Appendix A – List of Attendees

The workshop was open to the public (non-participants could attend as "observers"), and public comment was invited at the end of each day. Overall, 45 invited participants (mostly from the U.S.; a few participants were from Europe or New Zealand) and 51 observers attended at least one of the workshop sessions, with the vast majority attending at least three sessions.

The average session attendance was approximately 60-65 individuals (highest attendance was 75 individuals during Workshop #1; lowest attendance was 44 individuals during Workshop #5, which was expected based on the more targeted, recovery criteria topic).

Invited Participants

Name	Affiliation
Research Sector	
Fredrik Christiansen	Aarhus University, Assistant Professor
Mary Jo Barkaszi	Continental Shelf Associates, Marine Mammals Program Manager
Denise Boyd	Florida Fish & Wildlife Conservation Commission, Researcher
Jeremy Kiszka	Florida International University, Assistant Professor
David Zeddies	JASCO Applied Sciences, Director of U.S. Operations
Peter Corkeron	New England Aquarium, Marine Conservation Biologist
Jessica Redfern	New England Aquarium, Sr Scientist, Chair of the Spatial Ecology, Mapping, and Assessment Program (EcoMap)
Tracey Sutton	Nova Southeastern University/DEEPEND (Deep Pelagic Nekton Dynamics of the Gulf of Mexico), Professor
John Hildebrand	Scripps Institution of Oceanography, Professor of Oceanography
Len Thomas	Sea Mammal Research Unit, University of St. Andrews, Statistics Professor
Brandon Southall	Southall Environmental Associates, Inc., Bioacoustician
Rochelle Constantine	University of Auckland, Associate Professor
Non-Governmental Organization (NGO) Sector	
Kristin Carden	Center for Biological Diversity, Senior Scientist
Michael Jasny	Natural Resources Defense Council, Marine Mammal Project Director
Industry Sector	
Alex Loureiro	EnerGeo Alliance (previously named International Assoc. of Geophysical Contractors [IAGC]), Dir. of Marine Enviro. & Biology
Eric Brazer	Gulf of Mexico Reef Fish Shareholders' Alliance, Deputy Director
Lee Kindberg	Maersk, Head of Environment & Sustainability
Ruth Perry	Shell, Marine Scientist and Business Environment Advisor
State Agency Sector	
Leslie Ward	Florida Fish and Wildlife Conservation Commission (FWC), Fish and Wildlife Research Institute, Threatened and Endangered Species Research Lead

Federal Agency Sector	
Donald "Tre" Glenn	Bureau of Ocean Energy Management (BOEM), Biologist/Environmental Engineer
Tamara Arzt	BOEM, Environmental Protection Specialist
James Price	BOEM, Marine Mammals Studies Coordinator
Benjamin Colbert	Navy, Acoustician
Dawn Noren	NOAA Fisheries Northwest Fisheries Science Center (FSC), Research Fishery Biologist
Lance Garrison	NOAA Fisheries Southeast FSC/MMTD, Research Biologist
Melissa Soldevilla	NOAA Fisheries SEFSC, Research Fishery Biologist
Patricia Rosel	NOAA Fisheries SEFSC, Research Geneticist
Ruth Ewing	NOAA Fisheries SEFSC, Veterinary Medical Officer
Jessica Powell	NOAA Fisheries Southeast Regional Office (SERO), Fisheries Biologist
Barbara Taylor	NOAA Fisheries SWFSC/MMTD, Supervisory Research Biologist
John Walter	NOAA Fisheries, SEFSC Deputy Director of Science Operations and Council Services
Ashley Hill	NOAA Fisheries, Marine Debris Program, Florida & Caribbean Coordinator
Caitlin Wessel	NOAA Fisheries, Marine Debris Program, Gulf of Mexico Coordinator
Caroline Good	NOAA Fisheries, OPR, Cetacean and Pinniped Conservation
Allison Hernandez	NOAA Fisheries, OPR, Endangered Species Biologist
Ben Laws	NOAA Fisheries, OPR, Fishery Biologist
Eric Patterson	NOAA Fisheries, OPR, Fishery Biologist
Teri Rowles	NOAA Fisheries, OPR, Senior Advisor for Marine Mammal Health Science
Kevin Kirsch	NOAA, Office of Response & Restoration, Southeast Branch Chief
Fabian Gomez	NOAA, Office of Atmospheric Research (OAR)/Atlantic Oceanographic and Meteorological Laboratory (AOML), Northern Gulf Institute Research Scientist
Sang-Ki Lee	NOAA, OAR/AOML, Physical Oceanographer
Chris Kelble	NOAA, OAR/AOML, Supervisory Research Oceanographer
Charlie Stock	NOAA, OAR/Geophysical Fluid Dynamics Laboratory, Research Oceanographer
Mike Runge	U.S. Fish & Wildlife Service, Patuxent Research Refuge, Research Ecologist
Julien Martin	U.S. Geological Survey, Population Ecologist

Steering Committee and Workshop Support Staff

Name	Affiliation
LCDR Rosemary Abbitt	NOAA Fisheries SERO, Marine Mammal Branch, Maritime Liaison
Grant Baysinger	NOAA Fisheries SERO, Marine Mammal Branch

Vicki Cornish	Marine Mammal Commission, Energy Policy Analyst
Laura Engleby	NOAA Fisheries SERO, Marine Mammal Branch Chief
Nick Farmer	NOAA Fisheries SERO, Endangered Species Branch Chief
Krista Graham	NOAA Fisheries PIRO, Endangered Species Biologist
Kristen Koyama	NOAA Fisheries, OPR, National Recovery Coordinator
Mridula Srinivasan	NOAA Fisheries SEFSC, Director of Marine Mammal & Turtle Div.
Barb Zoodsma	NOAA Fisheries SERO, SER Large Whale Recovery Coordinator
Bennett Brooks	Consensus Building Institute (CBI), Senior Mediator
Cameron Hagar	CBI, Ops & Logistics Coordinator
Stephanie Horii	CBI, Senior Associate

Other Workshop Attendees

1. Amanda Debich (NOAA)
1. Amy Knowlton (NEAq)
2. Ana Nader (FWC)
3. Andrew Richard (NOAA)
4. Anne Witherup (NOAA)
5. Ashley Cook (NOAA)
6. Beth Nord (BOEM)
7. Dana Bethea (NOAA)
8. David Altiero
9. Eileen Douglass
10. Elizabeth Fetherston-Resch (NOAA Fisheries/SERO)
11. Elizabeth Stratton (NOAA Fisheries)
12. Emily Davidson (FWC)
13. Erin LaBrecque (MMC)
14. Graham Tuttle (BSEE)
15. Hayley Karrigan (BOEM)
16. Heloise Frouin-Mouy (NOAA Fisheries SEFSC)
17. Idrissa Boube (BOEM)
18. Jeff Pollock (Chevron)
19. Jennifer Lee (NOAA Fisheries SERO)
20. Jenny Litz (NOAA)
21. Joel Ortega-Ortiz (NOAA Fisheries/SEFSC)
22. Joseph Shields (NOAA Fisheries/SERO)
23. Kaitlin Frasier
24. Kara Shervanick (NOAA Fisheries SERO/ERT)
25. Karla Reece (NOAA Fisheries ESA Section 7)
26. Katie Moore
27. Kim Corcoran (NOAA Fisheries/OPR)
28. Laura Dias (NOAA)
29. Leila Hatch (NOAA-NOS)
30. Lindsey Feldman (NOAA Fisheries SERO)
31. Ludovic Tenorio (NOAA SEFSC)
32. Lynne Hodge (UCAR/SEFSC)
33. Lynsey Wilcox (NOAA Fisheries/SEFSC)
34. Madison Clapsaddle
35. Maggie Miller (NOAA)
36. Major Smith (BHP)
37. Meghan Sutton (FWC)
38. Michael Vecchione
39. Molly Schubert (FWC)
40. Molly Tucker (student/ public)
41. Nick Owens
42. Nikki Vollmer (CIMAS/SEFSC)
43. Rebeccah Hazelkorn (NOAA)
44. Sarah Garvin (NOAA Fisheries SERO ESA Sec 7)
45. Scott Skinner (Maersk)
46. Shannon Martin (BSEE)
47. Sierra Jarriel
48. Stacey Horstman (NOAA)
49. Tershara Matthews (BOEM)
50. William McLellan (UNCW)

Appendix B – Population Dynamics-Based Recovery Actions Brainstorm Mural Board Notes

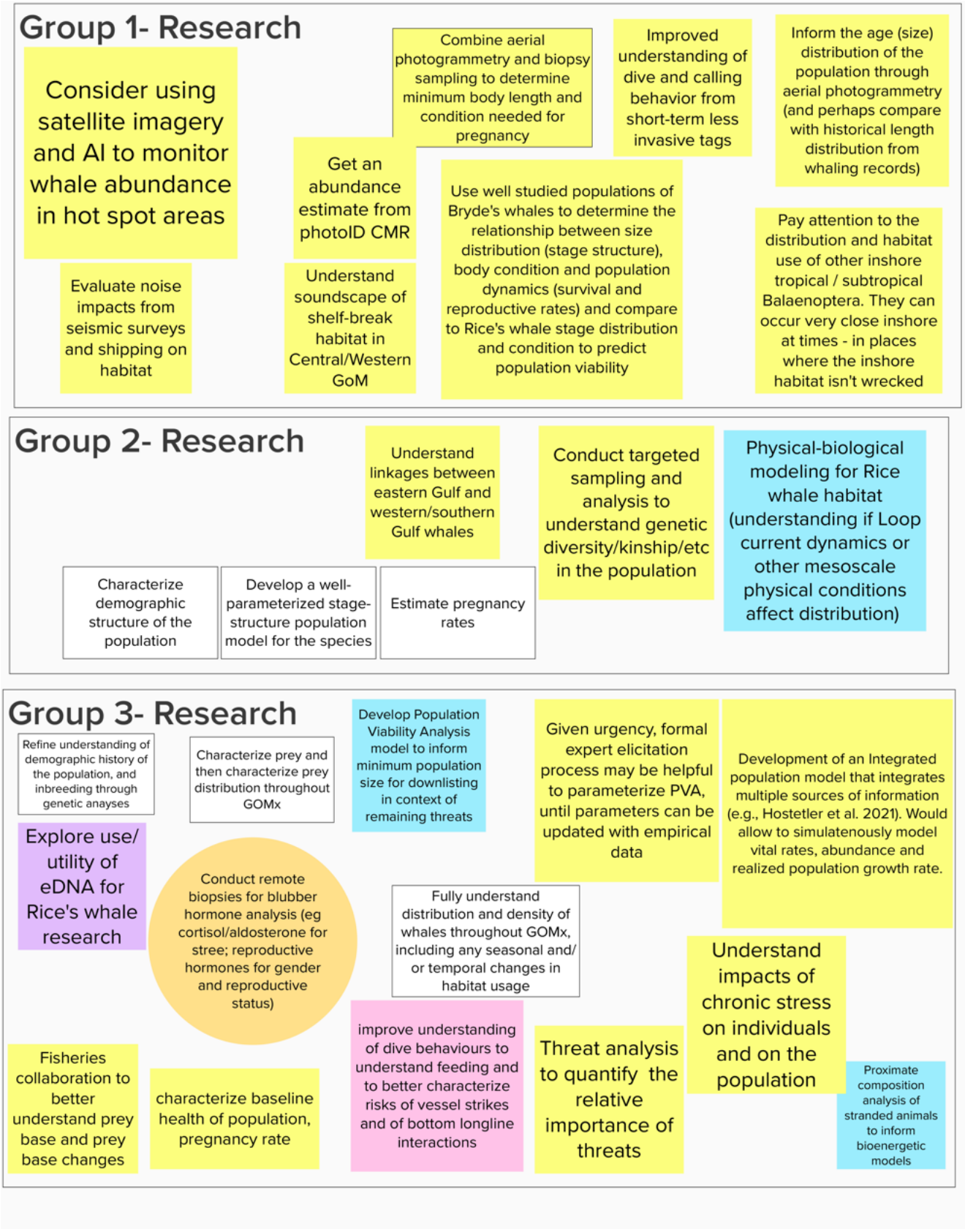
Workshop #1 focused on brainstorming potential population dynamics-based recovery actions. Following presentations on Rice's whale population dynamics and an overview of recovery actions, workshop participants were divided into three small groups and asked to brainstorm on possible research, management, monitoring, and outreach & engagement (O&E) recovery actions. Each group had members of the Steering Committee or NMFS staff to assist breakout group discussions (e.g., a process facilitator/moderator and a notetaker / flipcharter).

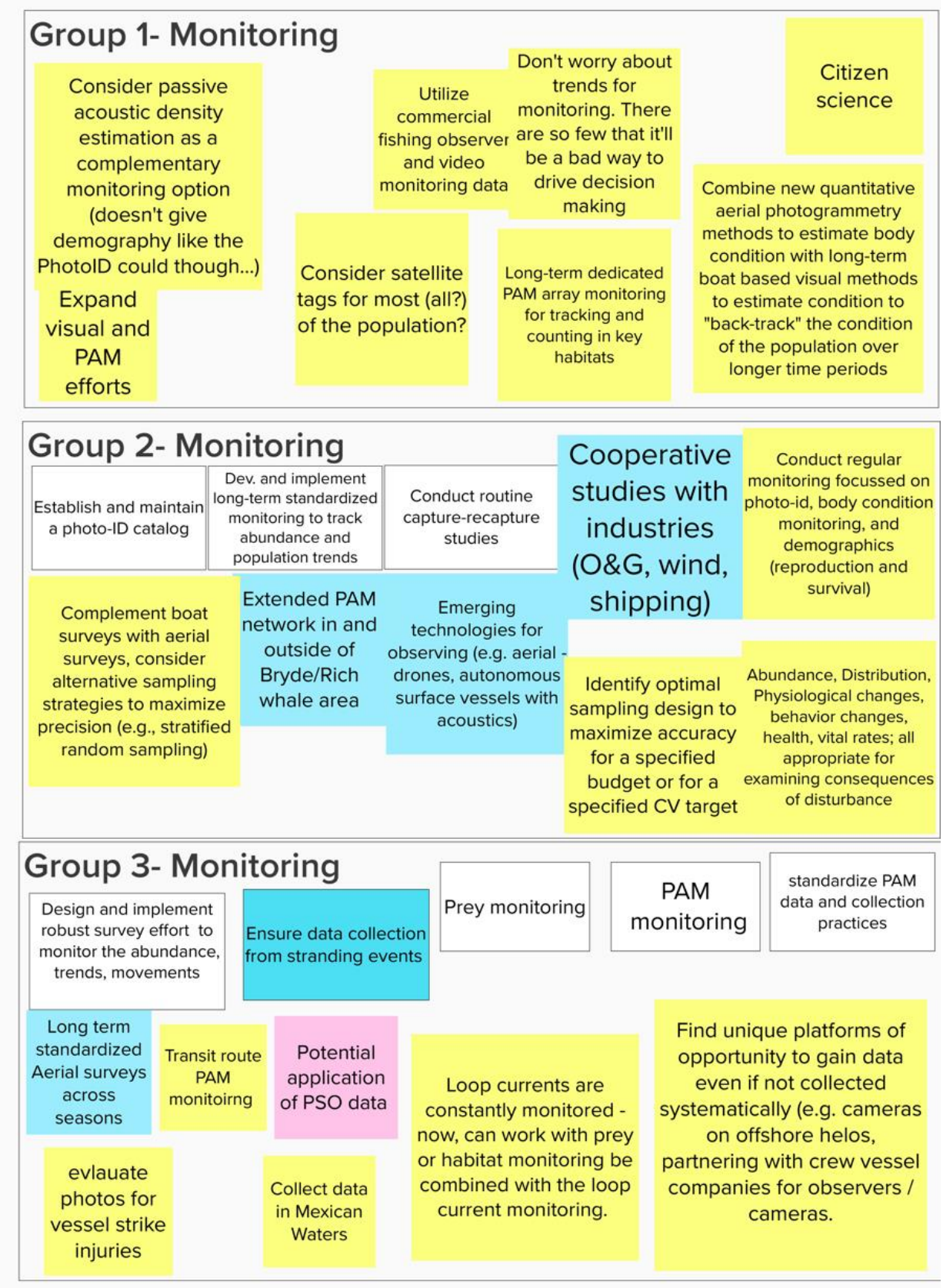
Through facilitated discussions, participants were asked to develop and discuss potential recovery action related to each of the four categories of recovery actions – research, management, monitoring, and outreach & engagement. During breakout group discussions, participants could type ideas directly via note-taking virtual media (i.e., Zoom chat or Mural board[1]) or share ideas verbally (which were then captured by the notetaker / flipcharter). Participants also had a week following the workshop session to review and add ideas to the Mural board.

A section of the Mural board was also dedicated for ideas that were related to Rice's whales, but outside the scope of this brainstorming discussion (e.g., related to threats-based recovery actions or outside the scope of Rice's whale recovery planning). A separate section was also added to the Mural board for participants to suggest other key threats that might warrant deeper discussion. Based on participants' input, the Steering Committee revised subsequent workshop sessions (e.g., added renewable energy to Workshop #2 threat topics).

The following are screenshots of the Mural board with the original suggestions from the three breakout groups (separated by the four categories of recovery actions), other/related ideas, and other new threats to consider.

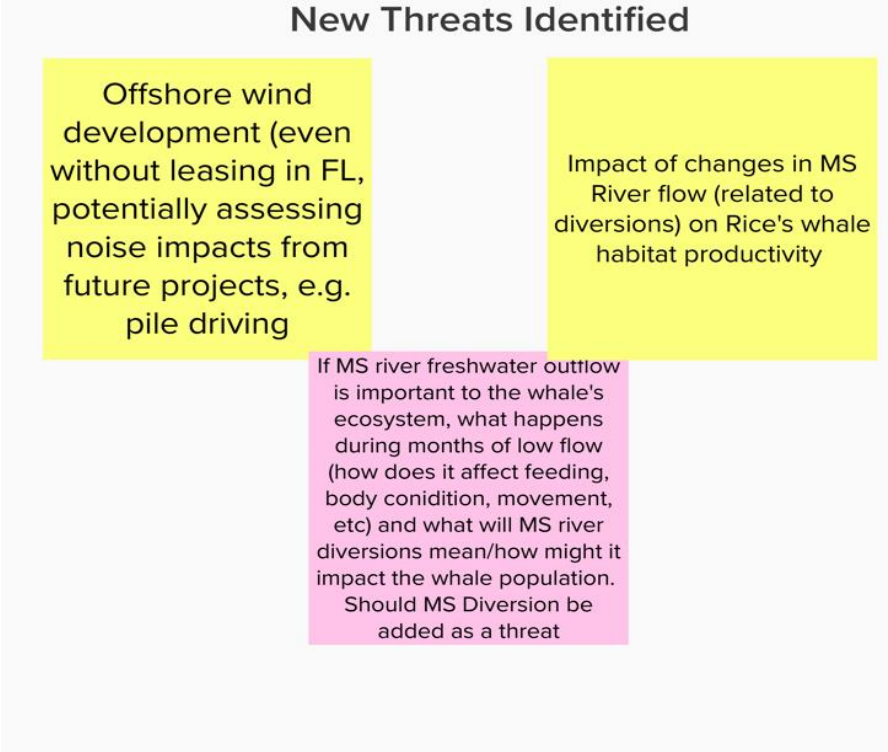
[1] Participants could choose to attend one of three short training sessions offered prior to the Rice's Whale Recovery Planning Workshop to help participants to prepare for breakout group discussions and navigating the Mural interface.

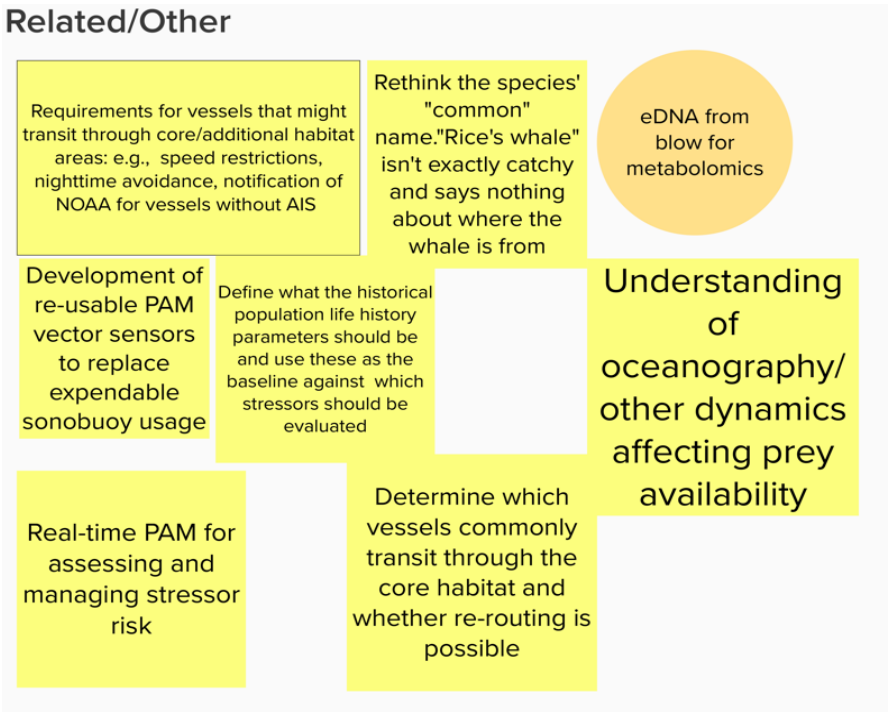

Group 1- Research
Consider using satellite imagery and AI to monitor whale abundance in hot spot areas
Combine aerial photogrammetry and biopsy sampling to determine minimum body length and condition needed for pregnancy
Improved understanding of dive and calling behavior from short-term less invasive tags
Inform the age (size) distribution of the population through aerial photogrammetry (and perhaps compare with historical length distribution from whaling records)
Get an abundance estimate from photoID CMR
Use well studied populations of Bryde's whales to determine the relationship between size distribution (stage structure), body condition and population dynamics (survival and reproductive rates) and compare to Rice's whale stage distribution and condition to predict population viability
Pay attention to the distribution and habitat use of other inshore tropical / subtropical Balaenoptera. They can occur very close inshore at times - in places where the inshore habitat isn't wrecked
Evaluate noise impacts from seismic surveys and shipping on habitat
Understand soundscape of shelf-break habitat in Central/Western GoM
Group 2- Research
Understand linkages between eastern Gulf and western/southern Gulf whales
Conduct targeted sampling and analysis to understand genetic diversity/kinship/etc in the population
Physical-biological modeling for Rice whale habitat (understanding if Loop current dynamics or other mesoscale physical conditions affect distribution)
Characterize demographic structure of the population
Develop a well-parameterized stage-structure population model for the species
Estimate pregnancy rates
Group 3- Research
Refine understanding of demographic history of the population, and inbreeding through genetic anayses
Characterize prey and then characterize prey distribution throughout GOMx
Develop Population Viability Analysis model to inform minimum population size for downlisting in context of remaining threats
Given urgency, formal expert elicitation process may be helpful to parameterize PVA, until parameters can be updated with empirical data
Development of an Integrated population model that integrates multiple sources of information (e.g., Hostetler et al. 2021). Would allow to simulatenously model vital rates, abundance and realized population growth rate.
Explore use/ utility of eDNA for Rice's whale research
Conduct remote biopsies for blubber hormone analysis (eg cortisol/aldosterone for stree; reproductive hormones for gender and reproductive status)
Fully understand distribution and density of whales throughout GOMx, including any seasonal and/ or temporal changes in habitat usage
Understand impacts of chronic stress on individuals and on the population
Fisheries collaboration to better understand prey base and prey base changes
characterize baseline health of population, pregnancy rate
improve understanding of dive behaviours to understand feeding and to better characterize risks of vessel strikes and of bottom longline interactions
Threat analysis to quantify the relative importance of threats
Proximate composition analysis of stranded animals to inform bioenergetic models


Group 1- Monitoring
Consider passive acoustic density estimation as a complementary monitoring option (doesn't give demography like the PhotoID could though...)
Utilize commercial fishing observer and video monitoring data
Don't worry about trends for monitoring. There are so few that it'll be a bad way to drive decision making
Citizen science
Combine new quantitative aerial photogrammetry methods to estimate body condition with long-term boat based visual methods to estimate condition to "back-track" the condition of the population over longer time periods
Consider satellite tags for most (all?) of the population?
Long-term dedicated PAM array monitoring for tracking and counting in key habitats
Expand visual and PAM efforts
Group 2- Monitoring
Establish and maintain a photo-ID catalog
Dev. and implement long-term standardized monitoring to track abundance and population trends
Conduct routine capture-recapture studies
Cooperative studies with industries (O&G, wind, shipping)
Conduct regular monitoring focussed on photo-id, body condition monitoring, and demographics (reproduction and survival)
Complement boat surveys with aerial surveys, consider alternative sampling strategies to maximize precision (e.g., stratified random sampling)
Extended PAM network in and outside of Bryde/Rich whale area
Emerging technologies for observing (e.g. aerial - drones, autonomous surface vessels with acoustics)
Identify optimal sampling design to maximize accuracy for a specified budget or for a specified CV target
Abundance, Distribution, Physiological changes, behavior changes, health, vital rates; all appropriate for examining consequences of disturbance
Group 3- Monitoring
Design and implement robust survey effort to monitor the abundance, trends, movements
Ensure data collection from stranding events
Prey monitoring
PAM monitoring
standardize PAM data and collection practices
Long term standardized Aerial surveys across seasons
Transit route PAM monitoirng
Potential application of PSO data
Loop currents are constantly monitored - now, can work with prey or habitat monitoring be combined with the loop current monitoring.
Find unique platforms of opportunity to gain data even if not collected systematically (e.g. cameras on offshore helos, partnering with crew vessel companies for observers / cameras.
evlauate photos for vessel strike injuries
Collect data in Mexican Waters


Group 1- Management
Ensure enhanced data collection from stranded animals
How many fishers are
Keep human activity (e.g., aquaculture, offshore wind) out of core/additional habitat areas; set strict requirements for vessels that may transit through habitat
Bar seismic exploration from areas that may ensonify core or additional RiWh habitat
Understand how many fishers are operating in the core habitat and how often?
Delineation of areas of importance (if possible prior to CH designation)
Make the public more aware that this species exists
Understand which fisheries are active in core habitat and whether entanglements are occurring
Improve understanding of stressors distribution and overlap
Set much stricter limitations on seismic exploration in Gulf, including but not limited to required use of alternatives to conventional seismic arrays
Understand emerging threats including new industries in the Gulf - Offshore Aquaculture and wind farms and potential impacts
Group 2- Management
Real-time detection buoys in Rice whale area (PAM) to inform vessel speeds - similar to the Stellwagen system
Work with industry to minimize threats from vessel strike in core habitat (speed, routing, real time measures)
Inform management benchmarks with integrated pop models proposed in "Research"
Development of risk maps to optimize enforcement activities (e.g., Moore et al. 2021; Udell et al. 2019; Crum et al. 2019)
Develop enhanced metrics of populaton status
Develop Best Management Practices asap, living document
Measures to protect/restore shelf-break habitat
Group 3- Management
Visual monitoring (PSOs) requirements in high density areas
identify actions to be taken if population monitoring indicates declining trends in abundance
RIWH alert platforms similar to NARW alert systems
Further strike risk analysis to pin point areas of mngt.
potentially close areas with high distribution of sightings to new experimental industries/fisheries
Revised stiock assessment
Design of speed reductions need to consider an understanding of vessel operations
Refine stressors spatially and temorally to be able to make the most of mangt actions.
Understsand total environmental impacts of management options
Fixed permanent PAM array in high density areas
inter-agency coordination between BOEM/ NMFS regarding industry operations
can this species be recovered at this point?
Design of ship speed and area prohibitions need to incorporate understanding of vessel operations
Require seismic surveys to report locations and times of activity
understand economic impacts of actions


Group 1- Outreach/Education
Dev., maint, and publicize coordinated syst for retrieving, collating, and reporting non-research RIWH sitings
Directly engage with state/regional fishery management bodies and the industry members who attend them
Public awareness campaign, individualizing whales through photo-ID work
Engage public - no one knows these whales exist and are among the most endangered on the planet
Slow pace of action on conservation?
engage federal, state, local politicians and make them aware of this species and the risks it faces
Collaboration with Mexico is important
Support non-NOAA based research into the species. Diversity is good
set up a citizen science application to engage with and learn from recreational and commercial fishers working in these waters
Group 2- Outreach/Education
Increase outreach efforts in the panhandle/offshore fishing community
Develop/integrate into curriculua for local schools and explore opportunities for citizen science (e.g., data analysis or photo ID studies)
Outreach to all stakeholders for awareness of critically endangered status and how conservation measures work
Explore citizen science approaches to improve monitoring/awareness/etc.
Group 3- Outreach/Education
Dev. and implement long-term standardized monitoring to track abundance and population trends
public outreach on all threats to the whales, including marine debris. Most residents of the Gulf region are unaware of the whale's existence
better way to explain only name changed; past research still applicable
Dev. partnerships with marine user grps to share info on RIWH status
Engage vessel operators with bridge & crew education
work with industry to coordinate on potential solutions
Outreach to operators fishing in core distributional area
citizen science/public reporting of sightings


New Threats Identified
Offshore wind development (even without leasing in FL, potentially assessing noise impacts from future projects, e.g. pile driving
Impact of changes in MS River flow (related to diversions) on Rice's whale habitat productivity
If MS river freshwater outflow is important to the whale's ecosystem, what happens during months of low flow (how does it affect feeding, body conidition, movement, etc) and what will MS river diversions mean/how might it impact the whale population. Should MS Diversion be added as a threat


Related/Other
Requirements for vessels that might transit through core/additional habitat areas: e.g., speed restrictions, nighttime avoidance, notification of NOAA for vessels without AIS
Rethink the species' "common" name."Rice's whale" isn't exactly catchy and says nothing about where the whale is from
eDNA from blow for metabolomics
Development of re-usable PAM vector sensors to replace expendable sonobuoy usage
Define what the historical population life history parameters should be and use these as the baseline against which stressors should be evaluated
Understanding of oceanography/ other dynamics affecting prey availability
Real-time PAM for assessing and managing stressor risk
Determine which vessels commonly transit through the core habitat and whether re-routing is possible

Appendix C – Recovery Actions Brainstorm: Breakout Group Original Notes

Workshops #2-4 focused on brainstorming potential threats-based recovery actions. Each session started with presentations and opportunities for clarifying Q&A intended to prepare participants for engaging in brainstorming discussions.

Following an overview of recovery actions, workshop participants were divided into groups and asked to brainstorm on possible research, management, monitoring, and outreach & engagement (O&E) recovery actions as they pertained to the days' themes (e.g., prey/climate change, fisheries interactions, contaminants, noise, vessel strikes, etc.). Each group had members of the Steering Committee/workshop support staff to assist breakout group discussions (e.g., a process facilitator and/or subject-matter expert moderator and notetaker / flipcharter). During breakout group discussions, participants could type ideas directly via note-taking virtual media (i.e., Zoom chat or Google Docs) or share ideas verbally (which were then captured by the notetaker / flipcharter). These brainstorming discussions were conducted in 2-3 rounds of breakout group discussions where small groups of participants (and observers) circulated among the session's threat topics such that all participants had an opportunity to contribute to each threat group and build off the ideas of preceding breakout group discussions.

The tables below capture the original notes from the breakout group discussions on brainstorming potential threats-based recovery actions. Each table contains four main components captured in the column headers – recovery action idea category (research [R], management [Mgt], monitoring [Mon], and outreach & engagement [OE]); the suggested recovery action idea; comments to expand on the idea; and implementation suggestions (specifically related to potential partners, cost estimates, and recurrence).

The designated notetaker captured ideas and characterized the recovery action whenever possible (in the left two columns). Participants could directly provide additional comments into the "Comments" to expand on the suggested recovery action idea and/or offer suggestions on partners, costs, and recurrence (right two columns). Participants often used these columns to capture data/information needs, share information, suggest other resources and pertinent examples, suggest qualifiers or considerations where appropriate, and offer different opinions. Notetakers capture discussion comments under the main potential recovery action statement or add to the "Comments" section (up to the notetaker's preference). Participants' contributions were tracked to help the Steering Committee and NMFS staff follow up on ideas if needed.

As mentioned in the main workshop summary report, few ideas on potential partners, costs, and recurrence needs were identified given time limitations and the greater focus on potential recovery actions; however, participants occasionally identified potential partners. The Steering Committee and NMFS staff indicated future stakeholder discussions could revisit this topic in 2022 as NMFS develops its draft implementation strategy.

After brainstorming discussions, NMFS staff reviewed discussion notes and drafted potential recovery actions to elicit feedback from participants via online surveys (i.e., Menti polling or Survey Monkey). Participants were asked to indicate the importance of recovery actions and had approximately one week after each session to review/edit/add ideas to potential recovery actions and criteria documents. The outcomes of these surveys are captured in the threats-based recovery actions subsections in the summary report or **Appendix D** on the post-workshop sessions recovery actions survey results.

The following are direct links to breakout group original notes in this appendix:

Prey / Climate Change | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
R	Investigate the effects of coastal sediment diversion projects on prey species	• [Comment: How about changes in the metabolic demands associated with the foraging environment? Would warming make foraging more difficult even if prey concentrations were resilient?]	
Mon	Develop and implement a long-term standardized monitoring effort to track prey abundance, quality, and distribution in the GOMx, particularly the southern GoMx		
R/Mon	Habitat: Look at the other habitat areas because they may become more important as prey shifts, etc.	• Prey/climate change should not be classified as a "low" threat; needs to be ranked higher because of trending towards a less productive system • In NZ, Bryde's whales are moving/relocating seemingly because the warming waters	
Mgt	Reduce burning of fossil fuels (both locally and globally)		
R/Mgt	Prey predators: What are the threat impacts to prey items specifically? What is causing direct mortality to prey? Understand patch dynamics to understand how whales can adapt over time.	• Individual fitness = it should have a larger distribution; the species is trying to find the best place/location to survive • Something is retaining the prey and the patches in those particular locations; need to better understand that	
R	Are we seeing prey and climate change linked together or more as independent threats?		
R/Mon	Habitat: Test our assumptions of the >400 m depth range (don't automatically stop our track lines at 400 m). Need to know depth contour of prey.		
R	Repeat trawling and stable isotope work (need more than n = 1); better flesh out understanding of prey		
R	Prey predators: What other predators might be targeting the main prey for Rice's whale? This may help us better understand future climate change effects.		

R	Prey type: Additional prey and stable isotope sampling in other locations and seasons. Alternative methods (fatty acids, fecal DNA, etc.) may also help identify prey types.		
R	Prey quality: Research quality of prey and not just quantity and see if it has changed over time for bioenergetics modeling		
R/Mon	Bioenergetics: Need more tag data across seasons and years to track through time including body conditions, reproductive rate. Include body index measurements, photo-ID. Is body condition currently optimal?	• A 'fat' and 'skinny' Rice's whale may not be as pronounced as other species. So long-term data across seasons is important. • I think it's important to not only focus on absolute body condition, but the seasonal variation in body condition, since the latter will give an indication of how fast an individual can gain and lose condition as a function of prey availability, reproduction etc. For example, the body condition of the Arabian Sea humpback whale population is actually quite high, even though the population is considered year around resident in tropical waters. • Also, if we had a better understanding of seasonal changes in body condition/health, then the impacts of other stressors at the times of year that body condition is poorer may become more important • Diving/energetics individual seems to be breathing more and lunging more. If animal is sick/in poor condition, that will affect respiration rate	
R	Prey abundance: Will prey move or decrease in number because of climate change?		
		• From chat: Just to try to challenge assumptions here: 1. I may have missed it, but what is the evidence that Rice's whales are generally in poor body condition for their life stage, compared with historical (or compared with what we'd expect if no historical data). 2. Under density dependence we expect animals to be in poor condition at carrying capacity, so do we have evidence they are in worse body condition than we'd expect? 3. Do we have evidence that poor body condition leads to mortality (in many long-lived species adult survival is the last thing to be affected -- fecundity, for example, is affected first). • From chat: I would expect these tropical whales to always be living at the edge and dependent on patchy prey that varies a lot in space and time. So, poor body condition may not be all that unusual. I think we	

		will have some data to characterize the variability at the individual level from our visual health data. ● From chat: One question: Do you think that ocean-biogeochemical modeling would be helpful to determine the potential changes in food resources? ● From chat: I agree that the bottleneck may be fecundity rather than adult mortality, but both would argue for heightened risk. Also, wouldn't prevalent poor body condition indicate heightened risk to resource changes, whether it has changed recently or not? ● From chat: I do think the coupled NPZ models would be helpful for identifying overall expected changes in the productivity of the habitat - I think (but don't know) that Ariomma are feeding mainly on zooplankton - so it would be very useful to understand ● From chat: I wonder whether the Mississippi River plume play a significant role promoting prey biomass in the region where Rice's whales live? (Response: Yes. I believe so. The seasonal Mississippi River plume is an important input of productivity into this habitat and the west florida shelf in general.) ● From chat: Certainly - DWH syntheses showed riverine input as a primary determiner of oceanic zoop biomass in NEGoM. Effect on higher trophic levels is unknown. ● From chat: also a few papers on northern elephant seals use changes in dive parameters to track changes in condition over the course of post fasting foraging trips	
Mgt	Ban/restrict exploratory/novel pelagic fisheries		
R	Suggest research on potential effects of aquaculture facility emplacement within the core distribution area to nearby prey. Once a facility is in place, it would be appropriate to have extensive monitoring of effects, both of facility discharges and potential for downstream effects to prey.	● Need to define area	Partner: MREP For Aquaculture Steering Committee
R	Are there local processes that might make local patterns of productivity more resilient?		
R	<u>Prey quantity</u>: Is there any reason to think that there is not enough food for ~50 whales?	● Food resources need to support the entire ecosystem; there may not be enough food to support the large whales of the ecosystem ● If we assume a healthy population is more than 50 whales, I think the	

		question needs to be if there is enough food to support X whales.	
Mgt	Risk assessment framework: given their habitat choice, what would be the key parameters to look at? Aquaculture, Wind energy, Renewable energy, shipping traffic. What other pieces do we need?		
R	Forecasting: How will prey and whales shift with climate change? Bottom temp warming could affect both prey and whales.		
Mon	Acoustic sampling: Adaptive sampling: real-time glider work (similar to right whales).	• Consistent and comparable acoustic analyses with PAM, long and short term	
Mon	Long-term monitoring: to understand changes in GOMx--passive acoustic monitoring		
Mgt	Consider creating MPA	• Need to define area • Need to identify goals, objectives, operationalization, enforcement, etc.	
Mgt	Habitat restoration: any areas that are underutilized now that could be improved to help with nutrient and prey limitation? What about fish restoration?	• Mississippi Canyon is currently degraded • Monitor the impact of offshore Harmful Algal Blooms on prey items and potential exposure to the whales.	
Mon	Long-term monitoring and climate change: might be synergistic effects where if the whales move, they may encounter even more threats? How will this affect the threat landscape in the future? Monitor the area that the prey use as well to see if they shift location.	• The future of habitat changes in their core area was alarming • This is where forecasting could be applied • Need comparative studies of similar fishes--with increase in temperature, do the fishes go deeper? • Focus on near-term but need to consider long-term	
Mgt	If we ever discuss MPAs or protected areas for these whales, we need to consider potential climate-change driven ecosystem/prey changes and encompass a protected area that allows the whales to adapt to those changes.	• Also must consider how fishing and other ocean-use industries would adapt to said changes	

Other Ideas / Parking Lot

- A potentially useful reference to aid in the discussion on climate change risk specific to Rice's whale is a manuscript in final review by Matthew Letrich at NMFS Office of Science and Technology. They conducted vulnerability risk assessments for cetaceans that provide Overall Vulnerability Ranking, and rankings for Biological Sensitivity, Climate Exposure, and Data Quality (certainty). These scores are collectively based on a group of sensitivity attributes and a group of exposure variables. They have resulting tables that provide score plots for Rice's whale (and other cetaceans).

Entanglement / Fisheries Interactions | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
Mgt	Deny applications for Aquaculture in core and projected habitat for Rice's whale (via multiple legal mechanisms). • Anchoring cables and other unknowns from gear/operation to harm Rice's whales or any whales are unknowns, so until there is a better understanding of risk, applications should be restricted. (burden of proof on applicant). There are multiple vehicles of impact and can lead to adverse modification of critical habitat. • Another perspective: establish a protected area that would limit new risk from new industries.	• PRD/Section 7 staff need support in understanding risks to the animal. Are there mitigation measures/BMPs that could be implemented in Aquaculture activities? (KR) • Need vessel speed limits that are enforceable (KR) • Water quality monitoring for aquaculture procedural activity induced changes. (RYEwing)	
Mgt	Require ropeless fishing gear (all types) in core and projected Rice's habitats. The dive profile of Rice's whales indicates risk from bottom longline fisheries.	[Post-workshop comment(s)]: • Need to identify how "ropeless" is defined in the regulations. • Need to identify BLL effort relative to habitat areas (see comment about defining areas above). • Need to examine evidence of BLL (and other fishing) interactions.	Partners: Gulf of Mexico Fishery Management Council, SERO, SEFSC, OLE, Shareholders' Alliance
Mgt	Expansion of observer coverage (including electronic monitoring as a potential) for fisheries particularly in Rice's whale habitats. • Potential partner for EM could be Mote Marine Lab.	• https://mote.org/research/program/center-for-fisheries-electronic-monitoring-at-mote-cfemm [Post-workshop comment(s)]: • Identify funding mechanism, observer provider resource availability, regulatory mechanism to implement this, etc. • Need to define area • Differing perspectives regarding the feasibility to operate EM. One viewpoint is that the bottom longline fishery maybe very difficult to observe given how they operate--even with EM; another viewpoint is that the industry is a relatively easy industry in which to operate EM.	Partners: Gulf of Mexico Fishery Management Council, SERO, SEFSC, OLE, Shareholders' Alliance
Mon	Require VMS reporting of all Gulf commercial, charter, recreational fisheries • (need to ensure that activities are kept out of RW core habitat) - helps to track vessel location - might	• Identify and make contact with active fishery associations in the Gulf of Mexico [EB] • Work with GMFMC to secure time slots on meeting agendas on a regular basis to update managers and the public (GMFMC meets 5x/year)	Partners: Gulf of Mexico Fishery Management Council, SERO,

	want think about ways to limit geographic reach (though not sure what that would be; need to cast wide net beyond fisheries with known overlap with RW). ● Bulk of Rec fisheries use hook and line and likely substantial push back to VMS ● All commercial reef fish vessels have VMS	[EB] [Post-workshop comment(s)]: ● Need to define area ● Are we considering rec fishery vessel collision a risk in addition to entanglement?	SEFSC, OLE, Shareholders' Alliance
OE	● Develop partnerships with GOMx FMC and others (e.g., GOMx Reef Fish Shareholders' Alliance) to develop and encourage RIWH BMPs. ○ Important to involve fishery managers and stakeholders. ○ Work with partners and FMC		Partners: Gulf of Mexico Fishery Management Council, SERO, SEFSC, OLE, Shareholders' Alliance, other industry organzations
	Consider entanglement in floating wind turbines (action?)	● Broader thinking- identify all sources of potential entanglement (e.g., parachutes, floating debris or debris that could be swallowed).	
R/Mgt	How does input of fish food/productivity into a local area and how that radiates out to larger area. What is the size and shape of that plume and what is the significance of that to ecosystem. ● Mgmt related action - Consider requiring aquaculture operations to model movement of effluent as part of their application)		
M	Dynamic management to make closures as effective as possible for Fisheries. Ex. Ecocast on West Coast, if possible.		
R	Determine viability of using modeling for dynamic management		
	Ship strike from large vessels or fishermen likely a large risk given rest at surface at night. If ships will transit through critical habitat at night, huge risk to animals given behavior.		
R/Mgt	Entanglement of trap pots on Rice's whales (2 trap/pot entanglements known for Rice's) ● Better understanding of habitat--where could they		

	be getting entangled ● Removing ghost gear ● Understand trap pot fisheries throughout Gulf wrt Rice's whale habitat (not just eastern Gulf)		
Mgt	Core habitat as a Fishery closures and no-go area for vessels (unless by special permit). ● No go areas are more effective ● Needs to consider rec fishing vessels as well	● Also suggestions for slow go if no go areas are not possible. ● Outreach for recreational people wrt whales, boat speed, fishing gear etc	
Mgmt	Protein needed for Aquaculture fisheries (esp. As industries scale up) ● Proactive ban on exploratory fishing for midwater spp. in the Gulf esp. at night. ● Preventing any exploratory fishing gulf wide for all pelagic spp (no deep-water trawls)		
Mgt	Consideration of recreational fishing impacts ● Deep drop fishing becoming more popular (don't use mono)		
R	Additional research on scarring on Rice's whales and association to entanglement ● B/c Rice's whales are smaller, there is the possibility that they might not survive entanglements (therefore scarring patterns not as informative?)	● [Post-workshop comment(s)]: Similar for vessel strikes; speeds and size requirements to reduce vessel collisions may also differ for smaller whales	
OE	General outreach to vessel operators about Rice's whale presence and behavior at night Go out to ports with signage		
R/Mgt	Understanding habitat use outside of Core Habitat and thinking about dynamic management in these areas What would trigger an area? Real time acoustic monitoring or surveys		
R/Mon/Mgt	Understand risk of aquaculture gear in hurricanes. What if net pens(?) get loose? Need response plan if such a thing happened in/near Rice's whale habitat		

Renewable Energy | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
Mgt	**Develop mitigation measures to eliminate/minimize threats from renewable energy construction and operation activities**	• Characterize RIWH use of habitat, provide routinely updated maps to be transparent about potential conflict with RIWH for potential lease sales - get this information public and adaptive to avoid overcapitalization on lease development in areas of high potential conflict • Consider transit routes to inform conflict-free siting of leases • Night travel restriction for construction and lease-servicing vessels • Overall the essential input for marine spatial planning is a robust species distribution model, preferably with environmental drivers that can be used to avoid conflicts in lease development, identify spatiotemporal windows for construction activities in areas where overlap exists, and predict future conflicts under climate change scenarios	
Mon	Incorporate passive acoustic monitoring guidelines into construction operation plans; for detecting whales as well as monitoring soundscape. Monitor vessel transit routes (near real-time) to develop alert system, similar to what exists for right whales.	• Similar to guidelines developed for North Atlantic right whales; perhaps can be tweaked for Gulf of Mexico • The guidelines include techniques for sound monitoring, appropriate depths, etc. • Recommendations cover before, during, and after construction of offshore wind projects and apply nationwide • Listening to characterize source production through life of the windpower project, but also listening for whale sounds to characterize their acoustic use of the surrounding environment • Characterize transit routes/areas of heavy traffic, increases in vessel traffic associated with port activity	
Mgt	No new threats in eastern planning area		
R	Better understand impacts of electrical energy transfer lines upon RIWH navigation and other behaviors, and any potential impacts on prey	• More research on EMF, predators/prey that may be attracted to areas [Comment: noise related with surveys to site/bury the lines?]	
	Increase surveys beyond current expected depth ranges, finer scale	• Focus on lease areas (100m-400m or slightly beyond; adjacent deeper areas) • Before, during, and after construction • Take ecosystem view, site windfarms in areas that are right for all resources; holistic spatial marine planning (similar to AOA)	

	Take climate change into consideration in planning process for siting.	• Potential climate driven changes in RIWH habitat	
	Passive acoustic surveys prior to siting/planning	• Surveys should be used to determine where siting should occur, not just after the fact once structures are being built.	
Mgt	Integrate renewable energy actions into section 7 consultation framework	• Section 7 mapper, tools to aid action agencies to integrate conservation measures into actions	
OE	Rice's whale outreach to vessel operators in Gulf of Mexico	• Small recreational vessels as well as large commercial vessels	
Mgt	Avoid siting of windfarms within projected habitat of Rice's whales (western Gulf).	• Mitigation is possible, but we don't know what impact will be on a baleen whale, so avoidance is key	
Mgt	Set vessel speed limits; guidelines for vessel behavior and strike avoidance	• Avoid vessel activity at night when whales are at the surface • [Post-workshop comment(s)]: Evaluate speed/size limits with respect to smaller whale size before setting	
R	Better habitat modeling in Southern Gulf; additional survey effort		
OE	Outreach to RODA-like entities, such as gulf of Mexico alliance, Gulf States Marine Fisheries Commission, Sea Grant.		
OE	Outreach to renewable energy community and NGOs engaged in renewable energy to date in other areas	• Will not be familiar with deep-diving whales	
Mgt	Avoid siting in waters deeper than 100m	• But consider that <100m is not a free for all -- need to verify that whales are not close to shore, even if they haven't been observed there yet.	
Mgt	Ensure strategies are dynamic, adaptive, responsive to changes in distribution, etc.		
Mgt	Mitigate sound from pile driving	• Not sure whether pile driving is an issue for RIWH • Should also consider impacts to prey species such as A. bondi	
R	Understand life cycle of prey species		
Mgt	Consider disaster response and potential impacts on equipment, structures	• Increasing strength/magnitude/frequency of storms	

Environmental Pollutants | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
R	Investigate contaminants load in Rice's whale and their prey		
Mon	Establish forum for collaboration and coordination on long term monitoring.	• Consider potential use of PSO data as part of long-term monitoring solution	
R	Learn more about what the impacts are to whales from stimulation chemicals, produced water and other oil +gas related activities	• [Post-workshop comment(s)]: Whales *and their prey*	
Mgmt	Reduce/cease new oil and gas leases in Gulf of Mexico (particularly in/near core habitat + projected habitat areas) • Catastrophic spill could be a stochastic event for this population • Perceived risk only increases as we understand more about habitat range and animal/prey movement • Possibly through re-consultation of ESA (newer or more specific information might be required for a jeopardy analysis) or through OCSLA	• Enact programmatic policy or funding method for decommissioning derelict oil rigs/pipelines - "orphaned" rigs can cause delays in response while officials try to figure out who is responsible. Cleanup of abandoned materials and infrastructure seems like low-hanging fruit • [Comment: A recovery plan for a single species is not an appropriate venue for policy positions. Energy exploration and development (including O&G and alternative) is a far more complex and nuanced issue than a blanket "ban". This comment appears to be seeking a specific outcome rather than focusing on the recovery plan objectives.]	
Mgmt	Reduce/cease new oil and gas leases in the entirety of the Gulf of Mexico • Catastrophic spill could be a stochastic event for this population • Perceived risk only increases as we understand more about habitat range and animal/prey movement • Possibly through re-consultation of ESA (newer or more specific information might be required for a jeopardy analysis) or through OCSLA ○ Looking at RESTORE funded data on distribution and frequency of occurrence	• [Comment: A recovery plan for a single species is not an appropriate venue for policy positions. Energy exploration and development (including O&G and alternative) is a far more complex and nuanced issue than a blanket "ban". This comment appears to be seeking a specific outcome rather than focusing on the recovery plan objectives.]	
R	Create a full understanding of RIWH habitat and range		
Mgmt	Put a water quality aspect into the critical habitat designation		

R	In 1970s, EPA permitted discharge of barrels of chemical (industrial waste) into the GOM. Helpful to get better understanding of where those dumped barrels are in relation to habitat and how it might be impacting RW directly or through ingestion of exposed prey.		
R	Create a better understanding of what pollutants/contaminants are entering the GoM from MS river flow or other sources ● Strengthen understanding through better partnerships with EPA (Superfund, etc.) and other water quality agencies/entities ● Consider possible shifting of barrel over time and/ or unknown dumping sites ● Identifying sources of contaminants - hard to come up with management initiatives without truly understanding the problem - loads in RW and prey, as well as contaminants sources		
R	Develop a better understanding of what is creating the Dead Zone in the Gulf of Mexico and how it could be mitigated		
R	Additional modeling for catastrophic spills (previous models are insufficient); important to more fully reflect the shifting in lease distribution	● Categorize each lease by spill risk (probably a categorical spill risk, with large and catastrophic spills being of highest concern -- this seems to be done already, per Kevin's presentation) and then look at hydrodynamic flow fields around leases to better understand the risk of oil from a spill at a lease site being carried into Rice's whale habitat, including the extended shelf-edge habitat beyond the core area. Evaluate relative risk profile (quantity and duration of oiling) for life of a lease when determining whether it can be approved - potentially identify thresholds of risk beyond which no leases can be approved (RPA?). Groundtruth "spill risk" assessment by applying the approach to DWH - would it have been "disapproved" under the RPA?	
R	Are there additional samples that can be run from stranded animals' necropsies ● Tissue samples remain in house, can they be subsampled for current case that we have (Jan 2019)		
M	Creation of a RIWH necropsy/sample/documentation portal, moving forward with more complete data sharing		
R	Better, more flexible sampling protocols with ability for team-		

	lead-driven changes due to "unknown unknowns" or novel findings		
Mon	More dynamic hydrodynamic modeling with more dynamic RIWH modeling - increase state of readiness and flow of information		
M	Are there GoM contaminant models already existing that we can feed back into		
R	Understand correlation between health/condition and various types of contaminants and contaminant load (as a precursor to being able to enact stronger regulations on leases)		
R	Scoping of aquaculture facility placement, what is the quality and quantity of outfall, and how far does it travel?	• Water quality and eDNA microbiome monitoring to assess the environmental impact.	
R	Better understanding of contaminants and pollutants from SpaceX capsules, recovery boats, mobile launch platforms		
Mgmt	Push EPA for containment/cleanup of existing coastal land-based Superfund sites around the Gulf of Mexico		
Mgmt	Creation of rapid response team for pollution events in or around RIWH habitat • Triggered by monitoring system for pollution events within RIWH habitat (current system isn't tracking RIWH - requires outreach to OR&R) • Seen as something that can enacted within the next year		
Mgmt	Give more attention to communication with RIWH personnel regarding smaller spills in and on edges of RIWH habitat due to their possible cumulative effects • Possible development of subsurface oil detection and communication		
Mon	Permanent long term water quality monitoring stations w/in RIWH habitat	• And on the edges?	
		• Enhance GOM-wide monitoring of circulation patterns and currents to better understand the areas where pollutants may pose the most important exposure risk.	

Disease / Health Indicators | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
Mgt	• Enhance carcass detection, reporting and data collection	• Collaborate with stakeholder groups with the access and knowledge necessary to facilitate enhanced detection and recovery	
Mon	• Establish forum for collaboration and coordination on long term monitoring.		
Disease R/Mon	• Morbillivirus--likely interactions from RIWH and bottlenose dolphins-->understand disease prevalence/disease monitoring in GoMx	• Need actions to reduce the source of disease (need mgmt action to come out of research) • Possible examples (mgt): vaccine development and delivery (to RIWH or dolphins); interrupting mechanisms of transmission; improve environmental conditions that contribute to disease susceptibility	
Disease Mon	• Monitor RIWH via breath samples to determine what pathogens are present		
R	• Identify appropriate metrics via visual/health monitoring or strandings that will aid in long-term monitoring of individual and population-level health	• Metrics from visual external observations, metrics from biopsy sample analyses, blow, metrics from stranding data. Identify the best metrics for long-term monitoring of individual and population health (survival, fecundity). • Put some health metric into recovery criteria. x% of population is "healthy" based on some metric	
R/Mon	• Monitoring for diseases, understanding impact disease can have on pop. and proportion of animals it can negatively impact...evaluate the threat and add into PComs model...what is the exposure and sublethal effect...monitoring through breath samples and microbiome and scanning for opportunistic pathogens can get to the animals health...sample some of the cohorts to see how the pathogen(s) is spreading in shared habitat...this is another way of getting at a risk assessment. ○ Determine what is the risk assessment and what is the rate of risk	• Look at NARW health assessment strategic plan as an example (reference by analogy). • Pacific Humpback whale health assessment strategic plan	

R/Mon	• What types of pathogens, etc., might get flushed into the habitat during freshwater runoff events...understand what is in the freshwater plume...research contaminants and disease	• Protozoal pathogens as well as toxicants could be introduced in effluents from land based sources • Might get some info from aquaculture monitoring plan	
R	• Prioritize sample/data collection that can inform immunosuppression (but then what can we do about it (e.g., control point source pollution, etc.)	• What factors impacts fecundity and immunocompetence,	
R	• Improve our ability to collect breath samples from mysticetes	• Analysis is easy; collection is hard • Link to one of the publications on SRKW breath https://www.nature.com/articles/s41598-017-00457-5	
R	• Body condition indices...take morphometric measures during necropsy that can be compared to aerial photogrammetry measurements...detailed necropsy protocol that includes condition measurements	• Collect and incorporate underwater images for body condition analysis	
Mgmt	• Consider controlling other synergistic threats where possible (e.g., O&G, farm pollutants) to lessen negative effects from primary threats...regulate primary threats to reduce effects from secondary threats (or vice versa)	• It's like with DDT. You couldn't remove the DDT that was already in the environment, but you could stop the addition of more. 40-50 years later, peregrines and eagles have recovered.	
R/Mon	• Body condition using photo-ID from small boats...using AI to evaluate images to speed evaluation process of body condition		
	• Climate change effects--RIWH may be more heat challenged than we currently realize...physiologically they may need to reduce insulation to dissipate heat...look at whole picture with a chronic-change lens...integrate all body condition measures		
R	• Establish a baseline on body condition...determine what a healthy RIWH looks like...identify proxy of healthy species (e.g., healthy Bryde's whale population from another coastal region)		
	• Body tissue collection becomes standard protocol in necropsy analysis		
Mgmt	• How to manage health indicators...how can we	• PComs doesn't seem to really drive management decisions or	

	improve environmental quality	actions...important for awareness building though...can be used to identify which suite of threats is the most significant...evaluate cumulative synergistic sub-lethal effects	
	• Lesions--review photos closely to see if animals are expressing lesions to indicate immunocompromised health	• Chat question: are Rice's whales prone to these lesions, possibly due to inbreeding?	
	• Are we monitoring for the right thing? Is monitoring population size getting us to the right outcome		
	• Ensure resources are in place to immediately deploy teams out to collect teams if/when there is a stranding/deceased animal		
O/E	• Efforts to increase detection of carcases...open ocean salvage and towing funds should be readily available to assist with preparedness/data collection	• Are crew boats/industry, etc. engaged in collaborating?	
	• From chat: List of potential stressors that may lead to a weakened condition (immunocompromised) and make the whales more susceptible to ubiquitous or opportunistic disease vectors (fungi, bacteria, viruses, etc.).		

Marine Debris | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
Mon	Establish forum for collaboration and coordination on long term monitoring.	• Collaborate with industry and other ocean users to determine what is possible/achievable to collect within the context of existing operations, and develop a streamlined reporting system to obtain data	
OE	Encourage reduction of plastic usage		
R/Mon	Determine what specific types of marine debris RIWH are encountering; monitoring of what is in environment where animals are feeding.	• Acoustic fish finders used for vaquita research, tune frequency backscatter for different types of marine debris. Hone understanding of specific types of marine debris that are a problem at feeding depths. • Can existing data be mined for that type of information? • Target ID - determine signal for different types of debris and determine which are easier to manage. • Sea Shepherd has experience looking for ghost nets; draw on others who have this type of expertise. • Maybe fishermen who have experience in the area/habitat • Separate known and unknown sources of debris - separate fisheries debris	
Mon	Collaborate with industry in tracking and monitoring where marine debris is in the environment.	• IAGC ghost gear and marine debris initiative - geophysical and exploration companies. Expand and increase participation in program [Comment: More on the GNI here: https://iagc.org/policy-issues/ghost-net-initiative/] • Communicate information needs to industry/partners [Comment: Discuss specific information needs with industry/ocean users in the context of what can be reasonably collected/reported during the course of normal operations.]	
	Explore methods of sourcing plastic, specifically the piece that was found in Everglades stranded animal.	• May be difficult, but worthwhile to try to do. • Draw on other expertise, human forensics, etc.	
R	Look at other deep divers that strand more frequently (e.g., Kogia), try to quantify the type of plastics that end up in deep divers.	• Recent GoMex stranding had multiple plastic bags • Has there been an overall decline in body condition since DWH? Across deep water species	

	Labeling gear to identify active vs derelict gear	• Where was gear set, has it moved, etc	
R/Mon	Engage student groups in robotics and other fields to explore innovative ways of investigating debris	• USF project - review videos taken for indications of marine debris	
Mgt	Develop best management practices in collaboration with experts, industry, etc.	• BMPs exist for removal of marine debris, but not aware of removal happening at deep depths • ID key user groups, debris associated with those user groups, establish consortium of those user groups that can approach issue in a more coordinated and efficient manner. • NFWF project working with commercial fishermen on gear disposal at ports, gear is converted to energy	
	Involve marine debris coordinators in outreach, recovery efforts, and development of BMPs in RIWH habitat		
Mon	Centralize reporting and tracking of debris	• PSOs are generally not tracking/reporting, usually it's the companies removing the debris. • PSOs may be opportunistically/voluntarily reporting, not in a standardized or comprehensive fashion. • Consider citizen science approach? ○ [Post-workshop comment(s)]: Debris Alert app like Whale Alert app? • Understanding origins of marine debris will help target outreach and mitigation efforts	
Mgt	Evaluate terms and conditions for dealing with derelict gear, other debris on permits and for EFH/ESA consultations to identify gaps in management actions		
Mgt	Work with NASA and other partners to prevent landing/launch of SpaceX capsules near RIWH habitat	• What kind of marine debris are they leaving? And where? • Boeing also engaged in launches/landings • Also disaster actions in case of a catastrophic failure of the craft	
Mgt	Consider need for disentanglement response training;		
R/Mon	Mine existing data (photo ID, stranding, other existing data) to determine prevalence of indication of entanglement on population	• Gain better understanding of entanglement risks	
Mgt	Add info to large whale stranding manual specific to RIWH	• Gain better understanding of entanglement risks	
R	Investigate microplastics in prey gut contents	• Prey can also be analyzed for toxicants and pathogens.	

Mon	Improve tracking of marine debris from disasters/catastrophic events		
OE	Outreach to fishermen (commercial and recreational) operating near RIWH habitat and throughout Gulf regarding prevention of marine debris		
OE	Outreach to schools on marine debris risk to marine animals and what they can do th help. Get them young!		
Mgt	Encourage investment in stormwater mitigation measures to limit stormwater marine debris in Gulf	• Work with EPA, NOAA, state agencies • Important pathway to prevent debris	
Mgt	Reduce sources of microplastics from industrial sources, including virgin pellets		
OE	Outreach to fishing community to determine whether they are using debris as aggregation devices, or survey to determine whether devices were seen		
Mgt	Strengthen reporting requirements for marine trash and debris appendix in the GOM O&G BiOp	(FYI, Appendix B of BiOp)	
	Exploration of/requirement of the use of ropeless fishing gear in Rice's whale core/projected habitat.		
R/Mon	Sampling should examine debris near seafloor where whales are feeding		
Mgt	Conduct large scale clean-up in Gulf of Mexico	Consider technologies being used in other parts of the world for large-scale clean-up.	

Acute and Chronic Noise | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
Mgt	• Keep "quiet" areas quiet -- i.e., no new noise sources in core habitat where noise levels are lower.	• In addition to barring new noise sources within habitat, also must address sources of noise outside the habitat that ensonifies that habitat, causing masking and/or other impacts\ Consider ensonification from the perspective of the receivers -- sound not relevant if only at frequencies outside of best hearing range, only propagating distances at depths at which the animals cannot reach, etc. • Include projected/western habitat as well as core habitat • What does it mean to keep habitat "quiet?" What is the current ambient "soundscape"? Consider the effect of activities beyond the habitat. • Define metrics of "quiet or reduction"...quantitatively and qualitatively; need metrics Given the conservation status of the species, the metrics would have to be conservative (certainly below the existing baseline even in relatively quiet areas in the Eastern Gulf). The metrics would also need to take masking effects into account. [Comment: This must be considered within the context of necessary activities in the region. Cannot cutoff or curtail anthropogenic activities with critical economic or national security implications.] • Give shipping and O&G industries ways [Comment: Work with industry to discuss currently available/in development technology] to meet those metrics • What level of equipment in GoMx is necessary to understand if we are meeting the metrics to confidently measure acoustic changes in the GoMx? ○ Don't need more deployments, they just need to be maintained and deployed in the appropriate locations • Characterize use of extended habitat and apply similar measures where appropriate	
Mgt	• Keep "nearby" areas quiet as well, and future areas of potential occupancy	• Two areas; core and handful of sightings west; third area: SGOM; need better data • Need to be flexible for changes b/c of potential RIWH redistribution due to climate change	

		• Consider habitat areas other than known areas where observations have been made for future potential range expansion [Comment: Use oceanographic data, prey concentration, etc.]	
Mgt	• Work with industry to reduce shipping and seismic survey noise levels in core, western, and predicted habitat		
Mgt	• Work with industry to develop newer quieter technologies	• For some industries (e.g., oil and gas), use action-forcing measures to drive development and implementation of "quieter" technologies	
R	• Characterize operational rig noise	• Consider Dynamic positioning systems on drillships or MODUs (mobile offshore drilling unit); offshore pile driving	
R	• Characterize aquaculture and renewable energy noise		
R	• Improve understanding of viable habitat and how noise levels and occupancy co-vary	• Current ambient "soundscape"; characterization of all industry vessel sounds, not only O&G (also international) • Employ eDNA monitoring along with PAM to understand whether whales are not being heard or are not present around PAM units that do not record whales.	
R/Mon	• Continue/expand collection and analysis of long-term PAM data to understand Gulf-wide soundscape	• High-priority action • There are ~12 PAM instruments out now but there are lots of variables that will change the soundscape • Consider air-based noise? Military jet noise? How common? Any effects? Even if uncommon now, protect core area air space in future. And SpaceX noise. • Use D-tags to record soundscape as well as noise from animals • All ships are not created equal wrt noise; have crew transport use the quieter, newer vessels in the areas where RIWH are; there are some modifications to propeller structures that reduce sound as well reduce energy consumption • Putland et al 2018 Global Change Biology reports acoustic footprint https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.13996?casa_token=amc8GUgKhR0AAAAA%3Abl48NLTem8YExpCjF3gWPcqf7a7loXn4L2Z3Qm2wagUbwP8lT6Bh7W6FJNQCRD83LYfrTlDjks8Cg8BH	
R/Mon	• Continue/expand collection and analysis of long-term PAM data to understand Gulf-wide distribution of RIWH • Need to better understand where and when RIWH	• High-priority action (other methods in addition to PAM data can/should be applied to address the question of RIWH distribution in space and time (GOMMAPPs, eDNA monitoring,) • Upper-looking deployment sounders	

	are located, including photo-ID	• Use D-tags to record noise from animals
		  ○ Q: Do tags harm the whales? A: These are silicone suction tags; there are penetrative tags that now have a better design/less impact to the animal
		  ○ From 1 D-tag - Acoustic footprint of vessels decreased dramatically when vessels decreased from 13 kts down to 10 kts (i.e., masking effects decreased)
		  ○ Evaluate D-tag data for behavioral response to large sound sources (seismic surveys, avoidance of large vessel passage, response to predator sounds)
		• Combination of tools--line transects,
		  ○ BOEM had a program doing line transects in the GoM but Gulf office is likely not continuing it
		• Use satellite imaging to locate animals
		• Use longer-term sat tags to better track animals to better understand spatio-temporal overlap with activities.
		• More use of Acousonde tags during whale monitoring for habitat usage and soundscape capture
		• Collaborate with industry as they are the eyes on the water; a lot of info is already gathered but needs some effective analysis
		• GoMaps-type survey to get at distribution/seasonality (https://www.boem.gov/gommapps) (GoMaps is currently on hold so there will be a data gap; need time-series to better see how animals are responding)	

R	• Research whether acoustics are actually driving the "core range" -- that RIWH are confining themselves to the quieter areas of the Gulf? Or is it just luck that the places they like to be are quieter?	• Point from Melissa's talk: whale absence at noisy sites versus lack of acoustic detectability	
R	• Research acoustic impacts on RIWH' prey		
O/E	• O/E to ports related to vessel activity including all ports: fishing, cruise, industry; collaboration with existing efforts in those ports; leverage Sea Grant, etc. to assist	• This O/E action can be applied to other threats as well (e.g., marine debris, vessel strikes) • Learn from ECHO Program in Vancouver and how they feedback results • Chamber Shipping of America	
R	• Adding to the stranding response plan--collecting ear bones and other parts of the whale to get a better understanding of their hearing sensitivities • Are they already experiencing hearing loss b/c of the environment they are in?		

R	• Better under RIWH hearing, what they are sensitive to, etc.	• Be mindful of other types of marine construction and geophysical activities that are creating noise; need to be representative of all noise sources (not just O&G and shipping)	
Mgt	• Adopt robust noise reduction and attenuation technologies/measures		
Mgt	• Expand speed/restriction of vessel transit at night--there is a gap out west		
Mgt	• Consider mandatory restrictions		
Mgt	• Consider more voluntary restrictions		
R	• Better understand effects of sound to bio rates (e.g., reproduction, stress levels)	• Could use proxy species as well • Vital rates and health • Hormone sampling to measure stress levels (baseline and with exposures)	
Mgt	• Consider expanding protections from core area to beyond		
Mgt	• Reevaluate protective regulatory measures in place--they need to be equally hard for established operations as they are for new operations; this has to be equal for all players especially as the environment begins to change from effects from climate change ○ First--identify the regulatory mechanisms that are in place, then development appropriate management measures	• We have some industries that are easier to regulate and others that are more difficult (and seemingly get away with more); look at equitability across industries to address threats and apply to all industries and not just the industries that have the greatest negative effect • O&G--we have ways to regulate them but it's more challenging to regulate shipping industry	

Vessel Collisions | Recovery Actions: Original Notes

Category (R / Mgt / Mon / OE)	RECOVERY ACTION IDEA	COMMENTS Expand on the idea. How might this idea work?	Potential Partners? Costs info? Recurrence?
R	• Characterize vessel traffic in RIWH habitat	• Need commercial, fishing, and recreational	
R	• Characterize night vs/ daytime traffic and diving behavior		
R/Mgmt	• Evaluate the effect of noise from various vessel types, oil & gas platform safety, and offshore wind farms and hydrokinetic generators if nighttime operations are restricted	• All vessel types, all industries including international traffic • Need metrics	
Mgmt	• Science-informed social process with vessel industry (a la NZ)	• The outcomes could be very different than in NZ, as the stakeholders might prefer different strategies, but could still lead to a solution.	
R	• Characterize animal behavior around aquaculture facilities - do they attract RIWH?		
Mgmt	• Mandatory 10 knot speed limits in core and proposed RIWH habitat for <u>all</u> vessel types ○ Consider having different restrictions dependent on vessel size (e.g., slower speeds for cruise ships) ○ Prioritize most critical vessel types, e.g., large ships ○ Consistent with petition already submitted to NMFS ○ Per Eric P: Slowing vessel will decrease lethality but it may also provide opportunity for avoidance (mostly from whale perspective) ○	• Add projected/predicted habitat; Need to consider temporal/seasonal aspect; • Add here or as separate bullets ○ Vessels should not transit core and projected/predicted habitat at night [Comment 1: This may not be possible due to the level of economically vital traffic. Consider use of IR or PAM monitoring?] [Comment 2: Research need - Is IR effective at detecting whales in warm Gulf waters? Is there an effective method of collecting good quality real-time low-frequency PAM data from a moving ship given flow noise and vessel noise challenges at low frequencies? Or is this envisioned as real-time moored buoys like for NARWs? Longer detection distances of RIWHs may mean PAM methods that incorporate localization capability are needed.] ○ Use visual observers on vessels when transiting during the day ○ Maintain a 500m separation distance from Rice's whales	

		○ Encourage or require all vessels to use AIS, regardless of size ○ Violations of rules must be reported to NOAA ● Also consider use of ATBAs, which has been used for avoidance of NARW habitat around Stellwagen Bank and Roseway Basin. (This measure may take significant time to implement as it is likely to require IMO approval.) ● Consider size/mass of vessel rather than vessel type (e.g., cargo vs. passenger) ● Consider importance of similar speed restrictions for competitors, need to treat everyone the same, may be more important than not being regulated at all. Perceived unfairness may create more pushback. ● Need clarity to enable planning ● Blue whales blue skies program, incentive program - learn from similar programs that work. MOU with Chamber of shipping (Canada) to try to achieve a certain level of compliance. ● Voluntary program in Cabot strait - big jump in participation and success recently (Canada) ● As noted in presentation, voluntary measures generally have not performed well where they have been tried off U.S. (east coast and Southern California). Important to consider elements conditioning success in the limited cases where higher voluntary compliance has occurred in North America (e.g., Canadian Salish Sea): e.g., slowdown going through piloted areas (with active engagement of pilots), financial compensation given to shipowners. Voluntary measures can also take years to socialize and organize among vessel operators/owners, ● Underwater detection using underwater drones (Transport Canada); suspend speed requirements in certain conditions, request alternative measures. Increases sense of partnership between vessel operators and regulators. ● Consider safety/steerage issues with speed restrictions; ship speed is only 14-18 knots and limited window for safe steerage. ● Ensure enforcement of any mandatory requirements. ● Do not defer this speed limit to Section 7 Consultations for any vessels (this is a major challenge with the rule on the east coast) ● The area has to be reasonable for a vessel to actually transit within daylight hours only at a specified speed ● Consider establishing lanes ● As Panmex vessels begin using the gulf regularly, will they be able to meet speed restrictions because they are so big? If not, keep them out of core habitat completely?	

		• The myriad support vessels, while smaller, move very fast and could pose significant risk ○ [Post-workshop comment(s)]: Will similar support vessels be required for new industries like renewable energy and aquaculture? If so, keep these in mind during planning as well.	
OE	• Engage and work collaboratively with user groups to identify solutions to mitigate vessel strikes.	• Go to companies that are sources of impact and ask if they want to be part of the solution; ask what they can do, what are the most viable solutions. (Observers on commercial vessels) • Engage industry with menu of proposed options (let them choose what works best for them but make it mandatory) • May be more successful with well-organized industry	https://www.frontiersin.org/articles/10.3389/fmars.2019.00501/full

Mgmt	• Avoid transit through slow zone at night
	• Maintain 500 m distance
	• Vessel lookouts
	• Report non-compliance to NOAA
		• Based on NARW data, in majority of cases, vessel operators did not sight whale prior to strike event, even with trained observers on board. Be cautious about relying on observers. For any Whale detection systems, need to consider is there sufficient time for vessel to take meaningful action to avoid whale, change trajectory of vessel, etc.
		  ○ [post-workshop comment(s)]: these whales can be cryptic on surfacing making it hard to see them in good conditions at times, and can be difficult to see in poorer conditions
		• Relevant publication: https://www.frontiersin.org/articles/10.3389/fmars.2019.00592/full
		• Consider difference between right whales and RIWH; spend a lot of time resting at or beneath surface at night. Real ship strike risk is at night, should focus management measures/restrictions on nighttime, not the same as right whales. Twilight to dawn.
		  ○ [Post-workshop comment(s)]: Ship strike risk is not negligible during day. Tagged whale spent more than 50% of its time in the upper 15m during daytime (Soldevilla et al 2017).
		• Tags were attached for a long time, so the data set is better than it may appear from limited number of whales.
		• But consider they may still spend significant portion of time at surface during the day, so don't want to lose that component (daytime risk)
		• Just noting that Calambokidis paper that looked at blue, fin, humpbacks and diurnal differences in strike risk may be useful in some insights for some species that may be more behaviorally similar than right whales, as noted Keen et al 2019 https://www.frontiersin.org/articles/10.3389/fmars.2019.00730/full	

R	• Increase understanding of unobserved vessel strike mortalities; good monitoring and observation of the population	• This work could build on research conducted on NARWs where unobserved or undetected mortality is quantified, and efforts are underway to apportion this to source. But at the most basic level, photoID monitoring of the population, every year, will almost certainly be necessary.	
	• Ensure vessel strike mitigation measures are equal across the board (i.e. avoid competitive advantages/disadvantages) and predictable to facilitate voyage planning.		
	• Consider a program similar to Canada's Enhancing Cetacean Habitat and Observation (ECHO) program with Chamber of Shipping (Canada)	• This program has been successful, but other voluntary programs have not. Considerations include financial compensation, piloted areas, many years spent socializing measures before adoption, can be a liability when considering highly endangered status of RIWH.	
	• Enforce any regulatory programs to ensure compliance	• Programs will be tough to implement if industry don't see programs being enforced evenly	
Research	• Optimize speed zones in space and time to consider different constraints	• except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question	
	• Develop app that synthesizes information and makes it available to vessel operators	• Would require major outreach • Maybe harness existing apps, like WhaleAlert	
R	• Better understand seasonal spatial distribution of RIWH to better understand rare events and risk (tagging or passive acoustics)	• Account for uncertainty of historical unidentified baleen whale sightings outside the core area, or historical distributions • Partner with oil and gas vessels to use as vessels of opportunity to potentially collect data (place researchers or train observers) • More use of Acousonde tags during whale monitoring for habitat usage, soundscape capture and variation between the sexes or animal ages (size) dive pattern differences. • https://www.boem.gov/gommapps	
Mgmt	• Consider/Investigate ATBAs in areas used by RIWH	• Look at avoidance, areas to be avoided approach (e.g., Stellwagen, Roseway basin); research to determine how these would work, implementation logistics (IMO).	
Mgmt	• Consider mgmt measures by time of day -civil twilight to dawn the animals are resting at or near the water's surface (night).	• Although, the whales do spend time at the surface during day.	
R	• Better understanding of avoidance behavior	• Slower vessels lead to more encounters; faster speeds may mean	

		fewer encounters ● What triggers avoidance behavior?	
EO	● Hold RIWH festival in Gulf annually as source of outreach		
	● Consider potential synergies between mitigating vessel speed and vessel noise	● Slowing vessel speed may have net benefit on acoustic impacts, though may increase transit time/exposure slightly. ● Depends on source of noise output (type of machinery, etc). ● Some vessels also optimized for most efficient operation at certain speeds (how propeller operates, shape of bow, etc)	
	● Identify acoustic or other monitoring systems that would increase knowledge about RIWH that we/NMFS could ask to be included in projects during Section 7 Consultations		

Other Ideas / Parking Lot:

- Do slower speeds mean less noise?

Appendix D – Recovery Actions Survey Results

Suggested Recovery Actions

Appendix C captures the original notes from the breakout group discussions. Refer to this appendix for additional context and details that fed into the list of potential threats-based recovery actions listed below.

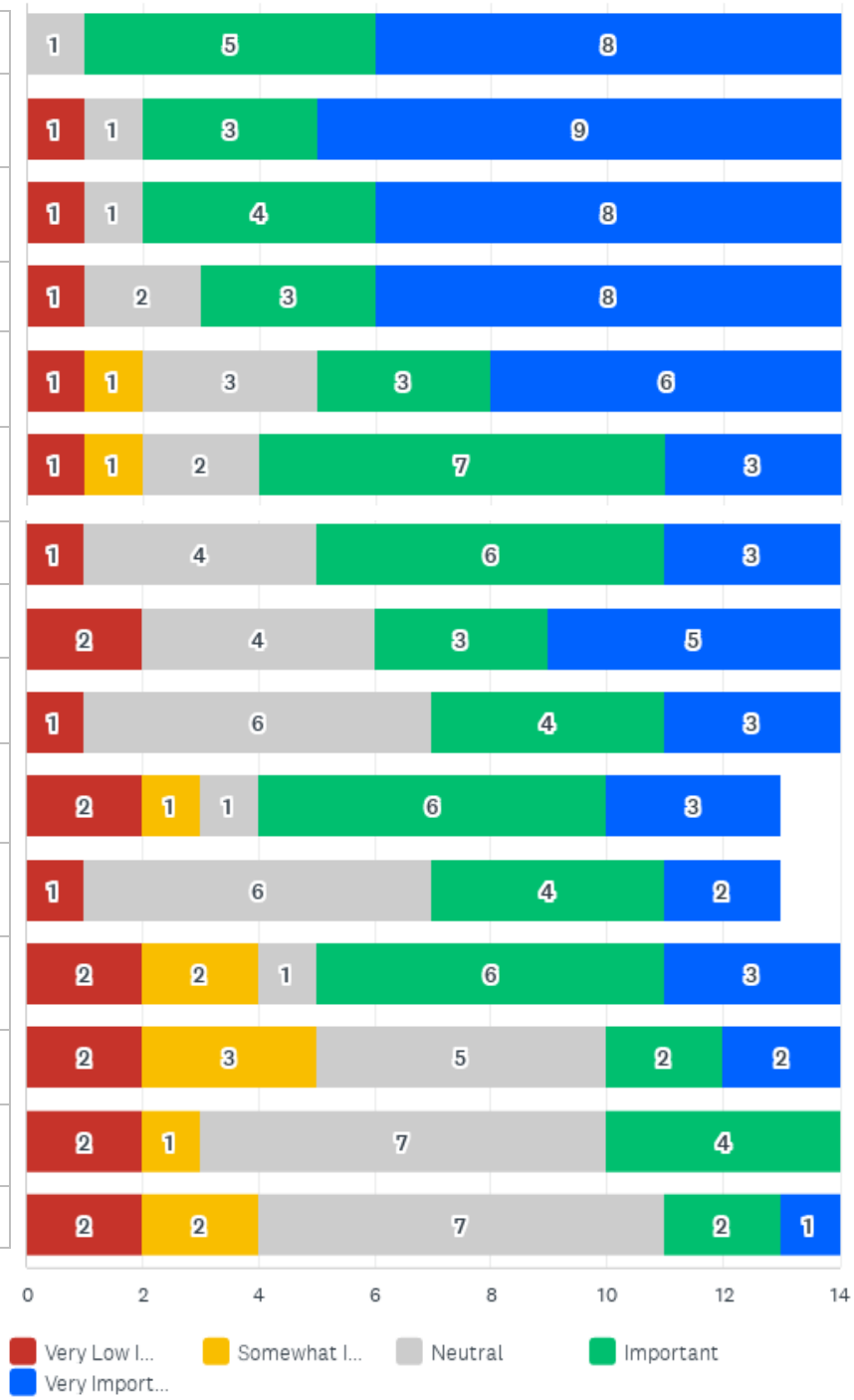
The following list of suggested recovery actions are based on the breakout group discussions and used for the post-working informal polling. The suggested recovery actions are listed in descending order of participants' expressed preference based on the informal polling results; however, they do not represent decisions or group recommendations on which recovery actions to include or prioritize in the recovery planning efforts. Additionally, not all participants responded to these online polls; therefore, the poll results do not necessarily convey trends for all participants' opinions involved in the workshop (the number of respondents is indicated in parentheses where appropriate).

Again, the suggested recovery actions are intended only to present the range of ideas from discussions and give the Agency a sense of which actions appear to resonate among those participants who submitted responses. They do not necessarily represent the opinions of the Agency.

The following are direct links to the threats-based recovery actions:

Prey and/or Climate Change Recovery Actions- Research

Habitat: Research presence of Rice's whales in the southern Gulf of Mexico.			1	5	8
Bioenergetics: Conduct additional RIWH tag data across seasons and years to track data through time including body conditions, reproductive rate, body index measurements (and whether current body condition is optimal), and photo-ID.	1	1	3	9	
Foraging dynamics/energetics: Deploy additional tags paired with visual or other health assessment research to improve understanding of foraging dynamics and energetics.	1	1	4	8	
Forecasting: Research how prey and whale distribution may shift with climate change. Monitor over time.	1	2	3	8	
Habitat: Research other potential RIWH habitat areas that may become more important as prey shifts, etc.	1	1	3	3	6
Prey dynamics: Review available acoustic data to examine prey patch dynamics elsewhere in the Gulf. That is, research what specifically is causing direct mortality to prey species. Better understand patch dynamics to understand how whales can adapt over time.	1	1	2	7	3
Prey biomass: Research both quality and quantity of prey to see if either have changed over time for bioenergetics modeling.	1	4	6	3	
Prey abundance: Investigate how effects from climate change and changes in stratification/mixing will affect diel migration of prey.	2	4	3	5	
Synergistic effects: Determine whether prey dynamics and effects from climate change (ocean warming, ocean productivity, etc.) are synergistically linked or are more independent threats.	1	6	4	3	
Aquaculture: Research potential effects to prey from aquaculture facility(ies) emplacement within the core distribution area. Once a facility is in place, include extensive monitoring of effects, both of facility discharges and potential for downstream effects to prey.	2	1	1	6	3
Prey type: Conduct prey and stable isotope sampling in other locations and seasons to further identify prey types.	1	6	4	2	
Habitat: Test our assumptions of the >400 m depth range to better understand the depth contour of prey.	2	2	1	6	3
Habitat: Investigate the effects of coastal sediment diversion projects on prey species.	2	3	5	2	2
Prey predators: Better understand what other predators might be targeting the main prey for Rice's whale as this may help us better understand future effects from climate change.	2	1	7	4	
Prey life history: Investigate life cycle of prey species.	2	2	7	2	1

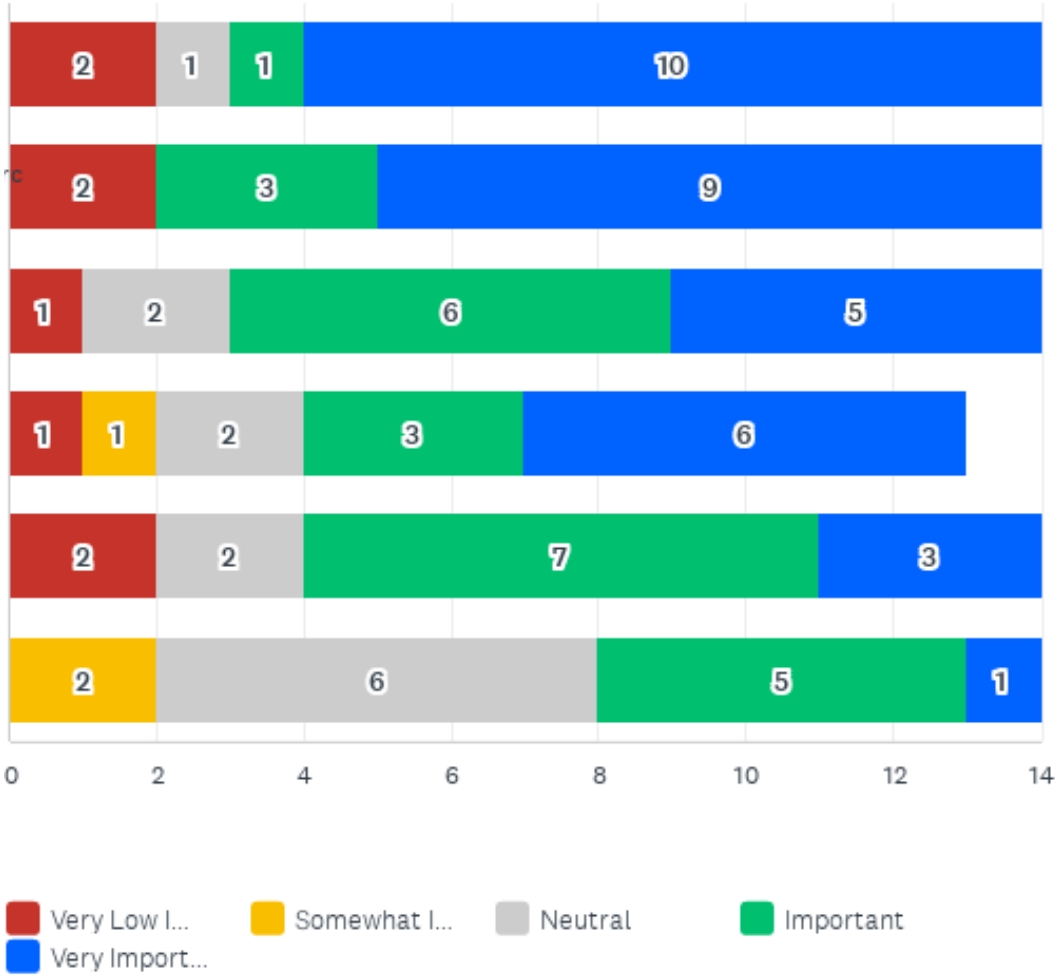


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Habitat: Research presence of Rice's whales in the southern Gulf of Mexico.	0.00% 0	0.00% 0	7.14% 1	35.71% 5	57.14% 8	14	4.50
Bioenergetics: Conduct additional RIWH tag data across seasons and years to track data through time including body conditions, reproductive rate, body index measurements (and whether current body condition is optimal), and photo-ID.	7.14% 1	0.00% 0	7.14% 1	21.43% 3	64.29% 9	14	4.36
Foraging dynamics/energetics: Deploy additional tags paired with visual or other health assessment research to improve understanding of foraging dynamics and energetics.	7.14% 1	0.00% 0	7.14% 1	28.57% 4	57.14% 8	14	4.29
Forecasting: Research how prey and whale distribution may shift with climate change. Monitor over time.	7.14% 1	0.00% 0	14.29% 2	21.43% 3	57.14% 8	14	4.21
Habitat: Research other potential RIWH habitat areas that may become more important as prey shifts, etc.	7.14% 1	7.14% 1	21.43% 3	21.43% 3	42.86% 6	14	3.86
Prey dynamics: Review available acoustic data to examine prey patch dynamics elsewhere in the Gulf. That is, research what specifically is causing direct mortality to prey species. Better understand patch dynamics to understand how whales can adapt over time.	7.14% 1	7.14% 1	14.29% 2	50.00% 7	21.43% 3	14	3.71
Prey biomass: Research both quality and quantity of prey to see if either have changed over time for bioenergetics modeling.	7.14% 1	0.00% 0	28.57% 4	42.86% 6	21.43% 3	14	3.71
Prey abundance: Investigate how effects from climate change and changes in stratification/mixing will affect diel migration of prey.	14.29% 2	0.00% 0	28.57% 4	21.43% 3	35.71% 5	14	3.64
Synergistic effects: Determine whether prey dynamics and effects from	7.14% 1	0.00% 0	42.86% 6	28.57% 4	21.43% 3	14	3.57

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Habitat: Research presence of Rice's whales in the southern Gulf of Mexico.	3.00	5.00	5.00	4.50	0.63
Bioenergetics: Conduct additional RIWH tag data across seasons and years to track data through time including body conditions, reproductive rate, body index measurements (and whether current body condition is optimal), and photo-ID.	1.00	5.00	5.00	4.36	1.11
Foraging dynamics/energetics: Deploy additional tags paired with visual or other health assessment research to improve understanding of foraging dynamics and energetics.	1.00	5.00	5.00	4.29	1.10
Forecasting: Research how prey and whale distribution may shift with climate change. Monitor over time.	1.00	5.00	5.00	4.21	1.15
Habitat: Research other potential RIWH habitat areas that may become more important as prey shifts, etc.	1.00	5.00	4.00	3.86	1.25
Prey dynamics: Review available acoustic data to examine prey patch dynamics elsewhere in the Gulf. That is, research what specifically is causing direct mortality to prey species. Better understand patch dynamics to understand how whales can adapt over time.	1.00	5.00	4.00	3.71	1.10
Prey biomass: Research both quality and quantity of prey to see if either have changed over time for bioenergetics modeling.	1.00	5.00	4.00	3.71	1.03
Prey abundance: Investigate how effects from climate change and changes in stratification/mixing will affect diel migration of prey.	1.00	5.00	4.00	3.64	1.34
Synergistic effects: Determine whether prey dynamics and effects from climate change (ocean warming, ocean productivity, etc.) are synergistically linked or are more independent threats.	1.00	5.00	3.50	3.57	1.05
Aquaculture: Research potential effects to prey from aquaculture facility(ies) emplacement within the core distribution area. Once a facility is in place, include extensive monitoring of effects, both of facility discharges and potential for downstream effects to prey.	1.00	5.00	4.00	3.54	1.34
Prey type: Conduct prey and stable isotope sampling in other locations and seasons to further identify prey types.	1.00	5.00	3.00	3.46	1.01
Habitat: Test our assumptions of the >400 m depth range to better understand the depth contour of prey.	1.00	5.00	4.00	3.43	1.35
Habitat: Investigate the effects of coastal sediment diversion projects on prey species.	1.00	5.00	3.00	2.93	1.22
Prey predators: Better understand what other predators might be targeting the main prey for Rice's whale as this may help us better understand future effects from climate change.	1.00	4.00	3.00	2.93	0.96
Prey life history: Investigate life cycle of prey species.	1.00	5.00	3.00	2.86	1.06

Prey and/or Climate Change Recovery Actions- Management

Habitat conservation: Consider creating a marine protected area(s) for these whales.
Habitat/Commercial Fisheries restrictions : Ban/restrict exploratory/novel pelagic and midwater species fisheries (no deepwater trawls)
Risk assessment framework: Given RIWH preferred habitat, develop a risk assessment framework using key parameters such as aquaculture, wind energy, renewable energy, shipping/vessel traffic, etc.
Reduce burning of fossil fuels (both locally and globally)
Aquaculture: Require aquaculture operations to model/track movement of effluent, fish food/productivity into local area and how that radiates out to a larger area (i.e., size, shape and significance of plume and water quality).
Habitat restoration: Determine if there are any unoccupied or underutilized areas that could be improved/restored to help with nutrient and prey limitation.

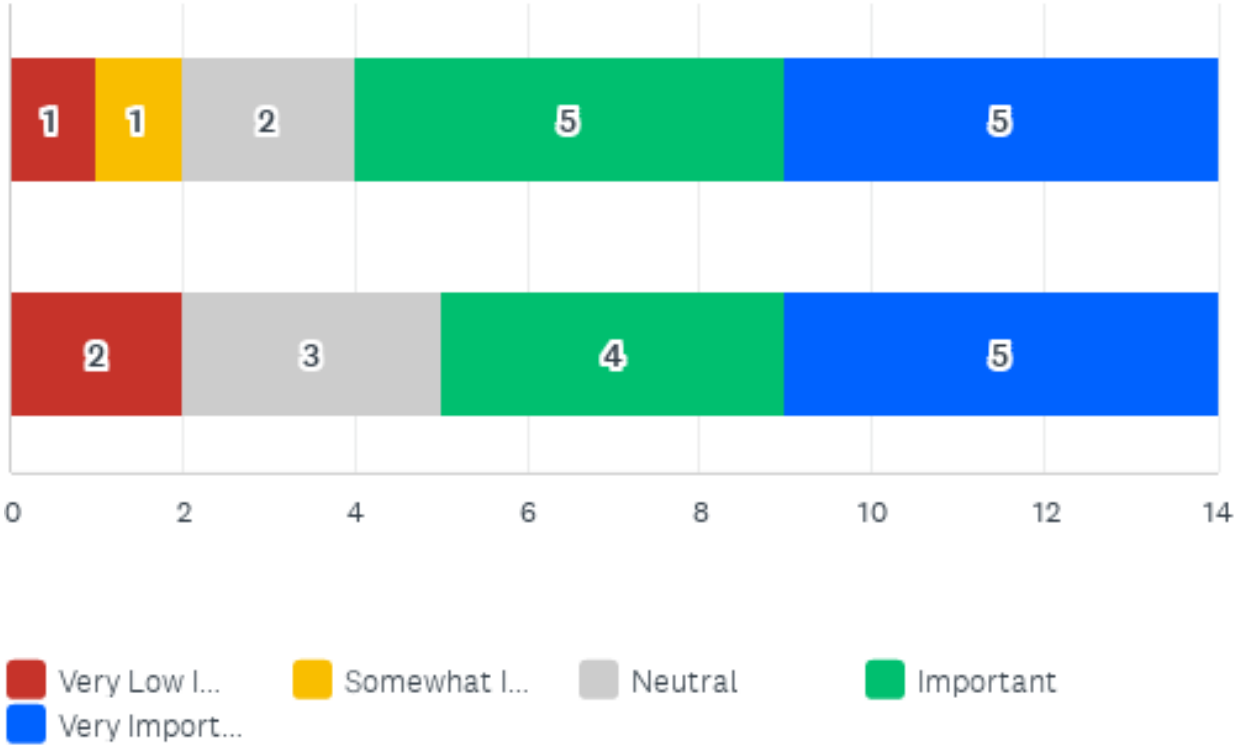


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Habitat conservation: Consider creating a marine protected area(s) for these whales.	14.29% 2	0.00% 0	7.14% 1	7.14% 1	71.43% 10	14	4.21
Habitat/Commercial Fisheries restrictions : Ban/restrict exploratory/novel pelagic and midwater species fisheries (no deepwater trawls)	14.29% 2	0.00% 0	0.00% 0	21.43% 3	64.29% 9	14	4.21
Risk assessment framework: Given RIWH preferred habitat, develop a risk assessment framework using key parameters such as aquaculture, wind energy, renewable energy, shipping/vessel traffic, etc.	7.14% 1	0.00% 0	14.29% 2	42.86% 6	35.71% 5	14	4.00
Reduce burning of fossil fuels (both locally and globally)	7.69% 1	7.69% 1	15.38% 2	23.08% 3	46.15% 6	13	3.92
Aquaculture: Require aquaculture operations to model/track movement of effluent, fish food/productivity into local area and how that radiates out to a larger area (i.e., size, shape and significance of plume and water quality).	14.29% 2	0.00% 0	14.29% 2	50.00% 7	21.43% 3	14	3.64
Habitat restoration: Determine if there are any unoccupied or underutilized areas that could be improved/restored to help with nutrient and prey limitation.	0.00% 0	14.29% 2	42.86% 6	35.71% 5	7.14% 1	14	3.36

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Habitat conservation: Consider creating a marine protected area(s) for these whales.	1.00	5.00	5.00	4.21	1.42
Habitat/Commercial Fisheries restrictions : Ban/restrict exploratory/novel pelagic and midwater species fisheries (no deepwater trawls)	1.00	5.00	5.00	4.21	1.37
Risk assessment framework: Given RIWH preferred habitat, develop a risk assessment framework using key parameters such as aquaculture, wind energy, renewable energy, shipping/vessel traffic, etc.	1.00	5.00	4.00	4.00	1.07
Reduce burning of fossil fuels (both locally and globally)	1.00	5.00	4.00	3.92	1.27
Aquaculture: Require aquaculture operations to model/track movement of effluent, fish food/productivity into local area and how that radiates out to a larger area (i.e., size, shape and significance of plume and water quality).	1.00	5.00	4.00	3.64	1.23
Habitat restoration: Determine if there are any unoccupied or underutilized areas that could be improved/restored to help with nutrient and prey limitation.	2.00	5.00	3.00	3.36	0.81

Prey and/or Climate Change Recovery Actions- Monitoring

RIWH long-term spatial monitoring: Research the potential for whales and prey to encounter even more/different threats as they spatially relocate due to effects from climate change. Better understand how this will affect the threat landscape in the future.
Prey long-term monitoring: Develop and implement a long-term standardized monitoring effort to track prey abundance, distribution, and quality in the GOMx.



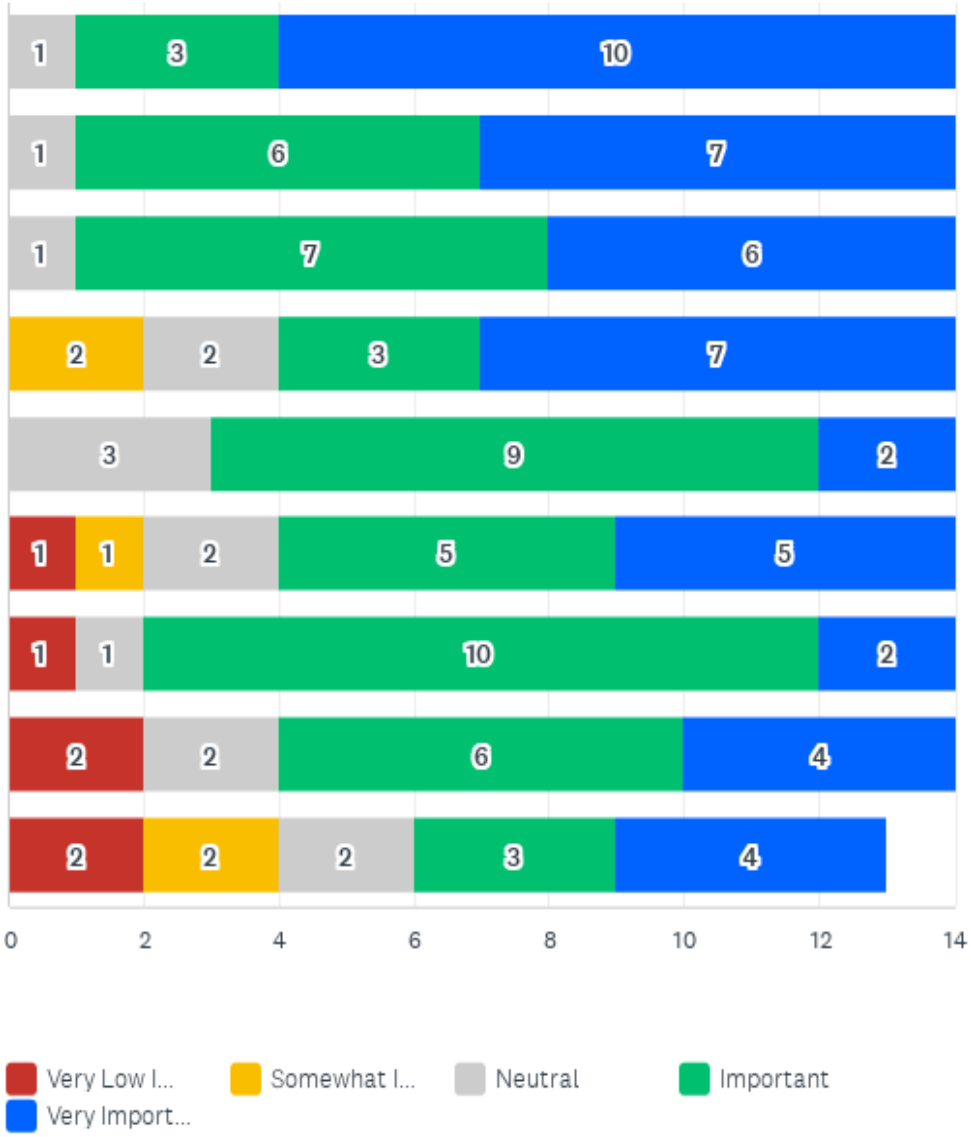
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
RIWH long-term spatial monitoring: Research the potential for whales and prey to encounter even more/different threats as they spatially relocate due to effects from climate change. Better understand how this will affect the threat landscape in the future.	7.14% 1	7.14% 1	14.29% 2	35.71% 5	35.71% 5	14	3.86
Prey long-term monitoring: Develop and implement a long-term standardized monitoring effort to track prey abundance, distribution, and quality in the GOMx.	14.29% 2	0.00% 0	21.43% 3	28.57% 4	35.71% 5	14	3.71

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
RIWH long-term spatial monitoring: Research the potential for whales and prey to encounter even more/different threats as they spatially relocate due to effects from climate change. Better understand how this will affect the threat landscape in the future.	1.00	5.00	4.00	3.86	1.19
Prey long-term monitoring: Develop and implement a long-term standardized monitoring effort to track prey abundance, distribution, and quality in the GOMx.	1.00	5.00	4.00	3.71	1.33

Entanglement Recovery Actions – Research

Entanglement: Identify all sources of potential entanglement.
Commercial fisheries: Identify areas of commercial fisheries within Rice's whale predicted habitat.
Commercial fisheries: Identify areas of highest risk entanglement risk to Rice's whales.
Commercial fishing: Investigate scarring rates and severity.
Recreational fishing: Better understand potential impacts to Rice's whales from deep drop fishing.
Commercial fisheries: Determine potential triggers (e.g. real-time acoustic monitoring or surveys) for fishery closures under a dynamic management scenario to target measures in a meaningful way.
Aquaculture & wind farms: Investigate and better understand risk of hurricanes on aquaculture facilities and floating wind turbines (anchoring cables and other unknowns from gear/operation; ghost gear/marine debris).
Aquaculture: Better understand risks of aquaculture facilities to Rice's whales.
Commercial fisheries: Determine viability of using modeling for dynamic management.

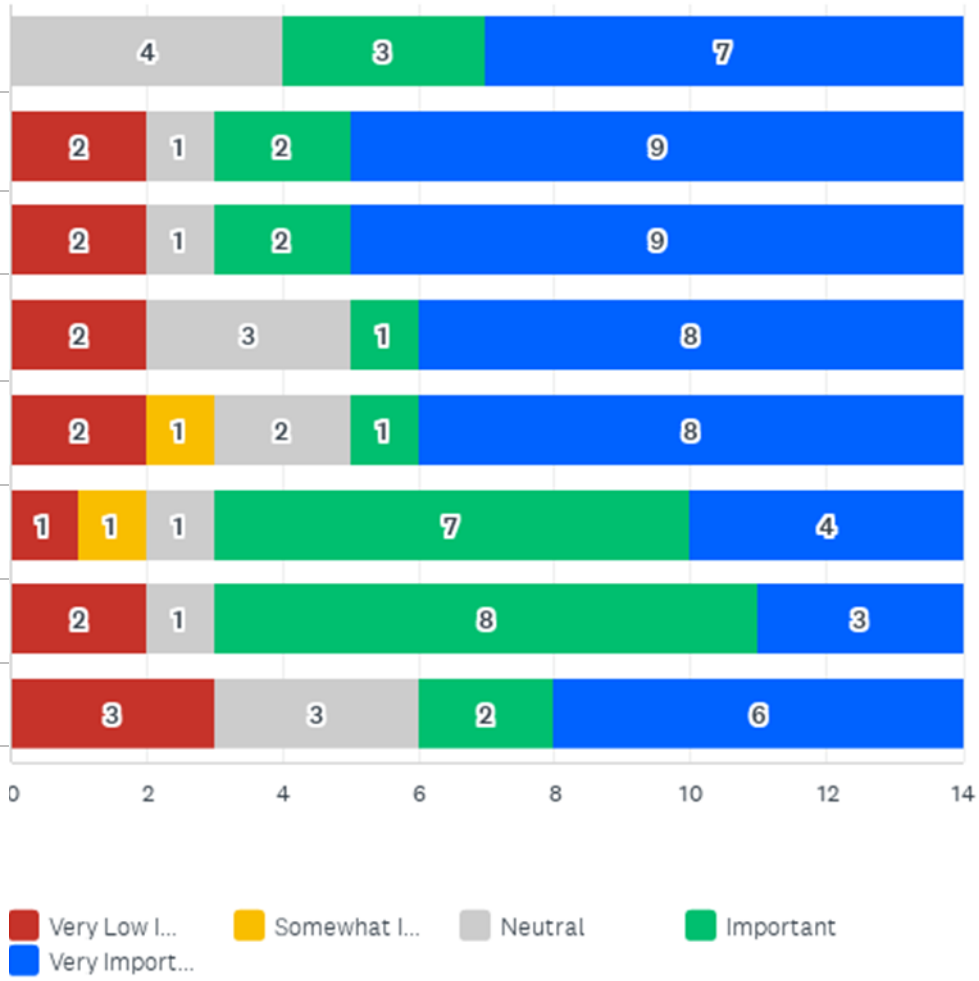


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Entanglement: Identify all sources of potential entanglement.	0.00% 0	0.00% 0	7.14% 1	21.43% 3	71.43% 10	14	4.64
Commercial fisheries: Identify areas of commercial fisheries within Rice's whale predicted habitat.	0.00% 0	0.00% 0	7.14% 1	42.86% 6	50.00% 7	14	4.43
Commercial fisheries: Identify areas of highest risk entanglement risk to Rice's whales.	0.00% 0	0.00% 0	7.14% 1	50.00% 7	42.86% 6	14	4.36
Commercial fishing: Investigate scarring rates and severity.	0.00% 0	14.29% 2	14.29% 2	21.43% 3	50.00% 7	14	4.07
Recreational fishing: Better understand potential impacts to Rice's whales from deep drop fishing.	0.00% 0	0.00% 0	21.43% 3	64.29% 9	14.29% 2	14	3.93
Commercial fisheries: Determine potential triggers (e.g. real-time acoustic monitoring or surveys) for fishery closures under a dynamic management scenario to target measures in a meaningful way.	7.14% 1	7.14% 1	14.29% 2	35.71% 5	35.71% 5	14	3.86
Aquaculture & wind farms: Investigate and better understand risk of hurricanes on aquaculture facilities and floating wind turbines (anchoring cables and other unknowns from gear/operation; ghost gear/marine debris).	7.14% 1	0.00% 0	7.14% 1	71.43% 10	14.29% 2	14	3.86
Aquaculture: Better understand risks of aquaculture facilities to Rice's whales.	14.29% 2	0.00% 0	14.29% 2	42.86% 6	28.57% 4	14	3.71
Commercial fisheries: Determine viability of using modeling for dynamic management.	15.38% 2	15.38% 2	15.38% 2	23.08% 3	30.77% 4	13	3.38

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Entanglement: Identify all sources of potential entanglement.	3.00	5.00	5.00	4.64	0.61
Commercial fisheries: Identify areas of commercial fisheries within Rice's whale predicted habitat.	3.00	5.00	4.50	4.43	0.62
Commercial fisheries: Identify areas of highest risk entanglement risk to Rice's whales.	3.00	5.00	4.00	4.36	0.61
Commercial fishing: Investigate scarring rates and severity.	2.00	5.00	4.50	4.07	1.10
Recreational fishing: Better understand potential impacts to Rice's whales from deep drop fishing.	3.00	5.00	4.00	3.93	0.59
Commercial fisheries: Determine potential triggers (e.g. real-time acoustic monitoring or surveys) for fishery closures under a dynamic management scenario to target measures in a meaningful way.	1.00	5.00	4.00	3.86	1.19
Aquaculture & wind farms: Investigate and better understand risk of hurricanes on aquaculture facilities and floating wind turbines (anchoring cables and other unknowns from gear/operation; ghost gear/marine debris).	1.00	5.00	4.00	3.86	0.91
Aquaculture: Better understand risks of aquaculture facilities to Rice's whales.	1.00	5.00	4.00	3.71	1.28
Commercial fisheries: Determine viability of using modeling for dynamic management.	1.00	5.00	4.00	3.38	1.44

Entanglement Recovery Actions – Management

Commercial and recreational fisheries: Require VMS reporting of all Gulf commercial, charter, recreational fisheries.	4, 3, 7
Protected area: Establish a protected area that would prevent new risk from new industries.	2, 1, 2, 9
Protected area: Establish a protected area to coincide with the core distribution area and prohibit commercial fishing and vessels (unless by special permit).	2, 1, 2, 9
Aquaculture: Prohibit aquaculture facilities in Rice's whale core distribution area as well as their predicted habitat.	2, 3, 1, 8
Aquaculture: Prohibit aquaculture facilities in the Rice's whale core distribution area as well as their predicted habitat until risk from gear/operation to Rices whale is better understood.	2, 1, 2, 1, 8
Commercial fisheries: Require reporting of lost gear and remove ghost gear (including parachutes).	1, 1, 1, 7, 4
Aquaculture: Develop mitigation measures/BMPs to address risks from aquaculture facility development and operation, if necessary.	2, 1, 8, 3
Commercial fisheries: Require ropeless fishing gear in Rice's whale core distribution area as well as their predicted habitat.	3, 3, 2, 6

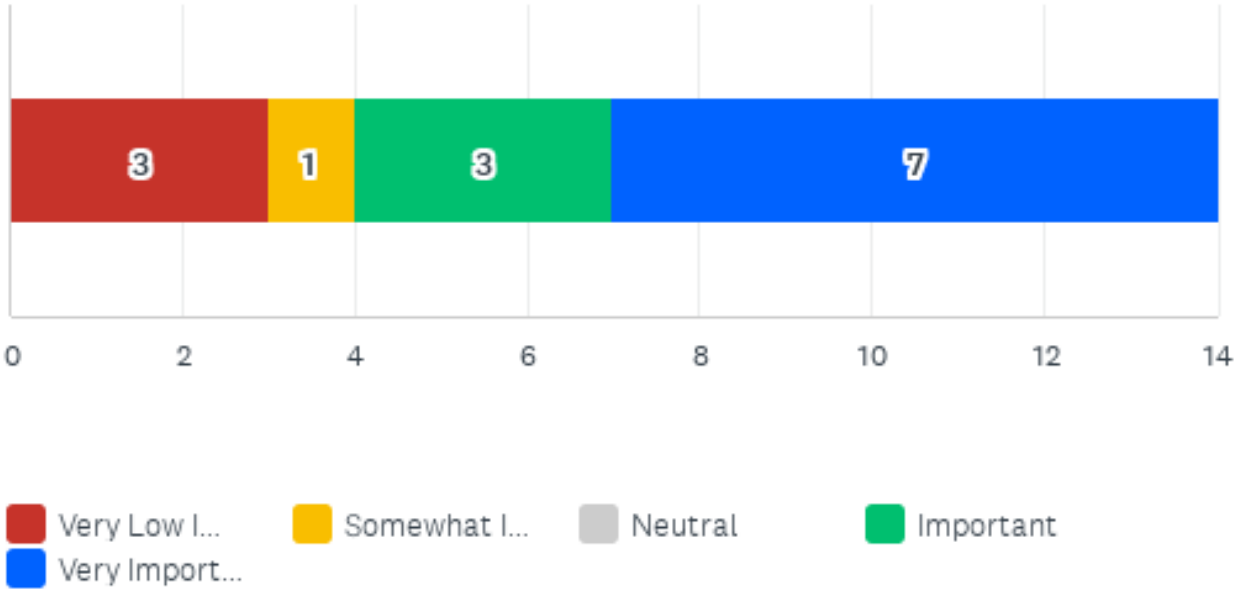


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Commercial and recreational fisheries: Require VMS reporting of all Gulf commercial, charter, recreational fisheries.	0.00% 0	0.00% 0	28.57% 4	21.43% 3	50.00% 7	14	4.21
Protected area: Establish a protected area that would prevent new risk from new industries.	14.29% 2	0.00% 0	7.14% 1	14.29% 2	64.29% 9	14	4.14
Protected area: Establish a protected area to coincide with the core distribution area and prohibit commercial fishing and vessels (unless by special permit).	14.29% 2	0.00% 0	7.14% 1	14.29% 2	64.29% 9	14	4.14
Aquaculture: Prohibit aquaculture facilities in Rice's whale core distribution area as well as their predicted habitat.	14.29% 2	0.00% 0	21.43% 3	7.14% 1	57.14% 8	14	3.93
Aquaculture: Prohibit aquaculture facilities in the Rice's whale core distribution area as well as their predicted habitat until risk from gear/operation to Rices whale is better understood.	14.29% 2	7.14% 1	14.29% 2	7.14% 1	57.14% 8	14	3.86
Commercial fisheries: Require reporting of lost gear and remove ghost gear (including parachutes).	7.14% 1	7.14% 1	7.14% 1	50.00% 7	28.57% 4	14	3.86
Aquaculture: Develop mitigation measures/BMPs to address risks from aquaculture facility development and operation, if necessary.	14.29% 2	0.00% 0	7.14% 1	57.14% 8	21.43% 3	14	3.71
Commercial fisheries: Require ropeless fishing gear in Rice's whale core distribution area as well as their predicted habitat.	21.43% 3	0.00% 0	21.43% 3	14.29% 2	42.86% 6	14	3.57

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Commercial and recreational fisheries: Require VMS reporting of all Gulf commercial, charter, recreational fisheries.	3.00	5.00	4.50	4.21	0.86
Protected area: Establish a protected area that would prevent new risk from new industries.	1.00	5.00	5.00	4.14	1.41
Protected area: Establish a protected area to coincide with the core distribution area and prohibit commercial fishing and vessels (unless by special permit).	1.00	5.00	5.00	4.14	1.41
Aquaculture: Prohibit aquaculture facilities in Rice's whale core distribution area as well as their predicted habitat.	1.00	5.00	5.00	3.93	1.44
Aquaculture: Prohibit aquaculture facilities in the Rice's whale core distribution area as well as their predicted habitat until risk from gear/operation to Rices whale is better understood.	1.00	5.00	5.00	3.86	1.51
Commercial fisheries: Require reporting of lost gear and remove ghost gear (including parachutes).	1.00	5.00	4.00	3.86	1.12
Aquaculture: Develop mitigation measures/BMPs to address risks from aquaculture facility development and operation, if necessary.	1.00	5.00	4.00	3.71	1.22
Commercial fisheries: Require ropeless fishing gear in Rice's whale core distribution area as well as their predicted habitat.	1.00	5.00	4.00	3.57	1.55

Entanglement Recovery Actions – Monitoring

Commercial fisheries: Expansion of observer coverage (including electronic monitoring) for fisheries particularly in Rice's whale habitats.

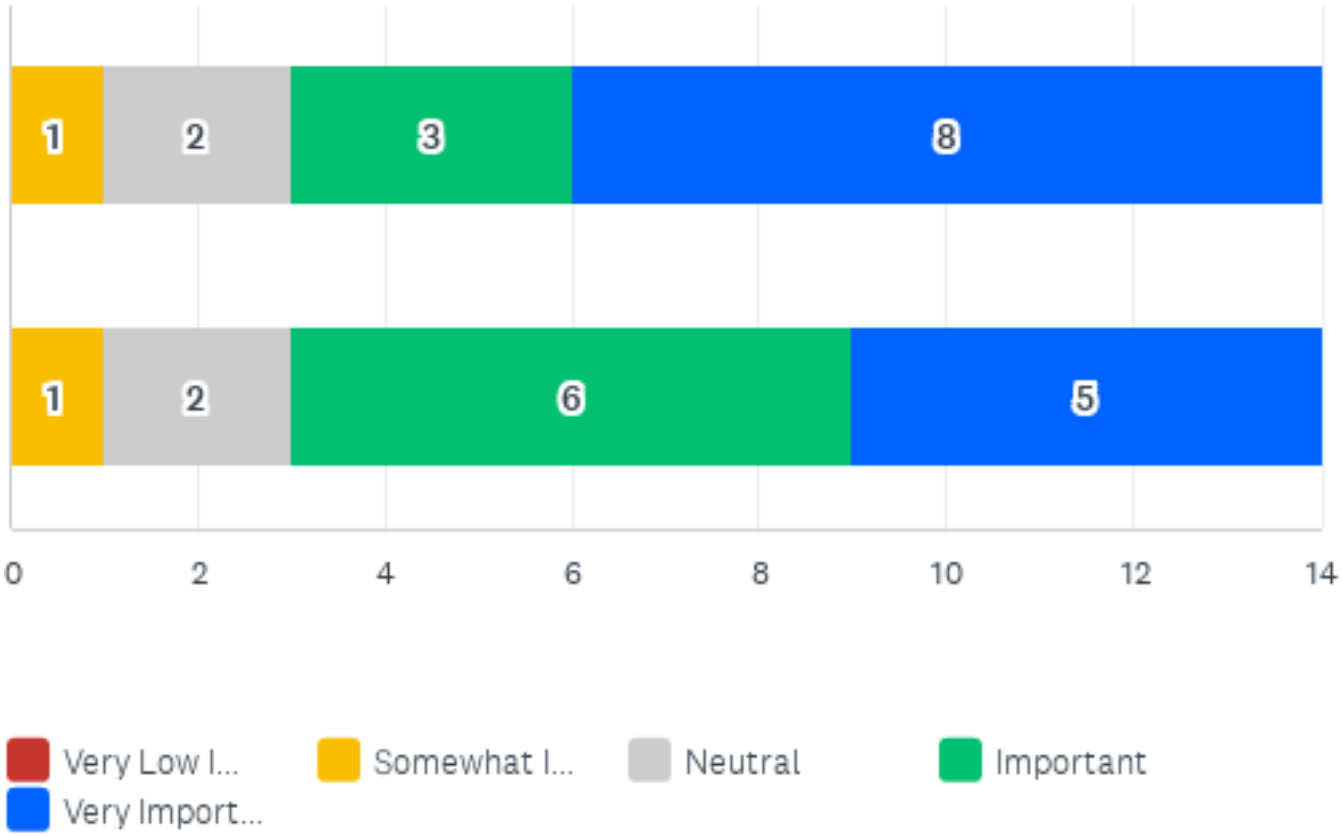


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Commercial fisheries: Expansion of observer coverage (including electronic monitoring) for fisheries particularly in Rice's whale habitats.	21.43% 3	7.14% 1	0.00% 0	21.43% 3	50.00% 7	14	3.71

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	4.50	3.71	1.62

Entanglement Recovery Actions – Outreach & Engagement

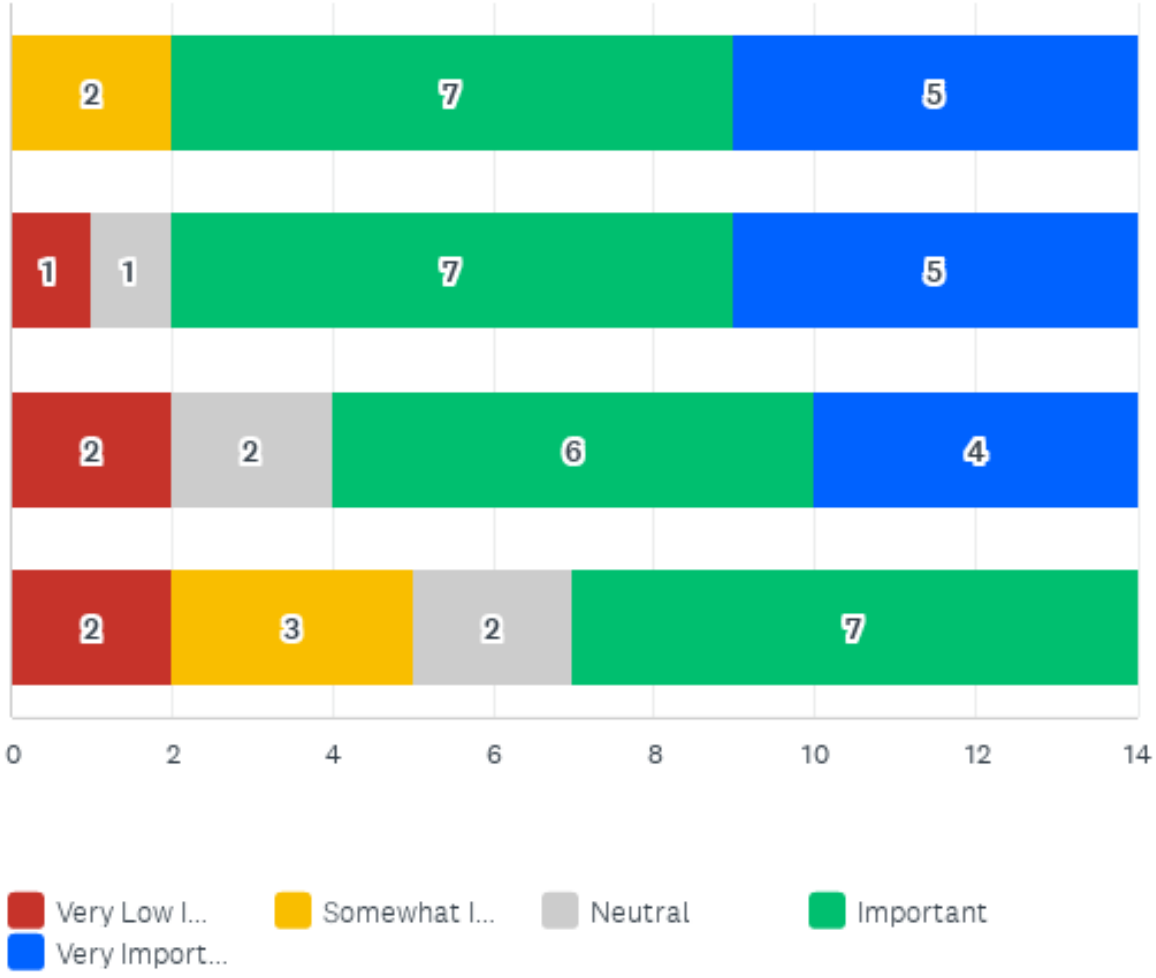
Commercial fisheries and renewable energy development: Develop partnerships with GOMx FMC, GOMx Reef Fish Shareholder Alliance, and Responsible Offshore Development Alliance-like entities (e.g. Gulf of Mexico Alliance, Gulf States Marine Fisheries Commission, Sea Grant, etc.) to develop and encourage best management practices to reduce risk to Rice's whales.	
Recreational fisheries: Develop outreach strategy for recreational boating community with respect to Rice's whales.	



	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Commercial fisheries and renewable energy development: Develop partnerships with GOMx FMC, GOMx Reef Fish Shareholder Alliance, and Responsible Offshore Development Alliance-like entities (e.g. Gulf of Mexico Alliance, Gulf States Marine Fisheries Commission, Sea Grant, etc.) to develop and encourage best management practices to reduce risk to Rice's whales.	0.00% 0	7.14% 1	14.29% 2	21.43% 3	57.14% 8	14	4.29
Recreational fisheries: Develop outreach strategy for recreational boating community with respect to Rice's whales.	0.00% 0	7.14% 1	14.29% 2	42.86% 6	35.71% 5	14	4.07

Renewable Energy Recovery Actions – Research

Renewable energy planning: Characterize Rice's whale use of habitat and provide routinely updated maps to the public regarding potential conflicts with Rice's whales and potential lease sales.
Marine spatial planning: Expand surveys prior to siting/planning, Increase surveys beyond current expected depth ranges and enhance to a finer scale.
Marine spatial planning: Consider climate change in future site planning processes.
Renewable energy impacts: Better understand impacts of electrical energy transfer lines upon RIWH (e.g., navigation and other behaviors), prey, and predators.



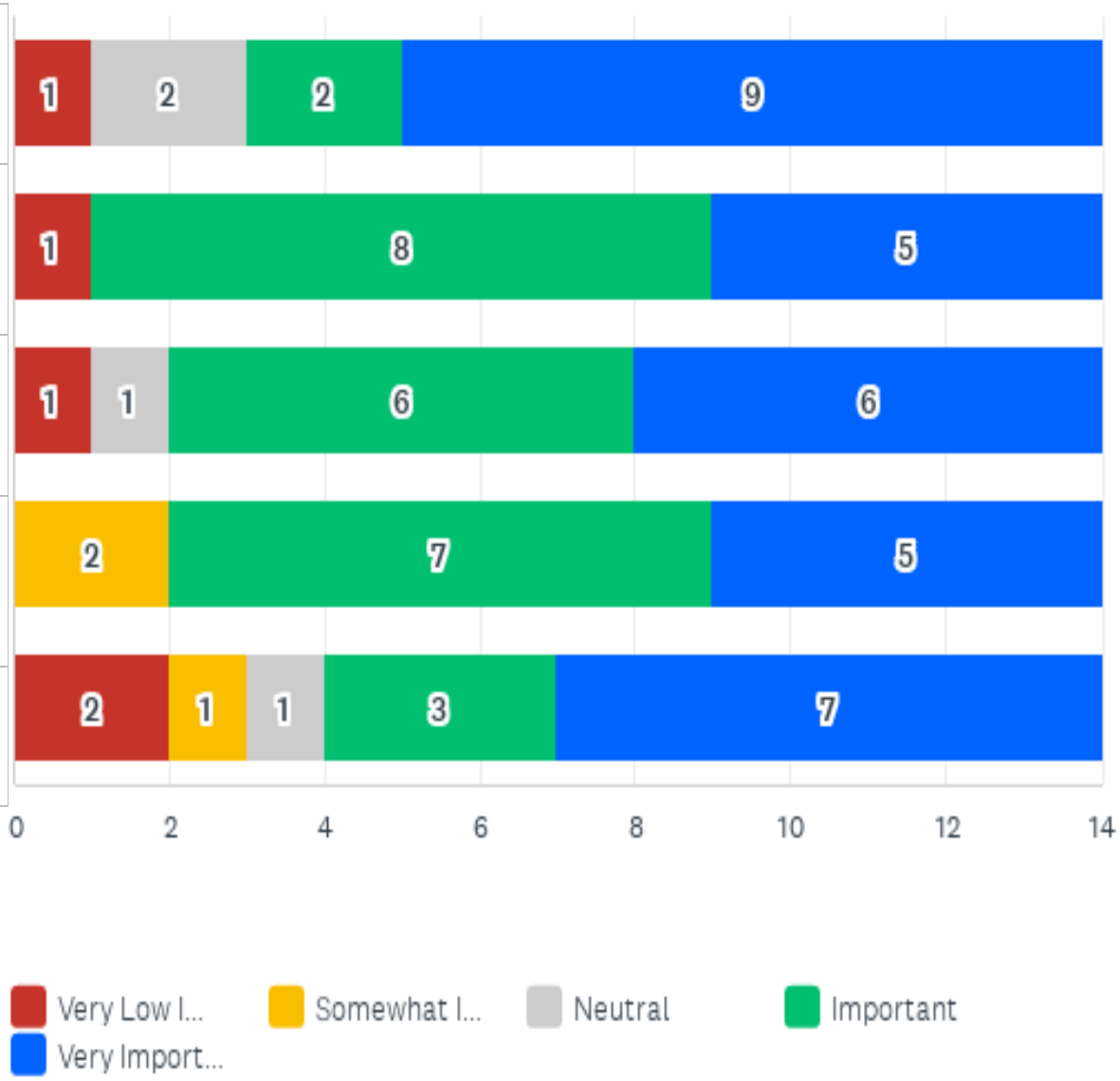
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Renewable energy planning: Characterize Rice's whale use of habitat and provide routinely updated maps to the public regarding potential conflicts with Rice's whales and potential lease sales.	0.00% 0	14.29% 2	0.00% 0	50.00% 7	35.71% 5	14	4.07
Marine spatial planning: Expand surveys prior to siting/planning, Increase surveys beyond current expected depth ranges and enhance to a finer scale.	7.14% 1	0.00% 0	7.14% 1	50.00% 7	35.71% 5	14	4.07
Marine spatial planning: Consider climate change in future site planning processes.	14.29% 2	0.00% 0	14.29% 2	42.86% 6	28.57% 4	14	3.71
Renewable energy impacts: Better understand impacts of electrical energy transfer lines upon RIWH (e.g., navigation and other behaviors), prey, and predators.	14.29% 2	21.43% 3	14.29% 2	50.00% 7	0.00% 0	14	3.00

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Renewable energy planning: Characterize Rice's whale use of habitat and provide routinely updated maps to the public regarding potential conflicts with Rice's whales and potential lease sales.	2.00	5.00	4.00	4.07	0.96
Marine spatial planning: Expand surveys prior to siting/planning, Increase surveys beyond current expected depth ranges and enhance to a finer scale.	1.00	5.00	4.00	4.07	1.03
Marine spatial planning: Consider climate change in future site planning processes.	1.00	5.00	4.00	3.71	1.28
Renewable energy impacts: Better understand impacts of electrical energy transfer lines upon RIWH (e.g., navigation and other behaviors), prey, and predators.	1.00	4.00	3.50	3.00	1.13

Renewable Energy Recovery Actions – Management

Marine spatial planning: Avoid siting of wind farms within predicted habitat (e.g. western Gulf, waters deeper than 100m).	
Renewable energy development and operation: Develop mitigation measures to eliminate/minimize threats (e.g. Mitigate sound from pile driving, night travel restrictions, spatiotemporal windows for construction activities, passive acoustic monitoring for detecting whales as well as monitoring soundscape, etc.).	
Renewable energy development and operation: Better inform Section 7 consultations by developing aids (distribution maps, conservation frameworks, etc.) for biologists that are involved in planning and assessing the effects of projects.	
Marine spatial planning: Develop a robust marine spatial planning tool that includes a species distribution model with environmental drivers that can be used to avoid conflicts in lease/wind development. Ideally, the tool will include a climate change component and empirical data on Rice's whale detections.	
Marine spatial planning: Prohibit renewable energy development in the eastern planning area.	

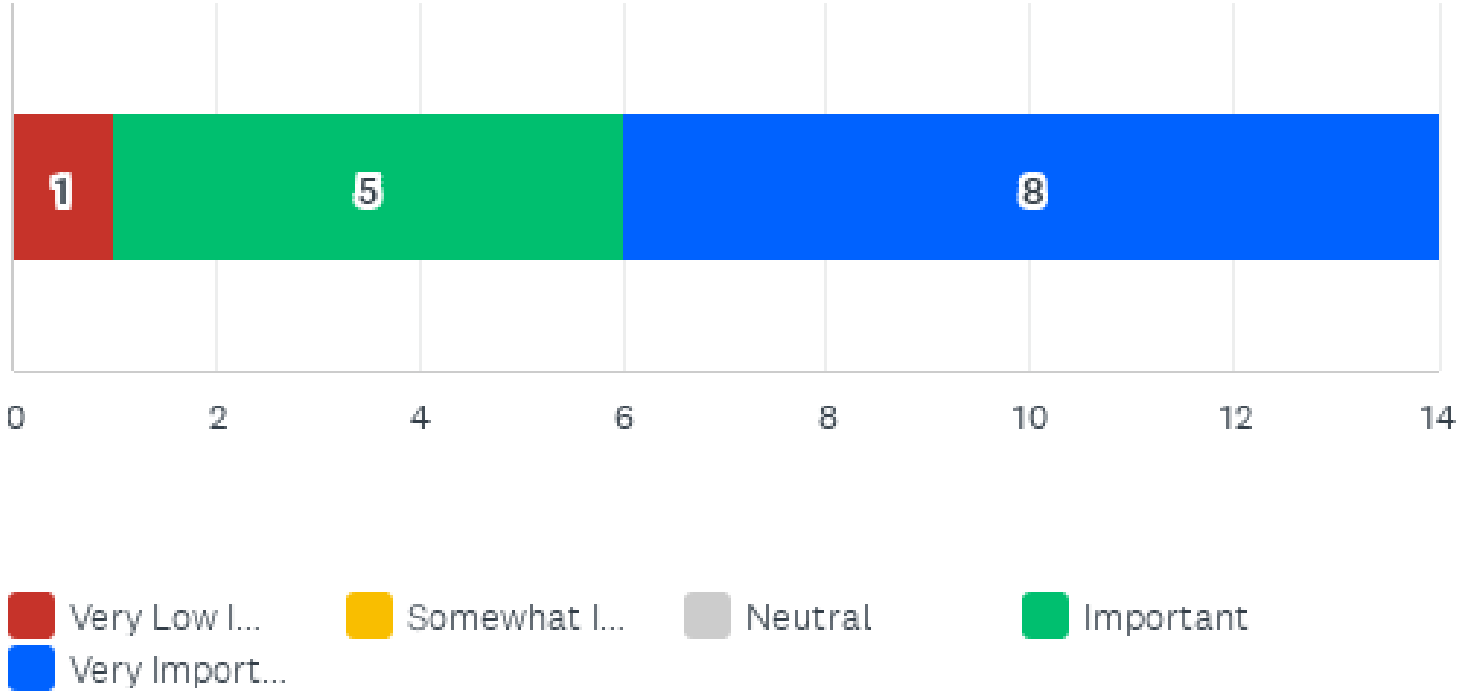


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Marine spatial planning: Avoid siting of wind farms within predicted habitat (e.g. western Gulf, waters deeper than 100m).	7.14% 1	0.00% 0	14.29% 2	14.29% 2	64.29% 9	14	4.29
Renewable energy development and operation: Develop mitigation measures to eliminate/minimize threats (e.g. Mitigate sound from pile driving, night travel restrictions, spatiotemporal windows for construction activities, passive acoustic monitoring for detecting whales as well as monitoring soundscape, etc.).	7.14% 1	0.00% 0	0.00% 0	57.14% 8	35.71% 5	14	4.14
Renewable energy development and operation: Better inform Section 7 consultations by developing aids (distribution maps, conservation frameworks, etc.) for biologists that are involved in planning and assessing the effects of projects.	7.14% 1	0.00% 0	7.14% 1	42.86% 6	42.86% 6	14	4.14
Marine spatial planning: Develop a robust marine spatial planning tool that includes a species distribution model with environmental drivers that can be used to avoid conflicts in lease/wind development. Ideally, the tool will include a climate change component and empirical data on Rice's whale detections.	0.00% 0	14.29% 2	0.00% 0	50.00% 7	35.71% 5	14	4.07
Marine spatial planning: Prohibit renewable energy development in the eastern planning area.	14.29% 2	7.14% 1	7.14% 1	21.43% 3	50.00% 7	14	3.86

BASIC STATISTICS					
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Marine spatial planning: Avoid siting of wind farms within predicted habitat (e.g. western Gulf, waters deeper than 100m).	1.00	5.00	5.00	4.29	1.16
Renewable energy development and operation: Develop mitigation measures to eliminate/minimize threats (e.g. Mitigate sound from pile driving, night travel restrictions, spatiotemporal windows for construction activities, passive acoustic monitoring for detecting whales as well as monitoring soundscape, etc.).	1.00	5.00	4.00	4.14	0.99
Renewable energy development and operation: Better inform Section 7 consultations by developing aids (distribution maps, conservation frameworks, etc.) for biologists that are involved in planning and assessing the effects of projects.	1.00	5.00	4.00	4.14	1.06
Marine spatial planning: Develop a robust marine spatial planning tool that includes a species distribution model with environmental drivers that can be used to avoid conflicts in lease/wind development. Ideally, the tool will include a climate change component and empirical data on Rice's whale detections.	2.00	5.00	4.00	4.07	0.96
Marine spatial planning: Prohibit renewable energy development in the eastern planning area.	1.00	5.00	4.50	3.86	1.46

Renewable Energy Recovery Actions – Monitoring

Renewable energy construction: Develop passive acoustic monitoring guidelines for before, during, and after construction of offshore wind projects.

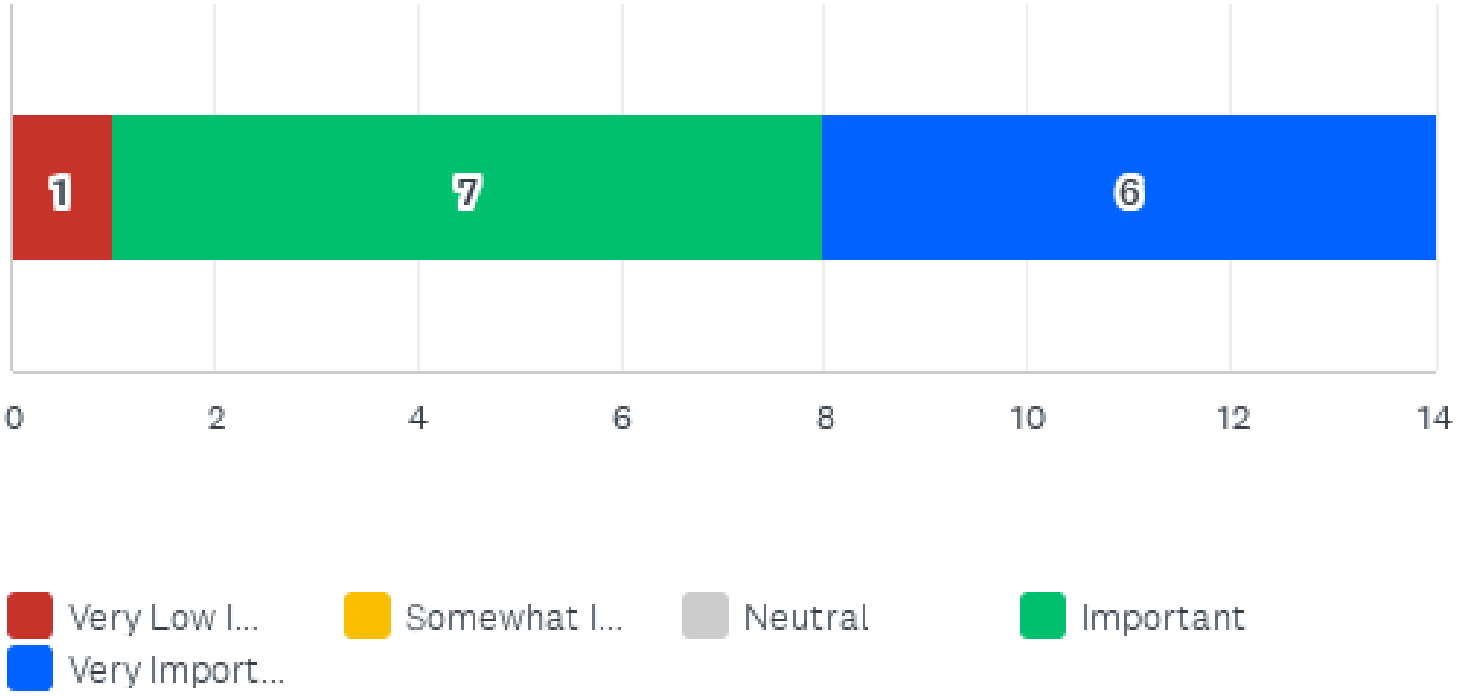


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Renewable energy construction: Develop passive acoustic monitoring guidelines for before, during, and after construction of offshore wind projects.	7.14% 1	0.00% 0	0.00% 0	35.71% 5	57.14% 8	14	4.36

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
1.00	5.00	5.00	4.36	1.04

Renewable Energy Recovery Actions – Outreach & Engagement

Outreach to the renewable energy community and NGOs engaged in renewable energy

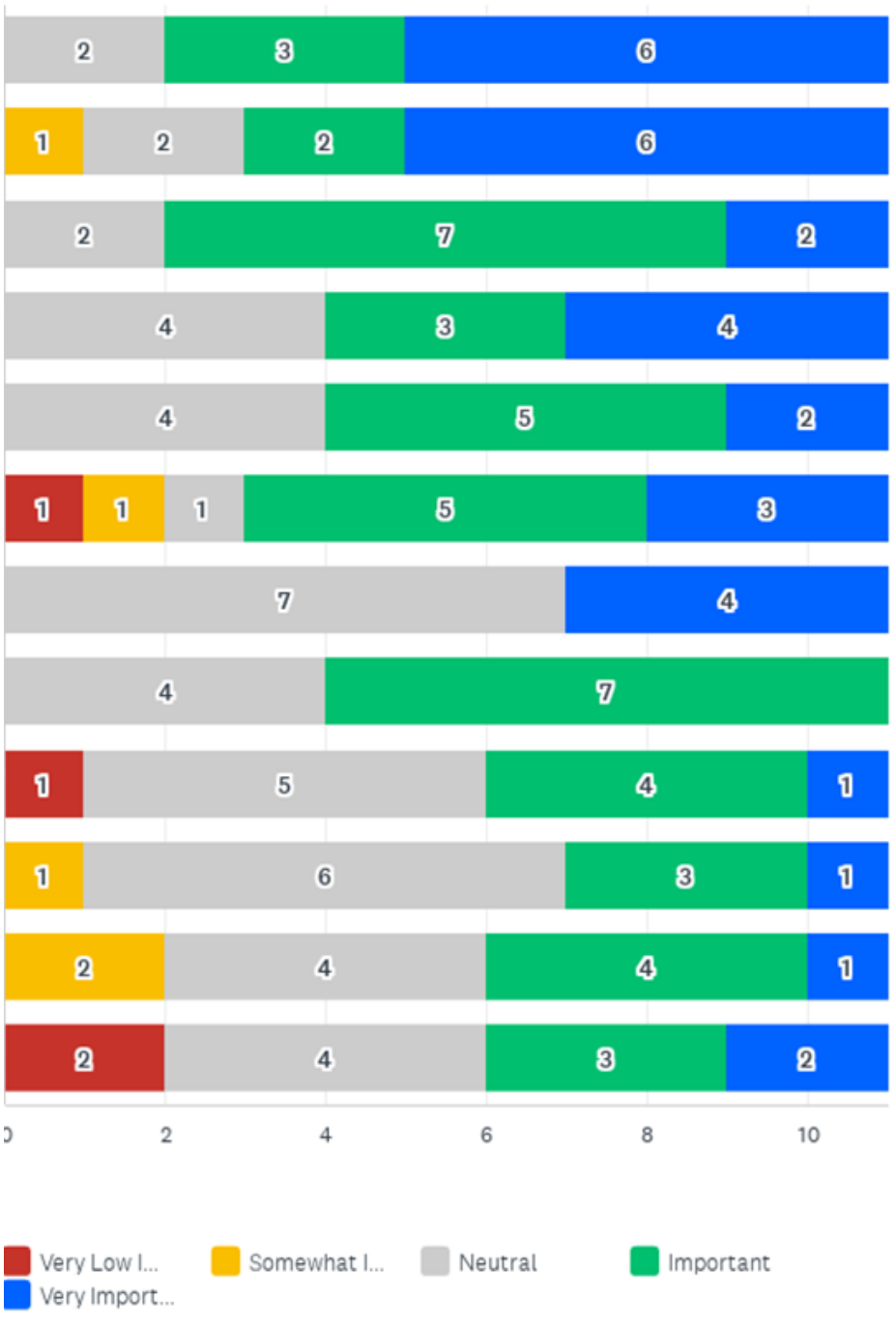


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Outreach to the renewable energy community and NGOs engaged in renewable energy	7.14% 1	0.00% 0	0.00% 0	50.00% 7	42.86% 6	14	4.21

BASIC STATISTICS				
Minimum 1.00	Maximum 5.00	Median 4.00	Mean 4.21	Standard Deviation 1.01

Environmental Pollutants Recovery Actions – Research

Impacts - Identify sources of contaminants and contaminants loads in Rice's whales and their prey species to inform management initiatives.
Impacts - Investigate contaminants load in Rice's whale and their prey.
Habitat/Range - Investigate and identify pollutants/contaminants that are entering the GOMx from MS river or other sources.
Habitat/Impacts - Conduct additional modeling for catastrophic spills to more fully reflect the shift in lease distribution to deeper water. Model should include hydrodynamic flow fields around leases to better understand the risk of oil spill being carried into Rice's whale habitat (Including the extended shelf-edge habitat beyond the core area).
Investigate existing GOMx contaminant models that can be enhanced with Rice's whale information.
Impacts - Learn more about impacts to Rice's whales from stimulation chemicals, produced water and other oil +gas related activities.
Habitat/Range - More dynamic hydrodynamic modeling with more dynamic RIWH modeling - increase state of readiness and flow of information.
Health Impacts - Investigate correlation between health/condition and various types of contaminants and contaminant load (as a precursor to being able to enact stronger regulations).
Habitat/Impacts - Determine if barrels of chemicals/industrial waste that were legally dumped in the Gulf of Mexico are degrading RIWH habitat or the health of the whales.
Habitat/Impacts - Develop and/or implement subsurface oil detection/monitoring.
Habitat/Impacts - Develop a better understanding of contaminants and pollutants from SpaceX capsules, recovery boats, and mobile launch platforms.
Habitat/Impacts - Develop a better understanding of what is creating the Dead Zone in the Gulf of Mexico and how it could be mitigated.



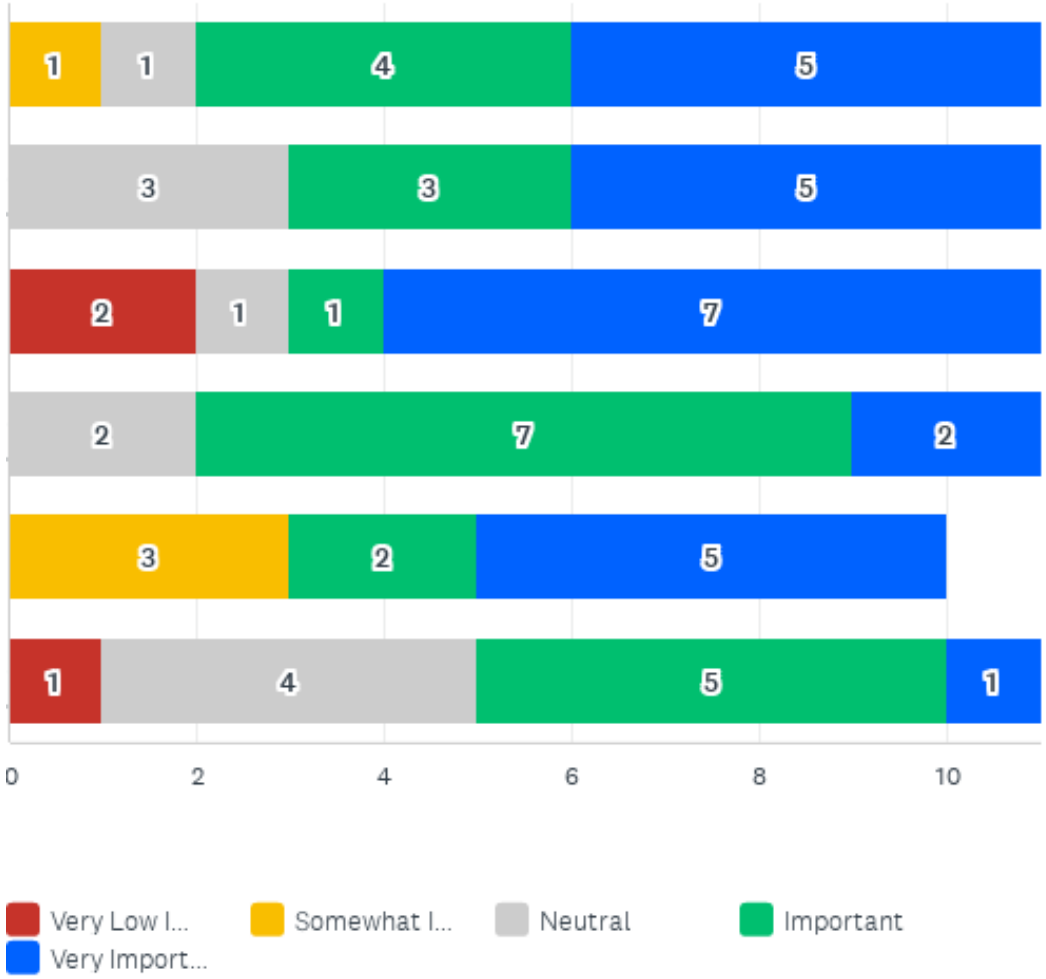
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Impacts - Identify sources of contaminants and contaminants loads in Rice's whales and their prey species to inform management initiatives.	0.00% 0	0.00% 0	18.18% 2	27.27% 3	54.55% 6	11	4.36
Impacts - Investigate contaminants load in Rice's whale and their prey.	0.00% 0	9.09% 1	18.18% 2	18.18% 2	54.55% 6	11	4.18
Habitat/Range - Investigate and identify pollutants/contaminants that are entering the GOMx from MS river or other sources.	0.00% 0	0.00% 0	18.18% 2	63.64% 7	18.18% 2	11	4.00
Habitat/Impacts - Conduct additional modeling for catastrophic spills to more fully reflect the shift in lease distribution to deeper water. Model should include hydrodynamic flow fields around leases to better understand the risk of oil spill being carried into Rice's whale habitat (Including the extended shelf-edge habitat beyond the core area).	0.00% 0	0.00% 0	36.36% 4	27.27% 3	36.36% 4	11	4.00
Investigate existing GOMx contaminant models that can be enhanced with Rice's whale information.	0.00% 0	0.00% 0	36.36% 4	45.45% 5	18.18% 2	11	3.82
Impacts - Learn more about impacts to Rice's whales from stimulation chemicals, produced water and other oil +gas related activities.	9.09% 1	9.09% 1	9.09% 1	45.45% 5	27.27% 3	11	3.73
Habitat/Range - More dynamic hydrodynamic modeling with more dynamic RIWH modeling - increase state of readiness and flow of information.	0.00% 0	0.00% 0	63.64% 7	0.00% 0	36.36% 4	11	3.73
Health Impacts - Investigate correlation between health/condition and various types of contaminants and contaminant load (as a precursor to being able to enact stronger regulations).	0.00% 0	0.00% 0	36.36% 4	63.64% 7	0.00% 0	11	3.64
Habitat/Impacts - Determine if barrels of chemicals/industrial waste	9.09% 1	0.00% 0	45.45% 5	36.36% 4	9.09% 1	11	3.36

that were legally dumped in the Gulf of Mexico are degrading Rice's whale habitat or the health of the whales.							
Habitat/Impacts - Develop and/or implement subsurface oil detection/monitoring.	0.00% 0	9.09% 1	54.55% 6	27.27% 3	9.09% 1	11	3.36
Habitat/Impacts - Develop a better understanding of contaminants and pollutants from SpaceX capsules, recovery boats, and mobile launch platforms.	0.00% 0	18.18% 2	36.36% 4	36.36% 4	9.09% 1	11	3.36
Habitat/Impacts - Develop a better understanding of what is creating the Dead Zone in the Gulf of Mexico and how it could be mitigated.	18.18% 2	0.00% 0	36.36% 4	27.27% 3	18.18% 2	11	3.27

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Impacts - Identify sources of contaminants and contaminants loads in Rice's whales and their prey species to inform management initiatives.	3.00	5.00	5.00	4.36	0.77
Impacts - Investigate contaminants load in Rice's whale and their prey.	2.00	5.00	5.00	4.18	1.03
Habitat/Range - Investigate and identify pollutants/contaminants that are entering the GOMx from MS river or other sources.	3.00	5.00	4.00	4.00	0.60
Habitat/Impacts - Conduct additional modeling for catastrophic spills to more fully reflect the shift in lease distribution to deeper water. Model should include hydrodynamic flow fields around leases to better understand the risk of oil spill being carried into Rice's whale habitat (Including the extended shelf-edge habitat beyond the core area).	3.00	5.00	4.00	4.00	0.85
Investigate existing GOMx contaminant models that can be enhanced with Rice's whale information.	3.00	5.00	4.00	3.82	0.72
Impacts - Learn more about impacts to Rice's whales from stimulation chemicals, produced water and other oil +gas related activities.	1.00	5.00	4.00	3.73	1.21
Habitat/Range - More dynamic hydrodynamic modeling with more dynamic RIWH modeling - increase state of readiness and flow of information.	3.00	5.00	3.00	3.73	0.96
Health Impacts - Investigate correlation between health/condition and various types of contaminants and contaminant load (as a precursor to being able to enact stronger regulations).	3.00	4.00	4.00	3.64	0.48
Habitat/Impacts - Determine if barrels of chemicals/industrial waste that were legally dumped in the Gulf of Mexico are degrading Rice's whale habitat or the health of the whales.	1.00	5.00	3.00	3.36	0.98
Habitat/Impacts - Develop and/or implement subsurface oil detection/monitoring.	2.00	5.00	3.00	3.36	0.77
Habitat/Impacts - Develop a better understanding of contaminants and pollutants from SpaceX capsules, recovery boats, and mobile launch platforms.	2.00	5.00	3.00	3.36	0.88
Habitat/Impacts - Develop a better understanding of what is creating the Dead Zone in the Gulf of Mexico and how it could be mitigated.	1.00	5.00	3.00	3.27	1.29

Environmental Pollutants Recovery Actions - Management

Habitat - Consider water quality as an essential feature of Rice's whale critical habitat.
Habitat/Impacts -Develop rapid response teams for pollution events detected by monitoring system within RIWH habitat.
Habitat/Range - Reduce/cease new oil and gas leases in Gulf of Mexico (particularly in core habitat + projected habitat areas).
Habitat/Impacts - Develop standardized communication protocols for notifying Rice's whale recovery personnel of smaller spills in RIWH habitat so they can track possible cumulative effects.
Impact - Enact programmatic policy or funding method for decommissioning derelict, abandoned/"orphaned" oil rigs/pipelines.
Habitat/Impacts - Pursue containment/cleanup of existing coastal land-based Superfund sites around the Gulf of Mexico

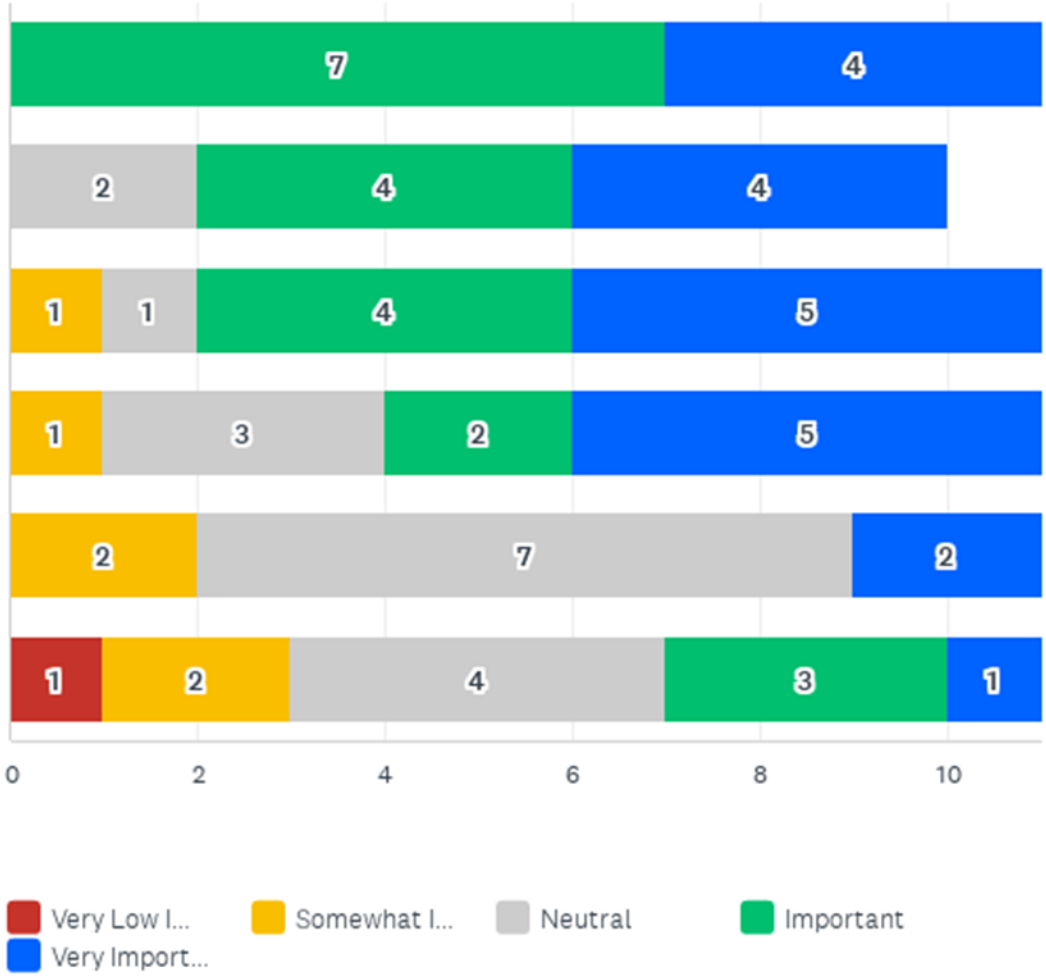


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Habitat - Consider water quality as an essential feature of Rice's whale critical habitat.	0.00% 0	9.09% 1	9.09% 1	36.36% 4	45.45% 5	11	4.18
Habitat/Impacts -Develop rapid response teams for pollution events detected by monitoring system within RIWH habitat.	0.00% 0	0.00% 0	27.27% 3	27.27% 3	45.45% 5	11	4.18
Habitat/Range - Reduce/cease new oil and gas leases in Gulf of Mexico (particularly in core habitat + projected habitat areas).	18.18% 2	0.00% 0	9.09% 1	9.09% 1	63.64% 7	11	4.00
Habitat/Impacts - Develop standardized communication protocols for notifying Rice's whale recovery personnel of smaller spills in RIWH habitat so they can track possible cumulative effects.	0.00% 0	0.00% 0	18.18% 2	63.64% 7	18.18% 2	11	4.00
Impact - Enact programmatic policy or funding method for decommissioning derelict, abandoned/"orphaned" oil rigs/pipelines.	0.00% 0	30.00% 3	0.00% 0	20.00% 2	50.00% 5	10	3.90
Habitat/Impacts - Pursue containment/cleanup of existing coastal land-based Superfund sites around the Gulf of Mexico	9.09% 1	0.00% 0	36.36% 4	45.45% 5	9.09% 1	11	3.45

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Habitat - Consider water quality as an essential feature of Rice's whale critical habitat.	2.00	5.00	4.00	4.18	0.94
Habitat/Impacts -Develop rapid response teams for pollution events detected by monitoring system within RIWH habitat.	3.00	5.00	4.00	4.18	0.83
Habitat/Range - Reduce/cease new oil and gas leases in Gulf of Mexico (particularly in core habitat + projected habitat areas).	1.00	5.00	5.00	4.00	1.54
Habitat/Impacts - Develop standardized communication protocols for notifying Rice's whale recovery personnel of smaller spills in RIWH habitat so they can track possible cumulative effects.	3.00	5.00	4.00	4.00	0.60
Impact - Enact programmatic policy or funding method for decommissioning derelict, abandoned/"orphaned" oil rigs/pipelines.	2.00	5.00	4.50	3.90	1.30
Habitat/Impacts - Pursue containment/cleanup of existing coastal land-based Superfund sites around the Gulf of Mexico	1.00	5.00	4.00	3.45	0.99

Environmental Pollutants Recovery Actions – Monitoring

Necropsies - Consider additional sample/tests from stranded animals' necropsies, including comparative analyses between stranded animals.
Necropsies - Enhance carcass sampling protocols and allow for team-lead-driven changes due to "unknown unknowns" or novel findings.
Necropsies - Create a RIWH necropsy and sample documentation portal with more complete data sharing.
Habitat - Establish a forum for inter-agency/inter-organization collaboration and coordination on long-term monitoring.
Habitat - Develop long term water quality monitoring stations w/in and just outside of RIWH habitat.
Impacts - Map and inventory barrels of chemicals/industrial waste that were permitted by the EPA to be dumped into the Gulf of Mexico in the 1970's.



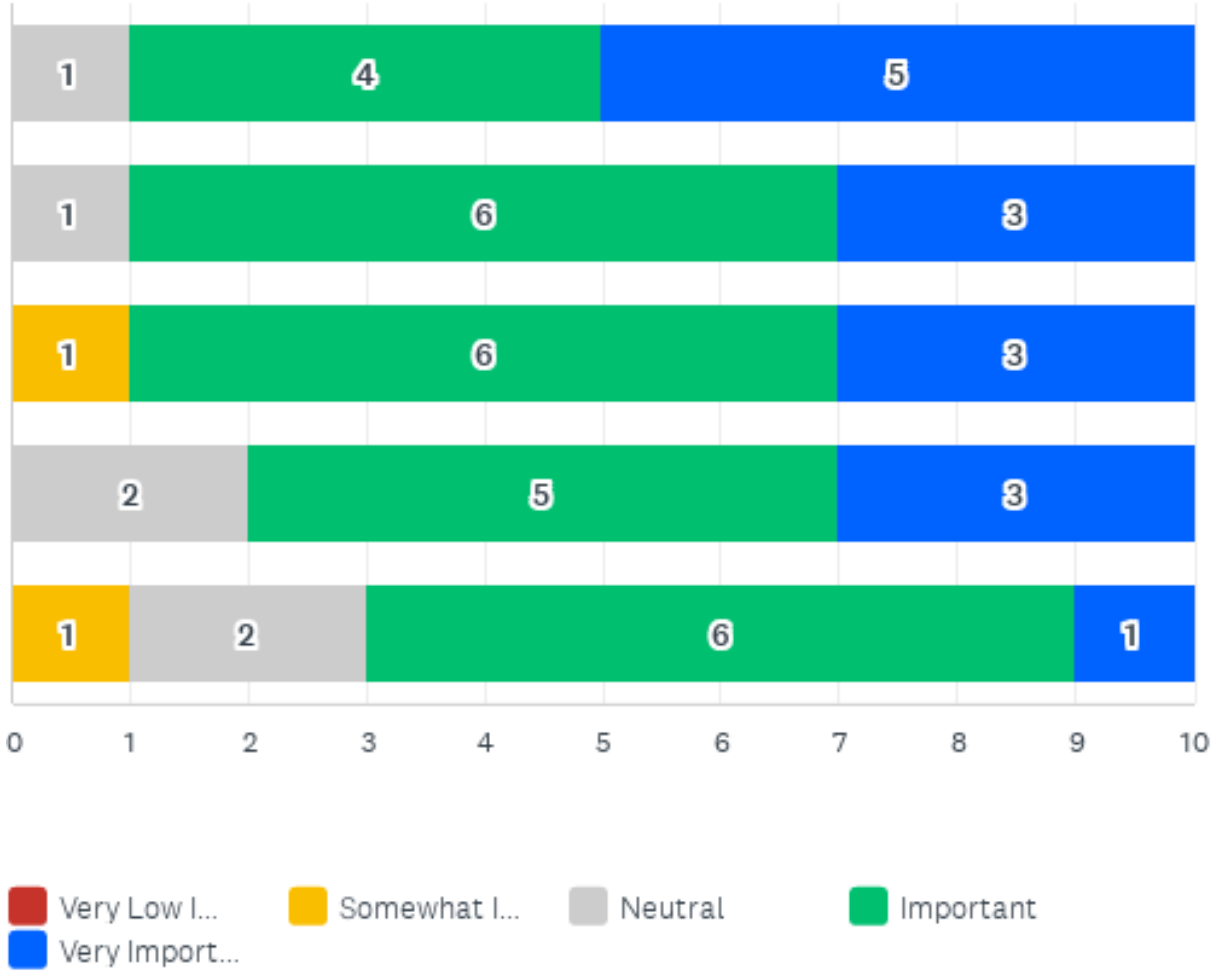
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Necropsies - Consider additional sample/tests from stranded animals' necropsies, including comparative analyses between stranded animals.	0.00% 0	0.00% 0	0.00% 0	63.64% 7	36.36% 4	11	4.36
Necropsies - Enhance carcass sampling protocols and allow for team-lead-driven changes due to "unknown unknowns" or novel findings.	0.00% 0	0.00% 0	20.00% 2	40.00% 4	40.00% 4	10	4.20
Necropsies - Create a RIWH necropsy and sample documentation portal with more complete data sharing.	0.00% 0	9.09% 1	9.09% 1	36.36% 4	45.45% 5	11	4.18
Habitat - Establish a forum for inter-agency/inter-organization collaboration and coordination on long-term monitoring.	0.00% 0	9.09% 1	27.27% 3	18.18% 2	45.45% 5	11	4.00
Habitat - Develop long term water quality monitoring stations w/in and just outside of RIWH habitat.	0.00% 0	18.18% 2	63.64% 7	0.00% 0	18.18% 2	11	3.18
Impacts - Map and inventory barrels of chemicals/industrial waste that were permitted by the EPA to be dumped into the Gulf of Mexico in the 1970's.	9.09% 1	18.18% 2	36.36% 4	27.27% 3	9.09% 1	11	3.09

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Necropsies - Consider additional sample/tests from stranded animals' necropsies, including comparative analyses between stranded animals.	4.00	5.00	4.00	4.36	0.48
Necropsies - Enhance carcass sampling protocols and allow for team-lead-driven changes due to "unknown unknowns" or novel findings.	3.00	5.00	4.00	4.20	0.75
Necropsies - Create a RIWH necropsy and sample documentation portal with more complete data sharing.	2.00	5.00	4.00	4.18	0.94
Habitat - Establish a forum for inter-agency/inter-organization collaboration and coordination on long-term monitoring.	2.00	5.00	4.00	4.00	1.04
Habitat - Develop long term water quality monitoring stations w/in and just outside of RIWH habitat.	2.00	5.00	3.00	3.18	0.94
Impacts - Map and inventory barrels of chemicals/industrial waste that were permitted by the EPA to be dumped into the Gulf of Mexico in the 1970's.	1.00	5.00	3.00	3.09	1.08

Disease / Health Indicators Recovery Actions – Research

Body condition/health - Develop detailed stranding/necropsy protocols that include body condition measurements and body tissue collection.
Body condition/health - Develop body condition indices via aerial photogrammetry/morphometrics, including at sea and when stranded to compare/contrast body condition/bioenergetics.
Body condition/health - Establish a baseline on body condition to determine what a healthy RIWH looks like.
Body condition/health - Identify potential stressors that may lead to a weakened condition (immunocompromised) and thus increase susceptibility to ubiquitous or opportunistic disease vectors (fungi, bacteria, viruses, etc.).
Body condition/health - Prioritize sample/data collection that can inform immunosuppression.



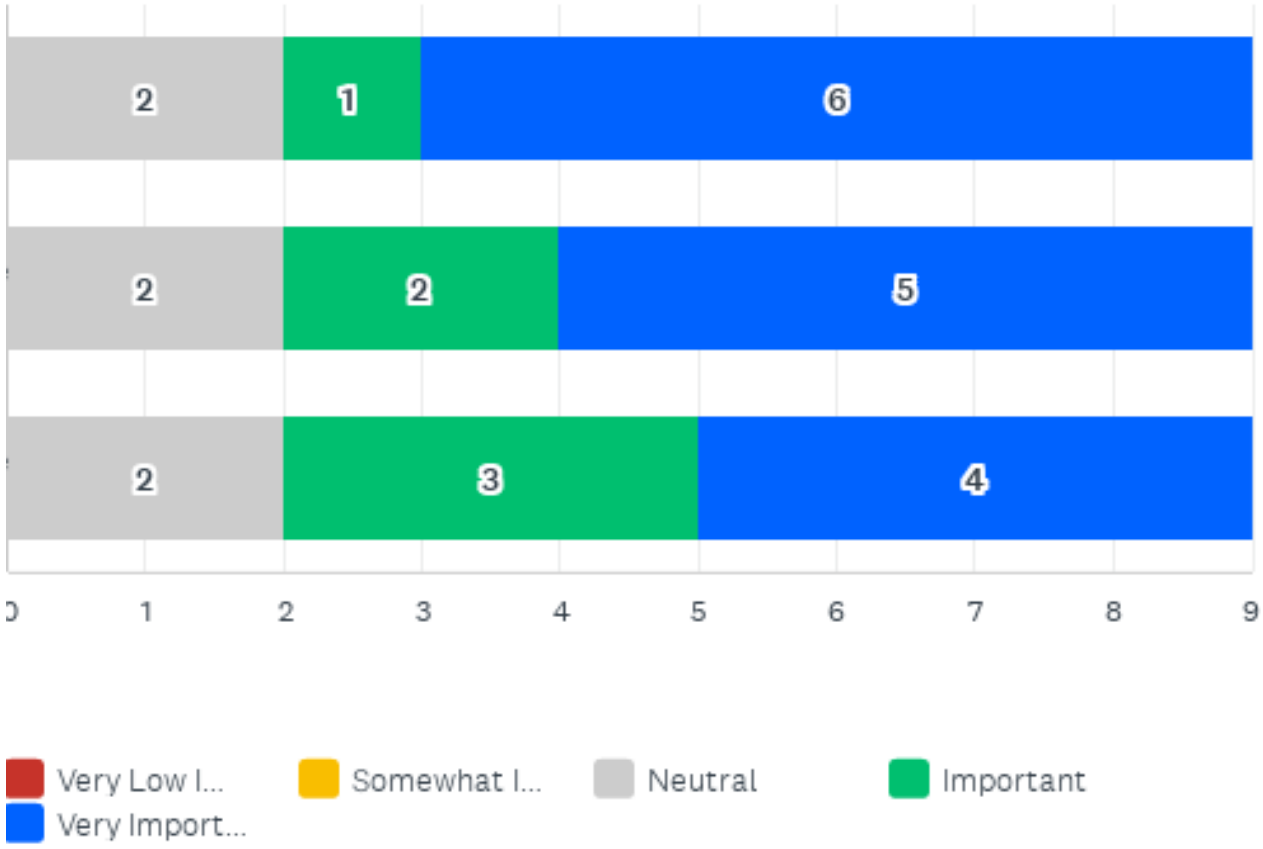
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Body condition/health - Develop detailed stranding/necropsy protocols that include body condition measurements and body tissue collection.	0.00% 0	0.00% 0	10.00% 1	40.00% 4	50.00% 5	10	4.40
Body condition/health - Develop body condition indices via aerial photogrammetry/morphometrics, including at sea and when stranded to compare/contrast body condition/bioenergetics.	0.00% 0	0.00% 0	10.00% 1	60.00% 6	30.00% 3	10	4.20
Body condition/health - Establish a baseline on body condition to determine what a healthy RIWH looks like.	0.00% 0	10.00% 1	0.00% 0	60.00% 6	30.00% 3	10	4.10
Body condition/health - Identify potential stressors that may lead to a weakened condition (immunocompromised) and thus increase susceptibility to ubiquitous or opportunistic disease vectors (fungi, bacteria, viruses, etc.).	0.00% 0	0.00% 0	20.00% 2	50.00% 5	30.00% 3	10	4.10
Body condition/health - Prioritize sample/data collection that can inform immunosuppression.	0.00% 0	10.00% 1	20.00% 2	60.00% 6	10.00% 1	10	3.70

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Body condition/health - Develop detailed stranding/necropsy protocols that include body condition measurements and body tissue collection.	3.00	5.00	4.50	4.40	0.66
Body condition/health - Develop body condition indices via aerial photogrammetry/morphometrics, including at sea and when stranded to compare/contrast body condition/bioenergetics.	3.00	5.00	4.00	4.20	0.60
Body condition/health - Establish a baseline on body condition to determine what a healthy RIWH looks like.	2.00	5.00	4.00	4.10	0.83
Body condition/health - Identify potential stressors that may lead to a weakened condition (immunocompromised) and thus increase susceptibility to ubiquitous or opportunistic disease vectors (fungi, bacteria, viruses, etc.).	3.00	5.00	4.00	4.10	0.70
Body condition/health - Prioritize sample/data collection that can inform immunosuppression.	2.00	5.00	4.00	3.70	0.78

Disease / Health Indicators Recovery Actions – Management

Response - Ensure resources are in place to immediately deploy teams if/when there is a stranding/deceased animal
Cumulative/synergistic threats - Address/manage other threats (i.e., potential sources for pathogen/disease transmission (e.g., O&G, farm pollutants) or noise/vessel traffic) to lessen negative effects from other primary or secondary threats
Disease/pathogens - Based on disease/pathogen research/monitoring, develop management measures to reduce the source of disease/pathogen (e.g., vaccines, transmission source, env. cond't.) and/or exclude activities that will exacerbate the immune system.

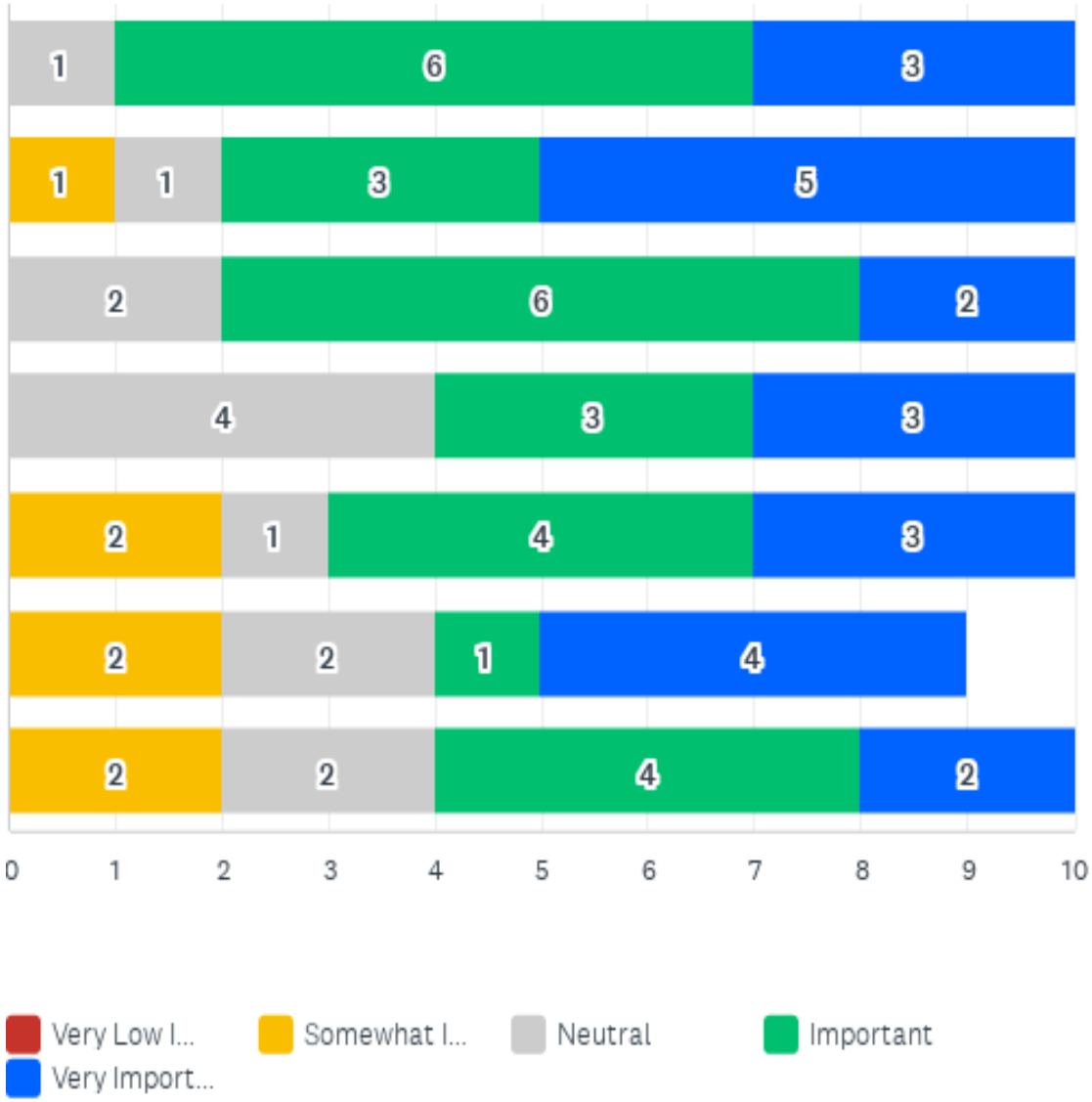


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Response - Ensure resources are in place to immediately deploy teams if/when there is a stranding/deceased animal	0.00% 0	0.00% 0	22.22% 2	11.11% 1	66.67% 6	9	4.44
Cumulative/synergistic threats - Address/manage other threats (i.e., potential sources for pathogen/disease transmission (e.g., O&G, farm pollutants) or noise/vessel traffic) to lessen negative effects from other primary or secondary threats	0.00% 0	0.00% 0	22.22% 2	22.22% 2	55.56% 5	9	4.33
Disease/pathogens - Based on disease/pathogen research/monitoring, develop management measures to reduce the source of disease/pathogen (e.g., vaccines, transmission source, env. cond't.) and/or exclude activities that will exacerbate the immune system.	0.00% 0	0.00% 0	22.22% 2	33.33% 3	44.44% 4	9	4.22

BASIC STATISTICS					
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Response - Ensure resources are in place to immediately deploy teams if/when there is a stranding/deceased animal	3.00	5.00	5.00	4.44	0.83
Cumulative/synergistic threats - Address/manage other threats (i.e., potential sources for pathogen/disease transmission (e.g., O&G, farm pollutants) or noise/vessel traffic) to lessen negative effects from other primary or secondary threats	3.00	5.00	5.00	4.33	0.82
Disease/pathogens - Based on disease/pathogen research/monitoring, develop management measures to reduce the source of disease/pathogen (e.g., vaccines, transmission source, env. cond't.) and/or exclude activities that will exacerbate the immune system.	3.00	5.00	4.00	4.22	0.79

Disease / Health Indicators Recovery Actions – Monitoring

Body condition - Using photo-ID images from small boats, use automated AI tools to evaluate/monitor body condition images to speed the evaluation process	1 6 3
Body condition - Identify appropriate health metrics through external conditions or intrinsic health parameters that will aid in long-term monitoring of individual and population-level health	1 1 3 5
Body condition - Identify lesions during photo-ID studies that may indicate immunocompromised health/malnutrition	2 6 2
Habitat - Determine what types of pathogens, etc., might get flushed into the habitat during freshwater runoff events; monitor for changes during runoff events; manage where possible	4 3 3
Body condition/health - Improve our tools/methods to better collect/monitor breath samples from mysticetes to determine the presence and risk of pathogens, etc.	2 1 4 3
Climate change - Integrate/analyze body condition measurements because RIWH may be more heat challenged than we currently realize, i.e., physiologically they may need to reduce insulation to dissipate heat; therefore, look at the whole picture with a chronic-change lens	2 2 1 4
Habitat - Better understand and monitor for disease/pathogen prevalence in GoMx to determine the what/where/how/and rate of the risk (e.g., threat of Morbillivirus caused by likely interactions between RIWH and bottlenose dolphins.)	2 2 4 2

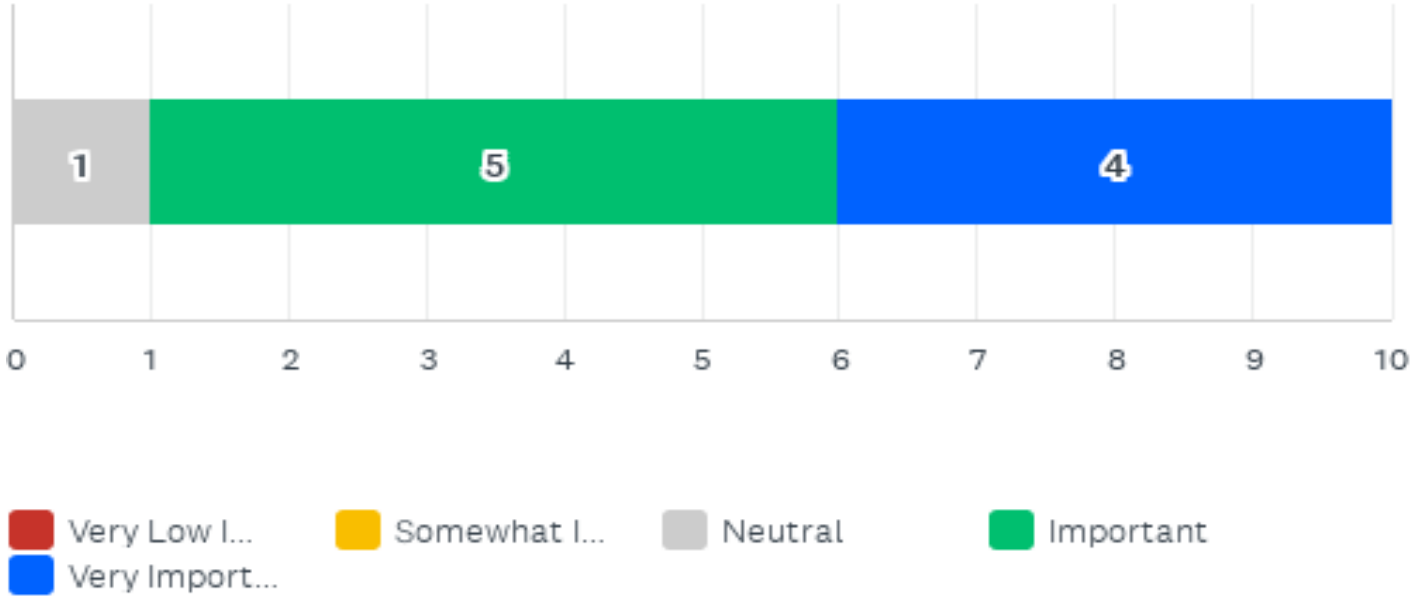


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Body condition - Using photo-ID images from small boats, use automated AI tools to evaluate/monitor body condition images to speed the evaluation process	0.00% 0	0.00% 0	10.00% 1	60.00% 6	30.00% 3	10	4.20
Body condition - Identify appropriate health metrics through external conditions or intrinsic health parameters that will aid in long-term monitoring of individual and population-level health	0.00% 0	10.00% 1	10.00% 1	30.00% 3	50.00% 5	10	4.20
Body condition - Identify lesions during photo-ID studies that may indicate immunocompromised health/malnutrition	0.00% 0	0.00% 0	20.00% 2	60.00% 6	20.00% 2	10	4.00
Habitat - Determine what types of pathogens, etc., might get flushed into the habitat during freshwater runoff events; monitor for changes during runoff events; manage where possible	0.00% 0	0.00% 0	40.00% 4	30.00% 3	30.00% 3	10	3.90
Body condition/health - Improve our tools/methods to better collect/monitor breath samples from mysticetes to determine the presence and risk of pathogens, etc.	0.00% 0	20.00% 2	10.00% 1	40.00% 4	30.00% 3	10	3.80
Climate change - Integrate/analyze body condition measurements because RIWH may be more heat challenged than we currently realize, i.e., physiologically they may need to reduce insulation to dissipate heat; therefore, look at the whole picture with a chronic-change lens	0.00% 0	22.22% 2	22.22% 2	11.11% 1	44.44% 4	9	3.78
Habitat - Better understand and monitor for disease/pathogen prevalence in GoMx to determine the what/where/how/and rate of the risk (e.g., threat of Morbillivirus caused by likely interactions between	0.00% 0	20.00% 2	20.00% 2	40.00% 4	20.00% 2	10	3.60

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Body condition - Using photo-ID images from small boats, use automated AI tools to evaluate/monitor body condition images to speed the evaluation process	3.00	5.00	4.00	4.20	0.60
Body condition - Identify appropriate health metrics through external conditions or intrinsic health parameters that will aid in long-term monitoring of individual and population-level health	2.00	5.00	4.50	4.20	0.98
Body condition - Identify lesions during photo-ID studies that may indicate immunocompromised health/malnutrition	3.00	5.00	4.00	4.00	0.63
Habitat - Determine what types of pathogens, etc., might get flushed into the habitat during freshwater runoff events; monitor for changes during runoff events; manage where possible	3.00	5.00	4.00	3.90	0.83
Body condition/health - Improve our tools/methods to better collect/monitor breath samples from mysticetes to determine the presence and risk of pathogens, etc.	2.00	5.00	4.00	3.80	1.08
Climate change - Integrate/analyze body condition measurements because RIWH may be more heat challenged than we currently realize, i.e., physiologically they may need to reduce insulation to dissipate heat; therefore, look at the whole picture with a chronic-change lens	2.00	5.00	4.00	3.78	1.23
Habitat - Better understand and monitor for disease/pathogen prevalence in GoMx to determine the what/where/how/and rate of the risk (e.g., threat of Morbillivirus caused by likely interactions between RIWH and bottlenose dolphins.)	2.00	5.00	4.00	3.60	1.02

Disease / Health Indicators Recovery Actions - Outreach & Engagement

Collaboration - Enhance efforts to increase detection/reporting of carcasses, and data collection

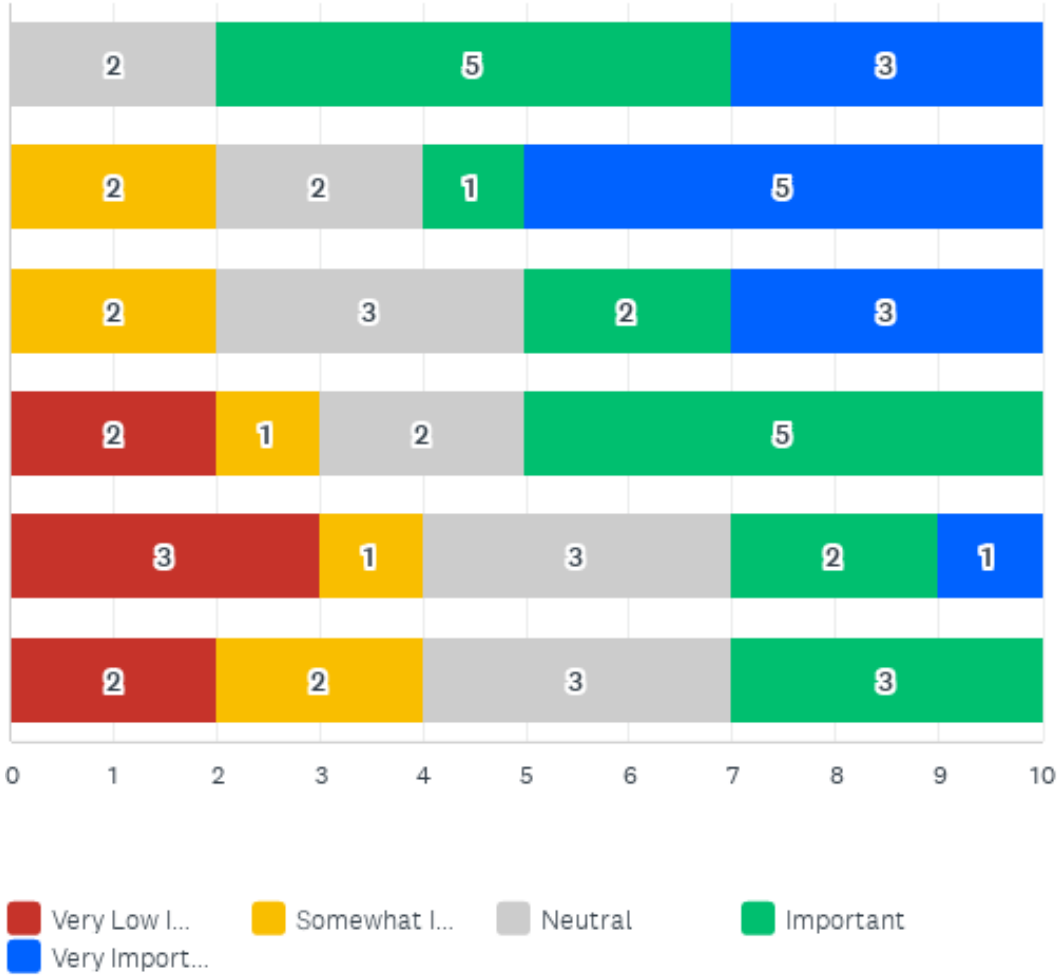


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Collaboration - Enhance efforts to increase detection/reporting of carcasses, and data collection	0.00% 0	0.00% 0	10.00% 1	50.00% 5	40.00% 4	10	4.30

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
3.00	5.00	4.00	4.30	0.64

Marine Debris Recovery Actions – Research

Body Condition/Health - Mine existing data (photo ID, stranding, other existing data) to determine prevalence of indication of entanglement on population
Prey - Determine what specific types of marine debris RIWH are encountering; monitoring of what is in the environment where animals are feeding.
Prey - Sampling should examine debris near seafloor where whales are feeding
Collaboration - Explore methods of sourcing plastic, specifically the piece that was found in Everglades stranded animal.
Collaboration - Engage student groups in robotics and other fields to explore innovative ways of investigating debris
Comparison Studies - Look at other deep divers that strand more frequently (e.g., Kogia), try to quantify the type of plastics that end up in deep divers.



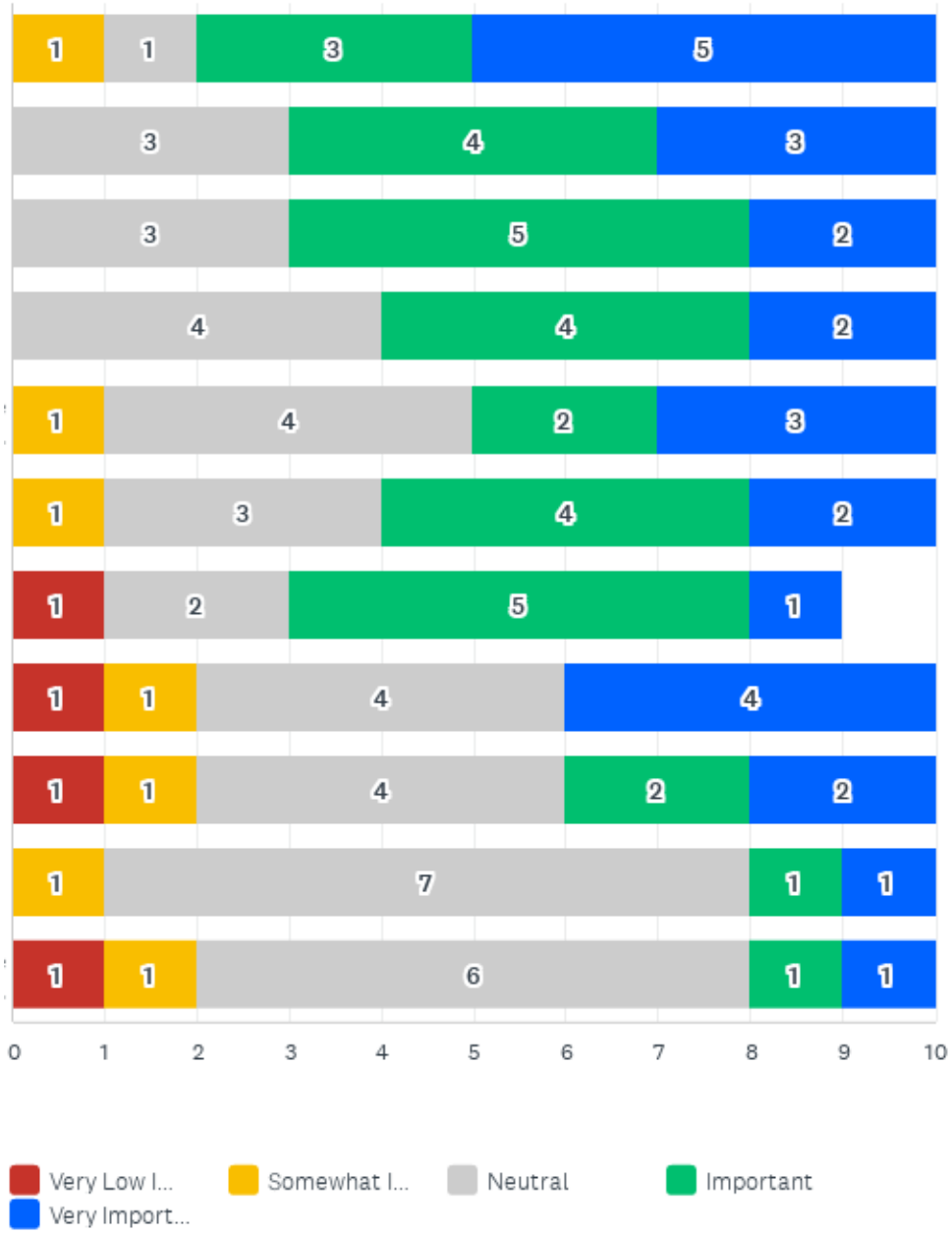
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Body Condition/Health - Mine existing data (photo ID, stranding, other existing data) to determine prevalence of indication of entanglement on population	0.00% 0	0.00% 0	20.00% 2	50.00% 5	30.00% 3	10	4.10
Prey - Determine what specific types of marine debris RIWH are encountering; monitoring of what is in the environment where animals are feeding.	0.00% 0	20.00% 2	20.00% 2	10.00% 1	50.00% 5	10	3.90
Prey - Sampling should examine debris near seafloor where whales are feeding	0.00% 0	20.00% 2	30.00% 3	20.00% 2	30.00% 3	10	3.60
Collaboration - Explore methods of sourcing plastic, specifically the piece that was found in Everglades stranded animal.	20.00% 2	10.00% 1	20.00% 2	50.00% 5	0.00% 0	10	3.00
Collaboration - Engage student groups in robotics and other fields to explore innovative ways of investigating debris	30.00% 3	10.00% 1	30.00% 3	20.00% 2	10.00% 1	10	2.70
Comparison Studies - Look at other deep divers that strand more frequently (e.g., Kogia), try to quantify the type of plastics that end up in deep divers.	20.00% 2	20.00% 2	30.00% 3	30.00% 3	0.00% 0	10	2.70

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Body Condition/Health - Mine existing data (photo ID, stranding, other existing data) to determine prevalence of indication of entanglement on population	3.00	5.00	4.00	4.10	0.70
Prey - Determine what specific types of marine debris RIWH are encountering; monitoring of what is in the environment where animals are feeding.	2.00	5.00	4.50	3.90	1.22
Prey - Sampling should examine debris near seafloor where whales are feeding	2.00	5.00	3.50	3.60	1.11
Collaboration - Explore methods of sourcing plastic, specifically the piece that was found in Everglades stranded animal.	1.00	4.00	3.50	3.00	1.18
Collaboration - Engage student groups in robotics and other fields to explore innovative ways of investigating debris	1.00	5.00	3.00	2.70	1.35
Comparison Studies - Look at other deep divers that strand more frequently (e.g., Kogia), try to quantify the type of plastics that end up in deep divers.	1.00	4.00	3.00	2.70	1.10

Marine Debris Recovery Actions - Management

Best Management Practices - Exploration of/requirement of the use of ropeless fishing gear in Rice's whale core/projected habitat.
Coordination - Evaluate terms and conditions for dealing with derelict gear, other debris on permits and for EFH/ESA consultations to identify gaps in management actions
Coordination - Add info to large whale stranding manual specific to RIWH
Coordination - Reduce sources of microplastics from industrial sources, including virgin pellets
Habitat/Range - Encourage investment in stormwater mitigation measures to limit stormwater marine debris in Gulf
Response - Consider need for disentanglement response training
Best Management Practices - Develop best management practices in collaboration with experts, industry, etc.
Coordination - Work with NASA and other partners to prevent landing/launch of SpaceX capsules near RIWH habitat
Coordination - Strengthen reporting requirements for marine trash and debris appendix in the GOM O&G BiOp
Coordination - Labeling gear to identify active vs derelict gear
Habitat/Range - Conduct large scale clean-up in Gulf of Mexico

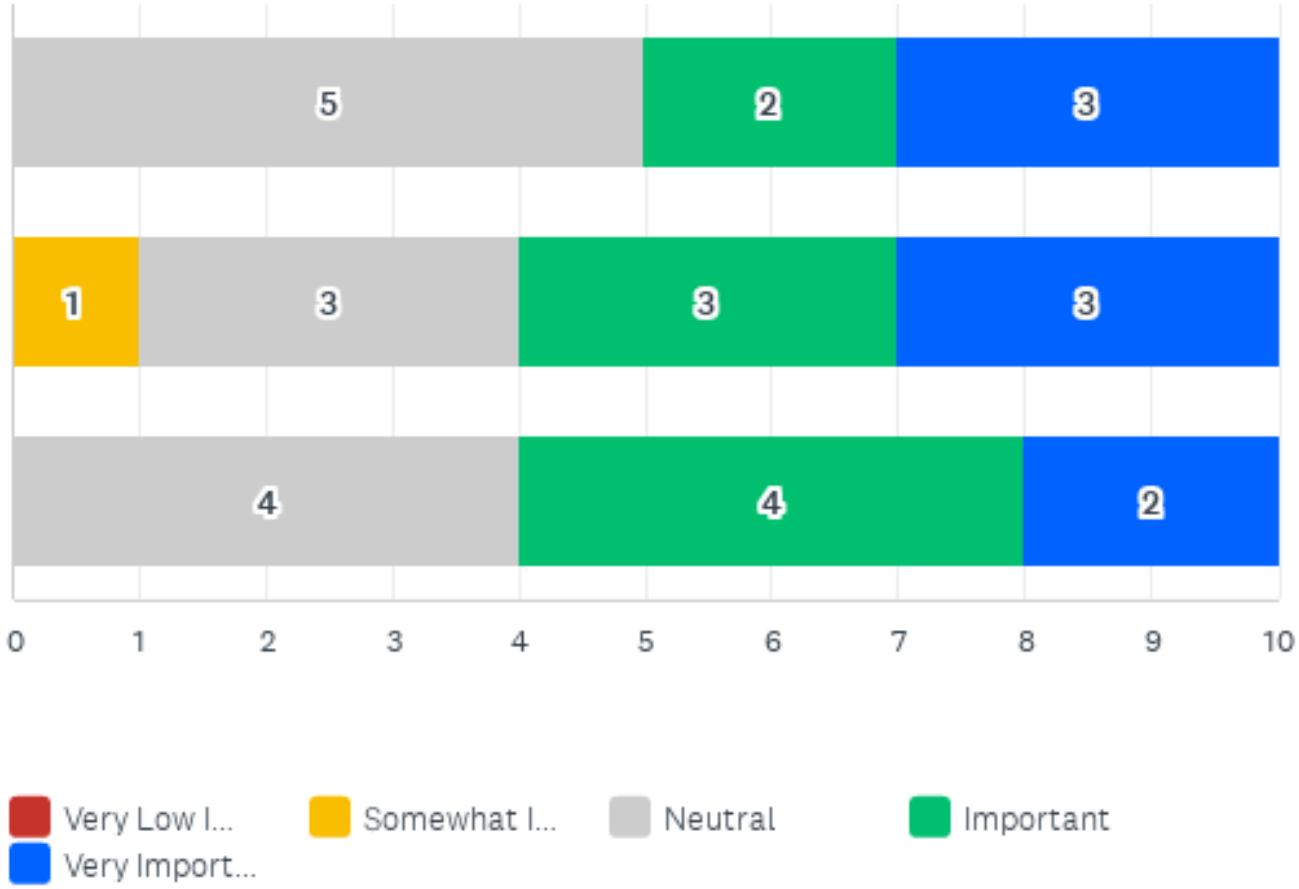


	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Best Management Practices - Exploration of/requirement of the use of ropeless fishing gear in Rice's whale core/projected habitat.	0.00% 0	10.00% 1	10.00% 1	30.00% 3	50.00% 5	10	4.20
Coordination - Evaluate terms and conditions for dealing with derelict gear, other debris on permits and for EFH/ESA consultations to identify gaps in management actions	0.00% 0	0.00% 0	30.00% 3	40.00% 4	30.00% 3	10	4.00
Coordination - Add info to large whale stranding manual specific to RIWH	0.00% 0	0.00% 0	30.00% 3	50.00% 5	20.00% 2	10	3.90
Coordination - Reduce sources of microplastics from industrial sources, including virgin pellets	0.00% 0	0.00% 0	40.00% 4	40.00% 4	20.00% 2	10	3.80
Habitat/Range - Encourage investment in stormwater mitigation measures to limit stormwater marine debris in Gulf	0.00% 0	10.00% 1	40.00% 4	20.00% 2	30.00% 3	10	3.70
Response - Consider need for disentanglement response training	0.00% 0	10.00% 1	30.00% 3	40.00% 4	20.00% 2	10	3.70
Best Management Practices - Develop best management practices in collaboration with experts, industry, etc.	11.11% 1	0.00% 0	22.22% 2	55.56% 5	11.11% 1	9	3.56
Coordination - Work with NASA and other partners to prevent landing/launch of SpaceX capsules near RIWH habitat	10.00% 1	10.00% 1	40.00% 4	0.00% 0	40.00% 4	10	3.50
Coordination - Strengthen reporting requirements for marine trash and debris appendix in the GOM O&G BiOp	10.00% 1	10.00% 1	40.00% 4	20.00% 2	20.00% 2	10	3.30
Coordination - Labeling gear to identify active vs derelict gear	0.00% 0	10.00% 1	70.00% 7	10.00% 1	10.00% 1	10	3.20
Habitat/Range - Conduct large scale clean-up in Gulf of Mexico	10.00% 1	10.00% 1	60.00% 6	10.00% 1	10.00% 1	10	3.00

BASIC STATISTICS					
	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Best Management Practices - Exploration of/requirement of the use of ropeless fishing gear in Rice's whale core/projected habitat.	2.00	5.00	4.50	4.20	0.98
Coordination - Evaluate terms and conditions for dealing with derelict gear, other debris on permits and for EFH/ESA consultations to identify gaps in management actions	3.00	5.00	4.00	4.00	0.77
Coordination - Add info to large whale stranding manual specific to RIWH	3.00	5.00	4.00	3.90	0.70
Coordination - Reduce sources of microplastics from industrial sources, including virgin pellets	3.00	5.00	4.00	3.80	0.75
Habitat/Range - Encourage investment in stormwater mitigation measures to limit stormwater marine debris in Gulf	2.00	5.00	3.50	3.70	1.00
Response - Consider need for disentanglement response training	2.00	5.00	4.00	3.70	0.90
Best Management Practices - Develop best management practices in collaboration with experts, industry, etc.	1.00	5.00	4.00	3.56	1.07
Coordination - Work with NASA and other partners to prevent landing/launch of SpaceX capsules near RIWH habitat	1.00	5.00	3.00	3.50	1.36
Coordination - Strengthen reporting requirements for marine trash and debris appendix in the GOM O&G BiOp	1.00	5.00	3.00	3.30	1.19
Coordination - Labeling gear to identify active vs derelict gear	2.00	5.00	3.00	3.20	0.75
Habitat/Range - Conduct large scale clean-up in Gulf of Mexico	1.00	5.00	3.00	3.00	1.00

Marine Debris Recovery Actions – Monitoring

Habitat/Range - Improve/centralize reporting and tracking of marine debris from disasters/catastrophic events to understand origins of marine debris to help target outreach and mitigation efforts
Collaboration - Establish a forum for collaboration and coordination on long term monitoring.
Collaboration - Collaborate with industry in tracking and monitoring where marine debris is in the environment.



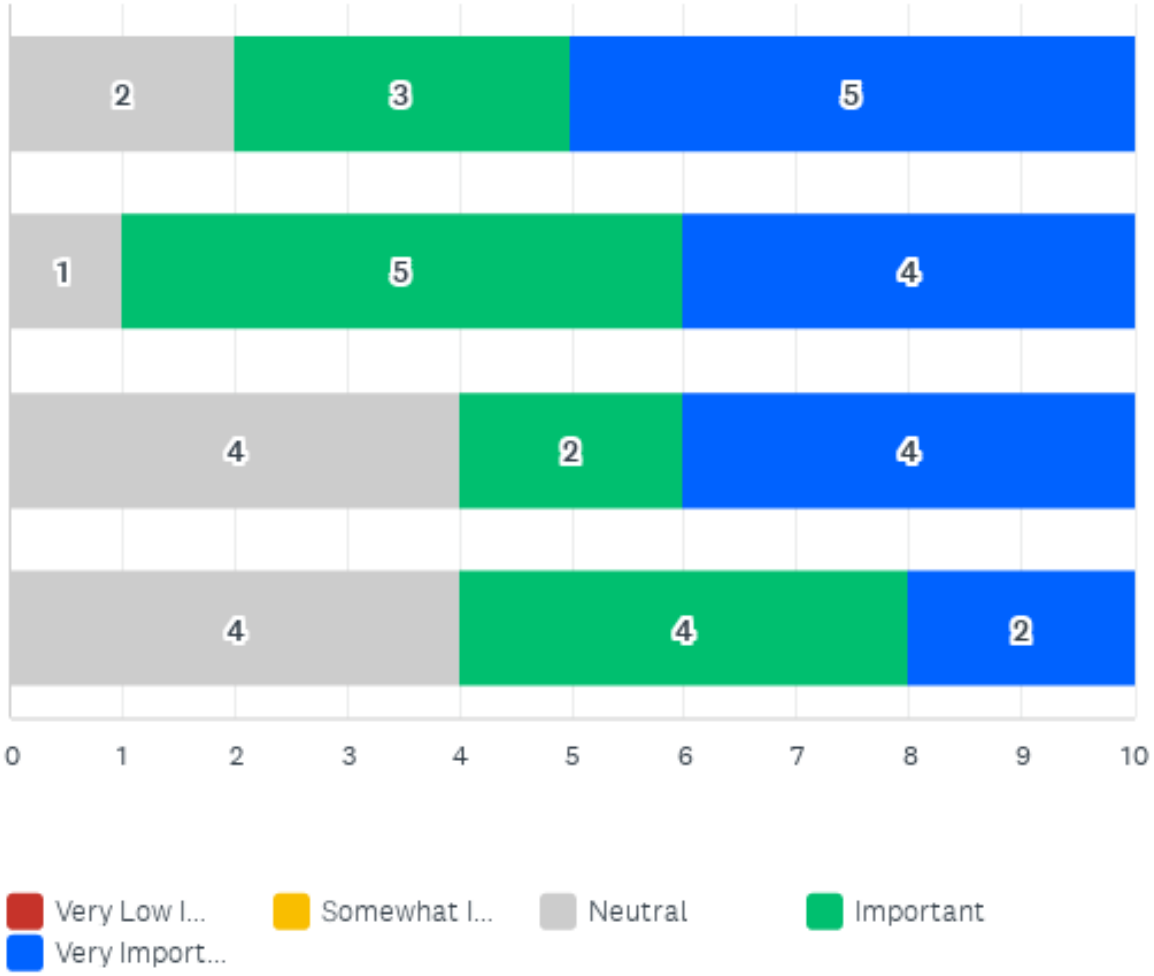
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Habitat/Range - Improve/centralize reporting and tracking of marine debris from disasters/catastrophic events to understand origins of marine debris to help target outreach and mitigation efforts	0.00% 0	0.00% 0	50.00% 5	20.00% 2	30.00% 3	10	3.80
Collaboration - Establish a forum for collaboration and coordination on long term monitoring.	0.00% 0	10.00% 1	30.00% 3	30.00% 3	30.00% 3	10	3.80
Collaboration - Collaborate with industry in tracking and monitoring where marine debris is in the environment.	0.00% 0	0.00% 0	40.00% 4	40.00% 4	20.00% 2	10	3.80

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Habitat/Range - Improve/centralize reporting and tracking of marine debris from disasters/catastrophic events to understand origins of marine debris to help target outreach and mitigation efforts	3.00	5.00	3.50	3.80	0.87
Collaboration - Establish a forum for collaboration and coordination on long term monitoring.	2.00	5.00	4.00	3.80	0.98
Collaboration - Collaborate with industry in tracking and monitoring where marine debris is in the environment.	3.00	5.00	4.00	3.80	0.75

Marine Debris Recovery Actions - Outreach & Engagement

Best Management Practices - Outreach to fishermen (commercial and recreational) operating near RIWH habitat and throughout Gulf regarding prevention of marine debris
Best Management Practices - Involve marine debris coordinators in outreach, recovery efforts, and development of BMPs in RIWH habitat
Best Management Practices - Encourage reduction of plastic usage
Best Management Practices - Outreach to fishing community to determine whether they are using debris as aggregation devices, or survey to determine whether devices were see



	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Best Management Practices - Outreach to fishermen (commercial and recreational) operating near RIWH habitat and throughout Gulf regarding prevention of marine debris	0.00% 0	0.00% 0	20.00% 2	30.00% 3	50.00% 5	10	4.30
Best Management Practices - Involve marine debris coordinators in outreach, recovery efforts, and development of BMPs in RIWH habitat	0.00% 0	0.00% 0	10.00% 1	50.00% 5	40.00% 4	10	4.30
Best Management Practices - Encourage reduction of plastic usage	0.00% 0	0.00% 0	40.00% 4	20.00% 2	40.00% 4	10	4.00
Best Management Practices - Outreach to fishing community to determine whether they are using debris as aggregation devices, or survey to determine whether devices were seen	0.00% 0	0.00% 0	40.00% 4	40.00% 4	20.00% 2	10	3.80

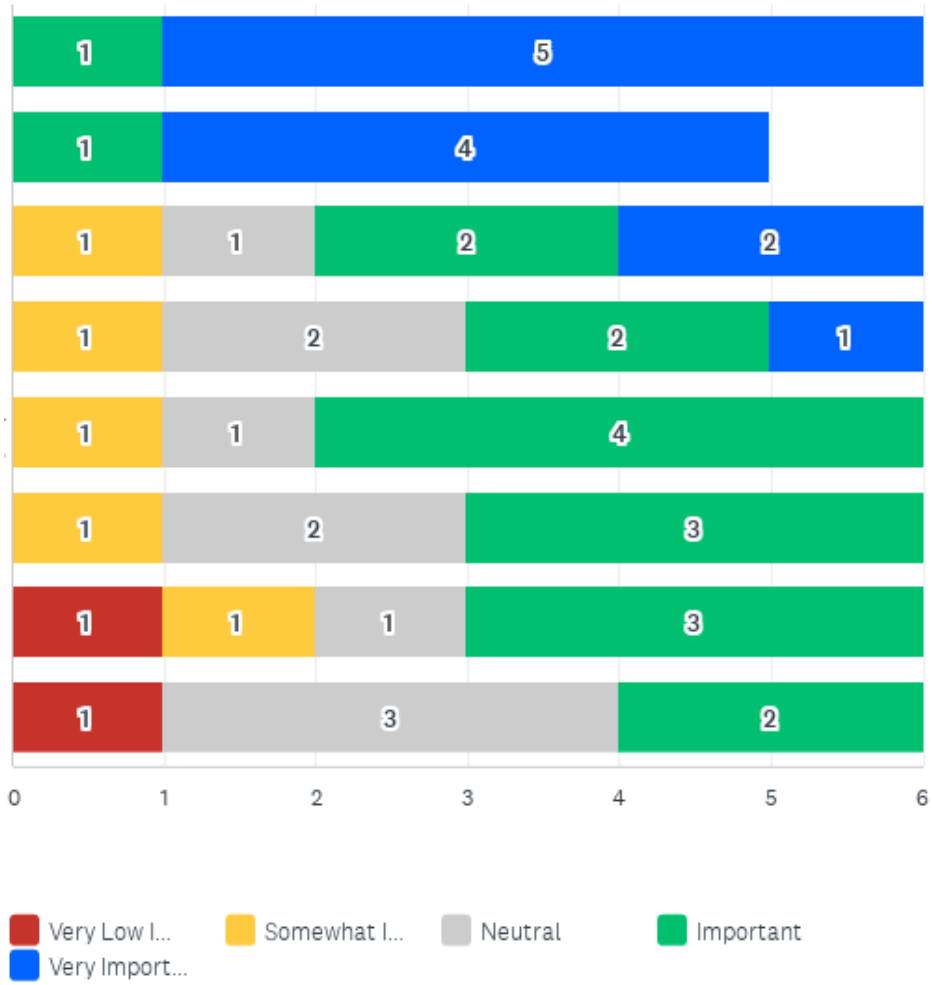
BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Best Management Practices - Outreach to fishermen (commercial and recreational) operating near RIWH habitat and throughout Gulf regarding prevention of marine debris	3.00	5.00	4.50	4.30	0.78
Best Management Practices - Involve marine debris coordinators in outreach, recovery efforts, and development of BMPs in RIWH habitat	3.00	5.00	4.00	4.30	0.64
Best Management Practices - Encourage reduction of plastic usage	3.00	5.00	4.00	4.00	0.89
Best Management Practices - Outreach to fishing community to determine whether they are using debris as aggregation devices, or survey to determine whether devices were seen	3.00	5.00	4.00	3.80	0.75

Noise Recovery Actions – Research

[6 respondents]

Characterizing sound - Improve understanding of viable habitat and how noise levels and occupancy co-vary
Habitat - Research whether acoustics are actually driving the "core range" to determine whether RIWH are confining themselves to the quieter areas of the Gulf or if it's just coincidence that the places they like to be are quieter
Hearing - Better understand effects of sound on bio rates (e.g., reproduction, stress levels)
Prey - Research acoustic effects on RIWH's prey
Hearing - Better under RIWH hearing, what they are sensitive to, etc.
Hearing - Add to the stranding response plan to collect ear bones and other parts of the whale to get a better understanding of their hearing sensitivities--are they already experiencing hearing loss b/c of the environment they are in?
Characterizing sound - Characterize operational rig noise
Characterizing sound - Characterize aquaculture and renewable energy noise



	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Characterizing sound - Improve understanding of viable habitat and how noise levels and occupancy co-vary	0.00% 0	0.00% 0	0.00% 0	16.67% 1	83.33% 5	6	4.83
Habitat - Research whether acoustics are actually driving the "core range" to determine whether RIWH are confining themselves to the quieter areas of the Gulf or if it's just coincidence that the places they like to be are quieter	0.00% 0	0.00% 0	0.00% 0	20.00% 1	80.00% 4	5	4.80
Hearing - Better understand effects of sound on bio rates (e.g., reproduction, stress levels)	0.00% 0	16.67% 1	16.67% 1	33.33% 2	33.33% 2	6	3.83
Prey - Research acoustic effects on RIWH's prey	0.00% 0	16.67% 1	33.33% 2	33.33% 2	16.67% 1	6	3.50
Hearing - Better under RIWH hearing, what they are sensitive to, etc.	0.00% 0	16.67% 1	16.67% 1	66.67% 4	0.00% 0	6	3.50
Hearing - Add to the stranding response plan to collect ear bones and other parts of the whale to get a better understanding of their hearing sensitivities--are they already experiencing hearing loss because of the environment they are in?	0.00% 0	16.67% 1	33.33% 2	50.00% 3	0.00% 0	6	3.33
Characterizing sound - Characterize operational rig noise	16.67% 1	16.67% 1	16.67% 1	50.00% 3	0.00% 0	6	3.00
Characterizing sound - Characterize aquaculture and renewable energy noise	16.67% 1	0.00% 0	50.00% 3	33.33% 2	0.00% 0	6	3.00

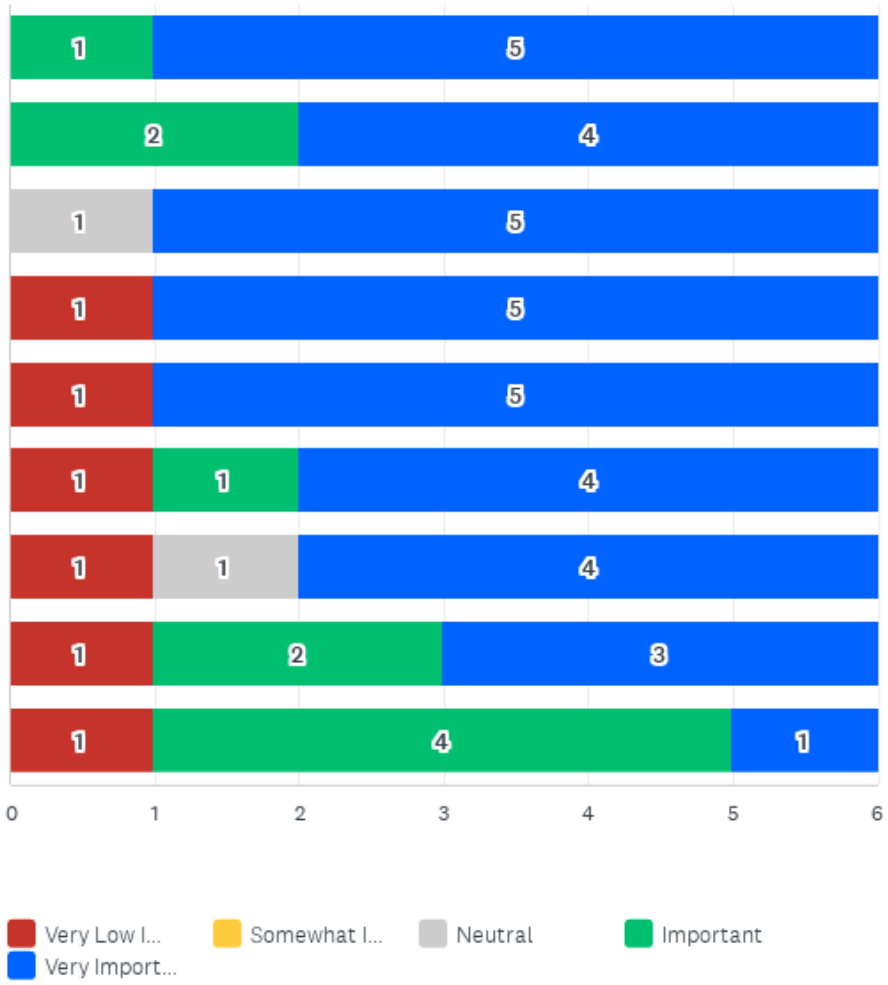
BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Characterizing sound - Improve understanding of viable habitat and how noise levels and occupancy co-vary	4.00	5.00	5.00	4.83	0.37
Habitat - Research whether acoustics are actually driving the "core range" to determine whether RIWH are confining themselves to the quieter areas of the Gulf or if it's just coincidence that the places they like to be are quieter	4.00	5.00	5.00	4.80	0.40
Hearing - Better understand effects of sound on bio rates (e.g., reproduction, stress levels)	2.00	5.00	4.00	3.83	1.07
Prey - Research acoustic effects on RIWH's prey	2.00	5.00	3.50	3.50	0.96
Hearing - Better under RIWH hearing, what they are sensitive to, etc.	2.00	4.00	4.00	3.50	0.76
Hearing - Add to the stranding response plan to collect ear bones and other parts of the whale to get a better understanding of their hearing sensitivities--are they already experiencing hearing loss because of the environment they are in?	2.00	4.00	3.50	3.33	0.75
Characterizing sound - Characterize operational rig noise	1.00	4.00	3.50	3.00	1.15
Characterizing sound - Characterize aquaculture and renewable energy noise	1.00	4.00	3.00	3.00	1.00

Noise Recovery Actions - Management

[6 respondents]

Collaboration - Work with industry to develop and adopt noise reduction and attenuation technologies/measures newer quieter technologies
Regulatory measures - Consider more voluntary restrictions
Regulatory measures - Identify the regulatory mechanisms that are currently in place; then develop appropriate management measures to ensure measures are equally restrictive for established operations as they are for new operations
Collaboration - Work with industry to reduce shipping and seismic survey noise levels in core, western, and predicted habitat
Regulatory measures - Consider mandatory restrictions
Habitat - Keep "quiet" areas quiet -- i.e., no new noise sources in core habitat where noise levels are lower.
Regulatory measures - Expand speed/restriction of vessel transit at night to the west of the core habitat
Regulatory measures - Consider expanding protections from core area to beyond
Habitat - Keep "nearby" areas quiet as well, and future areas of potential occupancy



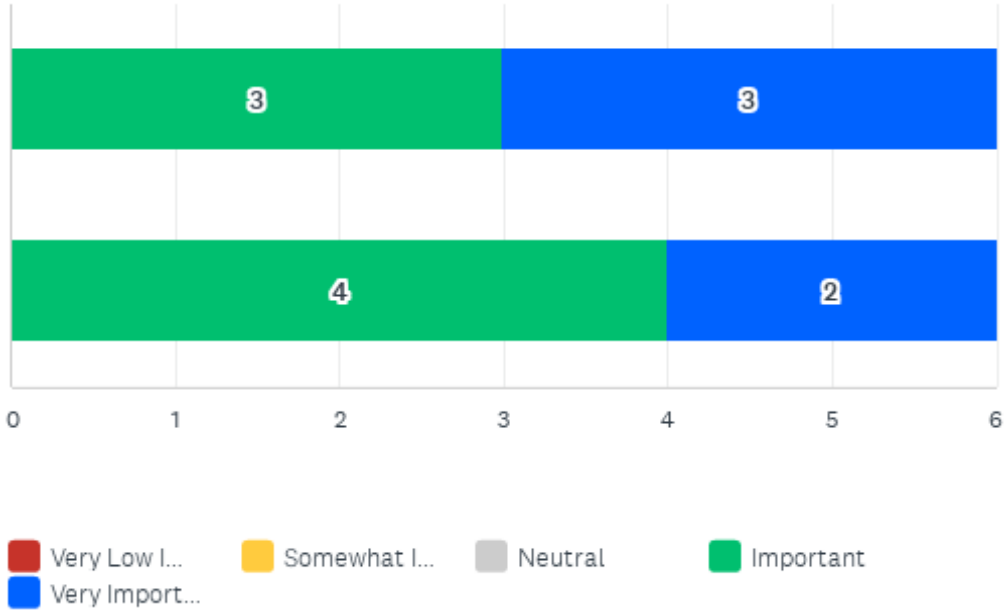
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Collaboration - Work with industry to develop and adopt noise reduction and attenuation technologies/measures newer quieter technologies	0.00% 0	0.00% 0	0.00% 0	16.67% 1	83.33% 5	6	4.83
Regulatory measures - Consider more voluntary restrictions	0.00% 0	0.00% 0	0.00% 0	33.33% 2	66.67% 4	6	4.67
Regulatory measures - Identify the regulatory mechanisms that are currently in place; then develop appropriate management measures to ensure measures are equally restrictive for established operations as they are for new operations	0.00% 0	0.00% 0	16.67% 1	0.00% 0	83.33% 5	6	4.67
Collaboration - Work with industry to reduce shipping and seismic survey noise levels in core, western, and predicted habitat	16.67% 1	0.00% 0	0.00% 0	0.00% 0	83.33% 5	6	4.33
Regulatory measures - Consider mandatory restrictions	16.67% 1	0.00% 0	0.00% 0	0.00% 0	83.33% 5	6	4.33
Habitat - Keep "quiet" areas quiet -- i.e., no new noise sources in core habitat where noise levels are lower.	16.67% 1	0.00% 0	0.00% 0	16.67% 1	66.67% 4	6	4.17
Regulatory measures - Expand speed/restriction of vessel transit at night to the west of the core habitat	16.67% 1	0.00% 0	16.67% 1	0.00% 0	66.67% 4	6	4.00
Regulatory measures - Consider expanding protections from core area to beyond	16.67% 1	0.00% 0	0.00% 0	33.33% 2	50.00% 3	6	4.00
Habitat - Keep "nearby" areas quiet as well, and future areas of potential occupancy	16.67% 1	0.00% 0	0.00% 0	66.67% 4	16.67% 1	6	3.67

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Collaboration - Work with industry to develop and adopt noise reduction and attenuation technologies/measures newer quieter technologies	4.00	5.00	5.00	4.83	0.37
Regulatory measures - Consider more voluntary restrictions	4.00	5.00	5.00	4.67	0.47
Regulatory measures - Identify the regulatory mechanisms that are currently in place; then develop appropriate management measures to ensure measures are equally restrictive for established operations as they are for new operations	3.00	5.00	5.00	4.67	0.75
Collaboration - Work with industry to reduce shipping and seismic survey noise levels in core, western, and predicted habitat	1.00	5.00	5.00	4.33	1.49
Regulatory measures - Consider mandatory restrictions	1.00	5.00	5.00	4.33	1.49
Habitat - Keep "quiet" areas quiet -- i.e., no new noise sources in core habitat where noise levels are lower.	1.00	5.00	5.00	4.17	1.46
Regulatory measures - Expand speed/restriction of vessel transit at night to the west of the core habitat	1.00	5.00	5.00	4.00	1.53
Regulatory measures - Consider expanding protections from core area to beyond	1.00	5.00	4.50	4.00	1.41
Habitat - Keep "nearby" areas quiet as well, and future areas of potential occupancy	1.00	5.00	4.00	3.67	1.25

Noise Recovery Actions - Research / Monitoring

[6 respondents]

Characterizing sound - Continue/expand collection and analysis of long-term PAM data to understand Gulf-wide soundscape
Characterizing sound - Continue/expand collection and analysis of long-term PAM data to better understand Gulf-wide spatio-temporal distribution of RIWH



	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Characterizing sound - Continue/expand collection and analysis of long-term PAM data to better understand Gulf-wide spatio-temporal distribution of RIWH	0.00% 0	0.00% 0	0.00% 0	50.00% 3	50.00% 3	6	4.50
Characterizing sound - Continue/expand collection and analysis of long-term PAM data to understand Gulf-wide soundscape	0.00% 0	0.00% 0	0.00% 0	66.67% 4	33.33% 2	6	4.33

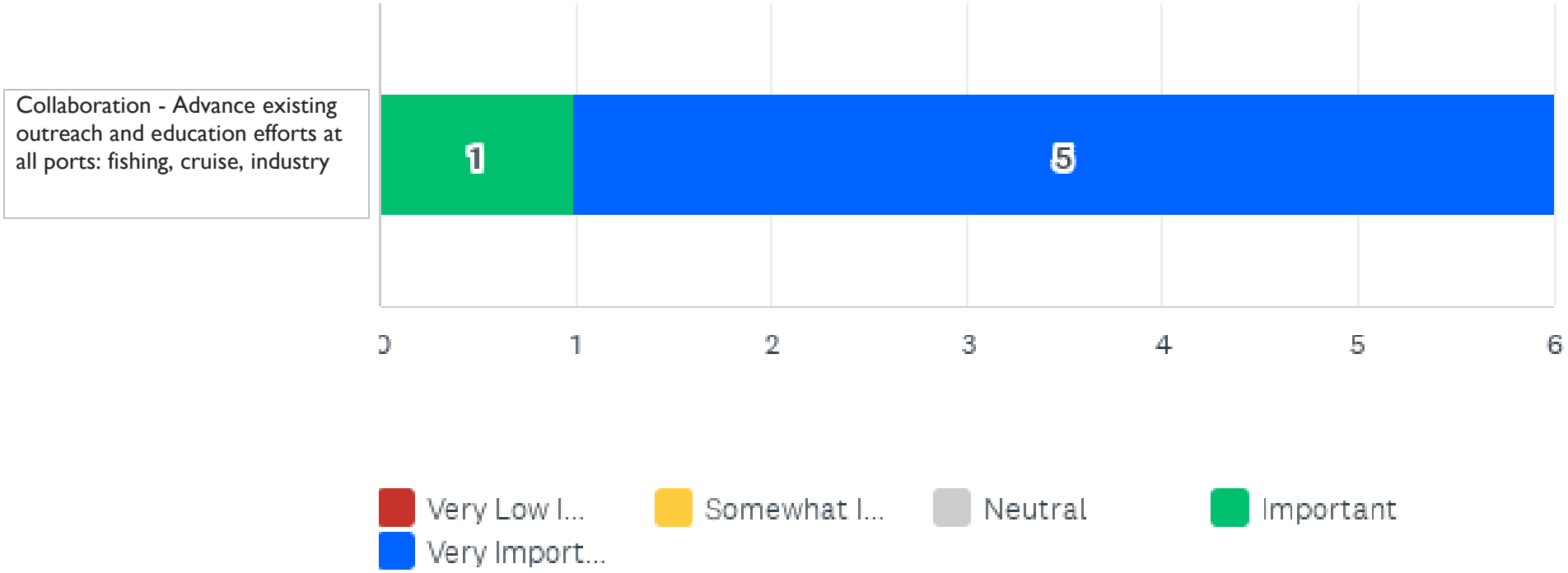
Comments (0)

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Characterizing sound - Continue/expand collection and analysis of long-term PAM data to better understand Gulf-wide spatio-temporal distribution of RIWH	4.00	5.00	4.50	4.50	0.50
Characterizing sound - Continue/expand collection and analysis of long-term PAM data to understand Gulf-wide soundscape	4.00	5.00	4.00	4.33	0.47

Noise Recovery Actions - Outreach & Engagement

[6 respondents]



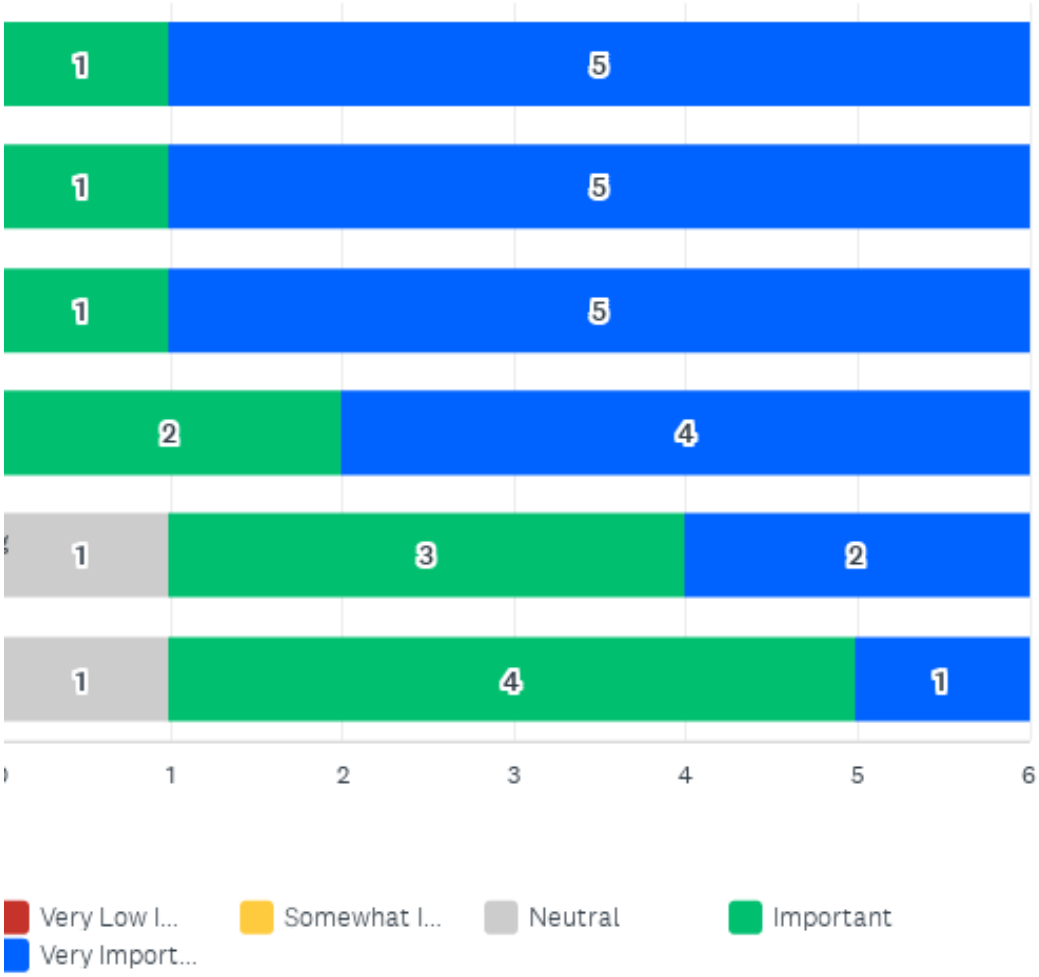
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Collaboration - Advance existing outreach and education efforts at all ports: fishing, cruise, industry	0.00% 0	0.00% 0	0.00% 0	16.67% 1	83.33% 5	6	4.83

BASIC STATISTICS				
Minimum	Maximum	Median	Mean	Standard Deviation
4.00	5.00	5.00	4.83	0.37

Vessel Collision Recovery Actions - Research

[6 respondents]

Characterizing vessel traffic - Characterize vessel traffic in RIWH habitat
Regulatory Measures - Optimize speed zones in space and time to consider different constraints
Regulatory Measures - Better understand seasonal spatial distribution of RIWH to better understand rare events and risk (tagging or passive acoustics)
Characterizing vessel traffic - Characterize night vs/ daytime traffic and diving behavior
[Research/Management] Noise Effects - Evaluate the effect of noise from various vessel types, oil & gas platform safety, and offshore wind farms and hydrokinetic generators if nighttime operations are restricted
Behavior - Develop a better understanding of avoidance behavior



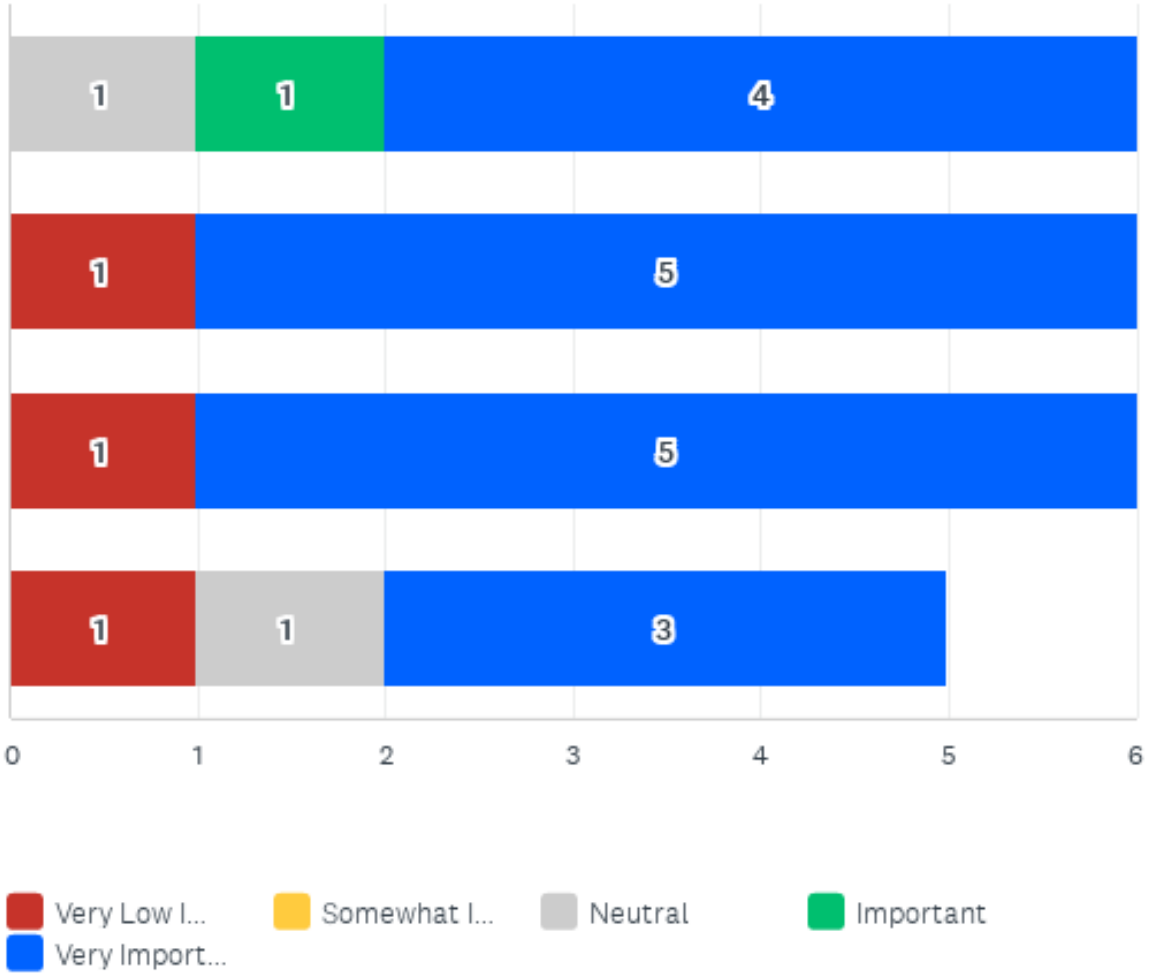
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Characterizing vessel traffic - Characterize vessel traffic in RIWH habitat	0.00% 0	0.00% 0	0.00% 0	16.67% 1	83.33% 5	6	4.83
Regulatory Measures - Optimize speed zones in space and time to consider different constraints	0.00% 0	0.00% 0	0.00% 0	16.67% 1	83.33% 5	6	4.83
Regulatory Measures - Better understand seasonal spatial distribution of RIWH to better understand rare events and risk (tagging or passive acoustics)	0.00% 0	0.00% 0	0.00% 0	16.67% 1	83.33% 5	6	4.83
Characterizing vessel traffic - Characterize night vs/ daytime traffic and diving behavior	0.00% 0	0.00% 0	0.00% 0	33.33% 2	66.67% 4	6	4.67
[Research/Management] Noise Effects - Evaluate the effect of noise from various vessel types, oil & gas platform safety, and offshore wind farms and hydrokinetic generators if nighttime operations are restricted	0.00% 0	0.00% 0	16.67% 1	50.00% 3	33.33% 2	6	4.17
Behavior - Develop a better understanding of avoidance behavior	0.00% 0	0.00% 0	16.67% 1	66.67% 4	16.67% 1	6	4.00

BASIC STATISTICS	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Characterizing vessel traffic - Characterize vessel traffic in RIWH habitat	4.00	5.00	5.00	4.83	0.37
Regulatory Measures - Optimize speed zones in space and time to consider different constraints	4.00	5.00	5.00	4.83	0.37
Regulatory Measures - Better understand seasonal spatial distribution of RIWH to better understand rare events and risk (tagging or passive acoustics)	4.00	5.00	5.00	4.83	0.37
Characterizing vessel traffic - Characterize night vs/ daytime traffic and diving behavior	4.00	5.00	5.00	4.67	0.47
[Research/Management] Noise Effects - Evaluate the effect of noise from various vessel types, oil & gas platform safety, and offshore wind farms and hydrokinetic generators if nighttime operations are restricted	3.00	5.00	4.00	4.17	0.69
Behavior - Develop a better understanding of avoidance behavior	3.00	5.00	4.00	4.00	0.58

Vessel Collision Recovery Actions - Management

[6 respondents]

Regulatory Measures - Consider potential synergies between mitigating vessel speed and vessel noise
Regulatory Measures - Implement mandatory speed limits in core and predicted RIWH habitat for all vessel types
Regulatory Measures - Avoid transit through slow zone at night, Maintain 500 m distance, Require Vessel lookouts, and Report non-compliance to NOAA
Regulatory Measures - Consider/Investigate ATBAs in areas used by RIWH



	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Regulatory Measures - Consider potential synergies between mitigating vessel speed and vessel noise	0.00% 0	0.00% 0	16.67% 1	16.67% 1	66.67% 4	6	4.50
Regulatory Measures - Implement mandatory speed limits in core and predicted RIWH habitat for all vessel types	16.67% 1	0.00% 0	0.00% 0	0.00% 0	83.33% 5	6	4.33
Regulatory Measures - Avoid transit through slow zone at night, Maintain 500 m distance, Require Vessel lookouts, and Report non-compliance to NOAA	16.67% 1	0.00% 0	0.00% 0	0.00% 0	83.33% 5	6	4.33
Regulatory Measures - Consider/Investigate ATBAs in areas used by RIWH	20.00% 1	0.00% 0	20.00% 1	0.00% 0	60.00% 3	5	3.80

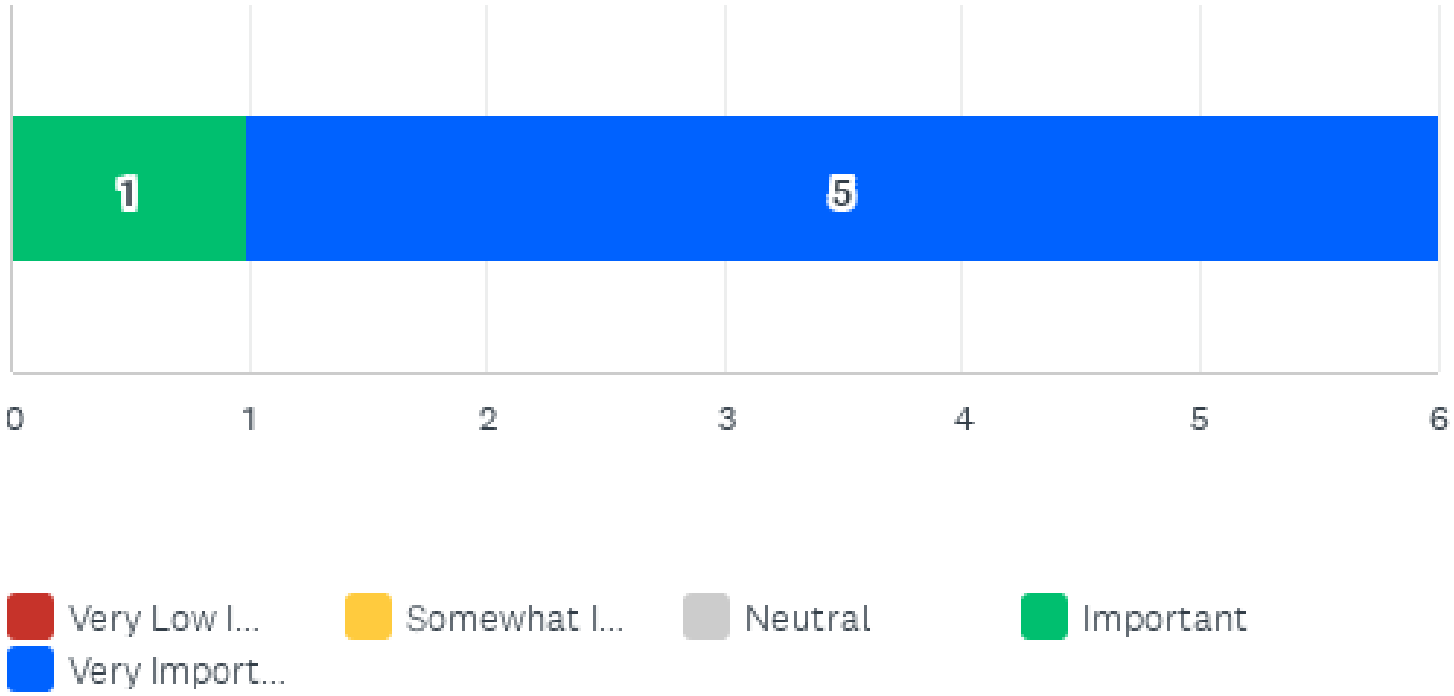
BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Regulatory Measures - Consider potential synergies between mitigating vessel speed and vessel noise	3.00	5.00	5.00	4.50	0.76
Regulatory Measures - Implement mandatory speed limits in core and predicted RIWH habitat for all vessel types	1.00	5.00	5.00	4.33	1.49
Regulatory Measures - Avoid transit through slow zone at night, Maintain 500 m distance, Require Vessel lookouts, and Report non-compliance to NOAA	1.00	5.00	5.00	4.33	1.49
Regulatory Measures - Consider/Investigate ATBAs in areas used by RIWH	1.00	5.00	5.00	3.80	1.60

Vessel Collision Recovery Actions - Monitoring

[6 respondents]

Mortalities - Improve understanding of unobserved vessel strike mortalities.



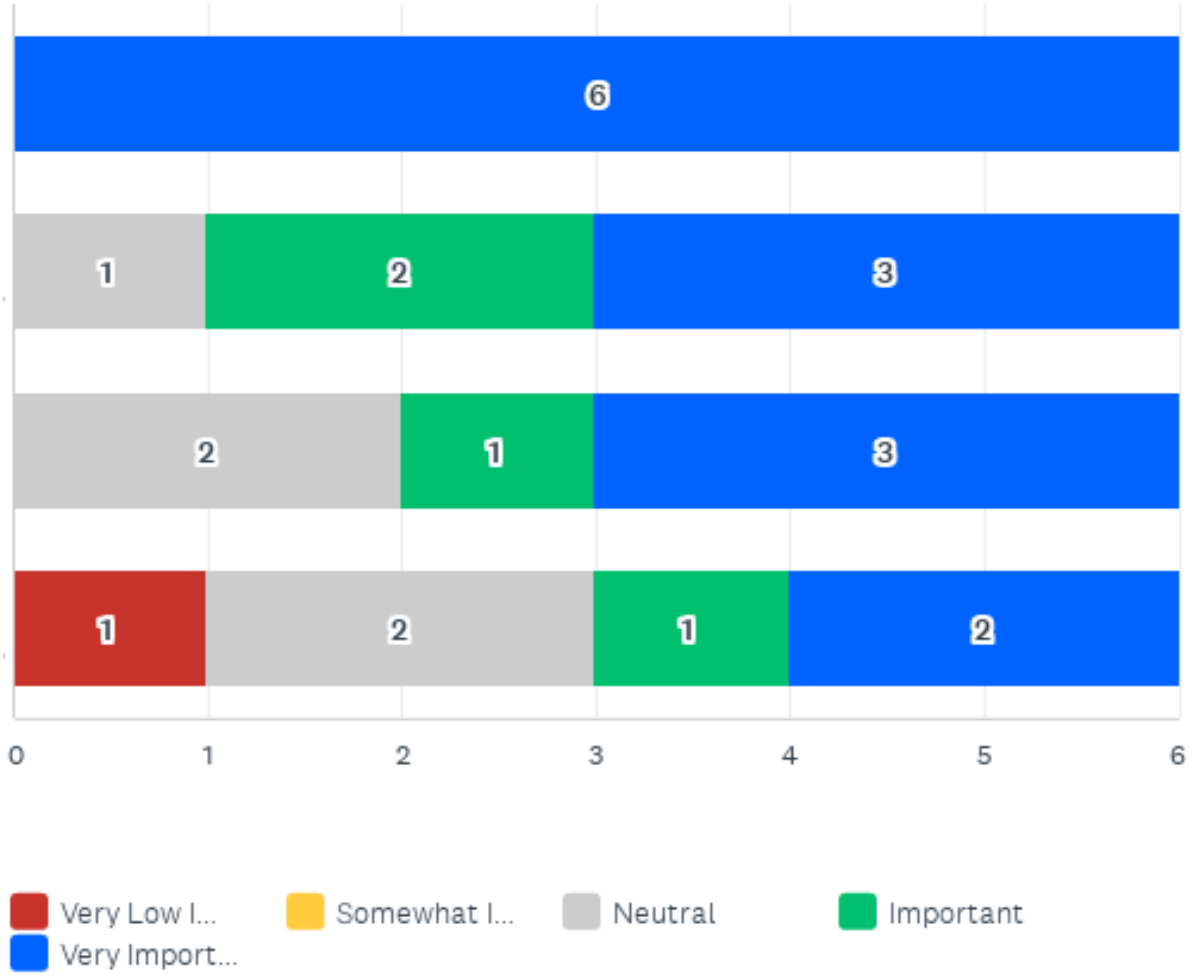
	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Mortalities - Improve understanding of unobserved vessel strike mortalities.	0.00% 0	0.00% 0	0.00% 0	16.67% 1	83.33% 5	6	4.83

BASIC STATISTICS				
Minimum 4.00	Maximum 5.00	Median 5.00	Mean 4.83	Standard Deviation 0.37

Vessel Collision Recovery Actions – Outreach & Engagement

[6 respondents]

Collaboration - Engage and work collaboratively with user groups to identify solutions to mitigate vessel strikes.
Collaboration - Utilize existing or develop new app that synthesizes information and makes it available to vessel operators
Collaboration - Consider a program similar to Canada's Enhancing Cetacean Habitat and Observation (ECHO) program with Chamber of Shipping (Canada)
Collaboration - Hold an annual festival in Gulf of Mexico region to raise awareness of Rice's whales and benefit coastal communities.



	VERY LOW IMPORTANCE (1)	SOMEWHAT IMPORTANT (2)	NEUTRAL (3)	IMPORTANT (4)	VERY IMPORTANT (5)	TOTAL	WEIGHTED AVERAGE
Collaboration - Engage and work collaboratively with user groups to identify solutions to mitigate vessel strikes.	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 6	6	5.00
Collaboration - Utilize existing or develop new app that synthesizes information and makes it available to vessel operators	0.00% 0	0.00% 0	16.67% 1	33.33% 2	50.00% 3	6	4.33
Collaboration - Consider a program similar to Canada's Enhancing Cetacean Habitat and Observation (ECHO) program with Chamber of Shipping (Canada)	0.00% 0	0.00% 0	33.33% 2	16.67% 1	50.00% 3	6	4.17
Collaboration - Hold an annual festival in Gulf of Mexico region to raise awareness of Rice's whales and benefit coastal communities.	16.67% 1	0.00% 0	33.33% 2	16.67% 1	33.33% 2	6	3.50

BASIC STATISTICS

	MINIMUM	MAXIMUM	MEDIAN	MEAN	STANDARD DEVIATION
Collaboration - Engage and work collaboratively with user groups to identify solutions to mitigate vessel strikes.	5.00	5.00	5.00	5.00	0.00
Collaboration - Utilize existing or develop new app that synthesizes information and makes it available to vessel operators	3.00	5.00	4.50	4.33	0.75
Collaboration - Consider a program similar to Canada's Enhancing Cetacean Habitat and Observation (ECHO) program with Chamber of Shipping (Canada)	3.00	5.00	4.50	4.17	0.90
Collaboration - Hold an annual festival in Gulf of Mexico region to raise awareness of Rice's whales and benefit coastal communities.	1.00	5.00	3.50	3.50	1.38

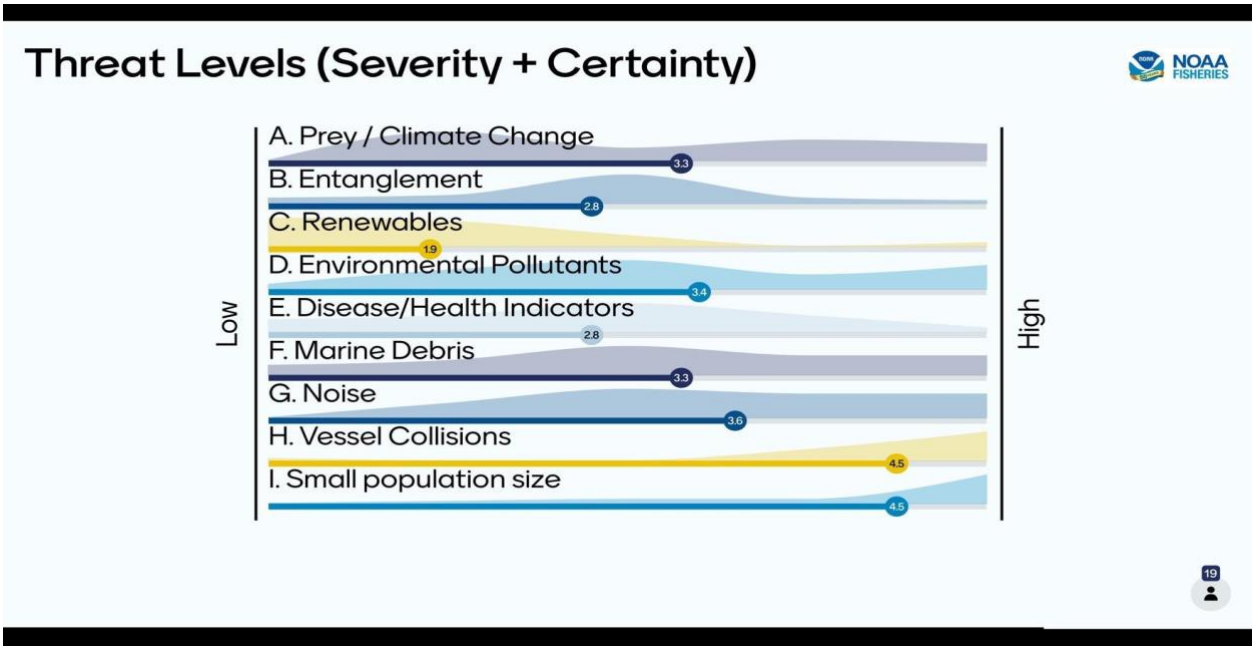
Appendix E – Threat Group Ratings

Workshop #5 Revisit Threat Rankings Discussion and Polling

Participants revisited the threats and threat levels.

Threat level rankings - Menti poll conducted during Workshop #5 (19 respondents)

During Workshop #5, participants were asked to rate the threat level (considering both severity and certainty) for the threat groups discussed during previous workshop sessions. "Score" options ranged from 1 (low threat) to 5 (high threat). The results, shared below, show the average ranking scores (in the circles) and the range in selections (as bell curves):



Appendix F - Recovery Criteria Brainstorm Notes

During each of the five sessions, NOAA Fisheries staff provided background on Recovery Criteria – when a species is listed as threatened or endangered under the ESA, the Act requires that recovery plans incorporate objective, measurable criteria, which, when met, would result in a determination that the species be removed from the list (i.e., delisted). Developing objective/informative, and measurable criteria for a Recovery Plan focus on two areas:

- **Population dynamics-based criteria**. These criteria (not required but highly recommended) address the species' long-term viability as measured by overall abundance, productivity, spatial distribution, and diversity.
- **Threats-based criteria**. These criteria focus on the reduction of threats that may have caused the population decline or that limit recovery, and must address each ofthe five ESA section 4(a)(1) factors that led to the listing of the species (i.e., habitat destruction or modification; overutilization; disease or predation; inadequacy of existing regulations; and other natural or manmade factors affecting its continued existence).

After a general overview of recovery criteria and examples from other Recovery Plans, workshop participants were asked to brainstorm on suggested recovery criteria for Rice's whale related to that day's topics (population dynamics or specific threat groups). Participants were encouraged to be as specific as possible with suggested criteria (e.g., measurable and informative) as well as identify where there is room for flexibility.

NOAA Fisheries staff captured participants' input on a Mural board during workshop sessions; participants then had a week after each session to provide additional input on the Mural board. Recovery criteria discussed during the first four workshop sessions were then compiled and presented during the fifth and final workshop session for more in-depth discussions. Participants were also given time after Workshop #5 to provide additional input if desired.

This appendix presents the full recovery criteria brainstorm notes from Workshop #5 and post-workshop comments. The summary report captures the suggested objectives, recovery criteria ideas, and key points from the plenary discussion.

Recovery Criteria Brainstorming Google Doc Notes

OBJECTIVE	DEMOGRAPHIC-BASED RECOVERY CRITERIA IDEAS (metrics and thresholds)	COMMENTS Expand on the (reclassification/delisting) criteria. How might these criteria work (justification/how the criteria will be objectively measured)?

(1) Ensure the **biological productivity/population size and trend** of the RIWH has met or exceeds target levels **(high)**
 	
(ranked 4.5 on threat ranking poll)
	• There are at least 355 individuals, measured by the lower 95% confidence bound of a stock assessment, and stable or increasing population estimate over 2 generations
	  ○ *[355 assumes starting w/ ~50 individuals w/ annual growth rate of 4% over next 50 years]*
	
	• *Probability of extinction and/or population trend as evidenced by a stock assessment or PVA analysis should be be <X% over Y years (consider short-term benchmarks in addition to long-term)*
		• CV should be high for stable/increasing population trend
		• Abundance estimate may be arbitrary until a later time
		• The following values are based on literature for Florida manatee: Reclassified from "Endangered" to "Threatened" with:
		  ○ Probability of the adult population falling below 500 animals on either coast within 100 years is 0.42% (Runge et al. 2015).
		  ○ Expected Minimum Population size was estimated at ~2,360 over 100 years
		  ○ Comment: Can we find a more closely analogous surrogate species to use here?
		• Trail et al. (2010) recommended a minimum viable population size of ~5000. There are several assessments of MVP available in the literature (e.g., Wang et al. 2019)
		• I think the abundance targets are low and the time is short for actual de-listing. The levels here are more in tune with other species criteria for EN-TH threshold
		• Need some historical context here on population size. Use genomics
		• Examine density and productivity to say how many animals could be supported in the habitat
		• Look at similar Bryde's-like species for reasonable maximum reproductive rate, fastest growth rate.
		• Is 50 years actually long enough of a timeframe here?
		• Have species reached maximum sustainable population levels considering their currently preferred habitat

	• There are at least 1000+ individuals, and stable or increasing population estimate over 2 generations	• CV should be high for stable/increasing population trend • Abundance estimate may be arbitrary until a later time
	• There are X# or % of breeding females and the fecundity rate is stable or increasing ○ Reproductive female survival rate and/or	• Can we tie this to a stock assessment model or population viability analysis?

	calving rate is X (good threshold for downlisting vs. delisting) [Comment: Is calving rate sufficient, or does a calf survival rate need to be included here?] ○ Total population growth rate is X% and the survival rate is Y%	
	● Genetic variability is deemed sufficient (this doesn't capture inbreeding) ○ This can be measured by…… ● ^Maintain genetic diversity by incorporating insights from demographic history into abundance criteria	● Instead of static/arbitrary/potentially unattainable fixed threshold population size number, focus on genetic diversity as a metric [Comment: I don't see genetic diversity as something that is suitable as a criteria for this species, but genomic data can inform the demographic history of the species and hence inform the first point about the number of individuals needed to maintain the diversity the species has. Is this a naturally rare species not vulnerable to inbreeding depression or does it need to reach a higher abundance to maintain the genetic diversity key to this species success in a relatively small body of water (for a whale). Perhaps the criteria should be: *Maintain genetic diversity by incorporating insights from demographic history into abundance criteria*] [Comment added] ● See upcoming paper in *Science* by Barb Taylor et al. about vaquitas and inbreeding depression not truly being a risk. They found empirical evidence that: 1) there is no evidence they've lost diversity in the past 30 years, 2) genomic data show evidence of purging deleterious genes (because they've been rare for 300,000 years) and don't have genes known to reduce fitness, and 3) PVAs incorporating that genomic data indicate a high chance of recovery even from 10 individuals if bycatch is eliminated. ● Need to specifically evaluate the components of small pop size that are threatening vs. not. ● For vaquitas, were able to quantify into a PVA model to determine that inbreeding depression is not a big of a threat as originally presumed
(2) Ensure that adequate **habitat (and prey? [but prey is in #10])** are available and are not limiting the recovery of	● There is adequate available habitat and sufficient transboundary distribution to support stable and/or increasing population ○ Core habitat is X% of the GOMx; species might occupy a larger portion of the	● i.e., geographic range expansion in Mexico and/or Caribbean ● [Comment: Can we wrap prey in here too? Ensure adequate habitat and prey to support a recovered population. Adequate would have to be defined.][Comment added] ● Consider X% of core habitat based on what can be gleaned from

RIWH and are managed accordingly **(threat level = ?)**	GOMx ○ Potential future habitat/unoccupied habitat is protected ● The distribution of the species is robust to anticipate catastrophes that have an X% chance of occurring in Y time. (Note that 'robust' will need to be defined in quantitative terms.) ● Establish corridors between known areas with suitable habitat that would result in probabilities of mortality < PBR from known threats ○ There is safe passage/connectivity to other habitat (so there is source/sink availability) ○ At a minimum, the current core habitat is maintained [Comment: Is this too low of a bar? Agree it must be maintained, but is that enough?]	whaling records [Comment: If using historical records, we need to consider how the GOM has changed since that time. Climate change, development, etc. Habitat that was formerly suitable may have experienced major changes in environmental factors since the historical records were obtained.] ● Population is spread over a larger area to ensure redundancy and resiliency of habitat [Comment: Resiliency needs to be specific to threats to be helpful. I think catastrophes need to be specifically noted. Resiliency to an oil spill catastrophe may have different properties than resiliency to a climate induced event, like a blob. Perhaps at this high level, the recovery criteria needs to be something like: *The distribution of the species is robust to anticipated catastrophes that have an X% chance of occuring in Y time. Note that 'robust' will need to be defined in quantitative terms*.] [Comment added] ● Clearly assess potential connectivity with Caribbean and Mexican waters via genetic studies prior to setting thresholds to ensure thresholds are appropriate ● Focus on habitat in existing occupied range rather than assuming potential spread outside De Soto area, which may or may not prove suitable/desirable for the species [Comment 1: I think the focus should be beyond the existing core habitat. We should assume that animals may move outside their current purported range.] [Comment 2: A specific item should be added to address the potential detrimental aspect of whales transiting through high risk areas to get to suitable habitat. Perhaps for this high-evel habitat/distribution objective the criteria should be something like: *Establish corridors between known areas with suitable habitat that would result in probabilities of mortality < PBR from known threats*] [Comment 2 added] ● Define "adequate" ○ In terms of both environmental/bioenergetic parameters and available prey ● Two pieces need to be defined: (a) what constitutes suitable habitat, and (b) how much do you need? Could you state this demographic criterion as a desired carrying capacity? ● Is there a metric from a proxy species that we could refer to? Other Bryde's whale complex members could be used as a proxy. Specifically, tropical whales.

		• I wonder if the concept of "habitat" is confusing us, because habitat is really the sum total of all the threatening processes. Is the demographic criterion simply something about carrying capacity?
	• Criteria not just for space but also for prey biomass and quality...	• Could a minimum prey biomass/population size be considered as a metric?

(3) Address threats from **vessel strikes and manage accordingly** **(high)**
 	
(ranked 4.5 on threat ranking poll)
	• There is sufficient evidence to indicate that vessel speed and size, and transit traveled in the core habitat are not impeding the viability of RIWH
	  ○ This can be measured by X% of AIS tracks are at speeds <Y km/hr [Comment: This metric doesn't capture all vessel traffic in the area]
	  ○ This can be measured by a threshold of estimated vessel strikes have at least a 90% chance of mortalities being <PBR (current PBR = 0.1) and this is based on modeling that incorporates uncertainty
	  ○ This can be measured by evidence of either no propeller wounds or propeller wounds healing as documented by long-term photo-ID (i.e., resightings over years). If RIWH are being negatively affected by vessel strikes, regulations and/or protected areas have been implemented. [Comment: For fishery entanglements, larger whales survive and bear evidence of entanglement injuries that can be measured, while smaller whales don't survive to observe this evidence. Is there an analogous situation for vessel strike wounds such that absence of observed injuries doesn't equate to absence of vessel strikes?]
		• Note that estimated vessel strikes would need to rely on modeling that could be improved through increased data
		• Reduce km of vessel traffic in core area by X% to reduce noise and vessel strike risk (could be done with routing, and could also focus on night-time traffic).[Comment: Is this only AIS vessels? What about recreational/fishing, etc.] Note that if this relies on AIS data, would need to ensure that longitudinal changes are real, and not AIS requirements changing or vessels turning AIS off, etc.
		• Do international vessels have AIS? Yes, large vessels do.
		• Verified number of vessel transits in target areas at some target speed selected to reduce strike risk and radiated noise (with reduced air emissions as correlate)
		• Need to achieve some target related to improvements in quantifying--in finer--detail both spatial and temporal distribution data (as well as baseline diving behavior to get the Z dimension) as this is pivotal to assessing the risk of both strike and disturbance and deriving strategic response is vital to recovery [Comment: Consider doing some near-real-time monitoring in the core habitat, to begin with, or in targeted high-vessel traffic routes to assess potential Rice's whale and vessel traffic overlap? This could inform vessel size/speed restrictions.]
		• Consider use of photo documentation from both planned line transect surveys and opportunistic (e.g. PSOs) to evaluate for potential ship strike injuries
		• I would support a metric based upon observed scarring rates/injury rates rather than one based on vessel speed or other metrics of traffic characterization- but it would require a minimum level of dedicated monitoring effort to detect these. [Comment: I could counter with the fact that these are such rare events, I wonder if it is a viable metric. But, if modeling were involved, then scar rates could be used in the modeling perhaps]

		• Military uses within preferred core habitat • Considering where core area expands west, there are existing O&G structures that require servicing • Related to Barb's comment (importance of modeling to capture uncertainty), the criteria could be tied to "expected mortality" see Crum, N., Gowan, T.A.*, Krzystan, A.M., Martin, J. (2019) Quantifying risk of whale–vessel collisions across space, time, and management policies. Ecosphere, 10, e02713. https://doi.org/10.1002/ecs2.2713
	• Management measures that reduce the risk of vessel strike [Comment: to <1 compliance 99% for 10 years?] to X are in place and compliance remains greater than Y% over Z years.	• Examples from other species: ○ Regulation implementing retention prohibition in pelagic longline vessels is maintained and compliance remains greater than X% over the next X years. ○ Turtle Excluder Devices maintained (97% exclusion rate) and enforced in shrimp fisheries in Gulf of Mexico, Southeast Atlantic
	• Use a combinations of: sufficient evidence to indicate that vessel speed and size, and transit traveled in the core habitat are not impeding the viability of RIWH, This can be measured by a threshold of estimated vessel strikes have a 90% chance of mortalities being <PBR (current PBR = 0.1), and Management measures that reduce the risk of vessel strike to X are in place and compliance remains greater than Y% over Z years.	
	• There exists an exclusion zone of no traffic (at least for large vessels) in the core habitat at night to ensure the viability of the species. ○ There are no deaths by vessel strike up to <10% of PBR and in the future, vessel strikes aren't limiting the viability of the population ○ (this is more or a regulatory measure--consider adding to criteria 8)	• Reducing speeds is likely not enough; similarly to vaquitas, there was zero tolerance for fishing in their habitat • Just remove the risk of vessel strikes to get at unseen mortalities since strikes and noticing strikes are rare

(4) Address threats from **anthropogenic noise and manage accordingly** **(high)** **(ranked 3.6 on threat ranking poll)**	• Noise levels (acute and chronic) are monitored in known and potential habitat and are below a threshold (X) level ○ If a quantitative threshold cannot be determined based on current information, could X instead be described qualitatively, e.g., "below the threshold at which X effects [masking, trauma, etc] are expected to occur"?	• Set a target of ongoing noise reduction from threshold X at time point Y • Needs to consider "masking" (note this is a narrow band of noise for RIWH though it is the predominant level of vessel sound; look at conspecific species) [Comment: Consider both frequency of sound and inter-pulse interval for intermittent sounds] • We don't know what sound levels impact animals or what frequency levels they are most sensitive to, so this is a data gap to fill. Is it sound level, or peak level or what that is most important? That needs to be fleshed out. • Core habitat = just because the sound levels there are driving them out of that range doesn't mean it's still not affecting RIWH. Specifically air guns are an issue. • Sound levels in potential habitat are much higher • Different criteria for core habitat vs potential habitat? • We don't know levels that are fully affecting species vs. partially affecting species
	• Management actions sufficiently address the effects of anthropogenic ocean noise (e.g., vessel traffic, sonar, alternative energy development) on RIWH and their habitat such that it is not adversely affecting and/or reducing their ability to successfully travel, communicate, and forage, and is not causing population-level effects	• If a management-related criteria is used in combination with the criteria above, consider reframing this in terms of noise levels, e.g., management actions are in place to maintain noise levels below the threshold at which X effects are expected to occur."
	• Noise levels within primary habitat are below levels that may interfere with feeding/communication, etc/	• Link noise with habitat • Where primary habitat is defined as anywhere that could support RIWH -not just in the current core habitat. • Since these are recovery criteria, the primary habitat sounds appropriate • Do we need to separate different mechanisms by which noise might be acting? Mechanism 1: reducing the core habitat area (essentially confines carrying capacity). Mechanism 2: preventing efficient feeding, through masking (perhaps reduces reproductive rate). Or something like that. Does that make it easier to define recovery criteria?

(5) Address threats from **environmental contaminants and manage accordingly (high → oil)**
 	
(ranked 3.4 on threat ranking poll; but if oil was separated out, it would be >4.0)
	• There is sufficient evidence to indicate that contaminant levels in the marine environment (i.e., POPs, PCBs, DDTs, PBDEs, heavy metals, and CECs) are not impeding the viability of RIWH.
	  ○ This can be measured in RIWH tissues, prey species, or surrogate marine mammals as well as in water samples in the GOMx.
	  ○ It can also be measured by determining if the cause of death from a stranding is due to elevated environmental contaminants. (Difficult to assess, so not sure if this is useful for POPs but it is for oil)
		• This could include data showing that overall contaminant levels in the population are decreasing or accumulation of legacy contaminants is slowing, or information that younger animals have a proportionally reduced contaminant load.
		• A decrease in the number of contaminated sites in XXX (if there are any) would also indicate a reduction in contaminants in a portion of the habitat of RIWH
		• Also consider environmental quality related to aquaculture off flows
		• The annual risk of an oil spill that produces a slick greater than x mi2 is less than y%.
		• It seems like a metric based on the occurrence/coverage of oil slicks from the remotely sensed data shown during workshop 3 is measurable and quantifiable.

	• Oil and hazardous substance spill prevention and response plans are in place and effectively address protections for RIWH and their habitat ○ This can be measured by a reduction (by X amount) of detected oil slicks to sufficiently ensure no effects on species	• A detailed response plan is in place for rapid deployment if/when a contaminant emergency occurs (define "rapid" in terms of habitat or species) • How would we detect this? • Can "effectively" be further described? • Can effectively be defined by what didn't work for DWH? There must be some time elements in responding and other lessons from that experience. Look at other species and other oil spill incidents. Criteria may have been developed for eg. CA sea otters.
	• There is minimal to zero expansion of new activities inside the core and predicted habitat (e.g., aquaculture, space launch/recovery), etc. that result in exposure to environmental contaminants and disease	• Include flexibility in determining when threshold has been reached • Is the number of new activities resulting in exposure to contaminants the correct metric though? Or rather should we think about impacts to the species?
	• The annual risk of an oil spill that produces a slick greater than X mi2 is less than Y%	• Y should be linked to extinction/survival rate; X is related to how oil affects the species and then the size of the spill. • Can effectively be defined by what didn't work for DWH? There must be some time elements in responding and other lessons from that experience.
(6) Address threats from **marine debris and**	• There is sufficient evidence that ingestion of marine debris is not causing population-level effects by	• Lack of info on amount of debris in habitat (exposure) and difficulty in identifying how that exposure would affect the animal

manage accordingly (high) **(ranked 3.3 on threat ranking poll)**	impeding the viability of RIWH ○ This can be measured by examination of the cause of death during necropsy. That is, while marine debris may be found in stomach contents, there is not an increase of strandings and known deaths attributable to ingestion of marine debris leading to population-level effects of RIWH	• Add in outreach to ocean-users on not adding marine debris into the environment, etc. • Link criteria to prevent • Data needs: occurrence of microplastics in prey stomachs, occurrence of larger debris (ghost gear, line, macroplastics) in the environment, and monitoring of animals for impacts from debris (necropsy, entanglement scars, etc)
	• Marine debris is reduced within RIWH critical habitat such that there are no lethal events within X years (< PBR) ○ A trained response team is in place for responding to disentanglements	• Collaborate with industry stakeholders/other ocean users with skills and access necessary to catalog and remove marine debris to develop a debris removal and monitoring program • Is it possible to measure the amount of marine debris in RIWH habitat? • Most likely the carcass will not be detected - need to fill debris information gap and then do risk assessment • Differentiate land-based and marine-based generated trash and debris • Rather than 'no lethal events' make this similar to the earlier one on PBR…estimated mortalities from marine debris does not together with mortalities estimated from other threats exceed PBR. • Since PBR is an MMPA concept, not an ESA requirement, are we using PBR here as a proxy for whatever the ESA-appropriate level of allowable mortality is? Or do we specifically mean PBR, since RIWH are protected by both ESA and MMPA?
	• Evidence of introduction of marine debris from ocean sources has been reduced by X% (90%?) [better to prevent the debris than try to remove it] • Estimated mortalities from marine debris does not, together with mortalities estimate from other threats, exceed PBR	• Reduce overlap between whales and debris, something that speaks to prevention aspect. • Systematic monitoring program to collect information on debris, provide a baseline or metric (since we likely don't have historical information). • Structure this criteria: microplastics, Macroplastics, fishing gear and nets, etc. • It's hard to make a direct connection to recovery criteria here.
(7) Better understand the effects of **climate change** and manage accordingly	• There is sufficient evidence to indicate that short- and long-term effects from climate change-related threats, such as ocean warming, diminished productivity, and ocean acidification, are not	• Climate related change in bottom water temperatures in the shelf-break region of the GoMex (100m-400m bottom depths) is less than X degrees C over Y years..(proxy for productive upwelling area) • Polar bear example: ice-free period is <4 months

(high) **(ranked 3.3 on threat ranking poll)**	impeding the viability of RIWHs. ○ This can be measured in quantity (biomass), quality (size), and availability of prey species and/or body condition of RIWHs (and relationships with body condition, e.g., disease, not eating due to disturbance) ○ Measured through changes in species distribution patterns from currently defined core habitat in the NE GoM [Comment 1: Changes in species distribution should also be evaluated in terms of increase/decrease in the use of risky or less risky habitats that may impede recovery.][Comment 2: Need to think about the difference between changes in distribution patterns from what is currently known vs new knowledge of distribution patterns in areas where there historically is limited data (e.g. Southern GOM)]	• If prey is the measurement mechanism, need a metric here: upwelling zones, etc. • Changes in dive patterns/respiratory changes due to shifting prey changes in the water column (temporally and spatially - horizontal and vertical) that may result in energy deficits, i.e., whales are not meeting their daily energetic requirements. • Seeing what has happened with NARW, as well as whale shifts driven by climate change along the west coast - resulting in increased vessel strikes and entanglements, this should be a major concern.
	• Distributional shifts resulting from climate change are accounted for in risk estimates such that expected recovery time is not delayed by > x% (10%?)	• If they can't go deeper, maybe they can go laterally (depending on other threats in that area though); even though we can't change things about climate change rapidly, we can try to better deal with other threats to the species
(8) Ensure that r**egulatory mechanisms**, including state and federal management and post-delisting monitoring, are in place prior to delisting **(high)**	• Regulatory mechanisms other than the ESA are in place to successfully manage threats and ensure that RIWH remains stable or increases after it is delisted	• Are there regulatory mechanisms in place (e.g., Fishery Management Plans) to prevent overexploitation of potential prey item or development of new fisheries that may impact RIWH prey.?
	• Regulations are in place to limit the introduction of harmful contaminants, and there is evidence of decreasing levels of contaminants detected in RIWH, prey species, or surrogate marine mammal populations, or evidence that the current level of contaminants causes no harm to the whales.	• What is the spatial scale of limiting the introduction of harmful contaminants? In RIWH habitat, Gulf of Mexico, etc.? • Are we referring to the current level of contaminants in the environment or in the whales?

	• A post-delisting monitoring plan is in place (what about pre-delisting monitoring?)	• Monitoring can be captured in all threats criteria
	• Sufficient monitoring is in place to assess population status and progress toward recovery goals(? Is this ok?) and identify emerging threats.	• Sufficient prey needs to be expressly monitored
(9) Address threats from **entanglements and manage accordingly** **(moderate)** **(ranked 2.8 on threat ranking poll)**	• Entanglement risk in RIWH habitat (and nearby habitat) is <PBR (i.e., zero or is targeted to be zero) over X # of years (short #) and is model-based vs. empirically-based	• Monitoring of Gulf activities is sufficient to document such attainment • What data are needed to evaluate entanglement risk? Is it possible to collect and/or monitor for that information? • Similar to vessel strike risk as detection of entanglement may be challenging, so need to rely on risk modelling.
	• The threat of entanglement has been evaluated, and, if determined to be impeding Rice's whale recovery, measures have been taken to minimize effects. Following this evaluation and where effects to the species are known, specific measures have been taken to minimize effects.	• Similar to the regulatory mechanisms above - can expansion of fisheries in or adjacent to RIWH habitats be prevented (e.g., Pelagic longline closures remain in place). • Again, this could be put in terms of PBR, but a high probability of not exceeding PBR and estimated through modeling. For now, fishing practices that have caused Bryde's whale deaths should be prohibited within their core range. • Similar to other criteria above, the target could be linked to population size and removal limits which change with population size • If entanglement rates can be estimated via evidence for scaring, then perhaps they can be incorporated into the modeling

(10) Address threats related to **prey and manage accordingly** **(low)**
 	
(ranked 3.3 on threat ranking poll)
	• The diet of RIWH and prey availability/abundance to sustain the population is sufficient to support a healthy population
	  ○ This can be measured in quantity (biomass), quality (size), and availability of prey species and/or body condition of RIWHs
	  ○ Quantity and quality of prey (calories) is enough to ensure reproduction, nursing of calves, etc.
		• Sufficient prey exists in places where other threats do not overlap
		• Scale of prey-based dynamics is deemed adequate
		• Consider effects from ecosystem (community-level species interactions, trophic cascades/ changes) and climate change here in the criteria
		• Also, prey will need to support future recovered population size
		• If climate change is considered here, then the ranking of prey might need to reflect that
		• Likely can quantify prey
		• SRKW Example: Objective: Ensure adequate habitat to support a recovered population of SRKW. Habitat needs include sufficient quantity, quality, and accessibility of prey species. Criteria: A1. Observations indicate that lack of prey is not a source of mortality or a

		factor limiting recovery of SRKW. Consistent observations or measurements of good body condition in a significant number of individuals, and no or limited observations of reduced feeding behavior or recovery of SRKW to determine that established fishery management regimes are not likely to limit the recovery of the whales. • If threat ranking is related to funding, then threats to prey needs more research and rated higher • Difficult to separate threat from the cause of the threat (reduced prey due to climate change or due to fisheries, etc.)
	• Harvest of offshore prey is not limiting the recovery or viability of RIWH ○ The standing biomass (abundance, availability, accessibility) of pelagic prey is X (more than there is now)	
	• From SRKW: Observations indicating that lack of prey is not a source of mortality or a factor limiting recovery of Southern Residents. Consistent observations or measurements of good body condition in a significant number of individuals, and no or limited observations of reduced feeding behavior or recovery of emaciated stranded animals.	• From CIBW RP: Measures are in place to evaluate and ensure adequate habitat exists to support a recovered population of CI belugas. Habitat needs include sufficient quantity, quality, and accessibility of prey species to support a stable or growing population at the identified demographic criterion level. Sub criteria: Sufficient prey are available to, at a minimum, sustain CI belugas at the identified demographic criterion level. This determination shall take into consideration belugas' energetic requirements, accounting for variances due to age, sex, and reproductive status, and the specific prey available to CI belugas. Absent information specific to CI belugas, estimates of the energetic requirements of belugas in other wild populations or belugas in captivity may be used as proxy values in this determination.
(11) Ensure that **secondary threats and synergies** among threats are not limiting recovery of the RIWH and manage accordingly **(threat level = ?)**	• There is sufficient evidence that each of the secondary threats independently is not causing population-level effects by impeding the viability of RIWH	
	• There is sufficient evidence that cumulative and synergistic effects among all of the threats are well understood and are not causing population-level effects by impeding the viability of RIWH	• For polar bears, I think we dealt with cumulative effects by referring back to the fundamental recovery criterion (probability of persistence), saying something like the combined effect of all threats didn't raise the risk of extinction to an unacceptable level.

		• Threats of any magnitude could potentially work synergistically and therefore with increased severity or frequency and act both directly and indirectly on RIWH. This could result in negative effects on individuals and the population. Having a better understanding of many of these threats is needed to fully understand the potential for cumulative and synergistic effects among them as well as how best to mitigate them. • SRKW recovery plan has a very small and general comment regarding cumulative effects and provides some examples. For SRKWs, one example is disturbance effects on foraging along with low prey numbers
	• Monitoring of RIWH is deemed sufficient for rapid response (~6 months) of redistribution brought about by multiple acute stressors	
(12) Address threats from **disease and manage accordingly** **(low)** **(ranked 2.8 on threat ranking poll)**	• A disease research and risk management plan is in place to adequately study, monitor, and manage for diseases that may affect Rice's whales	
	• X% amount of the population is considered "healthy" (based on skin and body condition)	• Criteria is set to improve reproductive success/calving success that is consistent with recovery • Maybe this type of criteria would also be appropriate for addressing threats related to prey?
	• There is sufficient evidence to indicate that effects from climate change are not increasing the widespread presence of disease vectors and thus impeding the viability of RIWHs. ○ This can be measured by the prevalence or severity of infectious diseases caused by pathogens, fungi, worms, or parasites. That is, results from biopsies, breath analyses, and/or necropsies do not indicate that there is an over burdensome load of infectious disease(s) leading to reduced health and fitness or mortality in individuals	

(13) Address threats from **marine structures** (e.g., aquaculture, renewable energy, sediment diversion, etc.) **(threat level = ?)**	• There is sufficient evidence that interactions with marine structures (e.g., aquaculture, renewable energy, sediment diversion, etc.) are not causing population-level effects by impeding the viability of RIWH. ○ This can be measured in a marked increase in sighting rate and duration and altered behavior of RIWH near marine structures. If RIWH are being negatively affected, regulations or other measures have been implemented to reduce interactions	
(14) Address threats from small population size (e.g., allee effects, demographic stochasticity) **(threat level = ?)**	• Pop has recovered such that allee effects are not a concern	• Maybe capture this in demographics as well as demographic stochasticity to the list of things that affect small population size

Appendix G – References

The following lists the references mentioned during workshop presentations and discussions (i.e., Zoom chat)

Workshop Session #1 - October 18, 2021

- Presentation on Section 7 Consultations under the Endangered Species Act by Allison Hernandez
    - (Conn and Silber 2013, Jansen and Silber 2004, Pace and Silber 2005, VanWaerbeek and Leaper 2008, Vanderlaan and Taggart 2007) * *Rockwood et al 2017
- Presentation on Rice's Whale Population Status and Distribution by Lance Garrison, Melissa Soldevilla, Laura Dias,Kevin Barry
    - Spatial Density Models- Roberts et al., 2016
- Chat References
    - Reeves et al. 2011. https://aquila.usm.edu/goms/vol29/iss1/4/
- Breakout Room Chat References
    - None listed

Workshop Session #2 - November 1, 2021

- Trophic Ecology of Rice's Whales
    - Small pelagics trawl data 2003-2013: NMFS, Southeast Fisheries Science Center
- Potential Threats from Fisheries & Aquaculture to Rice's Whales
    - Figures from Garrison & Stokes 2021
    - Figure from Soldevilla et al. 2017.
    - Figures from Mathers et al. 2020
    - Presentation available: https://gulfcouncil.org/wp-content/uploads/E-6-Manna-Fish-Farms-Gulf-of-Mexico_Update_lucas_GMFMC_6242021.pdf
- Plenary Chat References
    - None Listed
- Breakout Room Chat References
    - https://mote.org/research/program/center-for-fisheries-electronic-monitoring-at-mote-cfemm
    - Mandatory Ship Reporting System for North Atlantic right whale conservation: https://www.aoml.noaa.gov/phod/research/ecosystems/msr/
    - https://www.fisheries.noaa.gov/feature-story/new-passive-acoustic-monitoring-framework-help-safeguard-marine-resources-during

Workshop Session #3 - November 10, 2021

- Threat of Pollution to the Rice's Whale Population
    - None Listed
- Overview of Oil Spill, Contaminants, HABs, Pathogens Potential Impacts on Rice's Whales
    - BiOp 2020; Berenshtein et al. (2020a) showing spatiotemporal dynamics of the spill for dates showing cumulative oil concentrations in figures G- 15 May 2010; J- 18 June 2010; and M- 2 July 2010
    - Smith et al. (2021) IOSC Proc Vol 1
    - Thomas et al. (2021) https://www.mmc.gov/wp-content/uploads/21-05-13-BB-dolphin-popn-trajectory-MMC-response.pdf

    - Updated model in Marques et al. (in preparation) ; NOAA Library Webinar: Population Consequences of DWH oil spill for pelagic whale and dolphin species https://youtu.be/9_mlDu04yyU
    - https://www.nap.edu/catalog/23479/approaches-to-understanding-the-cumulative-effects-of-stressors-on-marine-mammals
- Marine Debris
    - None listed
- Plenary Chat References
    - https://www.health.state.mn.us/communities/practice/resources/phqitoolbox/prioritizationmatrix.html
    - https://www.naccho.org/uploads/downloadable-resources/Gudie-to-Prioritization-Techniques.pdf
- Breakout Room Chat References
    - publications on SRKW breath https://www.nature.com/articles/s41598-017-00457-5

Workshop Session #4- November 16, 2021

- Assessing acoustic impacts on marine mammals: Current understanding, recent progress, and future directions
    - McKenna (2020) Physics Today
    - Revised Auditory Exposure Criteria: Hearing, weighting functions, TTS/PTS onset Thresholds Southall et al., 2019
    - Migrating Bowhead whales and Seismic Surveys (Richardson et al., 1991)
    - Echolocating Porpoises and Seismic Surveys (Pirotta et al., 2014)
    - Risk Assessment Framework: Biological Significance of Noise Exposure
    - (Southall et al., 2018; in prep)
- Rice's Whales & Noise: Anthropogenic Noise Sources and Acoustic Habitat
    - Hildebrand 2005
    - Long-term DWH HARPs Wiggins et al 2016 June 2010 – Sept 2013
    - Pilot study Shelfbreak HARPs Soldevilla et al in prep July 2016 – July 2017
- Rice's whale recovery planning workshop: Vessel strikes
    - Annual average vessel traffic (kilometers) in the Gulf of Mexico by vessel type (AIS data 2016-2018)
    - Rosel et al. 2021, Rockwood et al. 2017, Williams et al. 2011
    - Conn and Silber 2013
    - Kelley et al. 2021
    - Unpublished data, Roberts et al. 2016
    - Soldevilla et al. 2017
    - Constantine et al. 2015
    - Currie et al. 2017
    - Reeves et al. 2011
- Plenary Chat References
    - Ebdon et al. 2020 Ocean & Coastal Management https://www.sciencedirect.com/science/article/pii/S0964569119309044?casa_token=dCyH1CE_9KUAAAAA:KTi1fiWhdrlPmbRnnJjr25rgF1U9ttYBLG5F2Pk2JFPUBrWoZ2T2ilmvVs_wPfJi0Pr2gTwtTnI
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