Comments in Response to the Bureau of Ocean Energy Management Request for Interest in Commercial Leasing for Wind Power Development on the Gulf of Mexico Outer Continental Shelf (OCS), 86 Fed. Reg. 31339 (June 11, 2021)

Submitted by National Wildlife Federation, Natural Resources Defense Council, National Audubon Society, Healthy Gulf, Audubon Delta, Ocean Conservation Research, Whale and Dolphin Conservation, Audubon Texas, Environment Texas, Mass Audubon, and Southern Environmental Law Center

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Contents

I. Introduction

On behalf of National Wildlife Federation, Natural Resources Defense Council, National Audubon Society, Healthy Gulf, Audubon Delta, Ocean Conservation Research, Whale and Dolphin Conservation, Audubon Texas, Environment Texas, Mass Audubon, Southern Environmental Law Center, and our millions of members and supporters, thank you for the opportunity to comment on the Bureau of Ocean Energy Management's (BOEM) Request for Interest in Commercial Leasing for Wind Power Development on the Gulf of Mexico Outer Continental Shelf (RFI).[1]

The Biden Administration has set forth an ambitious and necessary goal for the nation to have net-zero global greenhouse gas emissions by mid-century or before[2] and committed the U.S. to reducing net greenhouse gas emissions by 50-52% below 2005 levels in 2030.[3] As the Administration has recognized, offshore wind energy is one of the most abundant sources of zero emissions energy and it must play a significant role if the nation is going to meet these goals. Our organizations are united in support of responsibly developed offshore wind. We have long advocated for policies and actions needed to bring it to scale in an environmentally protective manner. Offshore wind provides a tremendous opportunity to fight climate change, reduce local and regional air pollution, and grow a new industry that will support thousands of well-paying jobs in both coastal and inland communities.

We welcome the Administration's interest in transitioning the Gulf of Mexico toward a cleaner, healthier renewable energy future, and urge a thoughtful and deliberative development of this new U.S. energy source. While the need to transition away from fossil fuels is only becoming more urgent, we can and must require that all U.S. offshore wind projects are sited, developed, operated, and decommissioned responsibly. Responsible development of offshore wind energy: (i) avoids, minimizes, mitigates, and monitors adverse impacts on marine and coastal habitats and the wildlife that rely on them, (ii) reduces negative impacts on other ocean uses, (iii) includes robust consultation with Native American tribes and communities, (iv) meaningfully engages state and local governments and stakeholders from the outset, (v) includes comprehensive efforts to avoid impacts to environmental justice communities, and (vi) uses the best available scientific and technological data to ensure science-based and stakeholder-informed decision making. The Gulf of Mexico has rich and diverse ecosystems, and offshore wind development here must require measures to ensure protection of the region's natural resources – including its billions of neotropical migrant birds, huge nesting colonies of coastal and marine birds, and wintering grounds for millions of waterfowl; marine mammals (including one of the world's most endangered whales); and the unique coastal habitat (including some of the most extensive U.S. coastal wetlands) – as well as account for the interests of tribes and environmental justice communities in the Gulf, some of which have suffered immense disproportionate impacts from energy development in the region.

We are at the dawn of envisioning a new energy age for the RFI Area, which comprises the entire Central Planning Area (CPA) and Western Planning Area (WPA) of the Gulf of Mexico out to 1,300 meters. These comments seek to provide BOEM with recommendations for what engagement process and baseline factors must be considered to responsibly identify and pursue new Gulf of Mexico areas for offshore wind leasing.

[1] RFI. 86 Fed. Reg. 31,339 (June 11, 2021).

[2] Proclamation No. 14008, 86 Fed. Reg. 7619 (EO 14008).

[3] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20States%20of%20America%20First/United%20States%20NDC%20April%2021%202021%20Final.pdf

II. Overview of the RFI Area's Ecological Resources

The Gulf of Mexico is comprised of richly varied, vitally important, and intertwined ecosystems. From the offshore waters of the open ocean to barrier and bay islands to coastal marshes, abundant estuaries, and inland swamps, the region supports an incredible diversity of habitats that many species, including species of conservation concern, need to survive and thrive. Its deep-sea houses hundreds year-old cold water corals that provide structure for brittle starfish, bottom-dwelling fish, and other unique fauna. The benthic zone also supports the abundant planktonic life that sit at the base of the region's food web and feeds juvenile fish populations. The Gulf of Mexico's subsurface waters are home to dozens of commercially and ecologically significant fish species.

For billions of birds, the coast of the Gulf of Mexico represents both the last rest-stop before a journey across or around the Gulf to the Caribbean and Central and South America during fall migration and the first land many return to after a grueling spring trip north, flying thousands of miles. Stretching across the Atlantic, Mississippi, and Central flyways, the U.S. Gulf Coast supports nearly half of North America's migrating birds, including the threatened Piping Plover and Red Knot, as well as resident iconic species of concern like the Black Skimmer, Brown Pelican, and Clapper Rail.[4]

The Gulf is home to a number of resident species and populations of marine mammals, including the Gulf of Mexico whale (also known as "Rice's Whale"). The Gulf of Mexico whale is the only large whale species to fully reside in the waters of the United States and, with only approximately 50 individuals remaining, is counted among the most endangered marine mammal species in existence. A myriad of small populations of coastal bottlenose dolphins reside juxtaposed along the coastline. Other migratory bottlenose dolphin populations rely seasonally on nearshore and coastal regions for breeding and rearing their young. Further offshore, a unique population of deep-diving sperm whales inhabit deeper canyon waters, alongside beaked whales and numerous other species.[5]

Of the seven species of sea turtles found in the U.S., five occur regularly in the Gulf of Mexico;[6] all species are threatened or endangered. The Gulf's *Sargassum* provides habitat and sustenance to endangered sea turtles, including Kemp's Ridley, green, and loggerhead sea turtles. Critical habitat in or near the WPA and CPA includes loggerhead nearshore reproductive habitat in coastal Mississippi and Alabama and *Sargassum* habitat, which provides developmental and foraging habitat for young loggerheads.[7]

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[4] Horton KG, Doren BMV, Sorte FAL, Cohen EB, Clipp HL, Buler JJ, Fink D, Kelly JF, Farnsworth A. 2019. Holding steady: Little change in intensity or timing of bird migration over the Gulf of Mexico. Global Change Biology 25:1106–1118.

[5] NMFS, "U.S. Atlantic and Gulf of Mexico Draft Marine Mammal Stock Assessment" at pp. 286-295. Available at: https://s3.amazonaws.com/media.fisheries.noaa.gov/2020-12/Draft%202020%20Atlantic-Gulf-marine%20mammal%20stock%20assessment%20reports.pdf?null.

[6] Valverde, R.A. and K.R. Holzwart. 2017. Sea Turtles of the Gulf of Mexico. Pages 1189-1351 in Ward, C.H., ed. Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill: Volume 2: Fish Resources, Fisheries, Sea Turtles, Avian Resources, Marine Mammals, Diseases and Mortalities. New York, NY: Springer New York. Foley, A.M., P.H. Dutton, K.E. Singel, A.E. Redlow, and W.G. Teas. 2003. The first records of olive ridleys in Florida, USA. Marine Turtle Newsletter 101:23-25; DoN (Department of the Navy). 2007. Marine resources assessment for the Gulf of Mexico. Contract number N62470-02-D-9997, CTO 0030 Norfolk, Virginia: Atlantic Division, Naval Facilities Engineering Command. Prepared by Geo-Marine, Inc., Plano, Texas.

[7] *See, e.g.,* https://www.federalregister.gov/documents/2014/07/10/2014-15748/endangered-and-threatened-species-critical-habitat-for-the-northwest-atlantic-ocean-loggerhead-sea

The Gulf's diverse habitats are deeply interconnected, with deep sea organisms feeding marine life at the bottom of the food chain, which in turn support fisheries, charismatic megafauna, and diverse bird populations that migrate through the Gulf every year. This interwoven ecosystem includes residents of the Gulf states, who subsist on the Gulf's oysters, shrimp, and fish and work in the industries those species support.

While hosting high levels of biodiversity, the Gulf of Mexico ecosystem continues to be heavily impacted by historic and extensive oil and gas development. In addition to the loss of human life and significant impacts on human health and well-being, the horrifying 2010 *Deepwater Horizon* oil spill from a BP offshore drilling rig in the Gulf of Mexico contaminated more than 1,300 mi of coastline, at least 400 mi^2 of the deep ocean floor, and 57,500 mi^2 of surface water.[8] The attempted clean-up effort involved intensive use of dispersants, which can be toxic to marine life.[9] The BP spill is estimated to have caused $17.2 billion worth of damage to the Gulf of Mexico's natural resources.[10] More than a decade later, much of the Gulf's habitats and wildlife are still struggling to recover from the impact of the 22,000 tons of oil that washed up on the Gulf shore.[11] The disaster's impacts on the Gulf's ecosystems are profound and many of the region's coastal and oceanic marine mammal, sea turtle, and seabird species are under significant environmental stress resulting from the oil and gas industry's contamination of this region.

III. Recommended Measures for Responsible Offshore Wind Leasing in the Gulf of Mexico

The RFI offers assurance that "[w]hether the leasing process is competitive or noncompetitive, BOEM will include opportunities for the public to provide input. In addition, BOEM will conduct a thorough environmental review and requisite consultations with appropriate Federal agencies, federally recognized Tribes, State and local governments, and other interested parties, which will be conducted in conformance with all applicable laws and regulations."[12] Our organizations urge BOEM to build beyond

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[8] Deepwater Horizon Natural Resource Damage Assessment Trustees, *Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement*, 2016, chapter 4, pp 28, 30, 57., http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan. MacDonald, I.R., et al., "Natural and Unnatural Oil Slicks in the Gulf of Mexico," *Journal of Geophysical Research: Oceans* 120, no. 12 (2015): 8364-8380, http://onlinelibrary.wiley.com/ doi/10.1002/2015JC011062/full.

[9] Wise, J. and Wise, J.P. "A review of the toxicity of chemical dispersants," vol. 26, no. 4, 2011, pp. 281-300. https://doi-org.stanford.idm.oclc.org/10.1515/REVEH.2011.035; Wise, C.F., Wise, J.T.F., Wise, S.S., Thompson, W. D., Wise Jr, J.P., Wise Sr, J.P. "Chemical dispersants used in the Gulf of Mexico oil crisis are cytotoxic and genotoxic to sperm whale skin cells," *Aquatic Toxicology*, vol. 152, 2014, pp. 335-340.

[10] Bishop, R.C., et al., "Putting a value on injuries to natural assets: The BP oil spill," *Science* 356, no. 6335 (2017): 253-254, https://science.sciencemag.org/ content/356/6335/253.

[11] Boufadel, M.C., et al., "Simulation of the Landfall of the Deepwater Horizon Oil on the Shorelines of the Gulf of Mexico," *Environmental Science & Technology* 48, no. 16 (2014): 9496–9505. http://pubs.acs.org/doi/abs/10.1021/es5012862. Fleeger, J.W. et al., "What promotes the recovery of salt marsh infauna after oil spills?" *Estuaries and Coasts* 42, no. 1 (2019): 204-217, DOI: 10.1007/s12237-018-0443-2. Hamden, L.J., et al., "The impact of the Deepwater Horizon blowout on historic shipwreck-associated sediment microbiomes in the northern Gulf of Mexico," *Scientific Reports* 8 (2018): 9057, https://www.nature.com/articles/s41598-018-27350-z.pdf.

[12] RFI at 31340.

the basics expressed here. We stress the value of a collaborative siting and development process that fully engages all impacted parties at the outset.

We advise that BOEM embrace the following recommendations to responsibly identify and lease Gulf of Mexico Wind Energy Areas (WEAs). These practices will help the offshore wind industry advance expeditiously, with minimal environmental and stakeholder conflicts, to successfully achieve the administration's offshore wind goals.

A. Meaningful Co-planning and Consultations with Native American Tribes Is Essential to Successful Gulf of Mexico Offshore Wind Development

Both federally and non-federally recognized tribal nations must be engaged from the very start – before Call Area identification. The RFI notes BOEM's responsibility to comply with Section 106 of the National Historic Preservation Act to ensure any actions appropriately consider impacts on historic tribal resources, as well as with Executive Order 13175, which mandates all executive agencies recognize and respect tribal sovereign status and engage in "regular, meaningful, and robust consultation with Tribal officials in the development of Federal policies that have Tribal implications."[13] We encourage BOEM to also adopt early consultation as envisioned in Secretary Haaland's Secretarial Order No. 3399:

> Bureaus/Offices will proactively begin consultation with potentially impacted Tribes, both those currently in the proposed area and those with a historic presence, as well as engage potentially impacted environmental justice communities early in the project planning process. "Early in the project planning process" includes when a Bureau/Office has enough information on a proposed action to determine that an environmental assessment or an environmental impact statement will be prepared.[14]

Native American and Alaska Native Tribes are sovereign governments recognized as self-governing under federal law, and the U.S. government has a "trust responsibility" to those tribes.[15] The federal government has special fiduciary obligations to protect Native resources and uphold the rights of Indigenous peoples to govern themselves on tribal lands.[16] In carrying out this duty, federal officials are "bound by every moral and equitable consideration to discharge the federal government's trust with good faith and fairness."[17] Acting in accord with these trust responsibilities requires nation-to-nation consultation from the first opportunity.

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[13] Exec. Order No. 13,175, 65 Fed. Reg. 67,249, 67,249–50 (Nov. 6, 2000) (mandating that agencies "respect Indian tribal self-government and sovereignty" when "formulating and implementing policies" that affect tribal interests). Reinforced in the Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships. Jan. 26, 2021. https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/26/memorandum-on-tribal-consultation-and-strengthening-nation-to-nation-relationships/.

[14] Secretarial Order No. 3399, at § 5(c). Apr. 16, 2021. https://www.doi.gov/sites/doi.gov/files/elips/documents/so-3399-508_0.pdf.

[15] *Id*.

[16] *Eric v. Sec'y of U. S. Dep't of Hous. & Urban Dev.,* 464 F. Supp. 44 (D. Alaska 1978).

[17] *United States v. Payne*, 264 U.S. 446, 448 (1924); *accord Yukon Flats School Dist. V. Native Village of Venetie* Tribal Govt't, 101 F.3d 1286 (9th Cir. 1996) *rev'd on other grounds* 522 U.S. 520 (1998); *see also* 84 Fed. Reg. 1200–01 (Feb.1, 2019) (including 229 Alaska Native entities in the list of tribes recognized as having the immunities and privileges of "acknowledge Indian tribes by virtue of their government-to-government relationship with the United States.") Note that the trust doctrine includes duties to manage natural resources for the benefit of tribes and individual landowners, and the federal government has been held liable for

B. Robust Stakeholder Engagement Will Produce a More Durable Outcome

We welcome BOEM's embrace of a regional-level planning approach, as actions offshore of one state impact ocean users beyond a state's boundaries, and having all affected parties engaged early on is crucial to successful outcomes. In the Gulf of Mexico, where discussion of offshore wind is fairly new, early outreach takes on even greater meaning. Fully engaging all stakeholders at the start – before Call Area identification – and throughout the leasing and permitting process will help secure greater trust and support of the siting outcomes. Beyond state and local governments, stakeholders include conservation groups, various sectors of the commercial and recreational fishing industry, wind developers, utilities, academia, maritime industry, labor groups, environmental justice communities, and impacted communities. At the lease identification stage, it is important to identify potential transmission landing sites to the greatest extent possible in order to encourage early participation from potentially impacted communities.

To provide for greater engagement, BOEM should foster an open exchange with federal and state officials beyond formal public meetings, including sector-specific and tribal-specific meetings where specific topics, data, and information can be discussed in greater detail. Meetings should occur at times and places that are convenient for stakeholders and tribes, and the next steps and opportunities to provide input should be clearly communicated. Translation needs should be assessed and provided as necessary. BOEM should continue to urge early participation and data sharing from all relevant federal (*e.g.*, National Oceanic and Atmospheric Administration [NOAA], U.S. Coast Guard, Department of Defense) and state agencies to improve coordination during all phases of planning, leasing, and development, including pre-planning discussions, to resolve potential conflicts upfront. We further recommend that BOEM consider providing a source of funds for tribes, states, and local communities, as needed, to allow groups that may be stretched thin in terms of time and capacity to engage more deeply. Facilitating an inclusive process helps advance leases that will result in operational projects, and are not mired in controversy.

C. Use of the Best Available Scientific and Technological Data Will Ensure Science-based and Stakeholder-informed Decision-making

BOEM must prioritize use of the best available science and Indigenous traditional knowledge to inform siting decisions and be data-driven, transparent, and inclusive of the interests of stakeholders and all levels of government (tribal, federal, state, local). We appreciate BOEM's initial efforts to characterize wildlife use of the Gulf of Mexico through the Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS), and we look forward to the results of this program. We also urge development of a publicly available decision-support tool, like the Northeast and Mid-Atlantic Ocean Data Portals, the California Offshore Wind Energy Gateway, and the Oregon Offshore Wind Mapping Tool, that allows users to easily navigate, overlay, and interpret multiple environmental and ocean use data layers. Agencies should provide data sources that are reflective of government and stakeholders' stated interests, and should allow stakeholders to review the available data and provide input and additional data sources as needed.

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mismanagement. (*See United States v. Mitchell*, 463 U.S. 206 (1983) (holding that the Department of the Interior was liable for monetary damages for mismanaging timber resources of the Quinault tribe in violation of the agency's fiduciary duty.))

All data products should clearly convey how they were compiled and with what data, and they should acknowledge uncertainties and existing gaps in knowledge. Maps should be transparent about the specific environmental considerations (*e.g.*, benthic habitat, marine mammal, and bird and bat presence and abundance) used to inform area designations. (Further detail on the importance of baseline data is found in Section IV.)

D. Siting Should Avoid and Minimize the Adverse Impacts on Marine and Coastal Habitats and the Wildlife That Rely on Them

BOEM should use environmental and social spatial data to select Call Areas for greater discussion that have optimum offshore wind energy potential with the least degree of environmental and social impacts. Section V identifies several specific environmental concerns to factor into BOEM's leasing analysis. In addition to careful consideration of these highlighted elements, the agency should also identify and map any persistent hotspots of species abundance and/or areas of rare environmental significance while reviewing potential Call Areas. Significant areas include, *but are not limited to*, state Marine Protected Areas and critical breeding and feeding habitats for wildlife like Audubon Marine Important Bird Areas (IBAs), Cetacean Density and Distribution Mapping Biologically Important Areas, critical habitat for Endangered Species Act-listed species, Essential Fish Habitat Conservation Areas, Habitat Management Areas, Habitat Areas of Particular Concern, and regionally relevant areas.[18] As per the "mitigation hierarchy" which seeks to first avoid, then minimize, and mitigate potential environmental impacts from all stages of offshore wind development,[19] avoidance should be the first approach.

In the Gulf of Mexico, significant areas include, *but are not limited to*, the following known areas:

1. The Region's IBAs, National Parks, National Marine Sanctuaries, and National Wildlife Refuges

The Gulf coast and barrier islands provide essential habitat for birds throughout the year and, hence, many have been designated as IBAs, National Parks, National Marine Sanctuaries, and National Wildlife Refuges for this reason. Offshore wind infrastructure, including cabling, should avoid impacts to IBAs.[20] Additionally, as per as per 30 C.F.R. § 585.204, leasing is prohibited in areas within the boundaries of the National Park System, National Wildlife Refuge System, and National Marine Sanctuary System. Important areas include the globally recognized IBAs along the Louisiana coast: Chenier Plain, Atchafalaya Delta, Barataria Terrebonne, Mississippi River Birdsfoot Delta, and Breton National Wildlife Refuge. South Padre Island and Laguna Madre, of Padre Island National Seashore along the southern Texas coastline, provide essential nesting habitat for Roseate Spoonbill and Reddish Egret rookeries, as well as wintering habitat for seaducks and stopover habitat for migratory landbirds along the central

[18] Please note that, as per 30 C.F.R. § 585.204, leasing should not advance in areas within the boundaries of the National Park System, National Wildlife Refuge System, National Marine Sanctuary System, or any National Monument.

[19] IUCN and The Biodiversity Consultancy. "Mitigating biodiversity impacts associated with solar and wind energy development: guidelines for project developers" (2021). Available at: https://portals.iucn.org/library/node/49283. Please note that the IUCN document provides general guidelines on how the mitigation hierarchy could be and has been applied, but its application in each case will be context and site-specific, and based on best available scientific information and technologies available at the time.

[20] Any projects with proposed cable routes through IBAs or state and federal protected areas should consult with local Audubon chapters and other avian experts and stakeholders to avoid impacts to essential bird habitat.

flyway; Green Island and the Islands South of South Bird Island are the IBAs associated with these protected areas. Also an IBA, the Units of the Gulf Islands National Seashore (GUIS), which is the longest stretch of federally protected seashore in the United States, stretching 160 miles from Cat Island in Mississippi to Santa Rosa Island in Florida, provide critical habitat supporting numerous special status species, including four types of sea turtles, gopher tortoise, Snowy Plover, Piping Plover, Perdido Key beach mouse, and the manatee.[21] Horn and Petit Bois Islands are both federally-designated wilderness areas, providing nesting habitat for Least Terns and Black Skimmer. Environmental NGOs, including Healthy Gulf, have long recommended a 12 nm buffer from the GUIS for *any* infrastructure development.[22]

2. Areas Within 12 nm of Coast and Barrier Islands and Habitat Shoreward of the 20-m Isobath

Multiple species of waterbirds and waterfowl congregate in large "rafts" along the shoreline of the Gulf during the winter, and so turbines located here would result in higher levels of collision for birds and bats, as well as habitat avoidance.[23] Satellite tracking studies of scoters[24] and transect surveys[25] off the coast of southern New England, for example, suggest that seaducks and loons mostly utilize habitats within 5 mi of shore, in depths of less than 20 m. In the Gulf of Mexico, coastal beaches and barrier islands provide critical nesting habitat for a variety of sensitive birds, including Brown Pelican, Black Skimmer, American Oystercatcher, Snowy Plover, Reddish Egret, and Roseate Spoonbill, among many others. In addition to being vulnerable to impacts from wind turbines, these species are already facing a multitude of stressors in the Gulf, including those from climate change, human disturbance, and

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[21] https://www.nps.gov/guis/learn/management/upload/Gulf-Islands-GMP-EIS-JULY-2014.pdf

[22] The 12 Miles South Coalition, formed in Mississippi in 2005 in response to several misguided oil and gas exploration and drilling proposals off the Gulf Islands National Seashore, has identified a 12 nm to be a sufficient minimum buffer zone to avoid environmental impacts to the coastlines and barrier islands. Twelve nautical miles was determined by the coalition to be sufficient to uphold the federal National Park and wilderness protections. See, *e.g.*, https://www.clarionledger.com/story/news/politics/2018/01/15/trump-offshore-drilling-plan-opposed-mississippi-groups-but-supported-governor/1033795001/.

[23] For example, a turbine array located near roosting habitat for wintering Redhead ducks near Laguna Madre, Texas found that the turbine array contributed to a significant change in the distribution of roosting Redheads. When compared with pre-construction abundance, the number of individuals significantly increased in ponds farther from the wind farm and significantly decreased in ponds nearer the wind farm after construction, with Redheads maintaining distances of at least 9 km from the turbine array. (*See*, *e.g.*, Lange CJ, Ballard BM, Collins DP. 2018. Impacts of wind turbines on redheads in the Laguna Madre. The Journal of Wildlife Management 82:531–537.) MDAT models suggest that avian density along the Atlantic OCS is greatest closest to shore, and spatial models of birds offshore UK suggest that species most vulnerable to collisions and displacement effects occur more frequently in the nearshore. (*See*, *e.g.*, A.J. Winship, B.P. Kinlan, T.P. White, J.B. Leirness, and J. Christensen. 2018. Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2018-010. x+67 pp.; also Bradbury G, Trinder M, Furness B, Banks AN, Caldow RWG, Hume D. 2014. Mapping Seabird Sensitivity to Offshore Wind Farms. PLOS ONE 9:e106366. Public Library of Science.)

[24] Loring PH, Paton PWC, Osenkowski JE, Gilliland SG, Savard J-PL, Mcwilliams SR. 2014. Habitat use and selection of black scoters in southern New England and siting of offshore wind energy facilities: Black Scoters and Offshore Wind. The Journal of Wildlife Management 78:645–656.

[25] Winiarski KJ, Burt ML, Rexstad E, Miller DL, Trocki CL, Paton PWC, McWilliams SR. 2014. Integrating aerial and ship surveys of marine birds into a combined density surface model: A case study of wintering Common Loons. The Condor 116:149–161.

pollution from oil and gas.[26] Many of these impacts can be avoided by not permitting development within 12 nm of the coast and barrier islands.

Additionally, there are 31 bay, sound, and estuary stocks of bottlenose dolphins within the northern Gulf of Mexico. National Marine Fisheries Service (NMFS) considers the majority of the stocks to be strategic stocks under the Marine Mammal Protection Act (MMPA) because most of the stock sizes are unknown but are likely to be small such that relatively few mortalities and serious injuries would exceed the potential biological removal level.[27] Waters shoreward of the 20-m isobath, where coastal dolphin stocks occur, represent the areas of greatest abundance for bottlenose dolphins.[28]

BOEM should avoid siting offshore wind energy in coastal bottlenose dolphin habitat shoreward of the 20-m isobath, and also require the seasonal avoidance of all offshore wind energy development activities (*e.g.*, cable laying) within this area from at least January through May.[29] Coastal bottlenose dolphin populations are still decades away from recovery from the *Deepwater Horizon* spill and are

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[26] Burger J. 2017. Avian Resources of the Northern Gulf of Mexico. Pages 1353–1488 in C. H. Ward, editor. Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill: Volume 2: Fish Resources, Fisheries, Sea Turtles, Avian Resources, Marine Mammals, Diseases and Mortalities. Springer, New York, NY. Available from https://doi.org/10.1007/978-1-4939-3456-0_4 (accessed July 20, 2021).

[27] NMFS. "Common bottlenose dolphin (*Tursiops truncatus truncatus*): Northern Gulf of Mexico Bay, Sound, and Estuary Stocks." Marine Mammal Stock Assessment Report (Feb. 2019). Available at: https://media.fisheries.noaa.gov/dam-migration/170_tm258_bottlenosebse.pdf; There have been 13 Unusual Mortality Events (UMEs) among common dolphins along the northern Gulf of Mexico coast since 1990; notably, stock areas in Louisiana, Mississippi, Alabama, and the western Florida panhandle have been impacted by a UME of unprecedented size and duration (began 1 February 2010 and ended 31 July 2014). Coastal bottlenose dolphin stocks were devastated by the *Deepwater Horizon* spill, and are still experiencing negative effects on health and reproduction a decade later.

[28] Roberts et al. (2016).

[29] The months of January and February, together with March and April, correspond with periods of higher neonate mortality and of peak calving and last gestation for bottlenose dolphins in the Central Gulf. A correspondence between neonate strandings and calving peaks has been observed in other U.S. regions, such as the southeast. (McFee, W.E., Speakman, T.R., Balthis, L., Adams, J.D., and Zolman, E.S., Reproductive seasonality of a recently designated bottlenose dolphin stock near Charleston, South Carolina, U.S.A., *Marine Mammal Science* 30: 528-543 (2014).) In the central Gulf, stranding data from various studies show peaks in neonate (<115 cm) mortality in the later winter and spring. (*E.g.*, Carmichael R.H., Graham, W.M., Aven, A., Worthy, G., and Howden, S., Were multiple stressors a "perfect storm" for northern Gulf of Mexico bottlenose dolphins (*Tursiops truncatus*) in 2011? *PLoS ONE* 7: e41155. doi:10.1371/journal.pone.0041155 (2012); Mattson, M.C., Mullin, K.D., Ingram, Jr., G.W., and Hoggard, W., Age structure and growth of the bottlenose dolphin (*Tursiops truncatus*) from standings in the Mississippi Sound region of the north-central Gulf of Mexico from 1986-2003, *Marine Mammal Science* 22: 654-666 (2006); Urian, K.W., Duffield, D.A., Read, A.J., Wells, R.S., and Shell, E.D., Seasonality of reproduction in bottlenose dolphins, *Tursiops trucatus*, *Journal of Mammalogy* 77: 394-403 (1996).) During the first year of the post-spill UME documented by NOAA, an unusual number (n=186) of perinatal (near-term to neonatal) bottlenose dolphin mortalities occurred, in waters running from Louisiana to western Florida, between 1 January and 30 April 2011. This time period was marked by heightened strandings within three distinct peaks: 29 January- 4 February, 19-25 February, and 19-25 March. (Carmichael et al., Were multiple stressors a "perfect storm," *supra*.) Overall, the greatest number of strandings of premature, stillborn, or neonatal dolphins reported during the five-year UME occurred in January (range=0-9), February (range=1-35), March (range=7-28), and April (range=2-16). (NOAA Fisheries (2015). Cetacean unusual mortality event in Northern Gulf of Mexico (2010-2014).) Similarly, before the recent UME began, the highest incidence of neonate strandings in the Mississippi Sound was recorded during the months of February through April. (Mattson et al., Age structure and growth of the bottlenose dolphin, *supra*.)

currently experiencing numerous synergistic and cumulative impacts. NMFS estimates that 38% of coastal bottlenose dolphins were killed in the recent Unusual Mortality Events, that 37% of their pregnancies were lost, and that 30% of them are suffering from adverse health effects.[30] Animals that are in poor health or are limited in range, such as the Gulf's small coastal dolphin communities, are more likely to remain in a disturbed area despite biological costs.[31]

Additionally, seasonal changes in the distribution of some bottlenose dolphin populations make them more vulnerable to offshore wind energy development activities during the winter months. Gulf bottlenose dolphins show varying degrees of residency,[32] with certain populations demonstrating strong site fidelity to feeding areas[33] and others exhibiting seasonal movements between the coastal waters of the Gulf and inshore bay, sound, and estuary habitat.[34] Populations that seasonally inhabit the Gulf's coastal waters in the winter months are more likely to be at risk of exposure to federally permitted offshore wind energy development activity during that time. A winter restriction on development activities would substantially reduce exposure of these populations.

3. Gulf of Mexico Whale Core Habitat

Recently determined to be a new and distinct species,[35] the Gulf of Mexico whale (*Balaenoptera ricei*) is the only large whale species to fully reside in the waters of the United States and is counted among the most endangered marine mammal species in existence. Approximately 50 individuals remain, according to best estimates, and the species can only afford to lose one whale about every fifteen years as a result of human impacts if it is to recover.[36] The Gulf of Mexico whale was listed as endangered under the

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[30] NOAA, NRDA-funded marine mammal monitoring, presentation to the National Academy of Science, Effective Approaches for Monitoring and Assessing Gulf of Mexico Restoration Activities (Oct. 22, 2015); *see also* Lane, S.M., Smith, C.R., Mitchell, J., Balmer, B.C., Barry, K.P., McDonald, T., Mori, C.S., Rosel, P.E., Rowles, T.K., Speakman, T.R., Townsend, F.I., Tumlin, M.C., Well, R.S., Zolman, E.S., and Schwacke, L.H., Reproductive outcome and survival of common bottlenose dolphins sampled in Barataria Bay, Louisiana, USA, following the *Deepwater Horizon* oil spill, *Royal Society Proceedings: Biological Science* 282(1818): 20151944 (2015).

[31] Beale, C.M., and Monaghan, P., Behavioural responses to human disturbance, *supra*; Bejder, L., Samuels, A., Whitehead, H., Gales, N., Mann, J., Connor, R., Heithaus, M., Watson-Capps, J., and Flaherty, C., Decline in relative abundance of bottlenose dolphins exposed to long-term disturbance, *Conservation Biology* 20: 1791-1798 (2006).

[32] Vollmer, N.L., and Rosel, P.E., A review of common bottlenose dolphins (*Tursiops truncatus truncatus*) in the northern Gulf of Mexico: Population biology, potential threats, and management, *Southeastern Naturalist* 13(6): 1-43 (2013).

[33] Wilson, R.M., Nelson, J.A., Balmer, B.C., Nowacek, D.P., and Chanton, J.P., Stable isotope variation in the northern Gulf of Mexico constrains bottlenose dolphin (*Tursiops truncatus*) foraging ranges, *Marine Biology* 160: 2967-2980 (2013).

[34] Hubard, C.W., Maze-Foley, K., Mullin, K.D., and Schroeder, W.W., Seasonal abundance and site fidelity of bottlenose dolphins (*Tursiops truncatus*) in Mississippi Sound, *Aquatic Mammals* 30: 299-310 (2004); Scott, M.D., Wells, R.S., and Irvine, A.B., A long-term study of bottlenose dolphins on the west coast of Florida, pp. 235-244 in Leatherwood, S., and Reeves, R.R. (eds.), *The Bottlenose Dolphin* (2012). Notably, some near-coastal bottlenose dolphin populations have been observed leaving the Mississippi Sound during the winter to temporarily reside outside of the barrier islands.

[35] Rosel, P.E., Wilcox, L.A., Yamada, T.K. and Mullin, K.D., "A new species of baleen whale (Balaenoptera) from the Gulf of Mexico, with a review of its geographic distribution." *Marine Mammal Science*. (Published online: Jan. 10, 2021).

[36] NMFS, "U.S. Atlantic and Gulf of Mexico Draft Marine Mammal Stock Assessment" at pp. 286-295. Available at: https://s3.amazonaws.com/media.fisheries.noaa.gov/2020-12/Draft%202020%20Atlantic-Gulf-marine%20mammal%20stock%20assessment%20reports.pdf?null; Potential Biological Removal (PBR) is the

Endangered Species Act (ESA) on 15 April 2019,[37] and is presently listed as a Critically Endangered subpopulation on the International Union for Conservation of Nature (IUCN) Red List.[38] Both listings occurred before the new taxonomic information on species-level delineation came to light.

The species' small population size and the deleterious genetic effects associated with limited abundance (*e.g*., inbreeding depression, loss of potentially adaptive genetic diversity, and accumulation of deleterious mutations), as well as the species' highly restricted distribution, and the myriad of anthropogenic threats it faces, place these whales at high risk of extinction.[39] Offshore wind energy siting and development, including all associated vessel activity and transits, must be avoided in the Gulf of Mexico whale's core habitat year-round.[40]

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product of the minimum population size, one-half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997; Wade 1998). According to the Draft Stock Assessment Report, the minimum population size is 34, the maximum productivity rate is 0.04, the default value for cetaceans, and the recovery factor is 0.1 because the stock is listed as endangered. We therefore calculate PBR for the Gulf of Mexico whale as 0.068 (in our view, PBR should not be rounded up to 0.1, as done in the Draft Stock Assessment Report; p. 289, Table 2).

[37] 84 Fed. Reg. at 15,446 (Apr. 15, 2019).

[38] Corkeron, P., *et al*., *supra*.

[39] Rosel, P.E., *et al*. (2016), *supra*. The Gulf of Mexico whale was the offshore cetacean most affected by the *Deepwater Horizon* spill; approximately 48% of its known habitat was oiled, and the spill is estimated to have killed 17% of the population. (DWH MMIQT, "Models and analyses for the quantification of injury to Gulf of Mexico cetaceans from the Deepwater Horizon oil spill," DWH marine Mammal NRDA Technical Working Group Report (2015). Available at: https://www.fws.gov/doiddata/dwh-ar-documents/876/DWH-AR0105866.pdf.); Rosel, P.E, *et al*. 2021, *supra*; citing Rosel, P.E., Corkeron, P.J., Engleby, L., Epperson, D., Mullin, K., Soldevilla, M.S., and Taylor, B.L., "Status review of Bryde's whales (*Balaenoptera edeni*) in the Gulf of Mexico under the Endangered Species Act," NOAA Technical Memorandum NMFS-SEFSC-692, U.S. Department of Commerce (2016); and Soldevilla, M.S., Hildebrand, J.A., Fraser, K.E., Dias, L.A., Martinez, A., Mullin, K.D., Rosel, P.E., and Garrison, L.P., "Spatial distribution and dive behavior of Gulf of Mexico Bryde's whales: Potential risk of vessel strikes and fisheries interactions," *Endangered Species Research*, vol. 32, pp. 533-550 (2017).

[40] For the purposes of this letter, we define "core habitat" following the NOAA Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico as: the area between 100 m and 400 m deep from approximately Pensacola, FL, to just south of Tampa, FL (*i.e*., from 87.5° W to 27.5° N) plus an additional 10 km around that area. The proposed area reflects the "Bryde's whale mitigation area" defined by NMFS in the "Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico" (Mar. 2020). Available at: https://media.fisheries.noaa.gov/dam-migration/final_biop_gomex_oil_and_gas_program_03132020.pdf; Once widespread in the northern and southern Gulf, the species' range has since contracted, and its core habitat is now restricted to the waters within and surrounding a single submarine canyon system—the De Soto Canyon—located mainly below the Florida panhandle. The reasons for the restricted distribution are unknown, but high levels of industrial activity in the Gulf of Mexico could be a significant factor; it is also likely that the presence of prey and relatively low levels of anthropogenic noise near the canyon make it an attractive area for this population. (Soldevilla, M.S., *et al*., *supra*. Wiggins, S.M., Hall, J.M., Theyre, B.J., and Hildebrand, J.A., "Gulf of Mexico low-frequency ocean soundscape impacted by airguns," *The Journal of the Acoustical Society of America*, vol. 140, pp. 176-183 (2016).) Beyond the core habitat area, multiple lines of evidence, including sightings, acoustic detections, and models of habitat suitability, suggest that the waters that fall between the 100-meter and 500-meter isobaths, including in the waters of the western Gulf off Texas, represent suitable habitat important to the eventual recovery of the species. (NRDC, "A report on designating critical habitat for the Gulf of Mexico Bryde's whale (*Balaenoptera edeni*) under the Endangered Species Act" (Apr. 6, 2020).)

4. Mississippi Canyon

It is well established, based on historic whaling records, mark-recapture data, and extensive surveys including by the GulfCet II and Sperm Whale Seismic Study, that the Mississippi Canyon constitutes important habitat for the Gulf's small, biologically distinct population of sperm whales,[41] most likely due to the input of a nutrient-rich, freshwater plume from the Mississippi Delta.[42] Nearly all sightings of females and mother-calf groups have occurred in the Mississippi Canyon area, strongly suggesting it functions as a nursery ground.[43] Acoustic monitoring also shows that the Mississippi Canyon constitutes the area with the vast majority of social activity.[44]

Yet this habitat is easily compromised. A controlled exposure experiment conducted in the Mississippi Canyon under the Sperm Whale Seismic Study found that sperm whales did not abandon the habitat when exposed to airgun noise, a predominantly low frequency sound; but their buzz rates, a measure of foraging success, declined substantially, by an average of 19%, on exposure to even moderate noise levels.[45] Moreover, deeper parts of the canyon, where deep-diving sperm whales are likely to spend considerable time foraging, are particularly susceptible to high levels of chronic noise.[46] BOEM should consider a year-round avoidance area for all offshore wind energy development activity within the Mississippi Canyon.

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[41] *E.g.*, Townsend, C.H., The distribution of certain whales as shown by logbook records of American whaleships, *Zoologica: Scientific Contributions of the New York Zoological Society* 19:3-50 (1935); Biggs, D.C., Leben, R.R., and Ortega-Ortiz, J.G., Ship and satellite studies of mesoscale circulation and sperm whale habitats in the northeast Gulf of Mexico during GulfCet II, *Gulf of Mexico Science* 18:15-22 (2000); Weller, D.W., Wűrsig, B., Lynn, S.K., and Schiro, A.J., Preliminary findings on the occurrence and site fidelity of photo-identified sperm whales (*Physeter macrocephalus*) in the northern Gulf of Mexico, *Gulf of Mexico Science* 18:35-39 (2000); Baumgartner, M.F., Mullin, K.D., May, L.N., and Leming, T.D., Cetacean habitats in the northern Gulf of Mexico, *Fishery Bulletin*, U.S. 99:219-239 (2001); Jochens, A., Biggs, D., Engelhaupt, D., Gordon, J., Jaquet, N., Johnson, M., Leben, R., Mate, B., Miller, P., Ortega-Ortiz, J., Thode, A., Tyack, P., Wormuth, J., Wűrsig, B., Sperm whale seismic study in the Gulf of Mexico: Summary report, 2002-2004 (2006) (OCS Study MMS 2006-034).

[42] Davis, R.W., Ortega-Ortiz, J.G., Ribic, C.A., Evans, W.E., Biggs, D.C., Ressler, P.H., Cady, R.B., Leben, R.R., Mullin, K.D., and Wűrsig, B., Cetacean habitat in the northern oceanic Gulf of Mexico, *Deep-Sea Research* 49:121-142 (2002).

[43] *E.g.*, Weller *et al.*, Preliminary findings, *supra*; Jochens *et al.*, Sperm whale seismic study, *supra*.

[44] MacDonald, E. et al., Building time-budgets from bioacoustic signals to measure population-level changes in behavior: a case study with sperm whales in the Gulf of Mexico, *Ecological Indicators* 72:360–364 (2017).

[45] Miller, P.J.O., Johnson, M.P., Madsen, P.T., Biassoni, N., Quero, M., and Tyack, P.L., Using at-sea experiments to study the effects of airguns on the foraging behavior of sperm whales in the Gulf of Mexico, *Deep-Sea Research I* 56: 1168-1181 (2009).

[46] Li, K., Sidorovskaia, N.A., Guilment, T., Tang, T., and Tiemann, C.O., "Decadeal assessment of sperm whale site-specific abundance trends in northern Gulf of Mexico using passive acoustic data." Journal of Marine Science and Engineering, vol. 9, p. 454 (2021). Available at: https://doi.org/10.3390/jmse9050454. The canyon was also at the epicenter of the *Deepwater Horizon* spill, presenting a serious long-term risk to sperm whale health and the health of other species with strong fidelity to the area. In early 2017, two endangered sperm whales stranded in the Gulf of Mexico, an indicator that this population must be safeguarded from additional stressors. (Fisherman snaps photos of dead whale in Louisiana Lake, *The Times-Picayne* (Jan. 4, 2017) http://www.nola.com/outdoors/index.ssf/2017/01/fishing_guide_snaps_photos_of.html; an unusual stranding of nearly 100 false killer whales also occurred in the Gulf off the Florida Coast in January 2017.)

5. The Alternative 5 Area of Flower Garden Banks National Marine Sanctuary Expansion

The Flower Garden Banks National Marine Sanctuary is one of 14 federally designated underwater areas in the U.S. protected by NOAA's Office of National Marine Sanctuaries, and is currently the only National Marine Sanctuary located in the Gulf of Mexico. The area delineated in alternative 5 of the Flower Garden Banks National Marine Sanctuary Expansion[47] covers ecologically important areas in the north central Gulf of Mexico that encompass benthic habitats and cultural resources that serve as a hotspot for marine life that extend beyond the designated Flower Garden Banks National Marine Sanctuary. Natural and cultural resources in these areas include mesophotic coral habitats; deep coral reef ecosystems; shipwrecks; and numerous species of marine life. The bank and pinnacles in this area are important habitats for threatened and endangered corals, sharks and rays, sea turtles, and marine mammals, including include beaked whales, Atlantic spotted dolphins, and common bottlenose dolphins.[48] Because of the importance of this area to supporting marine life and the sensitivity of the reefs, development should not occur within the area delineated in alternative 5 of the Flower Garden Banks National Marine Sanctuary Expansion.

6. Black-capped Petrel Core Habitat

The Gulf of Mexico is part of Black-capped Petrel normal range, year-round.[49] This species is currently under consideration for listing under the ESA and is classified as endangered by the IUCN, as populations continue to decline.[50] This expanded range designation does not translate to expanding population size, but does reveal that the species faces challenges associated with the Gulf of Mexico, including declines in foraging fish, increased storm frequency, and oil and gas infrastructure and pollution.

7. Additional Recommendations

We also recommend acoustic buffer zones be established around avoidance areas for marine mammals based on, at minimum, the 130 dB isopleth to avoid, or least significantly minimize, behavioral harassment from pile driving and other noise-producing activities. Best available science indicates that many marine mammal species, including sperm whale and baleen whales like the Gulf of Mexico whale, will suffer disruptions in foraging and other behavior in high percentages at much lower levels of noise exposure than NOAA's outdated 160 dB behavioral harassment threshold for impulsive noise, and that chronic low-level exposures can also accumulate to serious harm[51] (*see*, *also*, Section V(B) on noise

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[47] *See* map here: https://nmsflowergarden.blob.core.windows.net/flowergarden-prod/media/archive/img/maps/alternative5map.jpg

[48] NOAA NMS. "Flower Garden Banks National Marine Sanctuary." Available at: https://flowergarden.noaa.gov/about/welcome.html; Gulf of Mexico OCS, Proposed Geological and Geophysical Activities, Western, Central, and Eastern Planning Areas: Final Programmatic Environmental Impact Statement at 4-113.

[49] Jodice PGR, Michael PE, Gleason JS, Haney JC, Satgé YG. 2021. Expanding the marine range of the endangered black-capped petrel Pterodroma hasitata: Occurrence in the northern Gulf of Mexico and conservation implications. bioRxiv:2021.01.19.427288. Cold Spring Harbor Laboratory.

[50] https://www.iucnredlist.org/species/22698092/132624510

[51] *E.g.*, Blackwell, S.B., et al. Effects of airgun sounds on bowhead calling rates; Pirotta, E., et al. Variation in harbor porpoise activity in response to seismic survey noise; Miller, P.J.O., et al., Using at-sea experiments to study the effects of airguns; Miller, G.W., Moulton, V.D., Davis, R.A., Holst, M., Millman, P., MacGillivray, A., and Hannay. D., Monitoring seismic effects on marine mammals—southeastern Beaufort Sea, 2001-2002, *in* Armsworthy, S.L., et al. (eds.), *Offshore Oil and Gas Environmental Effects Monitoring/ Approaches and Technologies* 511-542

impacts to marine mammals). While effects from pile driving can occur at exposure levels below 130 dB (broadband SPL), we propose using that isopleth as a minimal practicable set back distance.[52]

We further urge that the utmost care be taken to identify and protect avian migration patterns for the estimated 2.1 billion trans-oceanic migrants, some of which are making circumpolar migrations.[53] Nearly half of migrating birds are concentrated during the 18-day period from April 19 to May 7, but migration is underway at some level for extended periods in both spring and fall. On northbound trips, migrants are likely to encounter offshore turbines along the Gulf coast when their energy reserves are lowest. Extensive studies at oil and gas platforms in the Gulf of Mexico have demonstrated the risks to trans-Gulf migrants of collision with offshore infrastructure, as migrants are attracted to offshore infrastructure, increasing collision risk.[54] Birds that land on offshore platforms may not have the energy reserves to take off or expend enough energy doing so that they are less likely to reach the shoreline to refuel. Landbirds landing on offshore infrastructure in the Gulf of Mexico are also more likely to encounter serious predators like Peregrine Falcon, which are also attracted to the platforms.

It is important that BOEM factor the following upcoming sources into its analysis of hotspots:

- Identification of primary avian migration patterns through marine radar and radio telemetry.[55] While BOEM has funded important research – leading to insights in distributions of Black-capped Petrels within the Gulf of Mexico – and continued the GoMMAPPS program to provide wildlife distributions, the final GoMMAPPS report summarizing avian distributions for other species traversing the Gulf is not yet available. This information will be invaluable in informing least conflict sites for offshore wind development and BOEM and the states along the Gulf should not proceed in identifying potential wind energy areas without the publication of this final report.

(2005). *See also* Finley, K.J., Miller, G.W., Davis, R.A., and Greene, C.R., Jr., Reactions of belugas, Delphinapterus leucas, and narwhals, *Monodon monoceros*, to ice-breaking ships in the Canadian high Arctic, *Canadian Bulletin of Fisheries & Aquatic Sci.* 224: 97-117 (1990); Cosens, S.E., and Dueck, L.P., Ice breaker noise in Lancaster Sound, NWT, Canada: implications for marine mammal behavior, *Marine Mammal Science* 9: 285-300 (1993); Di Iorio, L., & Clark, C., C.W. Exposure to seismic survey alters blue whale communication. Castellote, M., et al. Acoustic and behavioral changes by fin whales; Cerchio, S., et al. Seismic surveys negatively affect humpback whale singing activity. Clark C.W. and Gagnon G.C., Considering the temporal and spatial scales of noise exposures. Risch, D., Corkeron, P.J., Ellison, W.T. and Van Parijs, S.M., Changes in humpback whale song occurrence in response to an acoustic source 200 km away, *PLoS ONE* 7(1): e29741 (2012).

[52] This siting recommendation takes into consideration the short-term nature of offshore construction. Activities like oil and gas development that involve repeated or chronic acoustic disturbance of important habitat may necessitate broader buffer areas.

[53] Horton KG, Doren BMV, Sorte FAL, Cohen EB, Clipp HL, Buler JJ, Fink D, Kelly JF, Farnsworth A. 2019. Holding steady: Little change in intensity or timing of bird migration over the Gulf of Mexico. Global Change Biology 25:1106–1118.

[54] Based on research across the Gulf of Mexico's oil and gas archipelago, we know that birds face increased risk of collision from turbine infrastructure (whether the rotor is functioning or not); Russell, R.W. 2005. Interactions between migrating birds and offshore oil and gas platforms in the northern Gulf of Mexico: Final Report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-009. 348 pp.

[55] Jodice PGR, Michael PE, Gleason JS, Haney JC, Satgé YG. 2021. Expanding the marine range of the endangered black-capped petrel Pterodroma hasitata: Occurrence in the northern Gulf of Mexico and conservation implications. bioRxiv:2021.01.19.427288. Cold Spring Harbor Laboratory.

- Updating the cetacean habitat-based density models of Roberts et al. (2016)[56] with data collected during the last five years, and deriving core abundance areas from those updated models, particularly for noise-sensitive species.[57]
- Factoring in the new scientific information on the Gulf of Mexico whale generated through the RESTORE Science Program (as further noted in Section IV(B)).
- Data and analyses resulting from GoMMAPPS, as well as the results of the forthcoming NOAA-led passive acoustic monitoring research funded under the Natural Resources Damage Assessment (NRDA) Underwater Noise project, that will provide important scientific information on marine mammal habitats, including in previously under-surveyed regions.
- NOAA's updated list of Biologically Important Areas (BIAs) for all regions of the United States, including the Gulf of Mexico.
- Updated sea turtle density modeling, expected in early 2022, that will integrate a wide range of regional and Gulf-wide data sources and data types (*e.g.*, tagging, strandings, sightings) in the WPA and CPA.[58]

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[56] Roberts, J.J., Best, B.D., Mannocci, L., Fujioka, E.I., Halpin, P.N., Palka, D.L., Garrison, L.P., Mullin, K.D., Cole, T.V., Khan, C.B. and McLellan, W.A., 2016. Habitat-based cetacean density models for the US Atlantic and Gulf of Mexico. *Scientific reports*, *6*(1), pp.1-12. It is important to also note that the Roberts et al. models are known to under-represent important habitat in some cases, meaning that they should always be deployed in concert with other data sources and analyses, such as passive acoustic monitoring and opportunistic sightings, in order to capture additional factors such as ephemeral or seasonal feeding and breeding aggregations.

[57] An example of this type of analysis was undertaken by NMFS in the five-year proposed rule for geophysical survey activities in the Gulf of Mexico. Here, NMFS used the Roberts et al. models to evaluate "core abundance areas," defined as the smallest area containing a given percentage of the predicted abundance of each species. NMFS limited its analysis to two deep diving species, sperm whales and beaked whales, and its results formed the basis of the Dry Tortugas restriction area. (83 Fed. Reg. 29,212 (Jun. 22, 2018).)

[58] Data collected prior to the *Deepwater Horizon* oil spill which occurred in April 2010 can be used to provide historical occurrence information; however, data collected after the spill (but not directly after the spill) may provide a better baseline for offshore wind planning. Recent data sources include GoMMAPPS shipboard and aerial survey data, U.S. Navy survey data, the Florida Fish and Wildlife Conservation Commission and Mote Marine Laboratory tagging data, USACE Sea Turtle Data Warehouse, pelagic longline fisheries data, Sea Turtle Stranding and Salvage Network (STSSN), and additional satellite telemetry data. Halpin, P.N., A.J. Read, E. Fujioka, B.D. Best, B. Donnelly, L.J. Hazen, C. Kot, K. Urian, E. LaBrecque, A. Dimatteo, J. Cleary, C. Good, L.B. Crowder, and K.D. Hyrenbach. 2009. OBIS-SEAMAP: The world data center for marine mammal, sea bird, and sea turtle distributions. Oceanography 22(2):104–115, https://doi.org/10.5670/oceanog.2009.42. Latusek-Nabholz, J. 2014. Sightings for REMUS Sonar Test Event - July 2013. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/1098). Latusek-Nabholz, J. 2013. Sightings for AN/AQS-20 Sonar Aerial Monitoring in the NSWC PCD Study Area from July 2011 and May 2012. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/947). Tucker T. 2021. FWC-Mote Florida Loggerheads. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/658). Hirama, S., B. Witherington and R. Hardy. 2014. FWRI EPDC NonNeonate SeaTurtle Observations. Data downloaded from OBIS-SEAMAP (http://seamap.env.duke.edu/dataset/483). Iverson, A.R., A.M. Benscoter, I. Fijisaki, M.M. Lamont, and K.M. Hart. 2020. Migration corridors and threats in the Gulf of Mexico and Florida Straits for loggerhead sea turtles. Frontiers in Marine Science 7. http://www.seaturtle.org/tracking/. Fujisaki, I., K.M. Hart, D. Bucklin, A. Iverson, C. Rubio, M. Lamont, R. Miron, P.M. Burchfield, J. Peña, and D. Shaver. 2020. Predicting multi-species foraging hotspots for marine turtles in the Gulf of Mexico. Endangered Species Research 43. Hart, K.M., M.M. Lamont, A.R. Sartain, I. Fujisaki, and B.S. Stephens. 2013. Movements and habitat-use of loggerhead sea turtles in the northern Gulf of Mexico during the reproductive period. PLoS ONE 8(7):e66921.

E. Thorough Environmental Analysis Should Be Conducted Prior to Any Lease Sale

For over a half-century, the National Environmental Policy Act (NEPA) has ensured that federal agency decision-making is based on a thorough consideration of the environmental impacts of federal decisions. NEPA requires "efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man" and mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [NEPA]."[59] Under NEPA, federal agencies must consider the environmental impacts of their actions through preparation of an environmental impact statement (EIS) or environmental assessment (EA).[60] Before making any determination as to whether to lease or where leases may be issued, BOEM must conduct a thorough environmental review of the potential impacts, including cumulative impacts, under NEPA.

<u>Responsible offshore wind siting and NEPA require that no less than an EA of the proposed lease area(s) be conducted in advance of an area lease sale, even if the area is determined to be a non-competitive lease sale location</u>. The RFI notes that "[i]f, following this RFI, BOEM determines that there is no competitive interest in the RFI Area, BOEM may proceed with the noncompetitive leasing process under 30 CFR 585.232."[61] This process would allow BOEM to coordinate and consult with affected federal and state agencies, local governments, and Native American tribes, before potentially offering a lease *without* conducting further environmental review and public outreach. While under this non-competitive lease sale scenario, BOEM would likely still be required to produce a project-specific EIS and further review prior to awarding any lessee the right to proceed with construction and operations, opportunity for public comment and environmental review is clearly truncated. Though a lease does not confer or promise a permit, it does grant the ability to conduct site assessment activities, which bring their own potential impacts to bear on the area. To ensure sufficient environmental review in siting offshore wind in the Gulf region – or anywhere on the Outer Continental Shelf (OCS) – it is essential that no less than an EA be conducted on an identified WEA, and that this analysis guide BOEM's decision-making process regarding the offering of a lease.

Further, as noted in the RFI, prior to leasing, BOEM must also comply with various agency requirements of environmental review and consultation including, but not limited to, the Migratory Bird Treaty Act (MBTA) and the ESA. These consultations should be integrated into the NEPA process at every step of the way, from pre-leasing onward. With regards to these consultations, we stress the following:

1. BOEM Is Obligated to Consider Incidental Take Under the Migratory Bird Treaty Act

The MBTA[62] states "[u]nless and except as permitted by regulations . . . it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill . . . any migratory bird."[63] For decades, the Department of Interior (DOI) has interpreted the MBTA to encompass "incidental takes" of migratory birds, including those from wind turbines. We urge BOEM to implement its responsibilities to migratory birds as all administrations have done under the MBTA previous to the 2017 Jorjani Opinion M-37050 (which limited the MBTA's legal scope to only include

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[59] 42 U.S.C. § 4332
[60] *See Id*. (C)
[61] RFI at 31340.
[62] Migratory Bird Treaty Act of 1918, 16 U.S.C. § 703 (1918).
[63] *Id*.

actions that purposely take migratory birds),[64] with explicit recognition that incidental take is prohibited. This would also be consistent with the current administration's recently proposed rule,[65] intended to revoke the January 7 rule,[66] and is further consistent with BOEM's 2009 memorandum of understanding with the U.S. Fish and Wildlife Service (USFWS) to protect migratory bird populations.[67] Recognizing incidental take as prohibited, and producing an impact analysis consistent with this interpretation of the MBTA, is vital to maintain regulatory certainty and to create consistent expectations for developers and other stakeholders.

A number of signatories of these comments (Natural Resources Defense Council, National Wildlife Federation, and National Audubon Society), together with many other organizations and states, successfully challenged DOI's unlawful reinterpretation of the MBTA in court.[68] On August 11, 2020, the United States District Court for the Southern District of New York found that "the Jorjani Opinion's interpretation runs counter to the purpose of the MBTA to protect migratory bird populations."[69] The court found that the statute's unambiguous text makes clear that killing a migratory bird "by any means or in any manner," regardless of how, is covered by the statute.[70] As such, the district court struck down the Jorjani Opinion as unlawful, restoring the MBTA's protections for migratory birds from incidental takes,[71] and we expect BOEM to respect the court's ruling. The unlawful reinterpretation does not relieve BOEM or USFWS from their obligations for conservation of birds under the federal laws, including the ESA and Executive Order (EO) 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" (January 17, 2001),[72] as well as the MBTA.

2. The RFI Area Will Require Ongoing Endangered Species Act Consultation

In potentially leasing offshore wind in the Gulf of Mexico, BOEM has a duty to protect the myriad threatened and endangered species that reside in, migrate through, or use the region,[73] and must consult with USFWS or NMFS if "any action . . . may affect" endangered or threatened species.[74] As noted in Section II, this region hosts multiple marine, avian, and terrestrial ESA-listed species that the leasing of offshore wind "may affect." As of 2020, NOAA reported at least four endangered whale

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[64] U.S. Department of the Interior, "The Migratory Bird Treaty Act Does Not Prohibit Incidental Take," Memorandum M- 37050 (Dec. 22, 2017), https://www.doi.gov/sites/doi.gov/files/uploads/m-37050.pdf.

[65] 86 F.R. 24573 (2021).

[66] 50 C.F.R. § 10 (2021).

[67] Memorandum of Understanding Between the Department of the Interior U.S. Minerals Management Service and the Department of the Interior U.S. Fish and Wildlife Service Regarding Implementation of Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds" (Jun. 4, 2009). https://www.boem.gov/Renewable-Energy-Program/MMSFWS_MBTA_MOU_6-4-09-pdf.aspx.

[68] National Audubon Society v. U.S. Department of Interior, No. 18-cv-08084 (S.D.N.Y 2019).

[69] Natural Resources Defense Council v. United States DOI, 2020 WL 4605235, at *6 (S.D.N.Y. Aug. 11, 2020).

[70] *Id*. at 9-10.

[71] *Id*. at 14.

[72] Exec. Order No.13186, 3 C.F.R. 1 (Jan. 10, 2001), https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/Req-EO13186migratorybirds.pdf.

[73] Under the Endangered Species Act, federal agencies must measure to ensure the "conservation of such endangered species and threatened species . . . ." 16 U.S.C. § 1531(b). Section 7(a)(2) requires BOEM to ensure that its actions are "not likely to jeopardize the continued existence of any endangered species or threatened species." 16 U.S.C. § 1536(a)(2).

[74] 16 U.S.C. § 1536(a)(2). See, also, 50 C.F.R. § 402.14 ("Each Federal agency shall review its actions at the earliest possible time to determine whether any action may affect listed species or critical habitat. If such a determination is made, formal consultation is required . . . .").

species (Fin, Sperm, Sei, and Gulf of Mexico Bryde's, which is now recognized as a distinct species called the Gulf of Mexico whale or Rice's Whale) and at least five threatened or endangered sea turtle species (green, Kemp's ridley, leatherback, loggerhead, and hawksbill), as well as the oceanic whitetip shark, giant manta ray, and various coral and fish species.[75] Consultation must occur not only when BOEM considers opening the area to competitive leasing, but at each action point along the way up to and including the approval of specific projects.[76]

IV. Strong Scientific Monitoring and Robust Baseline Data Are Needed for the Gulf of Mexico

As a general matter throughout all stages of offshore wind development, BOEM should ensure the necessary research and monitoring is carried out to address the substantial uncertainties regarding offshore wind and wildlife interactions. Even with its immense long-term benefits, offshore wind power, like any type of energy, poses risks to the environment it operates in. As relatively nascent U.S. technology – and one brand new to the Gulf of Mexico – it is necessary to understand baseline environmental conditions prior to offshore wind development in the region.

Baseline data collection and long-term environmental monitoring of offshore wind project sites is a critical component of responsible offshore wind development. It allows us to build our understanding of the impacts of offshore wind development on marine and coastal resources and the effectiveness of mitigation technologies (*e.g.*, noise attenuation and thermal detection), so that relevant environmental concerns can be addressed most productively. Improved knowledge of an area's wildlife populations and oceanographic conditions (*e.g.*, seafloor habitat and airspace) before, during, and after project construction will help explain whether and how an offshore wind project impacts its surrounding environment and the degree to which efforts taken to avoid, minimize, and mitigate harm have been successful, while also enabling the adaptive management of environmental impacts that may occur.

A. The Gulf of Mexico Should Have a Comprehensive Monitoring Plan

BOEM should ensure creation of a robust, long-term scientific plan to monitor the effects of offshore wind development on marine mammals, sea turtles, fish, bats, birds, migratory insects including butterflies and dragonflies, and their habitats before, during, and after the first large-scale commercial offshore wind projects are constructed in the Gulf of Mexico. The plan should adopt a precautionary approach to account for fundamental gaps in our understanding of species and their behavioral responses, and employ the best available scientific methods to monitor and, if necessary, design further mitigation strategies. As noted in Section III, BOEM should support early tribal and stakeholder engagement in the identification of data needs. The science should be conducted in a collaborative and transparent manner, involving other federal agencies (*e.g.*, NMFS, USFWS), recognized marine and wildlife experts, and relevant stakeholders.

All data should be made publicly available and shared with standard metadata conventions used by the Marine Cadastre, the U.S. Integrated Ocean Observing System, regional ocean data portals, or other long-term collaborative data-management efforts. Discussions with these entities should begin before data collections efforts are initiated to ensure data collection and standards are aligned with appropriate systems. Data should be provided in appropriate formats, regionally standardized, and

[75] https://www.fisheries.noaa.gov/southeast/consultations/gulf-mexico
[76] 16 U.S.C. § 1536(a)(2).

synthesized where applicable for distribution through public data systems.[77] We also support the comprehensive analysis of these baseline data, and ongoing data compilation and analyses, in the selected RFI area as well as the region overall, to enhance collaboration with developers, scientists, managers, and other stakeholders in the Gulf area.

B. Baseline Data Should Be Comprehensively Collected for the Gulf of Mexico

Over the past twenty-five years, survey effort in the Gulf of Mexico has been sporadic, with yearly GOMEX (Southeast Fisheries Science Center, or "SEFSC") and GulfCet (SEFSC-Texas A&M) aerial surveys conducted annually through most of the 1990s, and periodic surveys held over two seasons in 2003-04 and one season in 2009, before the *Deepwater Horizon* response spurred a targeted survey of exposed swaths of the northern Gulf. Between 2017 and 2020, the GoMMAPPS program conducted broad-scale surveys to assess species distribution and abundance for marine mammals, sea turtles, and seabirds, from nearshore to the U.S. Exclusive Economic Zone (EEZ) in the Northern Gulf of Mexico.[78] Yet, as Taylor et al. (2007) made clear, even surveys conducted on a regular three-year cycle are unlikely to detect precipitous declines in abundance for many Gulf species.[79] In the case of marine mammals, for example, the report from the Guidelines for Assessing Marine Mammal Stocks (GAMMS) III workshop[80] recommended that NMFS serially reduce its minimum population estimates for each year following a survey that new abundance figures are not available, and that a 10% annual decline be retroactively assumed when more than eight years elapse.[81]

The need for regular abundance surveys is all the more critical in the Gulf of Mexico, given the offshore occurrence of most Gulf species and the extraordinary anthropogenic stressors – not the least of which is the remaining recovery from the 2010 disaster – affecting those populations. Obtaining seasonal distribution data is also essential. Most recent Gulf surveys have occurred in the spring and summer; however, understanding how species are distributed over the year is important to both impact assessment and to time-area management of offshore wind energy development activities. The Gulf of Mexico's baseline data needs include, *but are not limited to*:

- The distributions, migratory pathways, and flight behavior of seabirds, shorebirds, migratory landbirds, and bats in the Gulf of Mexico.
- Locations of coastal nesting birds and colonies.
- Avian abundance and population vital rates.
- Habitat use by and abundance, stock structure, population demographics, and reproductive rates of the region's cetacean populations, including sperm whales and other deep-diving species, such as *Kogia* spp. and beaked whales and pelagic delphinids.[82]

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[77] We recommend incorporation of the detailed recommendations for data transparency and equitable data sharing at Trice, A., Robbins C., Philip, N. and Rumsey, M. Challenges and Opportunities for Ocean Data to Advance Conservation and Management, Ocean Conservancy, Washington D.C., 2021.

[78] https://www.boem.gov/gommapps

[79] Taylor, B.L., Martinez, M., Gerrodette, T., and Barlow, J., Lessons from monitoring trends in abundance of marine mammals, Marine Mammal Science 23: 157-175 (2007).

[80] https://www.uscg.mil/Portals/0/Headquarters/Administrative%20Law%20Judges/NOAA%20files%202019/67.4%20Exh.%2013%20Moore%20and%20Merrick%20editors%202011%20Guidelines%20for%20Preparing%20Stock%20Assessment%20Reports%202011%20GAMMS%20III%20Workshop.pdf?ver=2019-09-06-120915-827.

[81] Moore, J.E., and Merrick, R., eds., Guidelines for assessing marine mammal stocks: Report of the GAMMS II Workshop, February 15-18, 2011, La Jolla, California (2011) (NOAA Tech. Memo. NMFS-OPR-47).

[82] Marine Mammal Commission, Gulf of Mexico Marine Mammal Research and Monitoring Meeting. Summary Report. New Orleans, Louisiana, 7-8 April 2015 (2015), at 28 (Table 5).

- Stock structure, abundance, and health of the northern Gulf of Mexico's 31 coastal bottlenose dolphins stocks.[83]
- The influence of climate change on distributions of coastal and marine species (*e.g.*, marine mammals, birds, forage fish, and sharks) and habitats (*e.g.*, range shifts), and on related predictive modeling.

Study of the Gulf of Mexico whale, conducted under the RESTORE Science Program,[84] should continue to allow for a fuller understanding of the species' demographics and distribution (See, also Section III(D)3).[85] Additionally, sperm whales in the Gulf of Mexico were the subject of a comprehensive research program, the Sperm Whale Seismic Study (SWSS), over a decade ago and many of the recommendations for further research posited by the scientific research team are still outstanding.[86] Perhaps most pertinent, the SWSS field cruises were both seasonally and spatially restricted (early June-September and along the 1000-m isobath between the Mississippi Canyon and the DeSoto Canyon) and therefore did not cover the full range of sperm whales in the Gulf in all seasons.[87] There is, therefore, a significant need to expand detailed studies of sperm whale populations to other regions, including off the Dry Tortugas, in the northwestern Gulf, in deeper waters, and, if possible, off Mexico. Studies should be conducted in all seasons to determine the seasonality of breeding and calving, and if habitat use patterns vary across the year.[88]

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[83] February 2019 Stock assessment report: https://media.fisheries.noaa.gov/dam-migration/170_tm258_bottlenosebse.pdf

[84] Findings from the study were presented in April 2021, in a three-day end-user workshop convened by NMFS. The RESTORE Science Program maintains a webpage on the study at https://restoreactscienceprogram.noaa.gov/projects/brydes-whales.

[85] Specifically, BOEM should undertake further photo-identification and mark-recapture studies in the species core habitat, and consider expanding to other areas. Installation of hydrophones in the western Gulf will provide important information on the western distribution of the Gulf of Mexico whale, as indicated by recent sightings off Texas. Now the taxonomy of the whale has been revised, it would also be useful to model an estimate of pre-whaling abundance for the species.

[86] Jochens, A., Biggs, D., Engelhaupt, D., Gordon, J., Jaquet, N., Johnson, M., Leben, R., Mate, B., Miller, P., Ortega-Ortiz, J. and Thode, A., 2006. *Sperm Whale Seismic Study in the Gulf of Mexico. Summary Report: 2002-2004* (No. 2006-034). United States. Minerals Management Service. Gulf of Mexico OCS Region.

[87] *Id.* at 272. Note that more recent research has also remained focused on this general area and coincident with the *Deepwater Horizon* oil spill. *See, e.g.,* Hildebrand, J. Passive Acoustic Monitoring for Marine Mammals in the Gulf of Mexico (available at http://cetus.ucsd.edu/projects_GoM.html).

[88] Such studies should comprise passive acoustic monitoring, photo-identification and tagging of representative individuals (including re-tagging of individuals over multiple years), and an examination of the feeding success and prey species of individuals. *See, e.g.,* Jochens, J., *et al*., Sperm Whale Seismic Study in the Gulf of Mexico. Synthesis Report, *supra*, at 273, 274, 280. Note that analytical advances have made it possible to derive density estimates of marine mammals from passive acoustic monitoring data. This approach is particularly valuable for deep-diving species not easily sighted during traditional vessel or aerial surveys, such as *Kogia* spp. and beaked whales. As for sperm whales, an expanded passive acoustic monitoring effort across the Gulf, including non-slope and deep-water areas, as well as the western Gulf and Mexican waters, would vastly improve our understanding of the density and seasonality of this endangered population species. Additional tagging and tracking efforts would also serve to refine density estimation parameters. See, *e.g.*, Marques, T.A., Thomas, L., Martin, S.W., Mellinger, D.K., Ward, J.A., Moretti, D.J., Harris, D., and Tyack, P.L., Estimating animal population density using passive acoustics, Biological Reviews 88: 287- 309 (2013). Marine Mammal Commission (2015). Gulf of Mexico Marine Mammal Research and Monitoring Meeting. Summary Report, *supra*, at 8.

To redress the lack of population trend information, the integration and synthesis of historically collected data could add significant value in establishing baseline information and in informing habitat and population models. Environmental data should be integrated to help identify important habitat features for various wildlife populations, which will be vital for identifying and monitoring current and potential high-use areas. As climate change causes shifting ocean conditions, marine wildlife may change historic or known patterns of habitat use, and predictive models including environmental data will be useful to understand these changes.[89]

The report, "A framework for studying the effects of offshore wind development on marine mammals and turtles,"[90] outlines detailed recommendations for monitoring the potential impacts of offshore wind on marine mammals and sea turtles, including long-term avoidance and/or displacement, by top scientists and experts working in this field. The Avian Considerations recommendations previously provided to BOEM on 23 October 2020 outline a framework for monitoring effects of displacement to birds using an integrated approach, incorporating transect surveys, telemetry, acoustics, and marine radar methods.[91]

C. Monitoring Plans Should Consider the Potential Use of Existing Structures for Data Collection

The presence of existing infrastructure (*i.e.*, oil and gas rigs) within the Gulf of Mexico provides a unique opportunity to incorporate technologies to monitor wildlife in the offshore environment before offshore wind infrastructure is deployed. Agencies and developers in the Atlantic OCS have needed to position structures offshore, like metocean buoys, to gather baseline environmental data in the marine environment prior to wind farm construction. For example, New York state's buoys are carrying passive radio telemetry receiver antenna, acoustic and ultrasonic song meters, underwater acoustic recorders, and underwater tag receivers to characterize the species of birds, bats, marine mammals, and fish that are utilizing the offshore wind planning areas.[92] BOEM; however, could act quickly in the Gulf of Mexico to kick off baseline monitoring efforts by working with existing offshore oil and gas lessees to install monitoring technologies, thereby decreasing the need to install metocean buoys. Monitoring methods to characterize species distributions will need to be designed to be high enough resolution and scope to 1) accurately inform responsible offshore wind planning and 2) document changes in species distributions.

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[89] Information and data resulting from ongoing and completed BOEM Environmental Studies Program (ESP) are publicly available on the ESP Information System (ESPIS). Researchers may also have archived samples that have not yet been analyzed due to resource or other constraints. We support the recommendations made at the recent meeting held by the Marine Mammal Commission that a mechanism be developed to collate, integrate, and analyze these data.

[90] Kraus, S.D., Kenney, R. D. and Thomas, L., "A Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Turtles," Report prepared for the Massachusetts Clean Energy Center, Boston, MA 02110, and the Bureau of Ocean Energy Management (May 2019).

[91] "Re:BOEM's obligations under Migratory Bird Treaty Act in Vineyard I Construction and Operation Plan Environmental Impact Statement." Submitted to BOEM Oct. 23, 2020; Available here: https://drive.google.com/file/d/1SNv6_3296W_S-c-OgMsfiKDAGFu7fOr4/view?usp=sharing

[92] https://remote.normandeau.com/docs/NYSERDA_buoy_information_with_spec_sheets.pdf

V. Potential Wildlife Impact Producing Factors and Recommendations for Monitoring and Mitigation

A. Turbine Installation: BOEM Should Incentivize the Use of "Quiet" Fixed-foundations

BOEM should encourage developers to evaluate a range of turbine foundations for use in the Gulf of Mexico. Although monopile and floating wind foundations were raised at the June 15, 2021 Gulf of Mexico Task Force meeting and are discussed below (*see* noise and entanglement sections, for example), other fixed foundation types that significantly reduce noise during installation, including gravity-based foundations, suction buckets (or "caissons"), and jack-up foundations,[93] are commercially available and we strongly encourage BOEM to incentivize full consideration of these foundations for all fixed-foundation wind energy projects.

Construction of "quiet" offshore fixed-foundation wind turbines do not require pile driving and, thus, avoid its associated noise impacts. By entirely avoiding the impact of pile driving noise, the installation of gravity-based or other quiet foundations represents a 'best practice' in the context of the mitigation hierarchy. As developers will not need the same level of noise protection in place, quiet foundations may offer the flexibility to construct year-round in some regions (e.g., avoiding seasonal restrictions (contingent on a requirement for a 10-knot speed restriction for all vessels), and eliminating the need for expensive underwater noise reduction and attenuation technologies (*e.g.*, hydro sound dampers, bubble curtains, etc.)).

B. Noise

Noise generated during each stage of offshore wind energy development (site assessment and characterization, construction, operations, and vessel-related noise) has the potential to negatively impact in-water species and the overall health of the ecosystem. Pile driving noise during the construction phase has been identified as a stressor of high concern for marine wildlife. Sensitivity to the loud impulsive sound that propagates through the water column and substrate from pile driving extends to marine mammals, sea turtles, fish, and invertebrates, some of which support economically valuable fisheries. Potential impacts of unmitigated exposure to pile driving noise include physical injury, hearing impairment, disruption of vital behaviors such as feeding, breeding, and communication, habitat displacement, stress, and other health effects. Low frequency continuous noise generated by operational turbines and vessel noise may also have the potential to displace species from important habitats, reduce communication space, mask vocalizations, or degrade acoustic habitat in other ways that impair an individual's ability to carry out its necessary life functions. Long-term exposure to noise can also result in chronic stress, health effects, and impaired reproduction across a wide array of species.[94]

The Gulf of Mexico already suffers from significant levels of anthropogenic noise, largely generated by the oil and gas industry, and those levels are having a measurable effect on the distribution and recovery rate of some species. Indeed, disruption from energy exploration and production in those areas may have led to an "abandonment" of habitat in the northwestern Gulf by the Gulf of Mexico whale.[95] Oil and gas activity may have already caused or contributed to a substantial contraction of the range of a

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[93] *See*, *e.g.*, http://www.windbaseoffshore.com/

[94] Duarte, C.M., Chapuis, L., Collin, S.P., Costa, D.P., Devassy, R.P., Eguiluz, V.M., Erbe, C., Gordon, T.A., Halpern, B.S., Harding, H.R. and Havlik, M.N., 2021. The soundscape of the Anthropocene ocean. *Science*, *371* (6529).

[95] Rosel and Wilcox, Genetic evidence reveals a unique lineage of Bryde's whales,

critically endangered baleen whale, and that contraction could be prolonged by noise generated by offshore wind development activities. This possibility, for the Gulf of Mexico whale and other species, should be explicitly considered by BOEM when moving forward with NEPA analysis in support of offshore wind energy development in the Gulf of Mexico.

In addition, for marine mammals, the development of compact data tags[96] and the continued refinement of locational passive acoustic monitoring has allowed the detection and tracking of animals over greater periods of time and across longer distances, providing a continuous account of the tracked animal's response to a disruptive stimulus or documenting changes in the vocalization of multiple animals over, in some cases, very large scales. The resulting data, reflected in numerous published papers, have found that behavioral disruptions are occurring at much higher percentages at lower noise exposure levels and at much greater distances than accounted for by the egregiously outdated 160 dB threshold for behavioral harassment for impulsive noise set by NOAA.[97] BOEM should assume that behavioral harassment of marine mammals will occur at noise levels below 130 dB,[98] and, until new, more sophisticated guidance can be developed, adhere to NOAA fisheries guidelines of Level B behavioral disruption of 120 dB (re: 1µPa) for continuous noise exposures.[99] This would include continuous operating noise in the near field and continuous reverberation at or above 120 dB from impulsive noise in the far field.

Mitigation and Research

Require Full Consideration of Quiet Foundations: As described in Section V(A) above, BOEM should require offshore wind energy developers to more fully evaluate the feasibility of quiet foundations as part of the project design envelope beyond simple cost. The more stringent noise requirements we propose BOEM require may also solidify the potential for and incentivize the expansion of quiet foundations for next generation wind turbines in the United States.

Require Best Available Control Technology be Used for Underwater Noise Reduction: If pile driving must occur, BOEM should require a *combination* of near-field (*e.g.*, hydrosound dampers) and far-field (*e.g.*, big bubble curtains) best available control technologies for underwater noise. Combinations of commercially available near- and far-field technologies now have the potential to reduce noise levels by 20 dB or more.[100] BOEM should require developers to meet noise reduction targets that reflect the noise reduction levels demonstrated to be attainable in the field.[101]

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[96] Data tags or "DTAGS" are data-logging devices that are attached to animals to record conditions such as depth, acoustical exposure, vector, temperature, and chemical conditions. Once fixed to a subject animal, DTAGS can intimately record the animal's responses to environmental conditions such as noise exposure.

[97] *E.g.*, Gomez, C., Lawson, J.W., Wright, A.J., Buren, A.D., Tollit, D. and Lesage, V., 2016. A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy. *Canadian Journal of Zoology*, *94*(12), pp.801-819.

[98] *See e.g.* Susanna B. Blackwell et al., *Effects of Airgun Sounds on Bowhead Whale Calling Rates: Evidence for Two Behavioral Thresholds*, Plos One 1 (June 3, 2015).

[99] https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/esa-section-7-consultation-tools-marine-mammals-west

[100] *E.g.* AdBm Demonstration at Butendiek Offshore Wind Farm with Ballast Nedam "Attenuation of up to 36.8 dB was realized across all hammer strikes at this location." https://tethys.pnnl.gov/sites/default/files/publications/AdBm-2014.pdf

[101] We view recent targets of 6 dB reductions in recent permitting documents for offshore wind to be underprotective and not commensurate with best available technologies.

BOEM Should Develop Regional Construction Calendars to Reduce Cumulative Noise Impacts: Prospective build-out of offshore wind energy in the Gulf of Mexico will likely lead to multiple leaseholders developing individual projects on parallel timelines (as currently being proposed in the Rhode Island and Massachusetts WEAs). If not well coordinated, these combined activities have the potential to lead to significant cumulative noise impacts on marine mammals and other wildlife offshore. BOEM should proactively address this issue and develop regional construction calendars in coordination with its partner agencies that schedule (spatially and/or temporally) noisy pre-construction and construction development activities in a way that reduces cumulative noise impacts.

Require Time of Year Restrictions on Construction: Pile driving should not occur during times of year that are of seasonal importance for species (*e.g.*, breeding and feeding areas).

BOEM Should Address Limitations of NMFS's Acoustic Thresholds: In determining the potential impact of noise from geophysical surveys and construction and operations activities, BOEM should request new guidelines on thresholds for marine mammal behavioral disturbance from NMFS that are sufficiently protective and consistent with the best available science.[102] Multiple marine species have been observed to exhibit strong, and in some cases lethal, behavioral reactions to sound levels well below the 160 dB threshold defined by NMFS for Level B take,[103] leading to calls from the scientific community for the Agency to revise its guidelines.[104] Acceptance of the current NMFS's acoustic threshold for Level B take will result in BOEM's significant underestimation of the impacts to marine mammals and potentially the permitting, recommendation, or prescription of ineffective mitigation measures (*e.g.*, under-protective exclusion zones).

To date, injury and behavioral zones for sea turtles have not been calculated correctly for other offshore wind projects.[105] Moreover, fundamental gaps remain in our knowledge of the sensory (*e.g.*, hearing and

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[102] Stocker, M. (2019) Best available science? Are NOAA Fisheries marine mammal noise exposure guidelines up to date? Proc. Of Meetings on Acoustics V.36 https://doi.org/10.1121/2.0001003

[103] As defined pursuant to the Marine Mammal Protection Act "any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild." 50 C.F.R. § 216.3.

[104] *E.g.*, Evans, D.L. and England, G.R., "Joint interim report: Bahamas marine mammal stranding event of 15-16 March 2000" (2001); Nowacek, D.P., Johnson, M.P., and Tyack, P.L., "Right whales ignore ships but respond to alarm stimuli," *Proceedings of the Royal Society of London B: Biological Sciences*, vol. 271, no. 1536 (2004): 227-231; Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A., and Burns, W.C.G., "Navy sonar and cetaceans: Just how much does the gun need to smoke before we act?" *Marine Pollution Bulletin*, vol. 56 (2008): 1248-1257; Tougaard, J., Wright, A.J., and Madsen, P.T., "Cetacean noise criteria revisited in the light of proposed exposure limits for harbour porpoises," *Marine Pollution Bulletin*, vol. 90 (2015): 196-208; Wright, A.J., "Sound science: Maintaining numerical and statistical standards in the pursuit of noise exposure criteria for marine mammals," *Frontiers in Marine Science*, vol. 2, art. 99 (2015).

[105] South Fork Wind Farm Draft EIS (South Fork DEIS) at H-58 footnote states: "Short-term, underwater noise from Project construction, specifically from pile driving and vessels supporting installation is the most extensive potential Project effect and is therefore used to define the analysis area based on current behavioral effects thresholds for these activities. This area extends approximately 1,716 feet from each monopile foundation, 175 feet from vibratory pile driving, and approximately 300 feet from the SFEC corridor and vessel transit lanes." Also, South Fork DEIS at H-66 states, "Vibratory pile-driving noise can exceed levels associated with behavioral disturbance in sea turtles but only within a short distance (*i.e.*, less than 200 feet) from the source. Given this

navigation) ecology of sea turtles.[106] It has been determined that sea turtle hearing sensitivity overlaps with the frequencies and source levels produced by many anthropogenic sources; however, more research is needed to determine the potential physiological and behavioral impacts of these noise sources on sea turtles.[107] Currently, BOEM's standard operating conditions for activities such as pile driving are based on a 180 dB (RMS) re 1 uPa exclusion zone,[108] which is the original generic acoustic threshold for assessing permanent threshold shift onset for cetaceans.[109] For forthcoming construction activities, at minimum BOEM must use NMFS's most recent pile driving calculator to obtain an accurate injury and behavioral radii for sea turtles during impact and vibratory pile driving.

As the offshore wind industry advances, studies are needed to determine critical ratios and temporary and permanent threshold shifts so that accurate acoustic threshold limits for anthropogenic sound sources can be added to NMFS's sound exposure guidelines for protected species like sea turtles, and additional monitoring and avoidance, minimization, and mitigation protocols can be developed to minimize impacts to sea turtles during offshore wind development and operation and other anthropogenic activities. Monitoring of sea turtle sensory ecology must be conducted as soon as possible to advise efforts, and a conservative approach should be adopted in the meantime to guard against impacts to these threatened and endangered species.

Research needs: It should be a top priority for BOEM to undertake the necessary research to understand the potential impacts of noise-generating offshore wind activities (site assessment, construction, operations, and vessel noise) on marine mammals and other marine species, including impacts on their acoustic habitat. Research priorities should include establishing acoustic baseline conditions, before-after-control-impact studies during construction, studies designed to detect short-term habitat displacement during construction and long-term habitat displacement during the operational duration of an offshore wind project, and analysis of the population consequences of cumulative impacts for endangered species.

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low exposure probability to vibratory pile-driving noise and the fact that vibratory pile-driving activities would be limited in extent, short term in duration, and widely separated, vibratory pile-driving noise effects on sea turtles would be negligible at the individual and population levels."

[106] *See*, *e.g.*, South Fork DEIS at H-65, H-70, H-76.

[107] Ridgway, S.H., E.G. Wever, J.G. McCormick, J. Palin, and J.H. Anderson. "Hearing in the giant sea turtle, Chelonia mydas." Proceedings of the National Academy of Sciences of the United States of America, vol. 64, no. 3 (1969):884-890.; Bartol, S.M., J.A. Musick, and M.L. Lenhardt. "Auditory evoked potentials of the loggerhead sea turtle (Caretta caretta)." Copeia, vol. 3 (1999):836-840.; Dow Piniak, W.E., S.A. Eckert, C.A. Harms, and E.M. Stringer. 2012. Underwater hearing sensitivity of the leatherback sea turtle (Dermochelys coriacea): Assessing the potential effect of anthropogenic noise. OCS Study BOEM 2012- 01156. Herndon, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management.; Martin, K.J., S.C. Alessi, J.C. Gaspard, A.D. Tucker, G.B. Bauer, and D.A. Mann. "Underwater hearing in the loggerhead turtle (Caretta caretta): A comparison of behavioral and auditory evoked potential audiograms." The Journal of Experimental Biology, vol. 215, no. 17(2012):3001-3009; Piniak, W.E.D., D.A. Mann, C.A. Harms, T.T. Jones, and S.A. Eckert. "Hearing in the juvenile green sea turtle (Chelonia mydas): A comparison of underwater and aerial hearing using auditory evoked potentials." PLoS ONE, vol. 11, no. 10 (2016):e0159711.

[108] BOEM. 2016. Commercial wind lease issuance and site assessment activities on the Atlantic Outer Continental Shelf offshore New York. Environmental assessment. OCS EIS/EA BOEM 2016-042. Herndon, Virginia: United States Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

[109] NMFS. 2018. 2018 Revision to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Version 2.0). Underwater acoustic thresholds for onset of permanent and temporary threshold shifts. NOAA Technical Memorandum NMFS-OPR-59. U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

C. Turbine Collisions

Collision is one of the primary concerns for direct impacts to birds and bats from wind turbines and the risk of collision must be heavily weighed as BOEM moves forward planning offshore wind in the Gulf of Mexico. As has been stated above, the Gulf of Mexico is a unique environment, providing essential stopover and migratory routes for trans-oceanic migrating birds and bats and foraging opportunities for a diverse array of species.

A wide variety of seabird species, including Brown Pelican, Black-capped Petrel, Caspian Tern, and Sooty Tern, use the Gulf of Mexico year-round and exhibit behaviors in the offshore environment that make them more vulnerable to collision with turbines. Brown Pelicans that breed in the Gulf of Mexico are predicted to be especially vulnerable to collision, because they generally fly within the rotor swept zone, do not exhibit strong avoidance behavior from turbines,[110] and regularly transit across the Gulf of Mexico.[111] We know from studies around oil and gas platforms in the Gulf of Mexico and elsewhere, that gulls, shearwater, storm-petrel, and peregrine falcons are attracted to platforms in the marine environment, which further heightens their potential collision risk with turbines.[112] We are additionally concerned that terns, pelicans, cormorants, gannets, boobies, and frigatebirds may also be attracted to the turbine platforms as perching opportunities.

As noted in Section III(D), the Gulf of Mexico serves as a migration highway for a variety of trans-oceanic migrants and extensive studies at oil and gas platforms in the Gulf of Mexico have demonstrated the risks to trans-Gulf migrants of collision with offshore infrastructure. Nocturnal migrants and foraging seabirds alike are attracted to lights associated with offshore infrastructure, which has led to an estimated 200,000 collision-induced mortalities per year. Trans-Gulf migrants are also attracted to offshore infrastructure, as demonstrated by the oil and gas archipelago.[113] In addition to survival impacts due to increased energy expenditure from pre-mature landings and increased predation from Peregrine Falcon, this attraction to offshore platforms could also put trans-Gulf migrants at heightened collision risk with turbine blades if operated without stringent mitigation measures. There may be weather conditions under which turbines cannot be safely operated with respect to birds, and mechanisms must be put in place that allow operators and regulators to anticipate these occasions.

[110] Kelsey EC, Felis JJ, Czapanskiy M, Pereksta DM, Adams J. 2018. Collision and displacement vulnerability to offshore wind energy infrastructure among marine birds of the Pacific Outer Continental Shelf. Journal of Environmental Management 227:229–247.

[111] Lamb JS, Satgé YG, Streker RA, Jodice PGR. (n.d.). Ecological Drivers of Brown Pelican Movement Patterns, Health, and Reproductive Success in the Gulf of Mexico:236.

[112] Ronconi RA, Allard KA, Taylor PD. 2015. Bird interactions with offshore oil and gas platforms: Review of impacts and monitoring techniques. Journal of Environmental Management 147:34–45.

[113] Russell, R.W. 2005. Interactions between migrating birds and offshore oil and gas platforms in the northern Gulf of Mexico: Final Report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-009. 348 pp.

Bat collisions with turbines are common at land-based wind facilities[114] with the potential for cumulative impacts to cause population-level declines.[115] Although bats' use the offshore environment is not well understood and no survey efforts seem to have been conducted in the Gulf of Mexico, a report prepared by Peterson et al. (2016)[116] for DOE found that bats were present at all locations surveyed in the Gulf of Maine, Mid-Atlantic, and Great Lakes and were detected up to 130 km offshore,[117] indicating that bat use of the offshore environment may be more extensive than previously believed.

Bats, especially the migratory tree bat species found in the Gulf States, are believed to be attracted to land-based wind turbines.[118] Limited research from Europe suggests that bats may be attracted to offshore wind turbines as foraging and roosting habitat.[119] Bats were found roosting aboard support vessels during the construction of Block Island Wind Farm, which suggests that the presence of artificial roosting structures offshore may provide some attraction to bats in the offshore environment,[120] which could increase their likelihood for collision with turbines.

While these impacts can be estimated at onshore wind facilities through carcass surveys, there are no reliable methods for measuring rates of collision in the offshore environment. Collision risk models (CRM) are currently used to assess potential risk to some avian species, and new variations of CRM are in development to incorporate seabird 3-dimensional flight behavior and to better predict collision risk to three ESA-listed species present in the Atlantic OCS (*i.e.*, rufus Red Knot, Piping Plover, and Roseate

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[114] Arnett, Edward B., and Erin F. Baerwald. 2013. "Impacts of Wind Energy Development on Bats: Implications for Conservation." In Bat Evolution, Ecology, and Conservation, 435–56. New York, NY: Springer New York. https://doi.org/10.1007/978-1-4614-7397-8_21.

[115] Frick, W. F., E. F. Baerwald, J. F. Pollock, R. M. R. Barclay, J. A. Szymanski, T. J. Weller, A. L. Russell, S. C. Loeb, R. A. Medellin, and L. P. Mcguire. 2017. "Fatalities at Wind Turbines May Threaten Population Viability of a Migratory Bat." Biological Conservation 209: 172–77. https://doi.org/10.1016/j.biocon.2017.02.023; Population-Level Risk to Hoary Bats Amid Continued Wind Energy Development: Assessing Fatality Reduction Targets Under Broad Uncertainty. EPRI, Palo Alto, CA: 2020. 3002017671.

[116] Peterson, Trevor S, Steven K Pelletier, and Matt Giovanni. 2016. "Long-Term Bat Monitoring on Islands, Offshore Structures, and Coastal Sites in the Gulf of Maine, Mid-Atlantic, and Great Lakes—Final Report." Topsham, ME, USA. Prepared for the U.S. Department of Energy.

[117] *Id*. The most remote site surveyed in the Gulf of Maine was Mount Desert Rock, 41.6 km from the mainland.

[118] Cryan, Paul M., P. Marcos Gorresen, Cris D. Hein, Michael R. Schirmacher, Robert H. Diehl, Manuela M. Huso, David T. S. Hayman, et al. 2014. "Behavior of Bats at Wind Turbines." Proceedings of the National Academy of Sciences of the United States of America. National Academy of Sciences. https://doi.org/10.2307/43189889; Cryan, P. M., & Barclay, R. M. R. (2009). Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions. Journal of Mammalogy, 90(6), 1330–1340. http://www.jstor.org/stable/27755139; Arnett et al. 2008; Horn, J. W., Arnett, E. B., & Kunz, T. H. (2008). Behavioral Responses of Bats to Operating Wind Turbines. Source: The Journal of Wildlife Management, 72(1), 123–132. https://doi.org/10.2193/2006-465; Kunz, T. H., Arnett, E. B., Erickson, W. P., Hoar, A. R., Johnson, G. D., Larkin, R. P., Strickland, M. D., Thresher, R. W., & Tuttle, M. D. (2007). Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses. In Ecology and the Environment (Vol. 5, Issue 6).; Ahlén, I. (2003). Wind turbines and bats-a pilot study.

[119] It is worth noting that this research was for nearshore wind facilities and a different suite of bat species; Ahlén et al. (2009) observed the common noctule changing altitude near turbines in the Baltic Sea, moving from flying near the sea surface to the top of the turbine. Bats were observed attempting to land on turbines, presumably to either glean insects or roost. In the same study, three bat species were found roosting on nearshore (5.8 km offshore) turbines, including in the nacelles. Ahlén, Ingemar, Hans J. Baagøe, and Lothar Bach. 2009. "Behavior of Scandinavian Bats during Migration and Foraging at Sea." Journal of Mammalogy 90 (6). American Society of Mammalogists Illinois Natural History Survey, 1816 South Oak Street, Champaign, IL 61820: 1318–23. https://doi.org/10.1644/09-MAMM-S-223R.1.

[120] Revolution Wind Construction and Operation Plan at 4.3.7.2, p. 420.

Tern). However, CRMs are simply predictions of avian risk, and none of the models have been verified for accuracy in the marine environment.

Mitigation and Research

Given the importance of the Gulf of Mexico to avian biodiversity and the potential risks posed from offshore wind collision, BOEM must consider bird and bat use of the coastal and offshore environment in its planning and development of offshore wind in the Gulf. BOEM cannot rely on boat and aerial surveys to evaluate risks to trans-Gulf migrants, which are better suited to evaluate distributions for species that are present for longer periods of time. Flight paths and altitudes of trans-Gulf migrant birds and bats are often dependent on time of day and weather, while transect surveys only occur during daylight hours and favorable weather. We expect BOEM to review the peer-reviewed scientific literature to characterize migratory routes, identify and fill knowledge gaps, and use this knowledge to identify least conflict areas.

Marine radar, acoustic, and collision detection technologies will all be necessary and are complementary tools to evaluate risks and impacts to birds and bats from turbine collision. For example, acoustic technology can help characterize the species present in and around the project area, but it cannot evaluate flux. Additionally, Empidonax flycatchers and vireos, two of the most abundant nocturnal migrant groups, do not likely emit nocturnal flight calls, and therefore, would not be accounted for using acoustic monitoring.[121] Similarly, hoary bats have been shown to travel without echolocating, indicating that a lack of recorded hoary bat calls does not necessarily mean hoary bats are not present.[122] Because bat calls can often only be detected at close range, BOEM should require the installation of acoustic detectors at nacelle height for projects to better understand risk within the turbine's swept area.

In addition to avoiding migratory pathways and areas of high avian use, BOEM must consider regulating turbine specifications to minimize collision risk. BOEM should consider setting turbine height limitations in the Gulf of Mexico, as it has done in areas of the Atlantic OCS to mitigate safety conflicts with the Department of Defense. The newest contracted offshore wind turbines are reaching heights of 300 m. Further increasing this maximum turbine height will increase risk to trans-Gulf migrants. Likewise, BOEM should also consider minimum requirements for turbine air-gap (*i.e.* the distance between the water surface and the rotor swept zone). Decreasing this air gap increases collision risk for foraging and commuting birds in the marine environment.

It will also be vital that, even at this early stage in the planning process, BOEM begins communicating standardized collision monitoring and mitigation requirements with developers to ensure a successful and efficient build out of environmentally responsible offshore wind in the Gulf of Mexico.

We expect that offshore wind in the Gulf of Mexico will incorporate a variety of technologies to minimize collision risks and measure collision impacts to birds and bats, including aircraft detection lighting systems (ADLS), smart curtailment, deterrent technology, and collision detection. At a basic level, we expect BOEM to require that developers use FAA-compliant ADLS on turbines, to diminish attraction effects by birds in the marine environment. This technology is well developed and has been

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[121] Evans WR, Rosenberg KV. 2000. Strategies for bird conservation: The Partners in Flight planning process; Proceedings of the 3rd Partners in Flight Workshop; 1995 October 1-5; Cape May, NJ:9.

[122] Corcoran, A.J., Weller, T.J. (2018). Inconspicuous echolocation in hoary bats (*Lasiurus cinereus*). Proceedings of the Royal Society B, 285: 20180441.

adopted across land-based wind facilities.[123] This has been a standard mitigation strategy identified in BOEM's environmental impact statements for offshore wind facilities to date. We commend this step by BOEM, and look forward to seeing mitigation strategies grow and evolve as technology allows.

While we acknowledge that blanket seasonal curtailment strategies are likely untenable for an economically viable and successful offshore wind industry, reasonably tailored, smart curtailment strategies will likely be necessary for responsibly operated offshore wind in the Gulf of Mexico. Developments in Nexrad make it easier to predict migration timing and various research into the timing and environmental cues driving migration dynamics across the Gulf of Mexico make it possible to predict specific periods when collision risk might be highest. Developments in collision detection technology will also likely provide a mechanism for smart curtailment based on the proximity of individual birds and bats to the turbines. This type of automated curtailment system has resulted in significant decreases in collision mortality events within land-based wind farms where it has been deployed.[124]

Deterrent technologies are being developed for land-based turbines, including turbine coatings (to counteract bat attraction to smooth surfaces which might be perceived as water),[125] ultraviolet lighting (which many bat species can see),[126] and ultrasonic noise emitters (to possibly 'jam' bats' radars and make wind facilities unappealing to bats).[127] One of the ultrasonic deterrent technologies, NRG Systems, has been commercially deployed at land-based wind facilities.[128] None of these technologies have been assessed yet in the offshore environment nor on turbines with such large swept areas, which may present a challenge for effective deterrent use offshore.

Understanding the population-level cumulative impacts of the offshore wind build out in the Gulf of Mexico and along the Atlantic OCS will require a method for accurately estimating the *observed* level of take of birds and bats of all sizes. DOE has recently funded development of collision detection technology from the Albertani Lab[129] at Oregon State University and WT Bird from WEST, Inc.[130] Similar technologies are being tested at Block Island Wind Project and other offshore locations in the European Union and United Kingdom and are making rapid gains in being effective, officially verified, commercially available, and affordable at scale in the near future, possibly at the same time as the Project would be

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[123] https://detect-inc.com/aircraft-detection-lighting-systems/

[124] McClure CJW, Rolek BW, Dunn L, McCabe JD, Martinson L, Katzner T. 2021. Eagle fatalities are reduced by automated curtailment of wind turbines. Journal of Applied Ecology 58:446–452.

[125] Texturizing Wind Turbine Towers to Reduce Bat Mortality DE-EE0007033, https://www.energy.gov/sites/prod/files/2019/05/f63/TCU%20-%20M17%20-%20Hale-Bennett.pdf (last visited Feb. 20, 2021).

[126] NREL Wind Research, Technology Development and Innovation Research Projects https://www.nrel.gov/wind/technology-development-innovation-projects.html (last visited Feb. 20, 2021)

[127] https://www.osti.gov/biblio/1484770; Weaver, S. P., Hein, C. D., Simpson, T. R., Evans, J. W., & Castro-Arellano, I. (2020). Ultrasonic acoustic deterrents significantly reduce bat fatalities at wind turbines. Global Ecology and Conservation, e01099. https://doi.org/10.1016/j.gecco.2020.e01099; Arnett, E. B., Hein, C. D., Schirmacher, M. R., Huso, M. M. P., & Szewczak, J. M. (2013). Evaluating the Effectiveness of an Ultrasonic Acoustic Deterrent for Reducing Bat Fatalities at Wind Turbines. PLoS ONE, 8(6), e65794. https://doi.org/10.1371/journal.pone.0065794.

[128] https://news.duke-energy.com/releases/duke-energy-renewables-to-use-new-technology-to-help-protect-bats-at-its-wind-sites

[129] Clocker K, Hu C, Roadman J, Albertani R, Johnston ML. 2021. Autonomous Sensor System for Wind Turbine Blade Collision Detection. IEEE Sensors Journal:1–1.

[130] Verhoef JP, Eecen PJ, Nijdam RJ, Korterink H, Scholtens HH. 2003. WT-Bird A Low Cost Solution for Detecting Bird Collisions:46.

ready for construction and operation.[131] However, these technologies must be fully integrated into turbine design before they can be deployed. The DOE is currently evaluating the development status of these integrated systems based on their readiness for offshore wind deployment.[132] BOEM must support the development of these technologies and must drive turbine developers to integrate these systems into their turbine designs. We cannot wait on offshore wind project developers to drive the market--BOEM must require this type of collision monitoring and work with the industry to support the development of these technologies to make deploying them a reality.

Additionally, before wind turbines can be safely operated in the Gulf, the circumstances under which and the factors that cause birds to land upon and approach offshore structures, putting them at higher risk of collision, have to be thoroughly understood. The existence of existing oil and gas infrastructure creates an opportunity to perfect mitigation and avoidance techniques in advance of any wind turbine deployment.

D. Vessel Traffic

The construction and maintenance of offshore wind energy projects will result in elevated vessel traffic in the area. Vessel traffic will be greatest during the construction phase, but frequent maintenance trips will be carried out through the decades-long operational phase.

BOEM must analyze collision risk from vessels associated with construction and maintenance of offshore wind energy development in the Gulf of Mexico. Vessel collisions remain one of the leading causes of large whale and sea turtle injury and mortality. Vessel strikes are one of the main factors driving the Gulf of Mexico whale to extinction and the species can only currently withstand *a single vessel strike every fifteen years* if the species is to survive, and strikes are currently exceeding that level. Gulf of Mexico whales are particularly prone to vessel strike given their tendency to rest just below the water's surface at night.[133] Mortality or serious injury of large whales can occur from a vessel traveling at speeds above 10 knots irrespective of its length,[134] and vessels of any length travelling below this speed still pose a serious risk.[135] The number of recorded vessel collisions on large whales each year likely grossly underestimates the actual number of animals struck, as animals struck but not recovered, or not thoroughly examined, cannot be accounted for.[136] In fact, observed carcasses of North Atlantic right whales from all causes of death may have only accounted for 36% of all estimated death during 1990-

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[131] Dirksen S. 2017. Review of methods and techniques for field validation of collision rates and avoidance amongst birds and bats at offshore wind turbines. Sjoerd Dirksen Ecology.

[132] Brown-Saracino J. 2018. State of the Science: Technologies and Approaches for Monitoring Bird and Bat Collisions Offshore. RENEWABLE ENERGY:23. Available at https://www.briloon.org/uploads/BRI_Documents/Wildlife_and_Renewable_Energy/NYSERDA_workshop_JocelynBrown-Saracino.pdf.

[133] NOAA-NMFS, "Recovery plan for the North Atlantic right whale" (August 2004).

[134] NOAA-NMFS, "Reducing ship strikes to North Atlantic right whales." Available at: https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales. To reflect the risk posed by vessels of any length, the Commonwealth of Massachusetts established a mandatory vessel speed restriction for all vessels (including under 20 meters) in the Cape Cod Bay SMA.

[135] Kelley, D. E., Vlasic, J. P. and Brilliant, S. W., "Assessing the lethality if ship strikes on whales using simple biophysical models," Marine Mammal Science, vol. 37, pp. 251-267 (2020).

[136] Reeves, R.R., Read, A.J., Lowry, L., Katona, S.K., and Boness, D.J., "Report of the North Atlantic Right Whale Program Review." 13–17 March 2006, Woods Hole, Massachusetts (2007) (prepared for the Marine Mammal Commission); Parks, S.E., Warren, J.D., Stamieszkin, K., Mayo, C.A., and Wiley, D., "Dangerous dining: surface foraging of North Atlantic right whales increases risk of vessel collisions." Biology Letters, vol. 8, p. 57-60 (2011).

2017.[137] Monitoring effort is vastly lower for marine mammal species in the Gulf of Mexico relative to North Atlantic right whales, indicating that observed strikes are likely an even smaller percentage of the true number.

Vessel speed significantly influences the likelihood of catastrophic damage to sea turtles even for small vessels (10-20 feet in length).[138] We know that the risk of collision with turtles is greatest when vessels are traveling at speeds greater than 10 knots based on a study of vessel speed and collision risk in green turtles.[46] We also know that it is very difficult to detect sea turtles from a vessel, even when dedicated observers are continuously scanning the water, unless they surface close to the vessel. Given that sea turtles are usually undetectable until the moment they surface in close proximity to a vessel, it may be too late to slow down or to maintain a specific distance from the turtle.

Vessel traffic can also impact wildlife indirectly through noise disturbance, habitat loss, and increased energy expenditure. Vessel noise degrades acoustic habitat and masks important biological sounds for a wide array of in-water species.[139] Alcids, waterbirds, and waterfowl are all vulnerable to disturbance from vessel traffic, as these species flush in response to oncoming vessels.[140] Increased vessel traffic during construction and operation of the wind project can even lead to changes in distribution patterns for marine birds.[141] The level and potential impacts of vessel-related noise during construction and operations should also be assessed by BOEM. Slower vessels also generate less noise, reducing disturbance to a wide variety of species.[142]

Mitigation and Research

Mitigation requirements: A ten knot vessel speed restriction for all vessels, regardless of size and whether vessels are transiting or operating at the project site, must be explicitly required. Vessels should be directed to further slow their speed to four knots if a sea turtle is sighted within 100 m of the vessel's path or if the vessel is transiting through areas of visible jellyfish aggregations, floating vegetation lines, or *Sargassum* mats. As discussed above, vessel speed significantly influences the likelihood of catastrophic damage to sea turtles even for small vessels (10-20 feet in length),[143] and risk of collision is greatest when vessels are traveling at speeds greater than 10 knots.[144] Vessels should also have a dedicated protected resources observer on board to visually detect Gulf of Mexico whales, sperm whales, and sea turtles, and also employ additional monitoring methods, including passive acoustic

[137] Pace III, R. M., Williams, R., Kraus, S. D., Knowlton, A. R. and Pettis, H. M.," Cryptic mortality of North Atlantic right whales," *Conservation Science and Practice*, e346 (2021).

[138] Work, P.A., A.L. Sapp, D.W. Scott, and M.G. Dodd. 2010. Influence of small vessel operation and propulsion system on loggerhead sea turtle injuries. Journal of Experimental Marine Biology and Ecology 393(1):168-175.

[139] Duarte, *et al.* (2021), *supra*.

[140] Schwemmer P, Mendel B, Sonntag N, Dierschke V, Garthe S. 2011. Effects of ship traffic on seabirds in offshore waters: Implications for marine conservation and spatial planning. Ecological applications: a publication of the Ecological Society of America 21:1851–60.

[141] Mendel B, Schwemmer P, Peschko V, Müller S, Schwemmer H, Mercker M, Garthe S. 2019. Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of Loons (*Gavia spp.*). Journal of Environmental Management 231:429–438.

[142] Leaper, R., 2019. The role of slower vessel speeds in reducing greenhouse gas emissions, underwater noise and collision risk to whales. *Frontiers in Marine Science*, *6*, p.505.

[143] Work, P.A., A.L. Sapp, D.W. Scott, and M.G. Dodd. 2010. Influence of small vessel operation and propulsion system on loggerhead sea turtle injuries. Journal of Experimental Marine Biology and Ecology 393(1):168-175.

[144] Hazel, J., I.R. Lawler, H. Marsh, and S. Robson. 2007. Vessel speed increases collision risk for the green turtle Chelonia mydas Endangered Species Research 3:105–113.

detections to improve situational awareness. We note, however, that while observers stationed aboard a vessel may increase the likelihood that a whale or sea turtle is detected, this approach cannot be relied upon, particularly in periods of darkness or reduced visibility. Sea turtles are also difficult to observe unless a turtle surfaces close to the vessel, at which point it may not be possible to course-correct in time to prevent collision. Keeping ship speed to 10 knots improves the ability to adjust speeds.[145] Slowing to a speed of four knots or less knots while transiting through important habitat areas will improve protection for sea turtles.

Research recommendations: Offshore wind energy development will lead to an incremental increase in vessel traffic in the Gulf of Mexico. BOEM should analyze how the density of vessel traffic at ports and in transit lanes may change, and what implications those changes may have for marine mammals and sea turtles (*e.g.*, new transit lanes intersecting important marine mammal habitat or *Sargassum* mats, increased vessel traffic at ports located in proximity to vulnerable coastal bottlenose dolphin populations, etc.).

E. Cable Installation

BOEM should consider the impacts from static subsea cable installation on the seabed. Structure installation will likely result in mortality, injury, or displacement of benthic fauna in the path of construction[146] and is also likely to cause adverse impacts on benthic habitats from loss or conversion of habitat.[147] In particular, cable installation can result in temporary displacement of species inhabiting the wind energy area and cable route, including important forage fish like menhaden.[148] Impacts would occur in the vicinity of construction and may include a reduction in fitness or mortality. Where cable routes intersect with hard bottom habitats, impacts can be long-term and/or permanent.[149] While the use of jet plow technology to bury subsea cables can have lower impact than dredging,[150] it can still result in entrainment of benthic larvae, and eggs and larvae of pelagic finfish and invertebrates, resulting in 100% mortality.[151] Cable laying also results in resuspension and deposition of sediments and increased turbidity. Where displaced sediment is thick enough, benthic species can be smothered, resulting in mortality.[152] Sediment deposition can increase mortality rates for benthic eggs and larvae.[153] The installation of the cable is also likely to result in increased turbidity, which is more likely to affect benthic species than pelagic species. For organisms that are unable to escape the increased sediment plumes, impacts may range from mortality to reduced fitness.[154] Turbidity may further displace mobile

[145] Kelley, D. E., Vlasic, J. P. and Brilliant, S. W., “Assessing the lethality if ship strikes on whales using simple biophysical models,” Marine Mammal Science, vol. 37, pp. 251-267 (2020).

[146] *See* Vineyard Wind Final EIS (VW FEIS) at 3-27.

[147] *See Id.*

[148] *See Id.* at 3-53-3-54.

[149] *Id.* at 3-7.

[150] *Id.* at 3-11, 3-27.

[151] *Id.* at 3-54.

[152] *Id.* at 3-33.

[153] Wilber, D.H., and D.G. Clarke. *Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries*. North American Journal of Fisheries Management 21, 855-875 (2001).

[154] *Id.*; Berry, W.J., N.I. Rubinstein, E.K. Hinchey, G. Klein-MacPhee, and D.G. Clarke. Assessment of Dredging Induced Sedimentation Effects on Winter Flounder (*Pseudopleuronectes americanus*) Hatching Success: Results of Laboratory Investigations. Proceedings of the Western Dredging Association Technical Conference and Texas A&M Dredging Seminar, Nashville, Tennessee, (June 5-8, 2011).

juvenile and adult finfish species, which could expose them to increased predation and reduce prey availability.[155]

Mitigation and Research

Beyond consideration of the siting recommendations in Section III(D), a baseline survey must first be conducted of marine mammals, diving birds, finfish, benthic resources, essential fish habitat (EFH), and invertebrates in the potential areas of the cable prior to construction. To the extent possible, BOEM should avoid routing cables through hard bottom habitats and evaluate whether seasonal construction restrictions can avoid impacts to the benthic habitat and organisms. For example, with the Vineyard Wind offshore wind project, the company committed to conducting burial activities in Nantucket Sound outside of the spring and summer spawning seasons for a number of benthic invertebrates and fish that lay demersal eggs, including commercially important species.[156]

Once construction begins, BOEM should require monitoring and surveying of fisheries and benthic habitats, and recovery, in the area of the cable during and post-construction. BOEM should adequately assess the impacts from entrainment of eggs and larvae during cable installation and burial and must consider the impacts from increased turbidity and sediment deposition on benthic resources, finfish, EFH, and invertebrates in cable routing decisions.

The use of horizontal directional drilling (HDD) for the cable landing has been found to avoid or minimize impacts to coastal habitats.[157] BOEM should assess whether an HDD method for cable landing would avoid or minimize impacts to benthic and coastal habitats when compared to the "cut and cover" method and whether seasonal restrictions for the cable landing installation would reduce impacts.

F. Considerations for Floating Offshore Wind Development

BOEM should carefully evaluate the appropriate size for an initial floating offshore wind energy development, giving special consideration to existing data gaps in the RFI Area and what is not yet known about potential impacts of large-scale floating wind technology on marine resources.

To date, most offshore wind energy projects planned in the Atlantic OCS employ monopile fixed-foundation turbines, which are limited to use in waters less than 60 meters deep. Floating offshore wind technology can be installed in waters of roughly 1,000 meters deep, allowing for the possible expansion of offshore wind to new areas, such as offshore areas in the Gulf of Mexico.

Floating technology has only recently become commercialized—the world's first commercialized floating offshore wind farm, located in Scotland, became operational in late 2017.[158] At five 6 MW turbines, the

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[155] Wilber, D.H., and D.G. Clarke. Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries. North American Journal of Fisheries Management 21, 855-875 (2001); Vineyard Wind Draft EIS (VW DEIS) at 3-54.

[156] VW DEIS at 3-27.

[157] *Id.* at 3-11.

[158] http://www.statoil.com/en/TechnologyInnovation/NewEnergy/RenewablePowerProduction/Offshore/HywindScotland/Pages/default.aspx?redirectShortUrl=http%3a%2f%2fwww.statoil.com%2fHywindScotland

30 MW windfarm is the largest in the world[159] and has been deployed in relatively shallow water in an ecosystem that is distinct from the Gulf of Mexico.

Floating offshore wind technology offers another alternative to develop offshore wind energy without the noise generated by pile driving; however, as with any new technology, floating offshore wind turbines present their own benefits and risks. A unique feature of floating offshore wind turbines is the mooring system used to anchor the floating foundation to the seabed and, for arrays with multiple turbines, the dynamic inter-array power (electrical) cables that connect each of the turbines and transmit the generated electricity to shore. The potential impacts resulting from the presence of mooring lines and cables (*e.g.*, degradation of *Sargassum*, secondary entanglement of marine species, habitat alteration, and species displacement) therefore require considerable forethought, targeted research, proactive development of research and mitigation measures, and robust science-based monitoring.

The environmental impacts of floating offshore wind technology are not yet known, especially for large-scale wind developments. In light of the importance and high public value of the Gulf of Mexico's marine resources, our organizations recommend that BOEM and other relevant agencies consider the potential for unforeseen synergistic and cumulative impacts of dramatic scaling up of floating wind technology. It will be important to carefully examine the scope and environmental impacts of an initial floating technology project and to prioritize avoiding sensitive habitat in making site selections. Because impacts of offshore wind on wildlife likely increase with the scale of the project,[160] it is advisable to test small-scale developments before permitting and constructing very large developments. This would also provide BOEM an opportunity to test and evaluate the infrastructure's climate resilience, in the face of tropical storms and hurricanes. In addition, we recommend that BOEM evaluate how initial projects might be phased in order to facilitate monitoring and identification of adaptive management strategies.

Mitigation and Research

Entanglement: BOEM must analyze the potential entanglement risk and impact of the mooring lines and cables. The wildlife entanglement risk associated with mooring lines and dynamic array cables is one of the key potential risk differences between fixed foundations and floating offshore wind technology. Entanglement risk may take two forms: "primary entanglement" where wildlife becomes entangled directly in the mooring lines and cables; and "secondary entanglement" where abandoned, lost, or discarded fishing gear or other marine debris becomes caught on mooring lines and subsequently entangles species.

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[159] https://www.theguardian.com/environment/2016/may/16/worlds-largest-floating-windfarm-to-be-built-off-scottish-coast

[160] Copping et al. (2016) found that this was the case for development of devices that generate energy from seawater. The risk to the environment was elevated from "low risk" to "medium risk" when the development was scaled up from a "small-scale project" to a "large-scale commercial array." A similar elevation of risk may occur for large-scale offshore wind development projects; Copping, A., Sather, N., Hanna, L., Whiting, J., Zydlewski, G., Staines, G., Gill, A., Hutchison, I., O'Hagan, A., Simas, T., Bald, J., Sparling C., Wood, J., and Masden, E. 2016. Annex IV 2016 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World.

The risk of entanglement in the northern Gulf includes a threat to *Sargassum*, the floating brown algae beds where many endangered juvenile sea turtles and other species find their home.[161] Kept afloat by gas-filled bladders, significant entanglement with mooring lines, cables, or floating offshore wind technology could cause *Sargassum* to sink, thereby destroying a unique habitat that is essential to the Gulf's sea turtle population.

In the case that floating offshore wind technology is deployed, BOEM should proactively research methods and technologies capable of inspecting the mooring cables and dynamic inter-array cables for lost, abandoned, and discarded fishing gear and other marine debris, and removing those materials. Entanglement is a leading threat to marine mammals globally, as well as many other marine species, including sea turtles and diving seabirds. While it is unlikely that species will become entangled in the cables themselves due to their large diameter and rigidity, the potential risk of becoming entangled in other materials that have become ensnared around those large cables (*i.e.*, secondary entanglement) is a real concern. It is important to have methods in place to mitigate this potential impact before floating wind is deployed in the Gulf of Mexico or elsewhere in the US.

Habitat alteration: Floating wind farm technology results in fewer physical structures (*i.e.*, no below-water foundation), however the development still significantly alters the physical characteristics of the habitat, both at the surface and in the water column. In the case that floating offshore wind technology is deployed, BOEM must sufficiently analyze the impacts from the mooring and anchoring system on wildlife and marine environments and assess different impact levels based on the different anchor/mooring types. Research shows that mooring cable anchors from other marine renewable energy technologies may significantly alter the seabed, particularly when high energy wave conditions and wind speeds cause the cables and anchors to move and subsequently scour the seabed. A combination of modeling and field studies should be carried out to demonstrate the potential impacts to the seabed and benthic communities in sea states appropriate to the lease areas, and at spatial and temporal scales that mirror the size and lifecycle of the development. In particular, the BOEM should analyze the impacts of anchoring and mooring systems with regards to habitat alteration and use, and increased sediment and altered hydrodynamics.

G. Electromagnetic Fields

Both marine and diadromous species can sense electric and/or magnetic fields and the generation of electromagnetic fields (EMFs) from power cables may affect the ability of organisms to navigate and detect prey.[162] Studies have shown that some fish species are magneto-sensitive and use geomagnetic field information for orientation purposes.[163] EMF effects can alter the ability to detect or respond to

[161] Witherington, B., Hirama S, Hardy R, Young sea turtles of the pelagic Sargassum-dominated drift community: Habitat use, population density, and threats, Mar Ecol Prog Ser 463:1-22 (2012).

[162] Taormina, B., J. Bald, A. Want, G.D. Thouzeau, M. Lejart, N. Desroy, and A. Carlier. *A Review of Potential Impacts of Submarine Power Cables on the Marine Environment: Knowledge Gaps, Recommendations and Future Directions*. Renewable and Sustainable Energy Reviews 96, at 380-91 (2018); Gill, Andrew B., and Marieke Desender. *Risk to Animals from Electromagnetic Fields Emitted by Electric Cables and Marine Renewable Energy Devices.* In: OES-Environmental 2020 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World. A.E. Copping and L.G. Hemery, eds (2020), *available at* https://tethys.pnnl.gov/sites/default/files/publications/2020-State-of-the-Science-Report-Chapter-5-LR.pdf.

[163] Normandeau, E., Tricas, T., & Gill, A. *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species, Bureau of Ocean Energy Management, Regulation, and Enforcement* (2011); Peters, R. C., Eeuwes, L. B. M., & Bretschneider, F. On the electrodetection threshold of aquatic vertebrates with ampullary or

natural magnetic signatures, potentially altering fish survival, reproductive success, or migratory patterns.[164] EMF exposure may affect sea turtles since they are known to use earth's magnetic field for orientation and migration. For example, young loggerhead turtles are known to use magnetic positional information to guide their first trans-oceanic migration to important developmental habitat in the Sargasso Sea, while older sea turtles use this information to navigate toward specific geographic areas for foraging and reproduction.[165] EMFs can also pose indirect consequences to seabird, fish, and marine mammal foraging patterns if distributions of prey fish are disrupted. However, results of scientific studies have been mixed or not significant.[166] In addition, while field studies have been conducted on the effects of EMF from cables buried in the seabed,[167] there is a limited understanding of the EMF impacts of cables suspended in the water column, as in floating wind dynamic power cables.[168] More work needs to be done to understand attraction or aversion effects of suspended, dynamic power cables, particularly on pelagic species.[169]

Buried cables reduce, but do not eliminate, EMF. Demersal species living on or near the seabed, where cable EMF is stronger, are more likely to be exposed to EMF than pelagic species.[170] Although there have been few studies of EMF impacts from buried cables on invertebrates, research has demonstrated that American lobster held in cages displayed behavioral differences when exposed to EMF. In that same study, little skate, an electrosensitive elasmobranch, demonstrated even greater sensitivity to EMF.[171] Thus, there is conflicting information on whether burying cables weakens the EMF and how deep the burial would have to be to have any effect on the EMF.[172]

In addition, the extent to which turtles utilize the earth's magnetic field is unknown. Newer studies suggest that turtles may use multiple cues to navigate in the marine environment and may rely on

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mucous gland electroreceptor organs. *Biological Reviews*, *82*(3), 361–373 (2007). https://doi.org/10.1111/j.1469-185X.2.

[164] Normandeau, et al. *Id*.

[165] Lohmann, K.J. and C.M.F. Lohmann. 2006. Sea turtles, lobsters, and oceanic magnetic maps. Marine and Freshwater Behaviour and Physiology 39(1):49-64.

[166] Mitchell, J. D., McLean, D. L., Collin, S. P., & Langlois, T. J. (2018). Shark depredation in commercial and recreational fisheries. *Reviews in Fish Biology and Fisheries*, *28*(4), 715–748. https://doi.org/10.1007/s11160-018-9528-z; O'Connell, C. P., Stroud, E. M., & He, P. (2014). The emerging field of electrosensory and semiochemical shark repellents: Mechanisms of detection, overview of past studies, and future directions. *Ocean & Coastal Management*, *97*, 2–11. https://doi.org/10.1016/j.ocecoaman.2012.11.005

[167] *E.g.*, Hutchison, et al., *supra*.

[168] Gill, A., & Desender, M. (2020). *2020 State of the Science Report, Chapter 5: Risk to Animals from Electromagnetic Fields Emitted by Electric Cables and Marine Renewable Energy Devices* (PNNL--29976CHPT5, 1633088; p. PNNL--29976CHPT5, 1633088). https://doi.org/10.2172/1633088

[169] Taormina, et al. (2018), *supra.*

[170] Normandeau Associates, Inc., Exponent, Inc., T. Tricas, and A. Gill. Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. BOEM (2011) available at https://espis.boem.gov/final%20reports/5115.pdf

[171] Hutchison, Z.L., P. Sigray, H. He, A.B. Gill, J. King, and C. Gibson, 2018. Electromagnetic Field (EMF) Impacts on Elasmobranch (Shark, Rays, and Skates) and American Lobster Movement and Migration from Direct Current Cables. BOEM (2018), available at https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Vineyard-Wind-1-FEIS-Volume-2.pdf.

[172] Michel, J., H. Dunagan, C. Boring, E. Healy, W. Evans, J.M. Dean, A. McGillis, and J. Hain. 2007. Worldwide synthesis and analysis of existing information regarding environmental effects of alternative energy uses on the Outer Continental Shelf. Prepared for Mineral Management Service (MMS), Herndon, Virginia by Research Planning, Inc., Columbia, South Carolina and ICF International, Inc., Lexington, Massachusetts.

magnetic cues for navigating to a distant target.[173] In order to develop effective protocols to minimize EMF interference from subsea cables, more information is needed on how these animals detect magnetic fields[64] and how to minimize EMF production from buried cables.

Research Needs

In general, the potential effects and thresholds for fish, crustaceans, and other species of concern need to be established, as do the levels of EMF emitted from the dynamic power cables associated with floating offshore energy technology need to be established. BOEM should quantify these levels, effects, and thresholds in the field, complementing ongoing laboratory experiments. Selecting study species from different functional groups may be an effective way to gain a broad understanding of potential effects if resources are limited.

H. Water Turbulence

BOEM should account for impacts to wildlife and ecosystems from increased water turbulence from offshore wind energy development in the Gulf of Mexico. Offshore wind turbine foundations generate turbulent wakes from the passing tidal currents, which can impact the local and global ecosystems. The design of an offshore wind farm, such as the location, number of turbines, and foundation types, may affect local and regional hydrodynamics. The turbulent wake will contribute to a mixing of the stratified water column. The loss of stratification within the wake of a single offshore wind turbine was observed in the German Bight, a relatively shallow area of the North Sea with typical water depths between 20 and 50 meters.[174] Research on a single monopile found that it was responsible for 7-10% additional mixing to that of the bottom mixed layer, whereby approximately 10% of the turbulent kinetic energy generated by the structure is used in mixing.[175] Although the effect of a single turbine on stratification is relatively low, large-scale build-out of offshore wind energy (*i.e.*, 100 km^2) could significantly affect the vertical structure of a weakly stratified water column, and could modify the stratification regime and water column dynamics on a seasonal scale, depending on local conditions and turbine layout.[176] NOAA Fisheries recently acknowledged that large-scale build out of offshore wind energy in the Northeast region may cause local oceanographic changes that may affect the distribution of North Atlantic right whale prey.[177] Additionally, some seabirds use upwellings and ocean turbulence as ecological cues to locate important foraging areas offshore. Turbine platforms can mimic these cues, even when foraging fish are not present, creating an ecological trap by which these birds both expend energy foraging in an unfruitful environment and potentially expose individuals to higher collision risk.[178]

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[173] Lohmann, K.J., P. Luschi, and G.C. Hays. 2008. Goal navigation and island-finding in sea turtles. Journal of Experimental Marine Biology and Ecology 356:83-95.

[174] Schultze, L. K. P., L. M. Merckelbach, J. Horstmann, S. Raasch, and J. R. Carpenter. "Increased mixing and turbulence in the wake of offshore wind farm foundations." *Journal of Geophysical Research: Oceans* 125, no. 8 (2020): e2019JC015858.

[175] *Id*.

[176] *Id.*; Carpenter JR, Merckelbach L, Callies U, Clark S, Gaslikova L, Baschek B (2016) Potential Impacts of Offshore Wind Farms on North Sea Stratification. PLoS ONE 11(8): e0160830. https://doi.org/10.1371/journal.pone.0160830.

[177] NOAA Fisheries, "State of the Ecosystem New England," Presentation to the New England Fishery Management Council, 15 April 2021.

[178] Lieber L, Langrock R, Nimmo-Smith WAM. 2021. A bird's-eye view on turbulence: seabird foraging associations with evolving surface flow features. Proceedings of the Royal Society B: Biological Sciences 288:rspb.2021.0592, 20210592.

Research Needs

There is a lack of available data on the local-scale hydrodynamic effects of fixed-foundation turbines, as well as the platforms, mooring lines, and dynamic power cables associated with floating offshore wind turbines. BOEM must undertake research to understand the hydrodynamic effects of individual fixed-foundation and floating offshore wind turbines in the Gulf of Mexico, the data from which can be used to parameterize models to predict the cumulative effects of utility-scale offshore wind on oceanographic conditions, including stratification, and the resulting effects on habitat for fish and key prey species, including the formation of *Sargassum* mats. In addition, pre-empting utility-scale deployment of offshore wind energy in the Gulf of Mexico, baseline stratification conditions should be established for the Gulf of Mexico and a monitoring system capable of detecting deviations from that baseline should be designed and implemented.

I. Displacement

The ways in which the presence of fixed foundation turbines, or floating platforms with extensive underwater network of mooring lines and dynamic power cables, will impact animal habitat is unclear. Impact studies at offshore wind farms in Europe reveal that offshore wind can cause significant changes to wildlife distributions. Some marine birds, fish, sea turtles, and marine mammals may avoid offshore wind farms due to noise, electromagnetic fields, vessel traffic, or other disruptions. Responses will likely be species dependent and vary over different scales, ranging from avoidance on a macro-scale, where species may avoid the entire floating wind energy area altogether, to micro-avoidance, where species avoid turbines in very close range.[179]

If offshore wind turbines are placed in important habitats, this avoidance behavior can have serious consequences. For example, when displaced from foraging grounds, animals must expend additional energy to find food elsewhere, which can compromise their survival. Studies have shown that some marine birds avoid offshore wind development areas and the surrounding area, up to 20 km from the array itself, which may result in loss of resources due to displacement from foraging grounds far beyond the footprint of the wind farm.[180] Gulf of Mexico whales are restricted to an extremely small habitat area and unrestricted and undisturbed foraging is extremely important for the species to maintain its energy budget.[181] For fish, displacement could cause alterations to aggregations, spawning events, and migration patterns, and may also influence the ecological community structure if species of ecological importance avoid impacted areas altogether.[182] Displacing wildlife from foraging grounds can lead to population-level impacts if it results in significant decreases in survival and fecundity.[183] Connections

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[179] Cook, A. S. C. P., Humphreys, E. M., Bennet, F., Masden, E. A., & Burton, N. H. K. (2018). Quantifying avian avoidance of offshore wind turbines: Current evidence and key knowledge gaps. *Marine Environmental Research*, *140*, 278–288. https://doi.org/10.1016/j.marenvres.2018.06.017.

[180] Peschko, V., Mercker, M., & Garthe, S. (2020). Telemetry reveals strong effects of offshore wind farms on behaviour and habitat use of common guillemots (*Uria aalge*) during the breeding season. *Marine Biology*, *167*(8), 118. https://doi.org/10.1007/s00227-020-03735-5.

[181] Van der Hoop, J., Nousek-McGregor, A.E., Nowacek, D.P., Parks, S.E., Tyack, P., and Madsen, P, "Foraging rates of ram-filtering North Atlantic right whales." *Functional Ecology*, vol. 33, pp. 1290-1306 (2019).

[182] Malcolm, I. A., Godfrey, J., & Youngson, A. F. (2010). Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: Implications for the development of marine renewables. *Scottish Marine and Freshwater Science*, *1*(14), 1–72.

[183] Onderz. Form. D., WIAS, Onderz. Form. I., Onderz. Form. B., van Kooten T, Soudijn F, Tulp I, Chen C, Benden D, Leopold M. 2019. The consequences of seabird habitat loss from offshore wind turbines, version 2 : Displacement and population level effects in 5 selected species. Wageningen Marine Research, IJmuiden.

between species in ecological communities can be highly complex and direct and indirect impacts on one species in a community can often lead to impacts on more than one species. The importance of apex predators such as sharks in maintaining food web structures across multiple species has been noted in certain systems, including coastal and pelagic environments.[184] As a result, reduced coastal and pelagic species abundance in impacted areas could therefore have impacts on upper trophic level populations, many of which prey heavily on forage fish species.[185] Many marine birds in the Gulf of Mexico also rely on schooling fish species, like menhaden, and changes to distributions or reductions to fecundity and overall population size of these forage fish can lead to reduced chick survival if they also reduce the rate at which adults are able to provision them.[186]

Displacement can also be of large consequence to migratory species if their migratory routes are disrupted by the presence of turbines, creating a barrier effect. This impact is especially important to consider in the Gulf of Mexico because of the large numbers of birds and bats that migrate over the Gulf in the spring and fall. Recent research by the Cornell Lab of Ornithology indicates that more than 2.1 billion birds fly over the Gulf of Mexico and enter the United States over the east coast of Texas and all along the Louisiana shoreline each spring. It takes most birds 11 to 18 hours to cross the roughly 600 miles of the Gulf from the Yucatan, where many of them stage before the crossing.[187] The enormous energy expenditure of this trans-Gulf crossing causes songbirds and shorebirds to "fall out" of the sky when they reach the shores of Texas, Louisiana, Alabama, and Mississippi. Even small changes to their migratory paths could decrease the likelihood that they will have the energy reserves to survive the journey, and could negatively affect survival and fecundity even if they make landfall.[188]

Displaced species may also experience secondary impacts if they are displaced into an area with greater relative potential for human conflict, such as noise, collision with vessels, or entanglement in fishing gear. The Gulf of Mexico whale is impacted by multiple factors impeding its recovery but is known to be currently experiencing a greater number of vessel collisions than the species can sustain.[189]

Available from https://research.wur.nl/en/publications/d794211c-8541-4a22-b317-e3bd8be35896 (accessed July 16, 2021)

[184] Bornatowski, H., Navia, A. F., Braga, R. R., Abilhoa, V., & Corrêa, M. F. M. (2014). Ecological importance of sharks and rays in a structural foodweb analysis in southern Brazil. *ICES Journal of Marine Science*, *71*(7), 1586–1592. https://doi.org/10.1093/icesjms/fsu025.

[185] Cury, P. M., Boyd, I. L., Bonhommeau, S., Anker-Nilssen, T., Crawford, R. J. M., Furness, R. W., Mills, J. A., Murphy, E. J., Osterblom, H., Paleczny, M., Piatt, J. F., Roux, J. P., Shannon, L., & Sydeman, W. J. (2011). Global Seabird Response to Forage Fish Depletion-One-Third for the Birds. *Science*, *334*(6063), 1703–1706. https://doi.org/10.1126/science.1212928; Smith, A. D. M., Brown, C. J., Bulman, C. M., Fulton, E. A., Johnson, P., Kaplan, I. C., Lozano-Montes, H., Mackinson, S., Marzloff, M., Shannon, L. J., Shin, Y.-J., & Tam, J. (2011). Impacts of Fishing Low-Trophic Level Species on Marine Ecosystems. *Science*, *333*(6046), 1147–1150. https://doi.org/10.1126/science.1209395.

[186] Lamb JS, Satgé YG, Jodice PGR. 2017. Diet composition and provisioning rates of nestlings determine reproductive success in a subtropical seabird. Marine Ecology Progress Series 581:149–164.

[187] Gauthreaux, SA. 1971. A Radar and Direct Visual Study of Passerine Spring Migration in Southern Louisiana. The Auk 88:343–365.

[188] Cohen EB et al. 2017. How do en route events around the Gulf of Mexico influence migratory landbird populations? The Condor 119:327–343.

[189] Natural Resources Defense Council, Healthy Gulf, Center for Biological Diversity, Defenders of Wildlife, Earthjustice, and New England Aquarium, "Petition to establish a mandatory 10-knot speed limit and other vessel-related mitigation measures for vessel traffic within the core habitat of the Gulf of Mexico Whale (*Balaenoptera ricei*)." Submitted May 11, 2021. Available at: https://www.nrdc.org/sites/default/files/gulf-of-mexico-whale-petition-20210511.pdf

Displacement of Gulf of Mexico whales into shipping or vessel transit lanes will only accelerate the species' decline.

Mitigation and Research

Given the potentially serious consequences across taxa and trophic levels of displacement from offshore wind developments in the Gulf of Mexico, BOEM, as noted previously, will need to support a robust, long-term scientific plan to understand species distributions and migratory pathways within the Gulf of Mexico in order to best avoid major environmental consequences when identifying WEAs offshore.

We further recommend that BOEM take steps to design studies that will allow scientists to quantify the consequences of displacement to population vital rates for species in the Gulf of Mexico that may be impacted by offshore wind development, including sea turtles, bats, landbirds, shorebirds, marine birds, finfish, and marine mammals. In addition to migrant land birds, it will be particularly important to document potential and realized population impacts from displacement to Black-capped Petrel, which are under consideration for listing under the ESA and are known to rely on a significant portion of the Gulf of Mexico year-round.[190]

VI. Conclusion

We thank BOEM for their consideration of these comments and look forward to the leasing process incorporating these recommendations. We urge BOEM to use these comments to enable responsible development of offshore wind in the Gulf of Mexico.

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[190] Jodice PGR, Michael PE, Gleason JS, Haney JC, Satgé YG. 2021. Expanding the marine range of the endangered black-capped petrel Pterodroma hasitata: Occurrence in the northern Gulf of Mexico and conservation implications. bioRxiv:2021.01.19.427288. Cold Spring Harbor Laboratory.

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