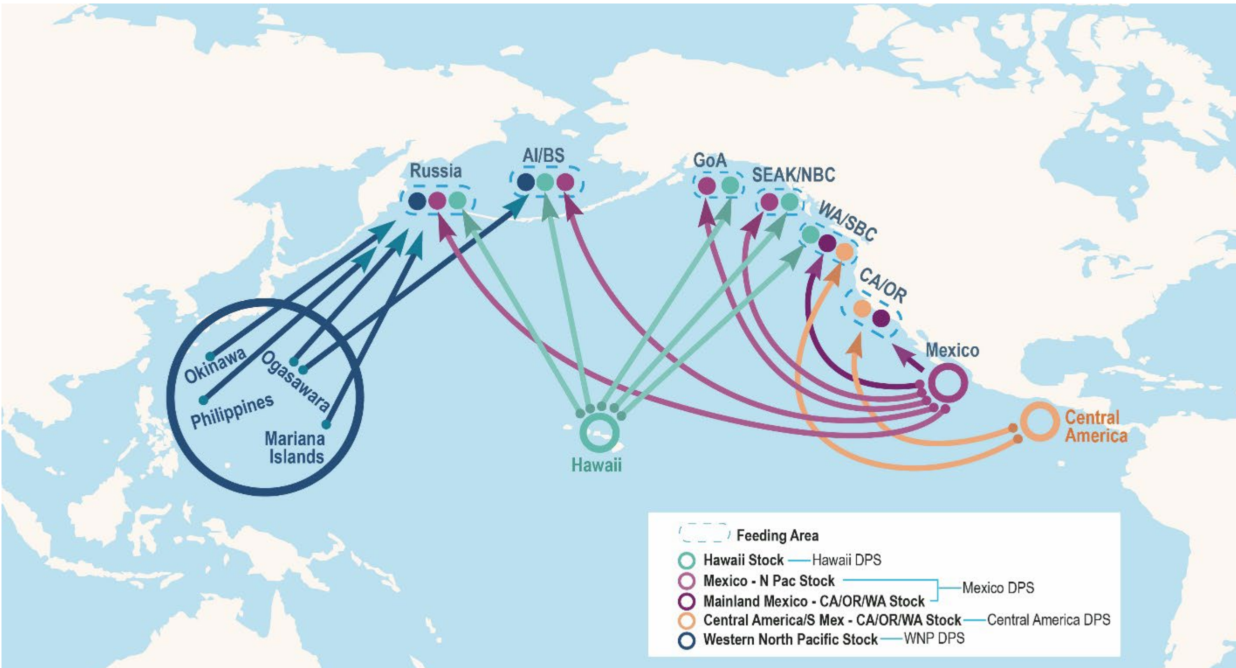

Figure 1. Pacific basin map showing wintering areas of five humpback whale stocks mentioned in this report. Also shown are summering feeding areas mentioned in the text. High-latitude summer feeding areas include Russia, Aleutian Islands / Bering Sea (AI/BS), Gulf of Alaska (GoA), Southeast Alaska / Northern British Columbia (SEAK/NBC), Washington / Southern British Columbia (WA/SBC), and California / Oregon (CA/OR).

Humpback whales occur worldwide and migrate seasonally from high latitude subarctic and temperate summering areas to low latitude subtropical and tropical wintering areas. Three subspecies are recognized globally (North Pacific, Atlantic, and Southern Hemisphere), based on restricted gene flow between ocean basins (Jackson *et al.* 2014). The North Pacific subspecies (*Megaptera novaeangliae kuzira*) occurs basin-wide, with summering areas in waters of the Russian Far East, Beaufort Sea, Bering Sea, Chukchi Sea, Gulf of Alaska, Western Canada, and the U.S. West Coast. Known wintering areas include waters of Okinawa and Ogasawara in Japan, Philippines, Mariana Archipelago, Hawaiian Islands, Revillagigedos Archipelago, Mainland Mexico, and Central America (Baker *et al.* 2013, Barlow *et al.* 2011, Calambokidis *et al.* 2008, Clarke *et al.* 2013, Fleming and Jackson 2011, Hashagen *et al.* 2009). In describing humpback whale population structure in the Pacific, Martien *et al.* (2020, 2023) note that 'migratory whale herds', defined as groups of animals that share the same summering and wintering area, are likely to be demographically independent due to their strong, maternally-inherited fidelity to migratory destinations. Despite whales from multiple wintering areas sharing some summer feeding areas, Baker *et al.* (2013) reported significant genetic differences between North Pacific summering and wintering areas, driven by strong maternal site fidelity to feeding areas and natal philopatry to wintering areas. This differentiation is supported by photo ID studies showing little interchange of whales between summering areas (Calambokidis *et al.* 2001).

NMFS has identified 14 distinct population segments (DPSs) of humpback whales worldwide under the Endangered Species Act (ESA) (81 FR 62259, September 8, 2016), based on genetics and movement data (Baker *et al.* 2013, Calambokidis *et al.* 2008, Bettridge *et al.* 2015). In the North Pacific, 4 DPSs are recognized (with ESA listing status), based on their respective low latitude wintering areas: "Western North Pacific" (endangered), "Hawai'i" (not listed), “Mexico” (threatened), and “Central America” (endangered). The listing status of each DPS was determined following an evaluation of the ESA section 4(a)(1) listing factors as well as an evaluation of demographic risk factors. The evaluation is summarized in the final rule revising the ESA listing status of humpback whales (81 FR 62259, September 8, 2016).

In prior stock assessments, NMFS designated three stocks of humpback whales in the North Pacific: the California/Oregon/Washington (CA/OR/WA) stock, consisting of winter populations in coastal Central America and coastal Mexico which migrate to the coast of California and as far north as southern British Columbia in summer; 2) the Central North Pacific stock, consisting of winter populations in the Hawaiian Islands which migrate primarily to northern British Columbia/Southeast Alaska, the Gulf of Alaska, and the Bering Sea/Aleutian Islands; and 3) the Western North Pacific stock, consisting of winter populations off Asia which migrate primarily to Russia and the Bering Sea/Aleutian Islands. These stocks, to varying extents, were not aligned with the more recently identified ESA DPSs (e.g., some stocks were composed of whales from more than one DPS), which led NMFS to reevaluate stock structure under the Marine Mammal Protection Act (MMPA).

NMFS evaluated whether these North Pacific DPSs contain one or more demographically independent populations (DIPs), where demographic independence is defined as “…the population dynamics of the affected group is more a consequence of births and deaths within the group (internal dynamics) rather than immigration or emigration (external dynamics)” (NMFS 2023). Evaluation of the four DPSs in the North Pacific by NMFS resulted in the delineation of three DIPs, as well as four “units” that may contain one or more DIPs (Martien *et al.* 2021, Taylor *et al.* 2021, Wade *et al.* 2021, Oleson *et al.* 2022, Table 1). Delineation of DIPs is based on evaluation of ‘strong lines of evidence’ such as genetics, movement data, and morphology (Martien *et al.* 2019). From these DIPs and units, NMFS designated five stocks. North Pacific DIPs / units / stocks are described below, along with the lines of evidence used for each. In some cases, multiple units may be combined into a single stock due to lack of sufficient data and/or analytical tools necessary for effective management or for pragmatic reasons (NMFS 2019).

Table 1. DPS of origin for North Pacific humpback whale DIPs, units, and stocks. Names are based on their general winter and summering area linkages. The stock included in this report is shown in bold font. All others appear in separate reports.

DPS	ESA Status	DIPs / units	Stocks
Central America	Endangered	Central America - CA-OR-WA DIP	Central America / Southern Mexico - CA-OR-WA stock
Mexico	Threatened	Mainland Mexico - CA-OR-WA DIP	**Mainland Mexico - CA-OR-WA stock**
		Mexico - North Pacific unit	Mexico - North Pacific stock
Hawai‘i	Not Listed	Hawai‘i - North Pacific unit	Hawai‘i stock
		Hawai‘i - Southeast Alaska / Northern British Columbia DIP	

Western North Pacific	Endangered	Philippines / Okinawa - North Pacific unit	Western North Pacific stock
		Marianas / Ogasawara - North Pacific unit	

Delineation of the Central America/Southern Mexico – California/Oregon/Washington DIP is based on two strong lines of evidence indicating demographic independence: genetics and movement data (Taylor *et al.* 2021). The DIP was designated as a stock because available data make it feasible to manage as a stock and because there are conservation and management benefits to doing so (NMFS 2023, NMFS 2019, NMFS 2022a). Whales in this stock winter off the Pacific coast of Nicaragua, Honduras, El Salvador, Guatemala, Panama, Costa Rica and likely southern coastal Mexico (Taylor *et al.* 2021). Summer destinations for whales in this DIP include the U.S. West Coast waters of California, Oregon, and Washington (including the Salish Sea, Calambokidis *et al.* 2017).

Delineation of the Mainland Mexico – California/Oregon/Washington DIP is based on two strong lines of evidence indicating demographic independence: genetics and movement data (Martien *et al.* 2021). The DIP was designated as a stock because available data make it feasible to manage as a stock and because there are conservation and management benefits to doing so (NMFS 2023, NMFS 2019, NMFS 2022b). Whales in this stock winter off the mainland Mexico states of Nayarit and Jalisco, with some animals seen as far south as Colima and Michoacán. Summer destinations for whales in the Mainland Mexico DPS include U.S. West Coast waters of California, Oregon, Washington (including the Salish Sea, Martien *et al.* 2021), Southern British Columbia, Alaska, and the Bering Sea.

The Mexico – North Pacific unit is likely composed of multiple DIPs, based on movement data (Martien *et al.* 2021, Wade 2021, Wade *et al.* 2021). However, because currently available data and analyses are not sufficient to delineate or assess DIPs within the unit, it was designated as a single stock (NMFS 2023, NMFS 2019, NMFS 2022b). Whales in this stock winter off Mexico and the Revillagigedo Archipelago and summer primarily in Alaska waters (Martien *et al.* 2021).

The Hawai‘i stock consists of one DIP - Hawai‘i - Southeast Alaska / Northern British Columbia DIP and one unit - Hawai‘i - North Pacific unit, which may or may not be composed of multiple DIPs (Wade *et al.* 2021). The DIP and unit are managed as a single stock at this time, due to the lack of data available to separately assess them and lack of compelling conservation benefit to managing them separately (NMFS 2023, NMFS 2019, NMFS 2022c). The DIP is delineated based on two strong lines of evidence: genetics and movement data (Wade *et al.* 2021). Whales in the Hawai‘i - Southeast Alaska/Northern British Columbia DIP winter off Hawai‘i and largely summer in Southeast Alaska and Northern British Columbia (Wade *et al*. 2021). The group of whales that migrate from Russia, western Alaska (Bering Sea and Aleutian Islands), and central Alaska (Gulf of Alaska excluding Southeast Alaska) to Hawai‘i have been delineated as the Hawai‘i-North Pacific unit (Wade *et al.* 2021). There are a small number of whales that migrate between Hawai‘i and southern British Columbia/Washington, but current data and analyses do not provide a clear understanding of which unit these whales belong to (Wade et al. 2021).

The Western North Pacific (WNP) stock consists of two units- the Philippines / Okinawa - North Pacific unit and the Marianas / Ogasawara - North Pacific unit. The units are managed as a single stock at this time, due to a lack of data available to separately assess them (NMFS 2023, NMFS 2019, NMFS 2022d). Recognition of these units is based on movements and genetic data (Oleson *et al.* 2022). Whales in the Philippines/Okinawa - North Pacific unit winter near the Philippines and in the Ryukyu Archipelago and migrate to summer feeding areas primarily off the Russian mainland (Oleson *et al.* 2022). Whales that winter off the Mariana Archipelago, Ogasawara, and other areas not yet identified and then migrate to summer feeding areas off the Commander Islands, and to the Bering Sea and Aleutian Islands comprise the Marianas/Ogasawara - North Pacific unit.

This stock assessment report includes information on the **Mainland Mexico – California-Oregon-Washington stock** (Figure 2). In previous marine mammal stock assessments, humpback whales that summer and feed off California, Oregon, and Washington were treated as a single stock (“California-Oregon-Washington”), but included whales from three DPSs (Central America, Mexico, Hawai‘i) defined by separate wintering areas. Some Hawai’i stock whales occur in Washington state and Southern British Columbia waters during summer (Calambokidis and Barlow 2020, Wade 2021), but the proportions using Washington vs Southern British Columbia waters during summer is unknown. The previous "California-Oregon-Washington stock" also included multiple DIPs (Central America – California-Oregon-Washington DIP and Mainland Mexico – California-Oregon-Washington DIP), which is inconsistent with management goals under the MMPA (NMFS 2019).

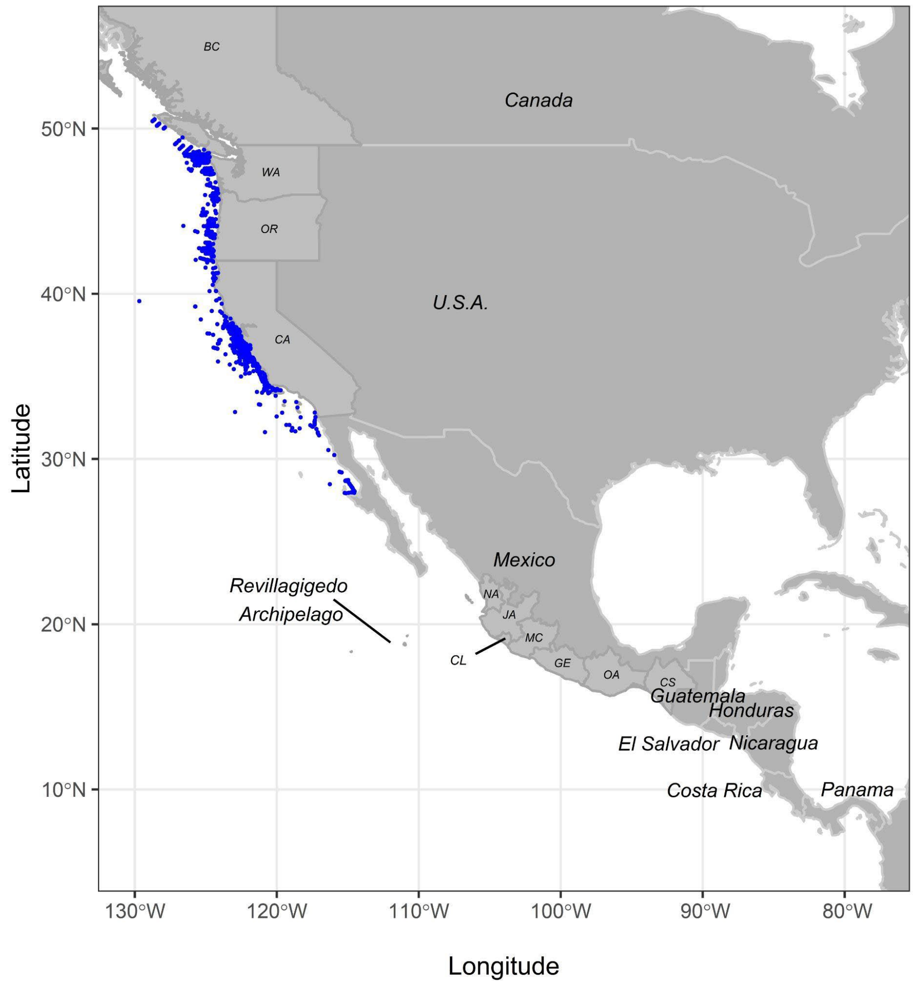

Figure 2. Wintering and summering areas for the Mainland Mexico - CA-OR-WA stock of humpback whales. The primary wintering areas of the Mainland Mexico - CA-OR-WA stock include the mainland Mexico states of Nayarit and Jalisco, with some animals seen as far south as Colima and Michoacán. Summer destinations for whales in the Mainland Mexico - CA-OR-WA stock include U.S. West Coast waters of California, Oregon, Washington, Southern British Columbia, Alaska, and the Bering Sea. Summering area sightings from 1991 - 2018 NMFS/SWFSC research vessel line-transect surveys are shown as blue dots and primarily represent whales from two stocks: the Central America / Southern Mexico - CA-OR-WA stock and Mainland Mexico - CA-OR-WA stock, although whales from the Hawai'i stock also have been matched to WA and Southern British Columbia (Wade 2021). Country and state names abbreviations from north to south are: BC = British Columbia, WA = Washington state, OR = Oregon, CA = California, U.S.A. = United States of America, NA = Nayarit, JA = Jalisco, CL = Colima, MC = Michoacán, GE = Guerrero, OA = Oaxaca, and CS = Chiapas.

Population Size

Curtis *et al.* (2022) estimated the abundance of whales wintering in southern Mexico and Central America using spatial capture-recapture methods based on photo-ID data collected between 2019 and 2021. Their estimate of abundance for the Central America / Southern Mexico – CA-OR-WA DIP is 1,496 (CV=0.171) whales. Given the availability of this estimate and a recent estimate of total abundance in the U.S. West Coast EEZ of 4,973 (CV=0.048) whales from mark-recapture (Calambokidis and Barlow 2020), Curtis *et al*. (2022) also estimated the abundance of whales from the Mainland Mexico – CA-OR-WA DIP as the difference, or 3,477 animals (CV=0.101). This may be an underestimate, because the estimate from Calambokidis and Barlow (2020) did not include photo-IDs off Washington state, but these authors state their estimate likely includes whales from Washington waters, since there is movement of whales between Washington and California and Oregon. Another estimate, based on a species distribution model from 2018 line-transect data, resulted in a lower abundance of 4,784 whales (CV=0.31) (Becker *et al.* 2020). This lends support to the statement of Calambokidis and Barlow (2020) that their estimate includes whales using Washington waters. Of those two estimates, the mark-recapture estimate of Calambokidis and Barlow (2020) has been previously used to represent U.S. West Coast abundance, as it is more precise, while the species distribution model reflects only whale densities and oceanographic conditions within the study area during summer and autumn of 2018. The best estimate of abundance for the Mainland Mexico – CA-OR-WA stock of humpback whales is considered to be the difference between the mark-recapture estimates of Calambokidis and Barlow (2020) and the Central America / Southern Mexico DIP reported by Curtis *et al.* (2022), or 3,477 animals (CV=0.101). Although the CA-OR-WA summer feeding area estimate includes some Hawai'i stock whales in Washington state, the abundance of the Hawai'i stock (11,278, CV = 0.56) is based on wintering area estimates (Becker *et al*. 2022), and more information on that stock, including prorated human-related mortality and serious injury totals from Washington state, is included in the Alaska region marine mammal stock assessments (Young *et al*. 2023).

Minimum Population Estimate

The minimum population estimate for this stock is taken as the lower 20th percentile of the 'difference' estimate from Curtis *et al.* (2022) cited above, or 3,185 whales.

Current Population Trend

Calambokidis and Barlow (2020) report that humpback whale abundance appears to have increased within the California Current at approximately 8.2% annually since 1989. This is consistent with observed increases for the entire North Pacific from ~1,200 whales in 1966 to 18,000 - 20,000 whales during 2004 to 2006 (Calambokidis *et al*. 2008). However, multiple humpback whale stocks utilize this region and a stock-specific population trend for the Mainland Mexico – CA-OR-WA stock of humpbacks has not been estimated.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Calambokidis and Barlow (2020) estimated that humpback whale abundance increased approximately 8.2% annually in the California Current since 1989, based on mark-recapture estimates largely restricted to whales summering in California and Oregon waters. However, these estimates included whales from at least two stocks; the Central America / Southern Mexico - CA/OR/WA stock and the Mainland Mexico - CA/OR/WA stock. The current net productivity rate for the Mainland Mexico - CA/OR/WA stock is unknown. However, the theoretical maximum net productivity rate can be taken to be at least as high as the maximum observed for the combined stocks, or 8.2% annually (Calambokidis and Barlow 2020), though it could be higher if one of the stocks is growing faster than another.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (3,185) times one half the estimated population growth rate for this stock of humpback whales (½ of 8.2%) times a recovery factor of 0.5, for a threatened stock with increasing population trend (NMFS 2023), resulting in a PBR of 65. Ryan *et al.* (2019) summarizes sighting and acoustic data, noting that humpbacks are present in central California waters at least 8 months annually, with December and April representing 'transition months', where whales are moving out of / into the region. Counting December and April each as one-half month of residency time during migration, plus the 7 months of May through November when whales are abundant, yields 8 months of residency time, or ⅔ of the year. This may be considered a minimum residency time, as some whales are still in U.S. waters from December to April. Therefore, the total PBR for this stock (65) is prorated by ⅔, to yield a PBR in U.S. waters of 43 whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Human-caused mortality and serious injury (MSI) of humpback whales in CA-OR-WA summer feeding areas includes whales from three stocks: **Central America / Southern Mexico – CA-OR-WA**; **Mainland Mexico – CA-OR-WA**; and **Hawai‘i**. Where multiple stocks share a summer feeding area, total human-caused MSI for the mixed-stock area may be prorated to each stock using point estimates of summer to winter area movement probabilities in Wade (2021) (Table 2). Human-caused MSI from CA-OR-WA waters for the Hawai‘i stock is reviewed in the Alaska stock assessments (Young *et al*. 2023).

Table 2. Summer to winter area movement probabilities from Wade (2021) used for prorating human-caused MSI to stocks of humpback whales using CA/OR/WA waters in summer.

	Location of MSI	
Stock	**California or Oregon**	**Washington**
Central America/Southern Mexico - CA/OR/WA	0.423 (CV=0.23)	0.059 (CV=0.935)
Hawai‘i	0.00	0.688 (CV=0.13)
Mainland Mexico – CA/OR/WA	0.577 (CV=0.169)	0.254 (CV=0.278)

Fishery Information

U.S. Commercial Fisheries

Table 3. Sources of humpback whale MSI in California (CA), Oregon (OR), and Washington (WA) commercial fisheries from 2016-2020, unless noted otherwise (Carretta 2022, Carretta *et al.* 2022, Jannot *et al.* 2021). Records include entanglements detected outside of U.S. waters, but confirmed to involve U.S. fisheries. Most cases represent strandings and at-sea sightings of entangled whales. Cases of entangled *unidentified whales* are prorated to humpback whale based on location, depth, and time of year (Carretta 2018). Sources derived from observer programs with statistical estimates of bycatch and uncertainty are shown with coefficients of variation (CV) where available. Totals for the Mainland Mexico – CA-OR-WA stock are based on prorating CA-OR-WA cases by summer to winter area movement probabilities in Table 2. In 2017, there was one non-serious injury of a humpback involving two gear types: CA Coonstripe Shrimp Pot and WA/OR/CA Sablefish Pot.

Fishery	Cases	All CA-OR-WA Humpback Stocks ∑ MSI	Mainland Mexico – CA-OR-WA Stock ∑ MSI	Mainland Mexico – CA-OR-WA Stock Mean Annual MSI
CA Spot Prawn Trap	5	3.25	1.88	0.375
CA Dungeness Crab Pot	34	23.75	13.7	2.74
Dungeness Crab Pot (Commercial, state unknown)	2	2	1.15	0.231
OR Dungeness Crab Pot	2	1.75	1.01	0.202
WA Coastal Dungeness Crab Pot	7	5.5	1.4	0.280
Gillnet Fishery	6	2	1.15	0.231
Unidentified Fishery Interaction (whales identified as humpback)	58	43.75	24.4	4.89
Unidentified Fishery Interaction (unidentified whales prorated to humpback)	7	5.25	3.03	0.606
Unidentified Pot/Trap Fishery Entanglement	13	9.5	4.67	0.935
WA/OR/CA Sablefish Pot[1]	2	7.82 (CV>0.8)	4.51 (CV>0.8)	0.902 (CV>0.8)

[1] Estimates are based on 2015-2019 data (Jannot et al. 2021) for the limited entry (LE) and open-access (OA) sablefish pot sectors combined. Two observer program entanglements since 2002 informed the bycatch estimates, both of which occurred in CA + OR waters. Other sablefish pot cases opportunistically reported (at-sea sightings of entangled whales, strandings) also occurred in CA/OR waters (Carretta et al. 2022). Estimates from Jannot et al. (2021) are used in this stock assessment report because annual MSI totals are higher than those reported based on opportunistic sightings (Carretta et al. 2022). Annual observer coverage varies between 14% and 72% for the LE fleet and between 2% and 12% for the OA fleet (Somers et al., 2020).

CA Swordfish and Thresher Shark Drift Gillnet (Observer Program)[2]	0	0.1 (CV>0.8)	0.042 (CV>0.8)	≈0.01 (CV>0.8)
Totals	**136**	**104.7**	**56.98**	**11.4**

Other human-caused mortality and serious injury

Non-commercial sources of human-caused MSI, including tribal fisheries, recreational fisheries, marine debris (including research buoys) and vessel strikes are also responsible for a fraction of reported cases annually (Carretta *et al.* 2022). These sources and case totals are summarized in Tables 4 and 5.

Marine Debris, Recreational and Tribal Fisheries

Table 4. Sources of MSI from marine debris, recreational, and tribal fisheries from 2016-2020 summarized in Carretta *et al*. (2022).

Source	Cases	All CA-OR-WA Humpback Stocks ∑ MSI	Mainland Mexico – CA-OR-WA Stock ∑ MSI	Mainland Mexico – CA-OR-WA Stock Mean Annual MSI
Dungeness Crab Pot Fishery (Recreational)	2	1	0.577	0.1154
Gillnet Fishery, Tribal	3	2.5	0.635	0.127
Hook And Line Fishery	1	0.75	0.43275	0.08655
Marine Debris	1	1	0.577	0.1154
Pot Fishery, Tribal	1	1	0.577	0.1154
Spot Prawn Trap/Pot Fishery (Recreational)	1	0	0	0
Totals	**9**	**6.25**	**2.80**	**0.56**

Vessel Strikes

Fourteen vessel strike cases involving humpback whales were observed in CA-OR-WA waters during 2016-2020 (8 in CA, 1 in OR, and 5 in WA), totaling 13.2 MSI, or 2.6 whales per year (Carretta *et al.* 2022). Most vessel strikes are likely undetected and thus, we use estimates of vessel strike mortality reported by Rockwood *et al.* (2017) for this region. The estimated number of annual vessel strike deaths was 22 humpback whales, though this includes only the period July – November when whales are most likely to be present in the U.S. West Coast EEZ and the season that overlaps with survey effort used in species distribution models (Becker *et al.* 2016, Rockwood *et al.* 2017). This estimate is based on an assumption of a moderate level of vessel avoidance by humpback whales, as measured by the behavior of satellite-tagged whales in the presence of vessels (McKenna *et al.* 2015). Based on estimates of 22 deaths due to vessel strikes annually, the number attributed to the Mainland Mexico - CA-OR-WA stock during 2016-2020 is 10.15 whales per year (Table 5). The estimated mortality of 10.15 humpback whales annually due to vessel strikes represents approximately 0.3% of the stock's estimated population size (10.15 deaths / 3,477 whales). The ratio of mean annual observed to estimated vessel strike deaths and serious injuries of humpback whales during 2016-2020 is 2.6 / 22 = 0.11, implying that vessel strike counts from opportunistic observations represent a small fraction of overall incidents.

Table 5. Summary of humpback whale vessel strike MSI during 2016-2020 (Carretta *et al*. 2022). Estimates are based on prorating annual estimates of humpback vessel strike mortality in this region (22/yr, Rockwood *et al*. 2017) by the fraction of observed vessel strikes in different feeding areas (WA vs CA/OR), which are then prorated to stock by summer to winter area movement probabilities from Wade (2021).

[2] There were no observed entanglements during 2016-2020 with 21% observer coverage, however the model-based estimate of bycatch is based on pooling 1990-2000 data, resulting in a small positive estimate (Carretta 2022).

State Detected	Observations	Fraction of Observations	Fraction of Observations *times* 22 MSI/yr estimated by Rockwood et al. (2017)	Mainland Mexico – CA-OR-WA stock prorated ∑ MSI based on summer to winter area movement probabilities (Wade 2021)
WA	5	0.357	7.86	1.99
CA/OR	9	0.643	14.14	8.16
Total	**14**			**10.15**

Vessel strikes in U.S. West Coast EEZ waters continue to impact large whales (Redfern *et al.* 2013; 2019; Moore *et al.* 2018). A complex of diverse vessel types, speeds, and destination ports all contribute to variability in vessel traffic and these factors may be influenced by economic and regulatory changes. For example, Moore *et al.* (2018) found that primary routes travelled by vessels changed when emission control areas (ECAs) were established off the U.S. West Coast. They also found that large vessels typically reduced their speed by 3-6 kts in ECAs between 2008 and 2015. The speed reductions are thought to be a strategy to reduce operating costs associated with more expensive, cleaner burning fuels required within the ECAs. In contrast, Moore *et al.* (2018) noted that some vessels increased speed when transiting longer routes to avoid the ECAs. Further research is ongoing to understand how variability in vessel traffic affects vessel strike risk and mitigation strategies, though Redfern *et al.* (2019) note that a combination of vessel speed reductions and expansion of areas to be avoided should be considered. Rockwood *et al.* (2017) note that 82% of humpback whale vessel strike mortalities occur within 10% of the region, implying that vessel strike mitigation measures may be effective if applied over relatively small regions.

Historic whaling

Approximately 15,000 humpback whales were taken from the North Pacific from 1919 to 1987 (Tonnessen and Johnsen 1982), and, of these, approximately 8,000 were taken from the west coast of Baja California, California, Oregon and Washington (Rice 1978). Shore-based whaling apparently depleted the humpback whale stock off California twice: once prior to 1925 (Clapham *et al.* 1997) and again between 1956 and 1965 (Rice 1974). There has been a prohibition on taking humpback whales since 1966.

Habitat Concerns

Increasing levels of anthropogenic sound in the world's oceans (Andrew *et al.* 2002), such as those produced by shipping traffic, or Low Frequency Active sonar, is a habitat concern for whales, as it can reduce acoustic space used for communication (masking) (Clark *et al.* 2009, NOAA 2016c). This can be particularly problematic for baleen whales that may communicate using low-frequency sound (Erbe 2016). Based on vocalizations (Richardson *et al.* 1995; Au *et al.* 2006), reactions to sound sources (Lien *et al.* 1990, 1992; Maybaum 1993), and anatomical studies (Hauser *et al.* 2001), humpback whales also appear to be sensitive to mid-frequency sounds, including those used in active sonar military exercises (U.S. Navy 2007).

Seven important feeding areas for humpback whales are identified off the U.S. west coast by Calambokidis *et al.* (2015), including five in California, one in Oregon, and one in Washington. Humpback whales have increasingly reoccupied areas inside of Puget Sound (the 'Salish Sea'), a region where they were historically abundant prior to whaling (Calambokidis *et al.* 2017).

STATUS OF STOCK

The Mainland Mexico - CA-OR-WA stock of humpback whales is a DIP delineated from the 'Mexico DPS' of humpback whales listed as threatened under the ESA (Bettridge *et al.* 2015, Martien *et al.* 2021), and is therefore considered 'depleted' and 'strategic' under the MMPA. Total annual human-caused serious injury and mortality of humpback whales is the sum of commercial fishery (11.4/yr) + estimated vessel strikes (10.15/yr), + non-commercial sources (0.56/yr), or 22 humpback whales annually. Total commercial fishery mortality and serious injury (11.4/yr) is > 10% of the calculated PBR (43) for this stock, thus takes are not approaching zero mortality and injury rate. There is no estimate of the undocumented fraction of anthropogenic injuries and deaths to humpback whales on the U.S. West Coast, but for vessel strikes, a comparison of observed vs. estimated annual vessel strikes suggests that approximately 10% of vessel strikes are documented. There is no direct estimate of population trend for this stock, but Calambokidis and Barlow (2020) report that humpback whale abundance increased within the California Current at approximately 8.2% annually since 1989, which includes animals from three stocks: Central America / Southern Mexico – CA-OR-WA, Mainland Mexico – CA-OR-WA, and Hawai'i. Habitat concerns include sensitivity to anthropogenic sound sources.

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