



MARINE MAMMAL COMMISSION

26 January 2022

Mississippi Trustee Implementation Group
c/o U.S. Fish and Wildlife Service
P.O. Box 29649
Atlanta, Georgia 30345

Dear Trustee Implementation Group Members:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Mississippi Trustee Implementation Group's (MS TIG) Draft Restoration Plan/Environmental Assessment 3: Habitat Projects on Federally Managed Lands; Sea Turtles; Marine Mammals; Birds; and Provide and Enhance Recreational Opportunities (draft RP/EA). The draft RP/EA evaluates the MS TIG's alternatives for restoring marine mammals and other marine resources injured by the *Deepwater Horizon* (DWH) oil spill.

Alternatives considered for marine mammal restoration

The MS TIG analyzed three alternatives for restoring injured marine mammals, with two identified as preferred by the TIG and one as non-preferred (including estimated project costs)—

- Alternative MM1 (preferred): Maintaining enhanced marine mammal stranding network capacity and diagnostic capabilities (\$2,350,000);
- Alternative MM2 (non-preferred): Marine mammal health assessments to monitor population health (\$3,000,000); and
- Alternative MM3 (preferred): Reduction of marine mammal fishery interactions through trawl technique and component material improvements (\$3,090,000).

Background on the project screening process

The range of alternatives was developed by the MS TIG through a screening process that evaluated marine mammal projects submitted via the DWH Natural Resource Damage Assessment (NRDA) Trustee Council Project Submission Portal and the MS Department of Environmental Quality Restoration Project Portal, as well as project ideas developed by the MS TIG and Gulf restoration reports, management plans, and other related efforts. The screening process considered the restoration goals identified for marine mammals in the *Deepwater Horizon's* NRDA Trustees' Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement (DWH NRDA Trustees 2016) and the Strategic Framework for Marine Mammal Restoration Activities (DWH NRDA Trustees 2017), as well as evaluation factors in the Oil Pollution Act (OPA) regulations (15 C.F.R. § 990.54) and the availability of funds for marine mammals in the MS restoration area (\$10 million) under the DWH NRDA settlement

payment schedule. Alternatives 1 and 2 are directed at restoration of all Gulf of Mexico marine mammals; Alternative 3 is primarily directed at restoration of the MS Sound stock of common bottlenose dolphins, which was significantly affected by the DWH oil spill (DWH NRDA Trustees 2016).

Collaborative workshop on MS bottlenose dolphins

In January 2021, the Commission moderated a virtual workshop on collaborative conservation for common bottlenose dolphins in MS state waters. The workshop was convened by NOAA's National Marine Fisheries Service (NMFS) and included researchers and managers from organizations and institutions across the state, including the Institute for Marine Mammal Studies (IMMS), Mississippi State University (MSU), MS Aquarium, MS Departments of Environmental Quality and Marine Resources, National Fish and Wildlife Foundation (NFWF), various NMFS offices, the University of Southern Mississippi, and representatives from Alabama (AL) and Louisiana (LA) stranding network organizations. The focus of the workshop was on the MS Sound/Lake Borgne/Bay Boudreau (MS Sound) stock of common bottlenose dolphins (i.e., the bottlenose dolphin stock that inhabits MS state waters). However, many of the workshop discussions were applicable to other marine mammal stocks that may strand in MS coastal waters. Workshop participants provided an overview of current and emerging capabilities¹, and summarized the current "state of the science" regarding what is known and not known about the abundance and conservation status of MS Sound common bottlenose dolphins and the natural and human-caused stressors affecting them. Key outcomes² of the workshop (see enclosed) included recognition of the need for data standards and data sharing to enhance information available to assess marine mammal stock abundance and trends in abundance, and for integrating data across seasons, areas, and programs. Data standards and data sharing were also noted as needed for investigations of stranded dolphins (e.g., what tissues are best for what types of analyses), cause of death determinations, and health evaluations of live free-swimming dolphins through remote visual assessments, remote sample collection, and targeted studies. Workshop participants stressed the benefits of enhanced collaboration among stranding network members, MS-based aquariums and universities, and state agencies to develop appropriate methods to monitor dolphin interactions with fisheries in MS Sound and to support investigations of cetaceans affected by oil spills and other environmental disasters. Consistent, standardized, collaborative efforts to integrate across studies and locations were also noted by workshop participants as critical for improving understanding of the status and health of MS Sound common bottlenose dolphins. The Commission believes that the discussions and key outcomes from the workshop can be helpful in informing the evaluation of the MS TIG's restoration plan alternatives for MS Sound common bottlenose dolphins as well as other marine mammals.

Evaluation of the marine mammal restoration alternatives

Alternative MM1 (preferred): Maintaining enhanced marine mammal stranding network capacity and diagnostic capabilities—Complete information on total human-caused mortality and serious injury was lacking

¹ Facilitated in recent years by funding provided by the NFWF Gulf Environmental Benefit Fund under the [Marine Mammal and Sea Turtle Conservation, Recovery, and Monitoring Program – Phase I](#).

² https://www.mmc.gov/wp-content/uploads/MS-Bottlenose-Dolphin-Workshop_Jan-2021_Key-Outcomes_final.pdf

for many common bottlenose dolphin stocks and other Gulf marine mammal stocks prior to the DWH oil spill (DWH NRDA Trustees 2016) and continues to be a significant data gap (Hayes et al. 2021). Information compiled from stranding networks is used to improve understanding of population demography, stock structure, vital rates (reproduction and survival), and causes of disease, injury, and mortality. When integrated with other environmental data through programs such as NOAA's Marine Mammal Health Monitoring and Analysis Platform for the Gulf (GulfMAP³) and the Open Ocean TIG's Compilation of Environmental, Threats, and Animal Data for Cetacean Population Health Analyses (CETACEAN⁴) project, data from strandings can also help to evaluate environmental and anthropogenic factors associated with trends in the health and abundance of marine mammals and other marine species and also help determine causes of illness and death.

The draft RP/EA states that this is a three-year project that would focus on maintaining the enhanced capacity of the MS stranding network to respond to sick, injured, and dead marine mammals⁵. The first component of the project would build on recent efforts⁶ to enhance the capacity of the MS marine mammal stranding network, which will be completed in 2022, and would continue to enhance the ability to respond to stranded marine mammals. It would cover personnel, equipment, supplies, training, and vehicle fuel and maintenance for response efforts by federally authorized MS stranding network members and enhance data reporting into regional marine mammal health and stranding databases (e.g., GulfMAP, CETACEAN) to inform data-driven management actions aimed at reducing marine mammal mortality. It would also provide for response to unusual natural or human-caused events, contingent on availability of funding. The second component would support timely and efficient analyses of the causes of illness and death of marine mammals that continue to strand in large numbers. It would enable veterinary personnel at MSU⁷ to continue to participate in necropsies and other diagnostic examinations, facilitate tissue analyses to assess trends in causes of mortality, and support data entry, archival, and reporting.

Consistent with the findings of the collaborative workshop, and to ensure continued support of the marine mammal stranding network in MS, the Commission recommends that the MS TIG implement Alternative MM1 as a means to improve decisions by network members regarding the care and treatment of stranded cetaceans, enhance the assessment and response to natural and human-caused stressors on marine mammal health, and evaluate causes of illness, injury, and mortality. The Commission encourages the MS TIG to stress with project leaders, stranding network members, and the regional and national stranding network coordinators the importance of (1) data standardization and data sharing amongst Gulf of Mexico stranding networks and institutions, (2) timely submission of information gained from stranding cases for peer review and publication, and (3) continued development of strong collaborations with NMFS, academic institutions, and other

³ <https://www.mmc.gov/priority-topics/marine-mammal-health-and-strandings/marine-mammal-health-and-monitoring-analysis-platform-marine-mammal-health-map/>

⁴ <https://www.gulfspillrestoration.noaa.gov/project?id=231>

⁵ The Commission notes that the project would also assist in response to entangled and out-of-habitat marine mammals.

⁶ Under NFWF's Gulf Environmental Benefit Fund (GEBF) project: [Marine Mammal and Sea Turtle Conservation, Recovery, and Monitoring Program – Phase I](#).

⁷ Under an agreement between MSU's College of Veterinary Medicine and IMMS, a longstanding federally authorized stranding network member in Mississippi.

organizations as appropriate to improve data collection methods and technologies, analytical capabilities, and network member training.

Alternative MM2 (non-preferred): Marine mammal health assessments to monitor population health—This project would enhance capabilities to rapidly assess dolphin health to identify impacts of threats by conducting health assessments on live common bottlenose dolphins using catch-and-release methods and photo-identification surveys with remote biopsy sampling. The project would require considerable collaboration with federal and state partners and other organizations with experience in catch-and-release health assessments and remote biopsy sampling of common bottlenose dolphin bay, sound, and estuary (BSE) stocks. The MS TIG determined that the project would have a high likelihood of success, but recommended that the other two marine mammal alternatives be implemented first. The Commission agrees that stronger collaborations, training, and tool development envisioned under the MS TIG's Alternative MM1, as well as similar programs implemented or proposed to enhance marine mammal stranding response capabilities in other parts of the Gulf⁸, would lead to greater success in implementation of a comprehensive life history and health assessment program for MS Sound common bottlenose dolphins. However, the Commission believes that efforts to restore common bottlenose dolphin populations in MS would benefit greatly from the timely implementation of a well-designed photo-identification survey with remote biopsy sampling as the first component of a staged approach to implementing life history and health assessments. Remote biopsy sampling can provide important life history and health data, including sex, age, genetics, contaminants, stable isotopes, fatty acids, reproductive hormones, stress hormones, percent lipid content, and epigenetics, without the need to catch live dolphins. The Commission therefore recommends that the MS TIG work with NMFS to develop protocols and a plan for including photo-identification surveys with remote biopsy sampling as a restoration strategy for MS Sound common bottlenose dolphins in the near future. The Commission further recommends that MS TIG carefully evaluate the additional information that might be gained from catch-and-release health assessments and the costs and benefits associated with such a program to determine to what extent they should be included as a restoration strategy for MS common bottlenose dolphins in the future.

Alternative MM3 (preferred): Reduction of marine mammal fishery interactions through trawl technique and component material improvements—Mortality and serious injury of marine mammals in shrimp trawl gear is currently unmitigated. Even with limited observer coverage (less than one percent) of the commercial shrimp trawl fishery, several interactions with cetaceans were documented from 1997 to 2019, involving Atlantic spotted dolphins, three stocks of coastal common bottlenose dolphins, the continental shelf common bottlenose dolphin stock, and 31 BSE stocks of common bottlenose dolphins, including the MS Sound stock (Soldevilla 2015, 2016, 2021). Entanglements were reported in trawl gear lazy lines, the main body of nets, Turtle Excluder Devices (TEDs), try nets, and the lines running from the trawl footrope to the tickler chain (Soldevilla et al. 2015, 2016, 2021). Annual mortality estimates of common bottlenose dolphins from the MS Sound stock (and other Gulf of Mexico bottlenose dolphin stocks) in shrimp trawl gear from 1997 to 2019 have consistently

⁸ For example, by the AL, LA, and Regionwide TIGs.

exceeded the stocks' Potential Biological Removal (PBR)⁹ levels (Soldevilla et al. 2015, 2016, 2021, see also Appendix V in Hayes et al. 2021), and are underestimates of total mortality. Clearly, effective actions are needed to reduce the frequency of dolphin entanglements in shrimp trawl gear.

The January 2021 workshop on collaborative conservation for common bottlenose dolphins in MS state waters (mentioned herein) highlighted (1) uncertainties regarding the distribution of commercial shrimp trawl effort in MS by gear type (i.e., skimmer vs. otter trawl), (2) the need to develop methods for quantitative estimation of mortality and serious injury of dolphins in shrimp trawl and other fishing gear, and (3) the need to develop gear modifications to reduce dolphin interaction rates.

It is well-established that most dolphin interactions with trawl gear in the Gulf of Mexico and elsewhere are due to dolphins intentionally depredating on finfish prey in or near active fishing nets (Santana-Garcon et al. 2018, Lorenz 2015, Broadhurst 1998, Fertl and Leatherwood 1997, Hill and Wassenberg 1990, Leatherwood 1975). This can result in loss of catch and damage to the nets (Fertl and Leatherwood 1997), which is frustrating and costly to fishermen and can be harmful to dolphins either caught in gear or targeted for retaliation by fishermen. The draft RP/EA notes dolphin depredation of skimmer trawl nets in MS waters is common, and cited a study that found that dolphins routinely swim alongside or under the skimmer trawl net and prey on finfish that become gilled in the trawl webbing, leaving bite holes in the net (Hataway and Foster 2015). That study found that dolphins are most aggressive at tearing the net when fish accumulate in pockets during haulback of the cod end (Hataway and Foster 2015). The draft RP/EA proposes to investigate two potential gear modifications suggested by the study authors: (1) stronger webbing that is more resistant to damage by dolphins, and (2) the use of protective coverings on the trawls (e.g., webbing socks) to prevent dolphins from accessing fish that have been gilled in the netting. Those approaches, and others mentioned in the Hataway and Foster (2015) report, such as ensuring that trawl have a smooth taper design to prevent fish from bunching up and making the trawl net more visible to fish at night, seem promising and warrant further investigation to determine their effectiveness at decreasing depredation of skimmer trawls by dolphins.

Although gear modifications have been effective in reducing bycatch of sea turtles (using TEDs¹⁰) and non-target finfish species (using bycatch reduction devices, or BRDs¹¹) in shrimp trawl gear, gear modifications alone may not be sufficient considering the role of dolphin behavior in gear interactions. A more thorough analysis of existing observer data, fisherman interviews and/or workshops, and increased observer coverage of the shrimp trawl fishery in MS state waters, and on skimmer trawl vessels specifically, would result in a better understanding of the factors associated with dolphin interactions with shrimp trawl gear. Reports of interactions between dolphins and trawl gear from other regions might also be instructive. For example, one study of dolphin depredation on demersal trawl gear in Western Australia noted that a contributing factor to more risky dolphin interactions (i.e., interactions resulting in injury to dolphins) appeared to be instability of fishing gear, particularly the otter boards used to maintain the integrity of the net during fishing. The

⁹ PBR is defined in Section 3(20) of the Marine Mammal Protection Act as the maximum number of animals, not including natural mortality, that may be removed from a stock while allowing the stock to reach or maintain its optimum sustainable population.

¹⁰ <https://www.fisheries.noaa.gov/southeast/bycatch/turtle-excluder-devices>

¹¹ <https://www.fisheries.noaa.gov/southeast/bycatch/bycatch-reduction-devices-gulf-mexico-and-south-atlantic>

authors recommended mitigation strategies that focus on improving and monitoring the stability of the gear during active fishing, for example by deploying sensors on the otter boards to monitor their orientation and stability during fishing (Santana-Garcon et al. 2018). Depredation appears to be a learned behavior of dolphins in areas of active trawling (Hill and Wassenberg 1990). Thus, the Commission also suggests investigating strategies to reduce dolphins' association of shrimp trawling with access to prey, perhaps by limiting or preventing at-sea discards in areas frequented by dolphins.

There is limited observer coverage in the skimmer trawl fishery, even though they are responsible for up to 55 percent of landings in Gulf state waters (Soldevilla et al. 2021). Skimmer trawl vessels operate in bays and coastal state waters throughout the northern Gulf of Mexico that are generally less than 3.6 m (12 ft.) deep (Hein and Meier 1995, Pulver et al. 2012). Skimmer trawl vessels are presumed to interact with BSE stocks of common bottlenose dolphins wherever that gear is used, including in MS state waters, although no serious injuries or mortalities have been observed (Pulver et al. 2012, Scott-Denton et al. 2020, Soldevilla et al. 2021). Alternative MM3 includes a plan for voluntary gear modifications in the MS skimmer trawl fishery, but implementation of gear modifications without a better understanding of how dolphins interact with skimmer trawl gear would make it extremely challenging to evaluate the effectiveness of any gear modifications.

To address common bottlenose dolphin interactions with shrimp (otter and skimmer) trawl vessels in MS state waters, the Commission recommends that the MS TIG implement Alternative MM3, with a primary focus on identifying and implementing gear modifications with the greatest potential for reducing dolphin interactions and injuries. To inform its efforts, the Commission recommends that the MS TIG (1) work with NMFS to increase observer coverage of the shrimp trawl fishery in MS state waters, (2) interview fishermen individually and/or at workshops about their experiences with dolphin interactions with shrimp trawl gear, (3) conduct a more thorough analysis of existing observer data, fisherman interviews, and the literature to determine alternative gear modifications that may have even greater potential to reduce interactions with shrimp trawl gear, and (4) investigate and implement, to the extent possible, fishing strategies to address factors that contribute to dolphin depredation, such as minimizing at-sea discards of non-target catch by shrimp trawl vessels, particularly in the presence of dolphins or in areas with high rates of dolphin depredation. The extent to which funding might be available to help alleviate the cost of fishermen adopting gear modifications determined to be most effective in the skimmer trawl fishery should also be explored.

Other restoration alternatives

In addition to the marine mammal restoration alternatives discussed herein, the Commission supports implementation of the *Habitat Projects on Federally Managed Land Alternative FM1: Improve Native Habitats by Removing Marine Debris from MS Barrier Islands*. Entanglement and ingestion of marine debris are significant conservation threats to marine mammals in the Gulf of Mexico and globally (Adimey et al. 2014, Baulch and Perry 2014). The ingestion of a hard piece of plastic material was implicated in the death of an endangered Rice's whale in Florida in March 2019¹². The

¹² <https://www.fisheries.noaa.gov/feature-story/dna-confirms-rare-brydes-whale-florida-gulf-mexico-species>

proposed activities under this alternative would be to remove marine debris on MS barrier islands managed by the National Park Service's Gulf Islands National Seashore. The Commission recommends that the MS TIG implement Alternative FM1 as part of its final restoration plan to reduce the potential for ingestion and entanglement of marine mammals in marine debris. As part of this program, the Commission recommends that the MS TIG collect data on the types, amounts, and areas where marine debris is removed.

The Commission appreciates the opportunity to review the draft RP/EA and hopes that the MS TIG finds these comments helpful. Please contact me if you have any questions concerning any issues raised in this letter.

Sincerely,



Peter O. Thomas, Ph.D.,
Executive Director

Enclosure

References

- Adimey, N.M., C.A. Hudak, J.R. Powell, K. Bassos-Hull, A. Foley, N.A. Farmer, L. White, and K. Minch. 2014. Fishery gear interactions from stranded bottlenose dolphins, Florida manatees and sea turtles in Florida, U.S.A. *Marine Pollution Bulletin* 81:103–115.
- Baulch, S., and C. Perry. 2014. Evaluating the impacts of marine debris on cetaceans. *Marine Pollution Bulletin* 80:210–221.
- Broadhurst, M.K. 1998. Bottlenose dolphins, *Tursiops truncatus*, removing by-catch from prawn-trawl codends during fishing in New South Wales, Australia. *Marine Fisheries Review* 60(3):9–14.
- DWH NRDA Trustees. 2016. *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. <http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan>
- DWH NRDA Trustees. 2017. *Deepwater Horizon* Oil Spill Natural Resource Damage Assessment: Strategic Framework for Marine Mammal Restoration Activities. <https://www.gulfspillrestoration.noaa.gov/strategic-frameworks>.
- Fertl, D., and S. Leatherwood. 1997. Cetacean interactions with trawls: A preliminary review. *Journal of Northwest Atlantic Fishery Science* 22:219–248.
- Hataway, D., and D. Foster. 2015. Investigating dolphin interactions with skimmer trawls using the DIDSON aboard the F/V Seaweed 2000. NMFS Southeast Fisheries Science Center, Pascagoula Laboratory Engineering and Harvesting Systems Branch, Pascagoula, MS. 15 pages.
- Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, and J. Turek (eds.). 2021. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2020. NOAA Technical Memorandum NMFS-NE-271, Woods Hole, Massachusetts. 394 pages.

- Hein, S., and P. Meier. 1995. Skimmers: Their development and use in coastal Louisiana. *Marine Fisheries Review* 57(1):17–24.
- Hill, B. J., and T. J. Wassenburg. 1990. Fate of discards from prawn trawlers in Torres Strait. *Australian Journal of Marine and Freshwater Research* 41(1):53–64.
- Leatherwood, S. 1975. Some observations of feeding behavior of bottle-nosed dolphins (*Tursiops truncatus*) in the northern Gulf of Mexico and (*Tursiops cf T. gilli*) off southern California, Baja California, and Nayarit, Mexico. *Marine Fisheries Review* 37(9):10–16.
- Lorenz, Crysta M. 2015. Bottlenose dolphin (*Tursiops truncatus*) behaviors in the presence of active and non-active shrimp trawlers in the Mississippi Sound. The University of Southern Mississippi Honors Theses 303. https://aquila.usm.edu/honors_theses/303
- Pulver, J.R., E. Scott-Denton, and J.A. Williams. 2012. Characterization of the U.S. Gulf of Mexico skimmer trawl fishery based on observer coverage. NOAA Technical Memorandum NMFS-SEFSC-636, 27 pages.
- Santana-Garcon, J., C.B. Wakefield, S.R. Dorman, A. Denham, S. Blight, B.W. Molony, and S.J. Newman. 2018. Risk versus reward: interactions, depredation rates, and bycatch mitigation of dolphins in demersal fish trawls. *Canadian Journal of Fisheries and Aquatic Sciences* 75(12):2233–2240.
- Scott-Denton, E., P.F. Cryer, B.V. Duffin, M.R. Duffy, J.P. Gocke, M.R. Harrelson, A.J. Whatley, and J.A. Williams. 2020. Characterization of the U.S. Gulf of Mexico and South Atlantic Penaeidae and rock shrimp (Sicyoniidae) fisheries through mandatory observer coverage, from 2011 to 2016. *Marine Fisheries Review* 82(1–2):17–46.
- Soldevilla, M.S., L.P. Garrison, E. Scott-Denton, and J.M. Nance. 2015. Estimation of marine mammal bycatch mortality in the Gulf of Mexico shrimp otter trawl fishery. NOAA Technical Memorandum NMFS-SEFSC-672, Miami, Florida. 70 pages.
- Soldevilla, M.S., L.P. Garrison, E. Scott-Denton, and R.A. Hart. 2016. Estimated bycatch mortality of marine mammals in the Gulf of Mexico shrimp otter trawl fishery during 2012 to 2014. NOAA Technical Memorandum NMFS-SEFSC-697, Miami, Florida. 47 pages.
- Soldevilla, M.S., L.P. Garrison, E. Scott-Denton, and J. Primrose. 2021. Estimated bycatch mortality of marine mammals in the Gulf of Mexico shrimp otter trawl fishery during 2015 to 2016. NOAA Technical Memorandum NMFS-SEFSC-749, Miami, Florida. 79 pages.

Workshop on Collaborative Conservation for Common Bottlenose Dolphins in Mississippi State Waters: 11-13 January 2021

Summary of Presentations, Data Needs, and Collaboration Opportunities



The purpose of this workshop was to enhance conservation of common bottlenose dolphins (dolphins) in Mississippi (MS) state waters by fostering collaborations and strengthening capacity for science, management, and marine mammal health. The workshop included researchers and managers from organizations and institutions across MS, and was convened by the National Marine Fisheries Service (NMFS). The Marine Mammal Commission (MMC) moderated the discussion and prepared this summary.

Workshop Objectives

- Provide an overview of the current status, health, and survival of dolphins in MS state waters
- Provide an overview of current threats impacting dolphins in MS state waters and related management challenges
- Discuss the current status of research activities in MS state waters and identify critical uncertainties
- Identify data, research, and partnership gaps and priority needs to address critical uncertainties and inform conservation of dolphins in MS state waters
- Determine immediate and long-term activities to address priority needs, and
- Identify and foster opportunities for coordination, communication, and collaboration.

Workshop Agenda and Discussions

Day One: The MS-based organizations each gave round-robin presentations on their current and future research and management priorities, focal areas, and critical uncertainties in the study of threats, status, and health of dolphins in MS state waters.

Day Two: The NMFS Southeast Fisheries Science Center, Southeast Regional Office, and Office of Protected Resources staff gave presentations on the status of dolphin stocks in MS state waters, major threats, stranding patterns, Unusual Mortality Events (UMEs), and health factors. Participants discussed critical uncertainties and priority needs regarding the status of dolphin stocks and primary threats.

Day Three: Participants continued discussion of threats, how abundance estimates are derived by NMFS, examples of successful collaborations in the Gulf of Mexico and elsewhere, and wrap-up/action items.

Presentation Highlights

Organizational Overviews

- Institute for Marine Mammal Studies (IMMS) has a 35+ year history working on dolphins and other marine mammals in the northern Gulf. Their expertise is in stranding response and research, rehabilitation, education, and outreach.
- The Mississippi State University College of Veterinary Medicine (MSU-CVM) has a long-standing history of research in aquatic animal health. They have board-certified veterinary pathologists and epidemiologists as well as veterinarians experienced in clinical care and advanced imaging of marine animals in addition to laboratories experienced in the specialized testing necessary for marine animals.
- The Mississippi Aquarium has emerging capabilities to provide veterinary care for captive dolphins and conduct baseline research to further understanding of wild dolphin behavior, physiology, and threats.
- The Mississippi Department of Environmental Quality (MS DEQ) serves to strengthen state partnerships and foster collaboration, coordination, and enhanced capacity in accordance with state priorities. It also represents the state on its DWH Trustee Implementation Group.
- The Mississippi Department of Marine Resources (MS DMR) coordinates state-funded research efforts regarding water quality and marine resources. Its focus is on water quality parameters associated with marine ecosystems.
- The National Fish and Wildlife Foundation (NFWF) has provided funding through its Gulf Environment Benefit Fund to enhance the capacity of the marine mammal stranding program and make information from strandings more accessible and useful for management.
- University of Southern Mississippi (USM) has a history of marine mammal research and is expanding its

technological capabilities to support coastal resilience, understanding of coastal and ocean issues, and the Blue Economy. It offers technology and infrastructure to further marine research in the Gulf.

- The NMFS Southeast Fisheries Science Center (SEFSC) Marine Mammal and Turtle Division (MMTD) conducts research on Gulf marine mammals. MMTD staff have conducted marine mammal abundance surveys since the 1970s, and participate in tagging/telemetry studies, bycatch monitoring, and age and growth studies. MMTD staff focus also on developing habitat models, bycatch estimation, passive acoustic monitoring, coordination of stranding and UME response for the Southeast, and genetics analyses to assist in species identification and stock structure.
- The NMFS Southeast Regional Office (SERO) coordinates management and conservation activities regarding marine mammals and implementation of the Marine Mammal Protection Act, including coordination and administration of the stranding response program.
- The Office of Protected Resources' (OPR) Marine Mammal Health and Stranding Response Program leads NMFS's implementation of marine mammal response and health investigations through strong partnerships, collaboration, and sound science. The program oversees UME response and investigations, stranding and entanglement response, bio-surveillance, health and stranding data management, and health studies on live and dead marine mammals.

State of the Science

- There is one estuarine stock of dolphins in MS state waters. The stock boundaries encompass MS Sound, Lake Borgne, Bay Boudreau, and adjacent Gulf coastal waters extending one km from the MS Sound barrier islands.
- Abundance estimates are derived from aerial line-transect surveys or small vessel-based Capture-Mark-Recapture (CMR) photo-ID surveys; CMR surveys are currently not inclusive of all MS Sound waters. Additionally, not all photo-ID data are currently used in stock assessments due to differences in methodologies across studies.
- Our understanding of the stock structure of dolphins in MS Sound is limited. Although individual home ranges may be relatively small, recent studies indicate the boundaries of the population may extend into waters outside MS Sound (e.g., Chandeleur Sound).
- Major ongoing threats to dolphins in MS state waters include exposure to episodic low salinity events, fishery interactions (i.e., shrimp trawl, menhaden purse seine, hook-and-line, and crab pot gear), harmful algal blooms (HABs) and other environmental threats, and intentional harm (e.g., shooting).
- There is currently no observer coverage on commercial fishing vessels in MS state waters. Information from strandings, on-water surveillance, and fisher self-reporting suggests that fishery-related mortality is underestimated.
- Dolphins in MS Sound were significantly affected by the Deepwater Horizon (DWH) oil spill. There is concern that changing environmental conditions (e.g., freshwater impacts, extreme weather events) and planned restoration effects (e.g., sediment diversions) could impact recovery.
- Dolphins in the northern Gulf continue to be subject to large-scale mortality events. The most recent mortality event occurred in 2019 (part of the second Northern Gulf UME) and was attributed to exposure to low salinity waters resulting from extreme freshwater discharges, with most of the mortalities occurring in MS and eastern Louisiana.
- The role of oil spills, other contaminants (including persistent organic pollutants, heavy metals, and emerging chemicals of concern), HABs, and diseases on dolphin health represents a significant data gap.
- Funding for marine mammal research is limited. Dolphin research and management efforts could be enhanced through cooperative data collection, the use of standardized sampling and analytical methods, and sharing of information and samples.

Critical Uncertainties and Priority Needs for MS Sound Dolphins

Population Structure and Assessment

- What are the trends in abundance of the MS Sound stock of common bottlenose dolphins?
- What is the degree of genetic connectivity to dolphins outside of the MS Sound region?
- What are biologically meaningful boundaries for the demographically independent population of dolphins that utilize MS Sound waters?

Distribution, Movements, and Habitat Use

- What are the primary prey species for MS Sound dolphins?

- How do individuals within the stock utilize and partition the habitat, and why?
- How do individuals within the stock respond (in terms of movements and health) to changes in salinity?

Health Assessments and Field Studies

- What are baseline health conditions of MS Sound dolphins?
- What is the prevalence of disease, contaminants, lesions, and other health issues in MS Sound dolphins?
- How are dolphins recovering from injuries determined to be caused by the DWH oil spill?
- How are dolphins being impacted by DWH restoration activities?

Mortality and Threats

Freshwater Exposure/Habitat Alteration

- How does freshwater exposure impact dolphin health and survival?
- What is the prevalence and characterization of skin lesions in both healthy and impacted populations?
- What are the systemic impacts of freshwater exposure and what lesions are noted histologically?
- How is the abundance and distribution of dolphin prey species affected by freshwater exposure?
- How do residency patterns affect dolphin responses to freshwater exposure?

Fishery Interactions

- What is the distribution of commercial shrimp trawl effort in MS Sound by gear type (i.e., skimmer, otter)?
- How can quantitative measures of mortality and serious injury in shrimp trawl, menhaden, and trap pot fisheries be better estimated? Can this be achieved through observer coverage, or are alternative methods needed?
- Are there gear modifications that can be made to fishing gear (specifically trawl, hook-and-line, and crab pot gear) that can reduce interaction rates with dolphins?

Intentional Harm

- What is the extent of illegal feeding and other interactions with wild dolphins, by user group? Where and when are those activities occurring? Are they increasing?
- What is the prevalence of harmful/lethal interactions (i.e., gunshot wounds or other evidence of intentional harm)?
- What are safe and effective deterrence techniques that can reduce dolphin-fishery interactions?

Oil Spills/Leaks

- Are MS Sound dolphins recovering from the acute and chronic impacts of the DWH oil spill?
- Are there collaborative data collection and modeling efforts that could be developed to monitor recovery?
- What are the long-term and chronic impacts of exposure to oil and hydrocarbon release events?
- How will we determine successful recovery and restoration?

HABs

- What are the impacts of climate change on HAB types and biotoxin production in MS Sound?
- How are HABs affecting the health, reproduction, and survival of MS Sound dolphins?
- What are the points of care or rapid field diagnostics for biotoxins that can be applied in MS Sound?

Contaminants

- What are the background levels and trends of contaminants in MS Sound dolphins?
- How are the levels and trends of contaminants in dolphins impacted by freshwater incursion into MS Sound?
- How are contaminants affecting the health, reproduction, and survival of MS Sound dolphins?

Diseases

- What are the background levels and trends of diseases in MS Sound dolphins?
- How are diseases affecting the health, reproduction, and survival of MS Sound dolphins?

Cumulative Impacts

- What are the potential impacts on MS Sound dolphins of exposure to multiple stressors?

- How do we incorporate modelling on the population consequences of multiple stressors into our assessment of MS Sound dolphin health, reproduction, and survival?

Opportunities for Developing Data Standards, Enhancing Data Sharing, and Expanding Collaborations

Data Standards and Data Sharing

- A long-term, cooperative survey plan for the MS Sound region is needed to enhance information available to assess stock abundance and track trends in abundance, and for integrating data across seasons, areas, and programs. The plans should build on previous and ongoing efforts to standardize and share data streams (e.g., GOMDIS). The plan should specify also the survey area(s) and methods that can be applied consistently across seasons, and at what intervals. The methods should address standardized data collection, processing, and analysis of survey data.
- NMFS SEFSC offered to convene a workshop on field survey methods (particularly for vessel-based CMR studies) and analytical approaches to estimate abundance, as part of developing a long-term, cooperative survey plan.
- Standardized data and sample collection methods, sample analyses, and data/sample sharing plans are also needed for investigations of stranded dolphins (e.g., what tissues are best for what types of analyses), cause of death determinations, and health evaluations of live free-swimming dolphins through remote visual assessments, remote sample collection, and targeted studies.
- Encourage sharing of long-term data series (e.g., dorsal fin photos).

Collaborations

- Vessels, equipment, and expertise are available at NMFS, IMMS, the MS Aquarium, MSU, USM, and MS DMR for expanding field studies to under-sampled areas (e.g., western MS Sound, Lake Borgne, and Bay Boudreau), under-sampled seasons (e.g., winter) and for conducting more comprehensive necropsies and laboratory analyses.
- Collaborations are needed to develop appropriate methods to monitor dolphin-fisheries interactions in MS Sound.
- Stronger collaborations are needed with first responders to support investigations of cetaceans affected by oil spills and other environmental disasters (following regional disaster response guidelines).
- Consistent, standardized, collaborative efforts to integrate across studies and locations are critical to improve understanding of the health and status of MS Sound dolphins.
- Models to determine ecological tipping points of aquatic resources could be expanded to include dolphins.
- Data gaps should drive research and tool development, integrating live and dead animal studies.
- Data sharing, consistency, integration, and collaboration are needed to address increasing challenges.
- Tool and technique development is a priority and could be an opportunity for leveraging across programs/agencies.

Workshop Invited Organizations/Participants

- IMMS: Moby Solangi, Theresa Madrigal
- MSU: Mark Lawrence, Debra Moore, Bill Epperson, Stephen Reichley
- MS Aquarium: Holley Muraco, Kurt Allen, Alexa Delaune, Sean Perry
- MS DEQ: Valerie Alley, Robbie Kroger
- MS DMR: Paul Mickle (now with MSU), Michael Brainard, Traci Floyd
- NFWF: Michael Sharp
- NMFS Office of Protected Resources: Donna Wieting, Teri Rowles
- NMFS SERO: Laura Engleby, Stacey Horstman, Erin Fougères
- NMFS SEFSC MMTD: Keith Mullin, Patricia Rosel, Lance Garrison, Jenny Litz, Melissa Soldevilla, and others
- USM: Kelly Lucas
- Dauphin Island Sea Laboratory (Alabama): Ruth Carmichael
- Audubon Institute (Louisiana): Gabriela Vazquez
- MMC: Vicki Cornish and Connor Fagan (moderators), France Gulland, Randall Reeves



The following is a link to the agenda, a more detailed meeting summary, and reference documents:
<https://tinyurl.com/2021-MS-BD-Workshop>