MARINE MAMMAL COMMISSION

10 December 2021

Dr. Rodney E. Cluck, Chief
Division of Environmental Sciences
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, Virginia 20166

Dear Dr. Cluck:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors, provides the following suggestions for consideration in the development of the Bureau of Ocean Energy Management's (BOEM) Environmental Studies Plan (ESP) for Fiscal Years (FY) 2023–2024. Overall, the Commission supports the projects identified in the current FY 2022–2023 Studies Development Plan and commends BOEM for its continued investments in marine mammal research and its commitment to working collaboratively with other agencies and funding entities to further our understanding of the effects of offshore energy development on marine mammals and their habitat.

Ecosystem-wide protected species assessment programs

BOEM's offshore energy program requires regularly updated information on marine mammals and their habitat to assess and monitor the potential impacts of various energy-related activities in all active Outer Continental Shelf (OCS) planning areas. Foundational to these assessments are ecosystem-wide surveys to estimate abundance, distribution, and behavior of marine mammals and develop spatially explicit habitat-density models for use in incidental take estimation. BOEM has provided multi-year funding for ecosystem-wide surveys in several areas of offshore energy development[1], in partnership with the National Marine Fisheries Service (NMFS) and other federal agencies. These include the Atlantic Marine Assessment Program for Protected Species (AMAPPS), which covers offshore waters from Florida to Maine, and the Pacific Marine Assessment Program for Protected Species (PacMAPPS), which covers waters in the northern Gulf of Alaska. In the Arctic, BOEM is planning a new large-scale survey, the Arctic Marine Assessment Program for Protected Species (ArMAPPS), which should provide data on cetacean abundance, distribution, and trends in Arctic waters. This would expand on sightings data previously available through the BOEM-funded Aerial Survey of Arctic Marine Mammals and its predecessors, and contribute to our understanding of responses of cetaceans to changing environmental conditions, including increasing human activities in Arctic waters. These programs (AMAPPS, PacMAPPS, and ArMAPPS), and the newly proposed Alaska Assessment of Cetaceans and Other Marine Mammals (ACOMM), should be continued and expanded as necessary, given the purposes described above,

[1] Throughout this letter, "energy development" refers to energy exploration, extraction, production, transport, and decommissioning.

and to contribute to the development and refinement of oil spill response planning and mitigation measures.

In the Gulf of Mexico, it is not clear whether ecosystem-wide surveys launched by BOEM under the Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS) will continue, as it was not included in BOEM's Studies Development Plan for 2022-2023. The GoMMAPPS surveys are critical to providing time-series data on abundance and distribution of marine mammals and habitat use of marine mammals and other protected species in the Gulf, an area of intense oil and gas development, which presumably will continue for several more decades, particularly in ultra-deep offshore waters (Murawski et al. 2020). In 2010, the Gulf experienced the largest oil spill in U.S. history following the explosion of the *Deepwater Horizon* platform, and marine life in the Gulf continues to be impacted by this and smaller spills and chronic hydrocarbon discharges (Asl et al. 2016, Frazier et al. 2020). Among the objectives of GoMMAPPS are to improve the quantity and quality of information used to mitigate and monitor various threats associated with oil and gas exploration and production in the Gulf. GoMMAPPS has made significant contributions to date, filling gaps in population-level data for several offshore marine mammal species[2]. Continuation of these aerial, shipboard, and acoustic surveys would provide trend data that would improve our ability to assess and monitor the impacts of energy development (both oil and gas and potential renewable energy), as well as other human activities on offshore marine mammal species. Some funding is available from *Deepwater Horizon* restoration-related sources for limited and targeted marine mammal surveys and for expanding the deployment of acoustic recorders[3], but these will not provide the broad-scale abundance, distribution, and trend data that can be obtained from aerial and shipboard visual surveys. This is of particular concern for species listed under the Endangered Species Act such as sperm whales and Rice's whales and acoustically sensitive species such as beaked whales and dwarf and pygmy sperm whales. The Commission recommends that BOEM continue funding GoMMAPPS or other similar regularly occurring, ecosystem-wide visual surveys of offshore marine mammals in the Gulf of Mexico in its FY 2023-24 studies development plan.

The large volumes of image and acoustic data obtained from large-scale visual and acoustic surveys can be time-consuming and cumbersome to process, resulting in delays in data becoming available on timelines relevant for environmental analyses and management decisions. The Commission recommends that BOEM continue and expand efforts to develop the use of artificial intelligence to expedite the processing of marine mammal image and acoustic data.

Complementary to large-scale ecosystem surveys are tagging and telemetry studies of individual animals. Such studies provide data to inform our understanding of animal movements, environmental characteristics, habitat use, and animal behavior in space and time, particularly in un-surveyed or under-surveyed areas. Multi-sensor tags, increasingly used in telemetry studies, can provide environmental and biological context for sightings and acoustic detections through the collection of associated environmental and behavioral information including water temperature,

[2] NMFS has submitted a draft report for the GoMMAPPS project to the BOEM Gulf of Mexico Office; a public version of the final report is not yet available.
[3] Under, for example, the LISTEN GoMex project (Long-term Investigations into Soundscapes, Trends, Ecosystems, and Noise in the Gulf of Mexico), being funded by the NOAA RESTORE Science Program and the Natural Resource Damage Assessment Open Ocean Trustee Implementation Group.

salinity, pH, diving behavior (direction, speed, and duration), and vocalizations, providing for better understanding of the roles that marine mammals play in marine ecosystems and their responses to human activities. The Commission is concerned with BOEM's discontinuation of support for the U.S. Animal Telemetry Network (ATN). Among other things, the ATN provides a platform for coordination and collaboration among federal, academic, and private researchers to share information from tagging and telemetry studies being conducted on the same or similar species or in the same areas. Therefore, the Commission recommends that BOEM continue funding for the ATN, which provides a means for coordinating and sharing research and data from tagging and telemetry studies to complement visual and acoustic detection data collected from large-scale ecosystem surveys.

Additional studies plan suggestions

Acoustic modeling. As noted in the Commission's 9 December 2020 letter, the impacts of sound-producing activities on marine mammals need to be better elucidated and mitigated, particularly as they relate to wind energy development in the Atlantic. The Commission is pleased that BOEM established its Center for Marine Acoustics (CMA) to expand the agency's acoustic impact modeling capabilities and notes that studies involving applied underwater acoustics and modeling also have been funded by BOEM's Environmental Studies Program. For the CMA to accurately model the impacts of various sound-producing activities, including pile driving, sediment composition and layering within each project area must be known[4]. Unfortunately, geoacoustic data are lacking in most regions and are not routinely described when measurements are collected *in situ* (including for pile driving). Because inaccurate geoacoustic data can cause major discrepancies between modeled results and *in-situ* measurements, it is imperative that accurate data are used to estimate the various harassment zones and to inform mitigation measure requirements for upcoming wind-energy construction projects. Therefore, the Commission again recommends that BOEM (1) consider funding studies investigating sediment composition and layering, particularly for the Atlantic OCS, and (2) work with other programs within the agency (e.g., the Environmental Assessment Program and the Marine Minerals Program) to compile a database of geoacoustic data for the Atlantic and other OCS regions.

Temporary threshold shift studies. Impulsive sounds generally are more harmful than non-impulsive sounds in terms of auditory impacts (Hamernik et al. 1987, Dunn et al. 1991, Hamernik et al. 2001). However, in certain situations, impulsive and non-impulsive sound can occur simultaneously (e.g., impact and vibratory pile driving, impact pile driving and vessel sound, etc.) or be emitted from the same sound source (e.g., a down-the-hole hammer). Sounds that contain both pulsive structures and steady-state continuous oscillation are referred to as complex in human psychoacoustic research (Ahroon et al., 1993). Despite the fact that studies on human and terrestrial species have shown that exposure to complex sounds is more detrimental than pure non-impulsive continuous sounds (Hamernik et al. 2003, Qiu et al. 2007, Hamernik et al. 2007, Zhao et al. 2010, Qiu et al. 2013, Xie et al. 2016), noise-induced threshold shift (namely temporary threshold shift (TTS)) studies have yet to be conducted on marine mammals exposed to complex sounds (Guan and Brookens 2021). Since marine mammals can be exposed to complex sounds on a routine basis and the effects are unknown,

[4] Sediment composition and the associated layering affect the depth-dependent sound speed and attenuation profiles (i.e., sediment porosity and particle size), which are dominant factors when modeling sound propagation in shallow water, including those of the Atlantic OCS.

the Commission recommends that BOEM partner with other federal agencies (e.g., U.S. Navy, NMFS, the Commission) to investigate the possibility of funding a TTS study on marine mammals exposed to complex sounds. Findings from such a study could help determine whether sound should be parsed into three types (impulsive, non-impulsive, and complex) rather than two (impulsive and non-impulsive) when assessing auditory impacts.

Effects of wind energy development on right whales. Disturbance from offshore energy development has the potential to result in long-term, cumulative effects on marine mammals. Of the greatest immediate concern are the potential impacts of offshore wind energy development on North Atlantic right whales, considering the significant declines in their abundance since 2010. In order to assess potential offshore wind impacts on right whales, the whales' dynamically changing distribution needs to be closely monitored. As noted in the Commission's 12 September 2021 letter to BOEM regarding its environmental assessment for commercial wind lease issuance and site assessment activities at the Wilmington East Wind Energy Area (WEA) off North Carolina, studies indicate a recent shift in distribution (Meyer-Gutbrod et al. 2021), inadequate prey availability (Davies et al. 2019, Record et al. 2019), and increased human-caused mortality of right whales (Davies and Brillant 2019, Sharp et al. 2019). These changes have made the mitigation of threats and monitoring of right whales in their migratory and calving habitat increasingly important (Gowan et al. 2019).

Significant effort has been devoted to monitoring the occurrence of right whales along their U.S. migratory pathways, feeding areas[5], and calving areas using both aerial surveys and passive acoustic monitoring, much of it funded by BOEM. An expert working group established by NMFS to review right whale monitoring and surveillance programs recommended that survey effort "be adjusted appropriately to achieve total enumeration [of females and calves] without excessive expenditure of survey resources" (Oleson et al. 2020). The expanded use of passive acoustic monitoring has been recommended to ensure that right whale presence is detected in key habitat areas and appropriate management measures are implemented (Gowan et al. 2019, Pettis et al. 2020). Implementation of a permanent acoustic monitoring program to include migratory and calving areas was recommended by the right whale expert working group (Oleson et al. 2020). The Commission recommends that BOEM continue to work with NMFS, the North Atlantic Right Whale Consortium, state resource agencies, and wind energy developers to collect information on the occurrence and demography of right whales in migratory, calving, and feeding areas (essentially from Florida to Maine) using an integrated visual and acoustic survey approach, at an appropriate level of monitoring in space and time given the dramatic shift in right whale distribution in recent years.

The Commission appreciates the opportunity to provide these comments and recommendations. Please contact me if you have questions.

Sincerely,

Peter O Thomas

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

[5] Including the Gulf of Maine, Cape Cod Bay, and waters south of Nantucket and Martha's Vineyard.

References

Ahroon, W.A., R.P. Hamernik, and R.I. Davis. 1993. Complex noise exposures: An energy analysis. The Journal of the Acoustical Society of America 93: 997–1006.

Als, S.D., J. Amos, P. Woods, O. Garcia-Pineda, and I.R. MacDonald. 2016. Chronic, anthropogenic hydrocarbon discharges in the Gulf of Mexico. Deep Sea Research Part II: Topical Studies in Oceanography. 129:187-195.

Davies, K.T., and S.W. Brillant. 2019. Mass human-caused mortality spurs federal action to protect endangered North Atlantic right whales in Canada. Marine Policy 104:157–162.

Davies, K.T., M.W. Brown, P.K. Hamilton, A.R. Knowlton, C.T. Taggart, and A.S. Vanderlaan. 2019. Variation in North Atlantic right whale *Eubalaena glacialis* occurrence in the Bay of Fundy, Canada, over three decades. Endangered Species Research 39:159–171.

Dunn, D.E., R.R. Davis, C.J. Merry, and J.R. Franks. 1991. Hearing loss in the chinchilla from impact and continuous noise exposure. The Journal of the Acoustical Society of America 90: 1979–1985.

Fraiser, K.E. 2020. Evaluating impacts of deep oil spills on oceanic marine mammals. Chapter 25 *in* S. Murawski, C.H. Ainsworth, S. Gilbert, D.J. Hollander, C.B. Paris, M. Schlüter, and D.L. Wetzel (eds.). Scenarios and Responses to Future Deep Oil Spills. Springer, Cham. https://doi.org/10.1007/978-3-030-12963-7_2

Gowan, T.A., J.G. Ortega-Ortiz, J.A. Hostetler, P.K. Hamilton, A.R. Knowlton, K.A. Jackson, R.C. George, C.R. Taylor, and P.A. Naessig. 2019. Temporal and demographic variation in partial migration of the North Atlantic right whale. Scientific Reports 9:353.

Guan, S., and T. Brookens. 2021. The use of psychoacoustics in marine mammal conservation in the United States: From science to management and policy. Journal of Marine Science and Engineering 9:507.

Hamernik, R.P., J.H. Patterson, and R.J. Salvi. 1987. The effect of impulse intensity and the number of impulses on hearing and cochlear pathology in the chinchilla. The Journal of the Acoustical Society of America 81: 1118–1129.

Hamernik, R.P., and W. Qiu. 2001. Energy-independent factors influencing noise-induced hearing loss in the chinchilla model. The Journal of the Acoustical Society of America 110: 3163–3168.

Hamernik, R.P., W. Qiu, and B. Davis. 2003. The effects of the amplitude distribution of equal energy exposures on noise-induced hearing loss: The kurtosis metric. The Journal of the Acoustical Society of America 114:386–395.

Hamernik, R.P., W. Qiu, and B. Davis. 2007. Hearing loss from interrupted, intermittent, and time Varying non-Gaussian noise exposure: The applicability of the equal energy hypothesis. The Journal of the Acoustical Society of America 122: 2245–2254.

Meyer-Gutbrod, E.L., C.H. Greene, K.T.A. Davies, and D.G. Johns. 2021. Ocean regime shift is driving collapse of the North Atlantic right whale population. Oceanography 34(3):22–31.

Murawski, S.A., D.J. Hollander, S. Gilbert, and A. Gracia. 2020. Deepwater oil and gas production in the Gulf of Mexico and related global trends. Pages 16–32 *in* S. Murawski, C.H. Ainsworth, S. Gilbert, D.J. Hollander, C.B. Paris, M. Schlüter, and D.L. Wetzel (eds.). Scenarios and Responses to Future Deep Oil Spills. Springer, Cham. https://doi.org/10.1007/978-3-030-12963-7_2

Oleson, E.M., J. Baker, J. Barlow, J.E. Moore, and P. Wade. 2020. North Atlantic Right Whale Monitoring and Surveillance: Report and Recommendations of the National Marine

Fisheries Service's Expert Working Group. NOAA Technical Memorandum NMFS-F/OPR-64. 47 pages.

Pettis, H.M., R.M. Pace, III, and P.K. Hamilton. 2021. North Atlantic Right Whale Consortium 2020 Annual Report Card. Report to the North Atlantic Right Whale Consortium.

Qiu, W., B. Davis, and R.P. Hamernik, 2007. Hearing loss from interrupted, intermittent, and time varying Gaussian noise exposures: The applicability of the equal energy hypothesis. The Journal of the Acoustical Society of America 121:1613–1620.

Qiu, W., R.P. Hamernik, and R.I. Davis. 2013. The value of a kurtosis metric in estimating the hazard to hearing of complex industrial noise exposures. The Journal of the Acoustical Society of America 133:2856–2866.

Record, N.R., J.A. Runge, D.E. Pendleton, W.M. Balch, K.T.A. Davies, A.J. Pershing, C.L. Johnson, K. Stamieszkin, R. Ji, Z. Feng, S.D. Kraus, R.D. Kenney, C.A. Hudak, C.A. Mayo, C. Chen, J.E. Salisbury, and C.R.S. Thompson. 2020. Rapid climate-driven circulation changes threaten conservation of endangered North Atlantic right whales. Oceanography 32(2): 162–169.

Sharp, S.M., W.A. McLellan, D.S. Rotstein, A.M. Costidis, S.G. Barco, K. Durham, T.D. Pitchford, K.A. Jackson, P.-Y. Daoust, T. Wimmer, E.L. Couture, L. Bourque, T. Frasier, B. Frasier, D. Fauquier, T.K. Rowles, P.K. Hamilton, H. Pettis, and M.J. Moore. 2019. Gross and histopathologic diagnoses from North Atlantic right whale *Eubalaena glacialis* mortalities between 2003 and 2018. Diseases of Aquatic Organisms 135:1–31.

Xie, H., W. Qiu, N.J. Heyer, M. Zhang, P. Zhang, Y. Zhao, and R.P. Hamernik. 2016. The use of the kurtosis-adjusted cumulative noise exposure metric in evaluating the hearing loss risk for complex noise. Ear and Hearing 37:312–323.

Zhao, Y., W. Qiu, L. Zeng, S. Chen, X. Cheng, R.I. Davis, and R.P. Hamernik. 2010. Application of the kurtosis statistic to the evaluation of the risk of hearing loss in workers exposed to high-level complex noise. Ear and Hearing 31:527–532.