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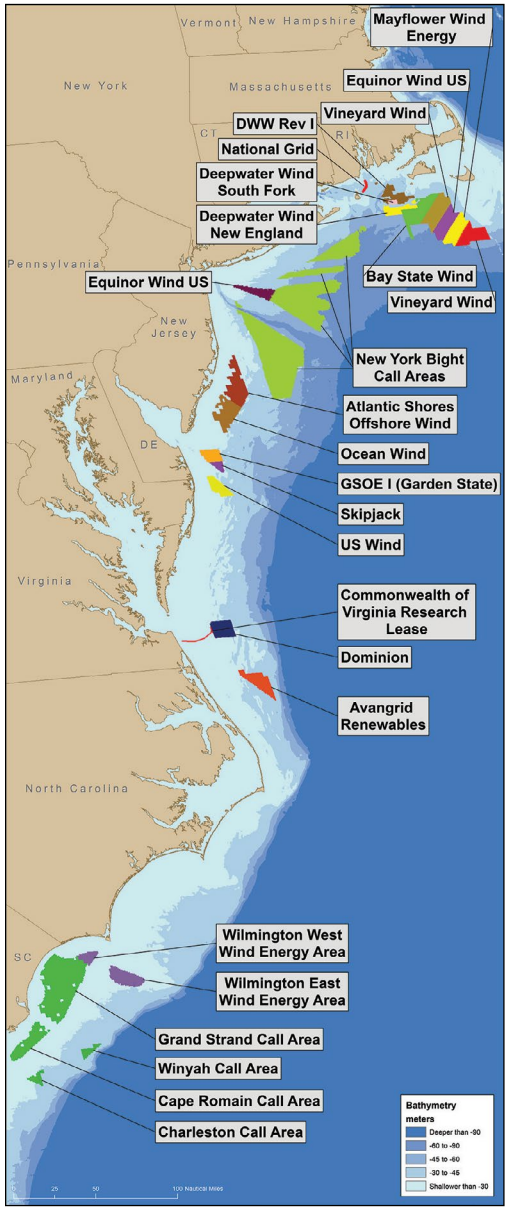
Bureau of Ocean Energy Management | Office of Renewable Energy Programs
2019
Atlantic Science
Year in Review
BOEM Bureau of Ocean Energy Management



The **Bureau of Ocean Energy Management (BOEM)** funds environmental studies for information needed to predict, assess, and manage impacts from offshore energy and marine mineral activities on human, marine, and coastal environments as mandated under Section 20 of the Outer Continental Shelf Lands Act.

This year in review presents the studies completed in 2019 specifically in support of BOEM's Offshore Renewable Energy Program along the Atlantic Coast. The studies represent a broad spectrum of research and monitoring to address a variety of environmental concerns and issues. This review represents a snapshot of the ongoing and completed studies funded in whole or in part by BOEM.

To learn more about other studies, please visit the BOEM website at **www.boem.gov.**

<< Renewable Energy Activity in the Atlantic Outer Continental Shelf, as of May 2020

Understanding Whale Presence in the Virginia Offshore Wind Energy Area

The presence and seasonal patterns of occurrence of baleen whales in and around the Virginia Wind Energy Area (WEA) was evaluated using passive acoustic monitors (PAM). These monitors record the sounds made by whales as well as capture ambient or background sounds.

A line of four stationary, bottom-mounted recorders was deployed across the continental shelf to detect baleen and toothed whales, and a synchronized array of six recorders was deployed within the WEAs to localize marine mammals.

Additionally, three years of previously collected PAM data from 2012-2015 is included in the analysis of newly collected data from 2015-2017.

FINDINGS

- North Atlantic right whales, humpback whales and fin whales showed patterns of seasonality and inter-annual variation with peak whale presence in the winter months.
- North Atlantic right whales were present throughout the year, with peak whale presence occurring November through April.
- The addition of turbine construction and operation sound would not represent a large increase in ambient noise levels, due to the current high levels of noise. However, even modest increases in ambient noise levels within the WEA may elicit behavioral responses from whales.

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-007.pdf

HOW BOEM WILL USE THIS INFORMATION

- To characterize the baseline seasonal and spatial patterns of marine mammal occurrence before wind energy development begins
- To inform the wind energy development process to help mitigate effects on protected marine mammal species
- As a reference to attempt to support the early detection of potential displacement and other effects on marine mammal species during and post construction

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Conducted by: Cornell University | **Key Researchers:** Daniel P. Salisbury, Bobbi J. Estabrook, Holger Klinck, Aaron N. Rice | **Funded by:** BOEM

Determining Habitat Use by Marine Mammals and Ambient Noise Levels Using Passive Acoustic Monitoring Offshore of Maryland

A 3-year passive acoustic monitoring study was conducted in and around the Maryland Wind Energy Area (WEA) to determine the seasonal and inter-annual variation in marine mammal occurrence and to characterize the ambient noise levels. Marine mammals known to occur in this region include the North Atlantic right whale, fin, humpback and minke whales, as well as dolphins and porpoises.

Twelve devices sensitive to the low-frequency calls of large whales were deployed inshore, offshore, and throughout the WEA. Four devices that detected dolphin and porpoise clicks were deployed in a line across the area studied, and four additional sites were added inside the WEA in 2017.

Dr. Helen Bailey and C-Pod Recording Instrument

Dolphins off the coast of Maryland *(Dr. Helen Bailey)*

FINDINGS

- Baleen whales (North Atlantic right whale, fin, humpback and minke whale) were mainly detected November to May.
- North Atlantic right whales were detected during all seasons within and surrounding the WEA, with peak presence from November to April indicating they migrated through and offshore of the Maryland WEA.
- Harbor porpoises were detected from November to June with the peak between January and May.

HOW BOEM WILL USE THIS INFORMATION

- To provide baseline data of marine mammal occurrence in the Maryland WEA
- To inform mitigation measures and assess environmental responses and impacts of future offshore wind activities

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-018.pdf

Webinar: vod.video.cornell.edu/media/Aaron+Rice%27s+Personal+Meeting+Room/1_215z8eoh

Information sheet: boem.gov/sites/default/files/documents/renewable-energy/studies/Maryland-PAM-Information-Sheet.pdf

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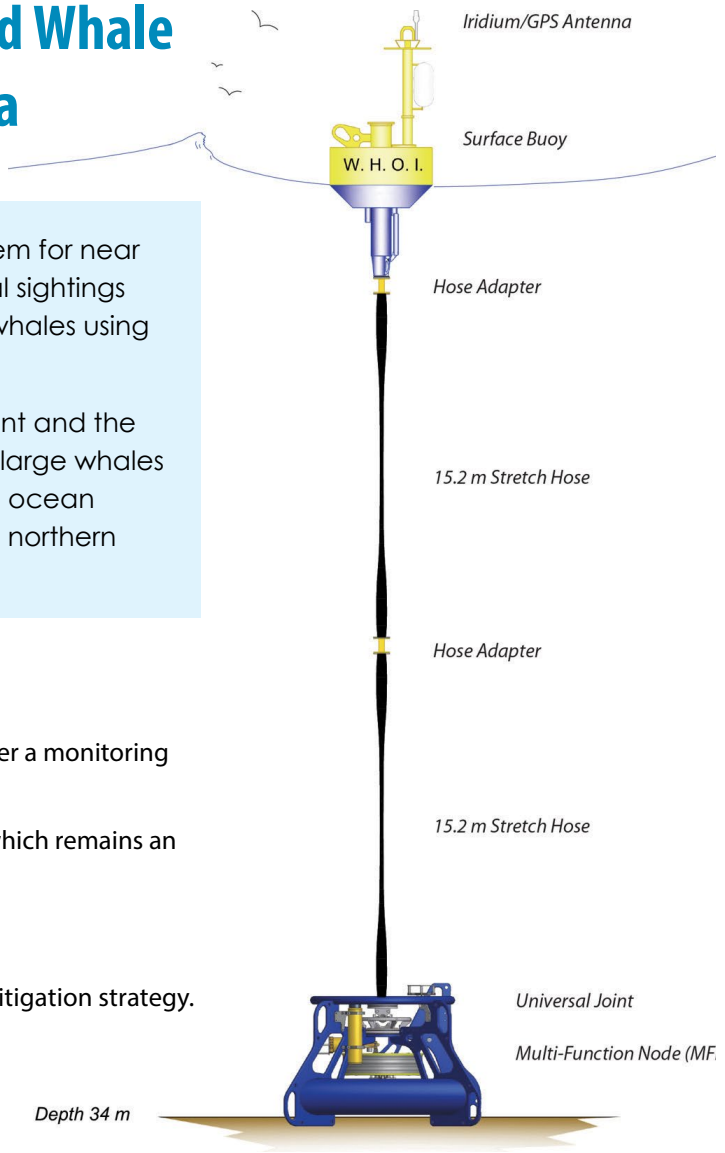
Conducted by: University of Maryland | **Key Researchers:** Helen Bailey and Aaron Rice | **Funded by:** Maryland Department of Natural Resources and BOEM

Evaluating the Accuracy and Detection Range of a Moored Whale Detection Buoy near the Massachusetts Wind Energy Area



This project sought to (1) evaluate the accuracy of a moored passive acoustic monitoring system for near real-time detections of right, humpback, sei and fin whales using acoustic recordings and visual sightings during the same time period, and (2) characterize the detection range of the system for right whales using collocated hydrophone arrays capable of localizing calling whales.

The Woods Hole Oceanographic Institution developed the digital acoustic monitoring instrument and the low-frequency detection and classification system to detect, classify, and report the sounds of large whales in near real-time from a variety of autonomous platforms, including moored buoys and electric ocean gliders. The moored buoy has been in operational use since its deployment during 2015 on the northern edge of the Massachusetts Wind Energy Area.

FINDINGS

- Observed strong associations between right whale visual sightings and near real-time acoustic detections over a monitoring range of 30-40 km and time scales of 24-48 hours.
- One limitation of this system is the absence of information about species-specific acoustic detection range, which remains an important knowledge gap for most passive acoustic monitoring systems.

HOW BOEM WILL USE THIS INFORMATION

- The system may be used for monitoring the presence of whales during construction as part of a potential mitigation strategy.

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-061.pdf

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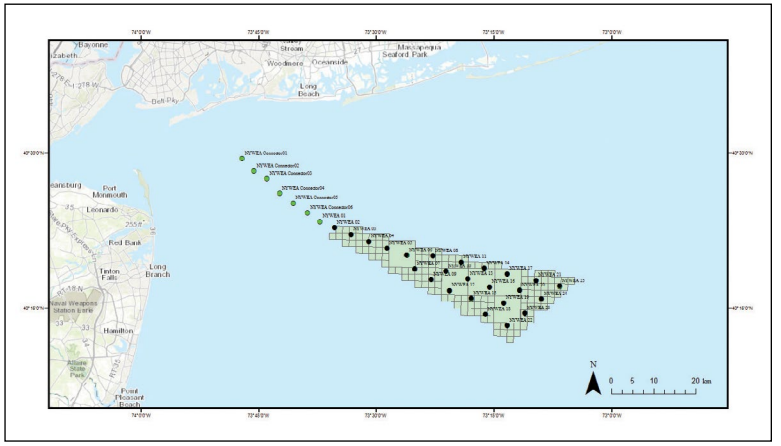
Conducted by: Woods Hole Oceanographic Institution | **Key Researchers:** Mark Baumgartner and YT Lin | **Funded by:** Massachusetts Clean Energy Center and BOEM

Atlantic Fish Telemetry: Monitoring Endangered Atlantic Sturgeon and Commercial Finfish Habitat Use Offshore New York

Atlantic sturgeon and other commercially important species were monitored in the New York lease area located off the coasts of New York and New Jersey from 2016 to 2018. The project established an acoustic telemetry array in the lease area and a near-shore connector array. The study tagged 186 Atlantic sturgeon with acoustic telemetry tags.

Other species of fish tagged included 40 summer flounder, 36 black sea bass and 17 winter flounder. Acoustic tags were also implanted in 21 common thresher sharks, six southern stingrays, three roughtail stingrays, and three shortfin makos.

The findings included an estimate of the total number and proportion of tagged individuals present in the area and an estimate of occurrence as a function of distance from shore, residency in the area, and movement rates.



Atlantic Sturgeon telemetry map

FINDINGS

- Atlantic Sturgeon occurrence in the lease area was highest during the fall and winter months. The occurrence was highest in shallow habitat, decreasing with increased distance and depth from shore.
- Commercial fish tagged in this study all used the lease area and are common in the region. Detailed analysis of temporal and spatial habitat occurrence was not possible given data limitations.
- Elasmobranchs (sharks, skates and rays) detected in the lease area were primarily individuals tagged by other institutions. All the elasmobranch species detected are highly migratory.

HOW BOEM WILL USE THIS INFORMATION

- To increase the baseline description of the distribution of the endangered Atlantic Sturgeon and other fish species in the New York lease area and surroundings
- To inform the timing of human activities that may negatively impact Atlantic sturgeon and other species that occur in the lease area

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-074.pdf

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Conducted by: Stony Brook University | **Key Researchers:** Michael Frisk, Evan Ingram, Keith Dunton | **Funded by:** New York State Dept. of Environmental Conservation and BOEM

Tracking Offshore Occurrence of Common Terns, Endangered Roseate Terns, and Threatened Piping Plovers with Very High Frequency (VHF) Arrays

150 Adult Roseate Terns, 266 Common Terns, and 150 Piping Plovers were fitted with digital VHF transmitters at select nesting areas on the Atlantic coast to track their offshore movements and flight altitudes. Tagged birds were tracked using an array of automated VHF telemetry stations extending from Massachusetts to Virginia, between 2014 and 2017.

Objectives were to develop three-dimensional models to estimate movements of the three species during breeding and post-breeding periods, to estimate the exposure to future offshore wind projects, and to quantify effects of meteorological conditions, temporal variation, and demographic variation.

Piping Plover with tag *(Dr. Peter Paton)*

Roseate Tern with tag *(Dr. Peter Paton)*

FINDINGS

- Peak exposure of both terns primarily occurred in mid-July and August during morning hours and fair-weather conditions.
- Offshore flight altitudes of terns were generally below the rotor-swept zone of offshore wind turbines.
- Peak exposure of Piping Plovers occurred in early August and flight altitudes generally occurred above the rotor-swept zone.

HOW BOEM WILL USE THIS INFORMATION

- To estimate exposure of birds to collision risks with wind turbines
- To incorporate in models to estimate the potential number of birds affected by offshore wind

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-017.pdf

Appendices: espis.boem.gov/final%20reports/BOEM_2019-017a.pdf

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Conducted by: U.S. Fish and Wildlife Service

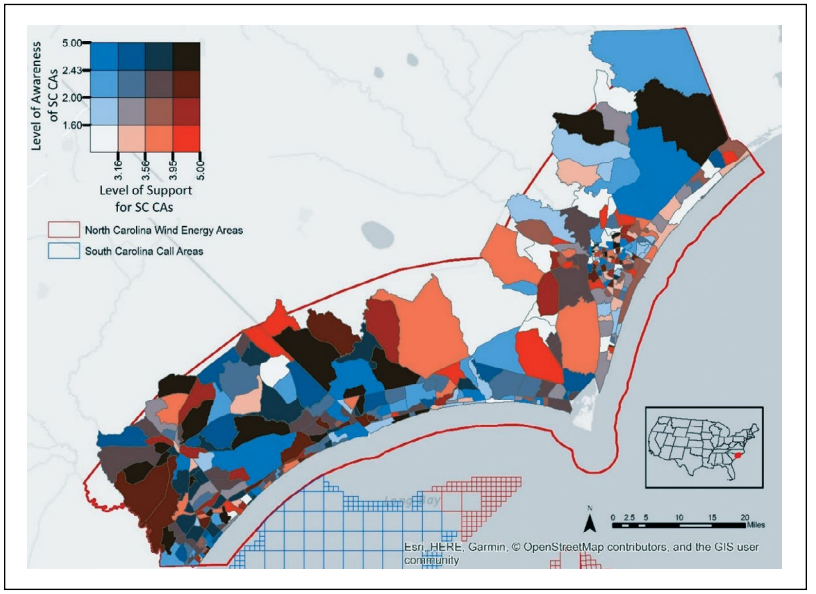
Key Researchers: Pamela Loring, Peter Paton, James McLaren, Hua Bai, Ramakrishna Janaswamy, Holly Goyert, Curtice Griffin, Paul Sievert | **Funded by:** BOEM

Resident Perceptions of Local Offshore Wind Energy Development: Support Level and Intended Action in Coastal North and South Carolina

The study sought to document the relevance and importance of local contextual factors, including place attachment, proximity, and perception of impacts, on the possible reception of proposed local offshore wind energy development among residents in affected coastal communities along North and South Carolina.

The objectives were to identify factors predictive of support level and intention to take future action to advance a position. A geographically stratified, random household survey was conducted in 2018 in a pre-defined coastal region of North and South Carolina adjacent to offshore wind energy development areas.

Residents 18 and older were invited to take the survey, which contained questions on place attachment, recreational activities, social value of favorite places, awareness, perceived impact to important quality of life items, support level, past and future action, and demographic and household characteristics. A 33% response rate was achieved with a final sample size of 3,593.



Awareness by support for offshore wind energy development in South Carolina

FINDINGS

- This research confirms the importance of local context when planning for offshore wind energy development.
- Residents in households located closer to the shoreline are more likely to oppose local offshore wind energy development than residents living farther inland.
- Need for policy-makers to engage, if possible, those most strongly opposed to better understand the quality of life items of greatest concern to them.

HOW BOEM WILL USE THIS INFORMATION

- To understand perceived impacts to a broader range of stakeholders for mitigation planning and to inform public engagement activities

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-054.PDF

Conducted by: National Centers for Coastal Ocean Science, National Oceanic and Atmospheric Administration
Key Researchers: Theresa L. Goedeke, Sarah Ball Gonyo, Chloe S. Fleming, Jarrod L. Loerzel, Amy Freitag, Chris Ellis | **Funded by:** BOEM

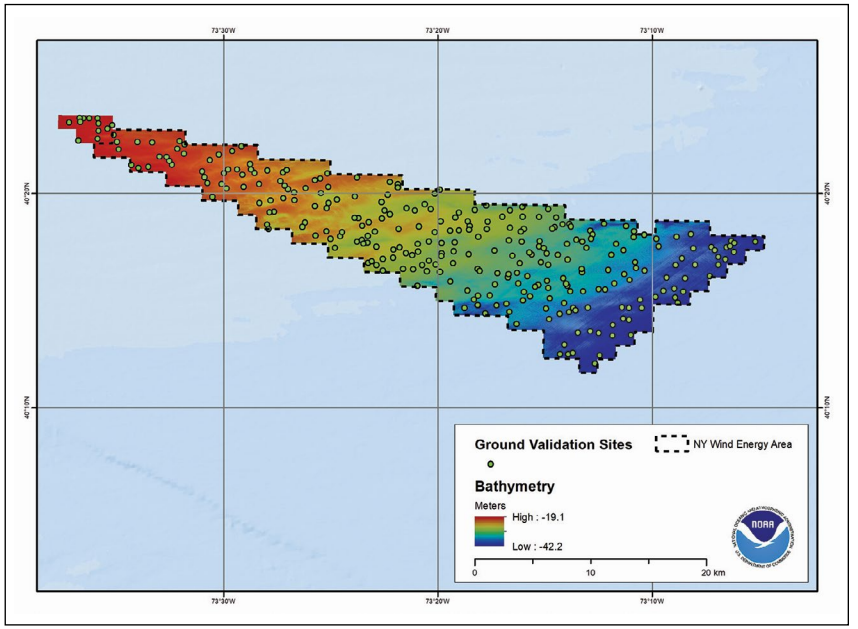
Comprehensive Seafloor Substrate Mapping and Model Validation in the New York Bight

Comprehensive seafloor mapping on regional scales is resource intensive. Models may be used to extrapolate results or predict changes. The National Oceanic and Atmospheric Administration developed models for the New York Bight, an area of interest to BOEM for offshore wind development, but these predictive models would be improved through groundtruthing.

The data collection and analysis focused on two locations: New York Lease Area OCS-A 0512 and the mid-Atlantic region study area. Extensive acoustic and sediment sampling, and ground validation studies were conducted within the lease area.

The regional study area encompasses 50,082 km^2 of coastal and ocean waters off the coast of New York and New Jersey. This area includes a portion of the mid-Atlantic Bight and much of the area characterized as the New York Bight.

This report contains analysis of hard bottom predictions and sediment texture throughout the regional study area.



FINDINGS

- The entire lease area was considered uniformly sand of varying coarseness, affecting the ability of model predictions to be accurate.
- Fisheries acoustic products developed under this project document baseline conditions within the lease area during the month of September.

HOW BOEM WILL USE THIS INFORMATION

- The results of site characterization studies, which include data collection and mapping of geophysical features on the seafloor, will be used to evaluate the potential effect of proposed activities.

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-069.pdf

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Conducted by: National Centers for Coastal Ocean Science, National Oceanic and Atmospheric Administration | **Funded by:** BOEM

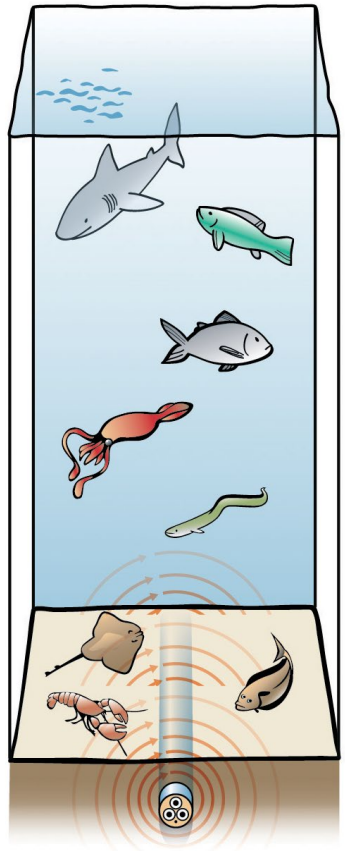
Key Researchers: Tim Battista, Will Sautter, Matthew Poti, Erik Ebert, Laura Kracker, Jennifer Kraus, Ayman Mabrouk, Bethany Williams, Daniel Dorfman, Rachel Husted, Chris Jenkins

Evaluation of Potential Electric and Magnetic Field (EMF) Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England

The development of offshore wind technology along the Atlantic coast has raised public concern about the potential effects of EMF from undersea power cables on commercially and recreationally important fish species.

This summary of the available science addresses the potential effects of EMF from undersea power cables associated with offshore wind energy projects on important fish species and was developed to help inform commercial and recreational fishing community concerns.

The report discusses what is currently known about EMF issues, addresses common concerns and misconceptions, and provides background information about EMF in the environment and the relevance of EMF to fish species in the southern New England area.



FINDINGS

- Undersea power cables associated with offshore wind energy projects within the southern New England area will generate weak EMF at frequencies outside the known range of detection by electrosensitive and magnetosensitive fishes.
- Bottom-dwelling fishes are most likely to encounter EMF from undersea power cables; however, EMF decays very quickly with distance from the cable, which minimizes potential exposure.
- Review of the evidence to date does not indicate that EMF from undersea power cables negatively affects commercially and recreationally important fish species in southern New England.

HOW BOEM WILL USE THIS INFORMATION

- To communicate about EMF in the environment
- To incorporate in environmental analyses of offshore wind projects

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-049.pdf

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Conducted by: CSA Ocean Sciences Inc. and Exponent | **Key Researchers:** David Snyder, William Bailey, Katherine Palmquist, Benjamin R.T. Cotts, Kimberley Olsen | **Funded by:** BOEM

Supporting National Environmental Policy Act Documentation for Offshore Wind Energy Development Related to Navigation

This study used a literature review to evaluate the documentation related to navigational concerns associated with offshore wind infrastructure, focusing on existing policy and guidance, navigational risk assessments, collisions and allisions, commercial fisheries, and recreational fisheries. Expert discussions were conducted with subject matter experts to gather supplemental information on concerns related to offshore wind energy development and marine vessel navigation.

This report provides summaries of the major topics identified and areas of broad agreement among the literature sources and stakeholders, as well as areas of divergent views where additional research may be necessary.

Construction vessels at Block Island

FINDINGS

- Each facility should be reviewed on a case-by-case basis to account for vessel type, size, and traffic density, among other site-specific considerations.
- Highest risk to navigation typically occurs during the wind farm construction phase. Safety zones are recommended during construction.
- The greatest risk of collisions or allisions is posed by potential loss of steering, power, or both vessel functions, which can be caused by human error.
- Offshore wind farms can create a conflict with commercial fishing, although the magnitude and mitigations for this risk are not well documented.
- Artificial offshore structures, such as bottom-founded oil and gas platforms, wind energy platforms, and shipwrecks are popular destinations for recreational fishing and diving.

HOW BOEM WILL USE THIS INFORMATION

- To inform environmental assessments of offshore wind facilities

ADDITIONAL INFORMATION

Final report: boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/BOEM-2019-011.pdf

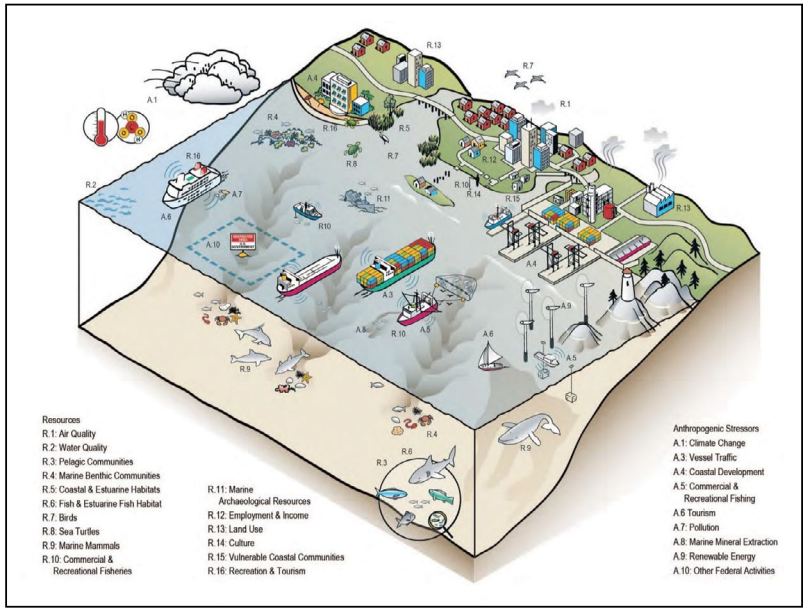
Conducted by: Booz Allen Hamilton | **Key Researchers:** Jennifer Salerno, Andrew Krieger, Mathew Smead, Lindsey Veas | **Funded by:** BOEM

National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf

National Environmental Policy Act (NEPA) guidance for evaluating cumulative effects specifies the need to include all relevant past, present, and reasonably foreseeable future actions and to focus on truly meaningful effects. Agencies are charged with developing action- or activity-specific cumulative impacts scenarios in accordance with this general guidance.

Considering expected growth in renewable energy projects offshore from Maine to Virginia, this document sought to establish a common cumulative impacts scenario framework for use in NEPA analyses for offshore wind activities on the North Atlantic Outer Continental Shelf (OCS).

A framework enables efficient and effective identification of relevant actions for the cumulative effects analyses, and the development of consistent, succinct NEPA documents that demonstrate sound logic for cumulative effects findings.



FINDINGS

- Identifies the important cause-and-effect relationships between renewable energy projects and potentially affected resources.
- Identifies the types of actions and activities to include in the cumulative impacts scenario.
- Identifies past, present, and reasonably foreseeable actions and activities in the North Atlantic OCS to consider in future NEPA cumulative impact scenarios.
- Provides guidance on and information sources for identifying relevant past, present, and reasonably foreseeable actions for each action/activity.

HOW BOEM WILL USE THIS INFORMATION

- BOEM will use this scenario in environmental impact statements to ensure consistent assessment of impacts from offshore wind facilities

ADDITIONAL INFORMATION

Final report: boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/IPFs-in-the-Offshore-Wind-Cumulative-Impacts-Scenario-on-the-N-OCS.pdf

Conducted by: Avanti Corporation and Industrial Economics, Inc. | **Funded by:** BOEM

Potential Impacts to Marine Mammals and Sea Turtles from Offshore Wind Research Framework Workshop

The Massachusetts Clean Energy Center, the Massachusetts Executive Office of Energy and Environmental Affairs, the Bureau of Ocean Energy Management, and the New England Aquarium convened a workshop in May 2018 that included marine scientists, non-governmental organization representatives, regulators, public stakeholders, and offshore wind leaseholders to inform the development of a scientific research framework (Framework) to guide studies of potential effects to endangered whales and sea turtles associated with offshore wind facility construction and operation in the U.S. Northeast.

The Framework focuses on assessing potential effects to baleen whales and sea turtles associated with offshore wind facility construction and operation within the Massachusetts and Rhode/Island Massachusetts Wind Energy Areas since sufficient current biological data exists, and offshore wind facility construction is anticipated to begin in the foreseeable future. However, the intention of the Framework is to make it applicable to address other offshore wind development along the Atlantic coast.

HOW BOEM WILL USE THIS INFORMATION

- Recommendations from the framework will be used to guide future funding to address the potential impacts of offshore wind development on marine mammals and sea turtles.

Humpback whale *(Dr. Helen Bailey)*

ADDITIONAL INFORMATION

Workshop Proceedings: boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/Potential-Impacts-to-Marine-Mammals-and-Sea-Turtles-from-Offshore-Wind.pdf

Framework: boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/A-Framework-for-Studying-the-Effects.pdf

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Conducted by: Consensus Building Institute | **Key Researchers:** Scott D. Kraus, Robert D. Kenney, and Len Thomas

Funded by: Massachusetts Clean Energy Center, Anderson Cabot Center for Ocean Life at the New England Aquarium and BOEM

RODEO Overview: Realtime Opportunity for Development Environmental Observations

The purpose of the study Realtime Opportunity for Development Environmental Observations is to make direct, real-time measurements of the nature, intensity, and duration of potential stressors during the construction and initial operations of selected proposed offshore wind facilities.

The study also records direct observations during the testing of different types of equipment that may be used during future offshore development to measure or monitor activities and their impact producing factors.

Data collected under RODEO may be used as input to analyses or models that are used to evaluate effects from future offshore activities.

This study is not intended to duplicate or substitute for any monitoring that may otherwise be required to be conducted by the developers of the proposed projects. Also, RODEO monitoring is coordinated with the industry and is not intended to interfere with or result in delay of industry activities.

The Block Island Wind Farm (BIWF) is the first facility to be monitored under the RODEO study. Observations were made during the installation of the wind turbine foundations, the installation of the turbines, and during early operations.

Installing the blade at Block Island Wind Farm

The following pages present methods, observations, results, findings, data, and recommendations from multiple environmental monitoring surveys conducted in and around the BIWF Project Area during the assembly of the wind turbine generator components (turbine towers, nacelles, and blades).

Additional reports from the installation of the foundations and cable can be found on the BOEM website.

Field Observations During Wind Turbine Installation at the Block Island Wind Farm

The construction of the Block Island Wind Farm, located 2.8 miles southeast of Block Island, Rhode Island, was completed over a two-week period in August 2016, when a turbine tower, a nacelle, and three blades were assembled on each of the five wind turbine generator foundations. The nacelle is a case that houses all of the generating components in a wind turbine, including the generator, gearbox, drive train, and brake assembly.

This report presents the results of observations during construction activities and airborne noise monitoring conducted during the installation. The purpose of visual monitoring was to document visibility of construction activities during the assembly of the turbine towers and installation of the nacelles and blades from selected onshore and offshore locations; and generate a real-time record of the construction-related impact-producing activities, and where possible, quantify such activities.

Turbine at Block Island Wind Farm

FINDINGS

- Assembly of the wind turbine generator components on the foundations was completed in approximately two weeks, with an average of three days per turbine installation. On windy days, construction had to be suspended because of potential risk from crane operations.
- Only four vessels were used during installation of the towers, as compared to 16 vessels during foundation construction.
- During construction, local boat traffic was impacted, turbine construction had no influence on the local fishing traffic.
- The monitoring results indicated that at no point during the tower installation was construction noise audible or detectable at the onshore monitoring locations.

HOW BOEM WILL USE THIS INFORMATION

- To evaluate impacts from future wind development
- To address concerns raised by the public

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-027.pdf

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Conducted by: HDR | **Key Researchers:** Adam Collett, James Elliott, Anwar Khan, Timothy Mason | **Funded by:** BOEM

Field Observations During Wind Turbine Operations at the Block Island Wind Farm

The Block Island Wind Farm (BIWF), located 2.8 miles southeast of Block Island, Rhode Island, began operation in December 2016. Visual observations of the operating turbines, airborne noise monitoring, and underwater sound monitoring were conducted during the first year of operations.

Observations of the turbines were made from Southeast Lighthouse on Block Island (2.8 miles), Point Judith (16 mi) and Brenton State Park (24 mi).

Airborne noise from the operating turbines was monitored at Block Island and from a survey vessel. Underwater acoustic signals were measured during winter (December 2016 to January 2017) and late summer (October to November 2017) conditions.

Extended underwater acoustic monitoring was conducted over 100 days during July to October 2017.

(Deepwater Wind)

FINDINGS

- Turbines were visible both during the day and at night at Brenton State Park (24 mi) under clear conditions.
- Airborne noise from the turbine operations was not detected at the onshore monitoring station on Block Island.
- Underwater sound at 50 meters from the turbine was near background levels and often not measurable due to other natural and anthropogenic noise (waves or boat sounds).

HOW BOEM WILL USE THIS INFORMATION

- To inform mitigation of visual impacts from wind farm lighting
- To address concerns about sound from operating turbines, both in the air and underwater

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-028.pdf

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Conducted by: HDR | **Key Researchers:** James Elliott, Anwar A. Khan, Ying-Tsong Lin, Timothy Mason, James H. Miller, Arthur E. Newhall, Gopu R. Potty, Kathleen J. Vigness-Raposa

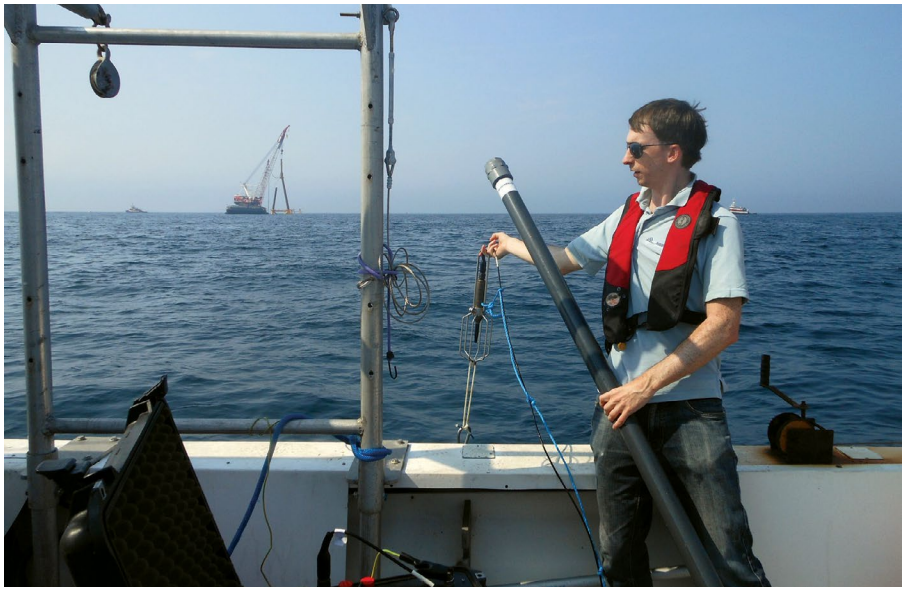
Funded by: BOEM

Underwater Acoustic Monitoring Data Analyses for the Block Island Wind Farm

The installation of foundations of the Block Island Wind Farm, 2.8 miles southeast of Block Island, Rhode Island, was completed in October 2015. The installation included the driving of segmented piles at each of the four corners of the jacket foundations. For most piles, three segments were driven.

Pile driving produces intense sound that will affect marine life. During some of the pile driving events, sound was measured using a towed array as well as a sled with hydrophones configured to measure particle acceleration. Particle acceleration potentially can impact fish and invertebrates.

The data collected during pile driving was evaluated using three-dimensional sound propagation modeling.



Deploying acoustic monitor

FINDINGS

- Underwater pile driving sound was above background sound levels at ranges in excess of 20 km (12.4 mi) and the received levels were approximately 120 decibels.
- Sound levels were also shown to be dependent upon the orientation of the pile to the recording sensor.
- Particle acceleration levels (pressure from the sound) in water are slightly above the behavioral sensitivity in the frequency range 30 to 300 Hertz and suggest that some fish may barely 'detect' the particle motion during construction at the 500 m range.

HOW BOEM WILL USE THIS INFORMATION

- To evaluate impacts on marine life from sound generated during pile driving
- To identify mitigation measures to reduce the impacts from sound

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-029.pdf

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Conducted by: HDR | **Funded by:** BOEM

Key Researchers: Jennifer L. Amaral, Adam S. Frankel, Anwar A. Khan, Ying-Tsong Lin, James H. Miller, Arthur E. Newhall, Gopu R. Potty, Kathleen J. Vigness-Raposa

Benthic Monitoring During Wind Turbine Installation and Operation at the Block Island Wind Farm – Year 2

The Block Island Wind Farm is a five-turbine, 30-megawatt facility located 2.8 miles southeast of Block Island, Rhode Island. Turbines are fixed to the seafloor by steel jacket (lattice) structure foundation type.

Three turbine foundation locations were selected for sampling based on their different seafloor types present in the study area. Triplicate, clustered seabed samples were collected using a quantitative grab at distances of between 30 m and 90 m from the center point of each foundation, and at control stations, to determine the presence of any gradient effects and modified physical, chemical, and biological conditions over and above natural variations.

Video and photographic stills provided complementary information on seabed substrate types, bedforms and larger epibenthos.

Mussels on Block Island foundation

FINDINGS

- No substantial differences within the range of 30 to 90 meters from the center of the foundations two years after installation.
- While the area of seabed underneath the jacket structure at Turbine 1 exhibited significantly higher levels of fine-grained sediment and organic material, marine species sampled were comparable with surrounding benthic habitats.

ADDITIONAL INFORMATION

Final report: espis.boem.gov/final%20reports/BOEM_2019-019.pdf

HOW BOEM WILL USE THIS INFORMATION

- The results from this study are valuable in improving the understanding of changes to macrofaunal and sediment characteristics resulting from wind facility construction and initial operations in the New England region over short time scales (e.g., < 1 to 2 years).
- The results and findings from this study could serve as the basis for extrapolation to larger wind facilities and will provide useful information on the effects of jacket type foundations, which are generally underrepresented in European studies.

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