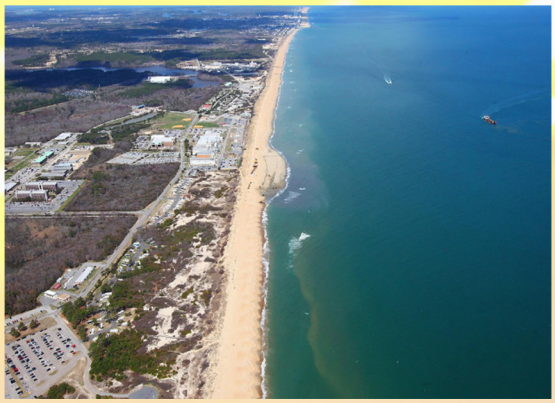
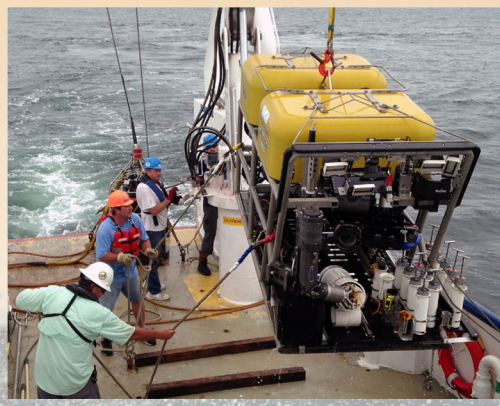
Bureau of Ocean Energy Management | Environmental Studies Program

Quarterly Report FY 2018 First Quarter

Latest Reports and Study Profiles Posted to the Environmental Studies Program Information System (ESPIS)





BOEM Bureau of Ocean Energy Management

June 2018

Contents

During the first quarter of fiscal year (FY) 2018, BOEM posted new findings from 11 studies to the Environmental Studies Program Information System (ESPIS). Below are report titles, summaries of the findings, links to documents, and related peer-reviewed journal articles. Note: there are no new recent starts to report in this Quarterly Report.

Visit ESPIS at https://marinecadastre.gov/espis/#/.

Contents

Hanna Shoal Ecosystem Study

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/26833
Conducted by: University of Texas at Austin, 2011–2017
National Studies List: AK-11-03

Purpose:

To build on previous studies on the Hanna Shoal region of the northeastern Chukchi Sea in relation to potential oil and gas drilling; to identify the important physical and biological processes driving the high levels of ecosystem productivity.

Findings

- Water column on the shelf to the east of Hanna Shoal remains strongly stratified year-round.
- Clockwise currents and water mass movements around the Shoal have profound impacts on water column chlorophyll *a*, biomass, and zooplankton distribution, abundance, and composition in shelf waters.
- Chlorophyll *a* concentrations were found to be among the highest ever reported in marine sediments, while there was also evidence of active benthic grazing of chlorophyll *a*.
- Greatest biomass was on the Shoal's northwest and southeast flanks, which receive Bering Sea water.
- Total organic carbon was highest in finegrained sediments from stations on the flanks of the shoal. Up to 35% of sediment organic matter is derived from sources such as coastal erosion and inputs from Arctic rivers (e.g., the Yukon).
- No Hanna Shoal stations exhibited detectable anthropogenic contributions of trace metals.

Special edition of Deep Sea Research Part II, Vol. 144, Oct. 2017

How BOEM Will Use This Information

To improve BOEM's understanding of the physical oceanography and biological productivity of this unique ecosystem.

Study Products

Dunton, K.H., C. Ashjian, R.G. Campbell., L.W. Cooper, J.M. Grebmeier, H.R. Harvey, B. Konar, D. M. Maidment, J.H. Trefry, and T.J. Weingartner. 2016. Chukchi Sea Offshore Monitoring in Drilling Area (COMIDA): Hanna Shoal Ecosystem Study. Final Report. OCS Study BOEM 2016-047. Prepared for the Bureau of Ocean Energy Management, Anchorage, AK, by The University of Texas Marine Science Institute, Port Aransas, TX. 352 p.

National Oceanographic Data Center, NOAA. doi:10.7289/V5GX48MN; COMIDA Hanna Shoal website, University of Texas, Austin http://arcticstudies.org/hannashoal/; Special Edition of Deepsea Research Part II, Vol. 144. October 2017.

Arctic Tracer Release Experiment (ARCTREX) Applications For Mapping Spilled Oil In Arctic Waters

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/26872
Conducted by: University of Alaska Fairbanks, 2013–2017
National Studies List: AK-12-03b

Purpose:

To map the evolution of a dye plume over time and space in order to simulate an oil spill event in the Chukchi Sea, and to provide real-time data to the shore-based Arctic Environmental Response Management Application (ERMA) system.

Findings

- During two ice-free seasons in diverse environments, the shipboard thermos-salinograph (which determines sea surface temperature and conductivity from vessels underway), and the towed undulating Acrobat vehicle (an open frame holding sensors) were capable of tracking dye over time in great detail while operating in stormy seas with wave heights nearly 3 meters.
- Situation required instruments capable of sustained subsurface measurements in addition to surface waters.
- Feasible to track a passive dye in detail using the technologies mentioned above and transfer real-time dye concentration data to ERMA.

Study Products

Winsor, P., H. L. Simmons, R. Chant, 2017. Arctic Tracer Release Experiment (ARCTREX): Applications for Mapping Spilled Oil in Arctic Waters, Final Report to Bureau of Ocean Energy Management, M13AC00008, OCS Study BOEM 2017- 062, University of Alaska Fairbanks, Fairbanks, AK, 79 p.

Data Products

Temperature, salinity, and dye concentration from CTD, gliders and other instruments as well as drifter velocity collected in the Chukchi Sea, Beaufort Sea and other locations for the Arctic Tracer Release Experiment (ARCTREX) and the Bureau of Ocean Energy Management (BOEM) from 2014-09-09 to 2016-01-20 (NCEI Accession 0168859) US Dept. of Commerce, National Oceanic and Atmospheric Administration, National Centers for Environmental Information.

How BOEM Will Use This Information

The technologies used in this study ony tracked dye, not oil. The technology demonstrated that location data of a subsance could be mapped into the NOAA ERMA system, which will be used for tracking oil, if ever required.

Surface drifter moving in a pool of Rhodamine-WT dye in the Chukchi Sea, by Dr. Peter Winsor, from the aft deck of the Norseman II in 2015.

Testing the Use of Unmanned Aircraft Systems for Intertidal Surveys – Proof of Concept

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/26911
Conducted by: : University of Alaska Fairbanks, Coastal Marine Institute, April 1–May 31, 2015
National Studies List: AK-13-03-08

Purpose:

To test the potential of small unmanned aerial systems (sUAS) for monitoring rocky intertidal and intertidal seagrass areas in the northern Gulf of Alaska.

Findings:

- Visual data from observers always resulted in the most types of marine life being identified.
- On a large scale, data from observers on the ground versus aerial observations were mostly similar.
- Monitoring goals or research questions that can be answered on a relatively coarse taxonomic level can benefit from use of sUAS-based approaches, since they allow much larger spatial coverage than is possible by observers on the ground.

Study Products

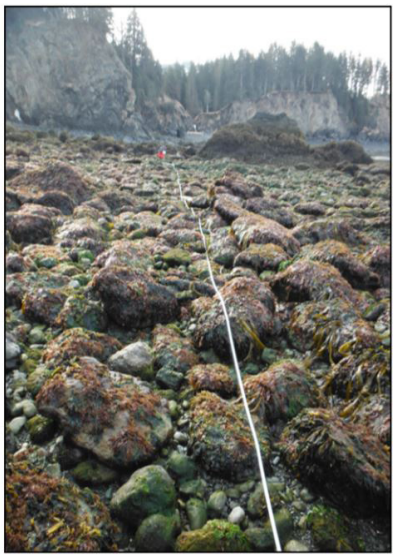
Konar B, Iken K. 2016. Testing the use of Unmanned Aircraft Systems for Intertidal Surveys-proof of concept. BOEM 2016-051. 24p.

Konar B and K Iken. Submitted to Deep Sea Research II (special issue: Gulf of Alaska). The use of unmanned aerial vehicle imagery in intertidal monitoring.

The use of unmanned aerial vehicle imagery in intertidal monitoring, published by Elsevier.

Oral presentations and posters presented at science conferences in Anchorage and Kachemak, Alaska, in 2015 and 2016.

Transect layouts prepared before sUAS and ground observer cameras take images of the rocky intertidal areas at mean tidal level.



How BOEM Will Use This Information

- To understand the effectiveness of sUAS for monitoring the sustained ecosystem health and functioning of coastal systems, which are vulnerable to environmental stressors and human impacts.
- To develop maps showing the distribution patterns and patchiness of seagrass.

Atlantic Marine Assessment Program for Protected Species: 2010-2014

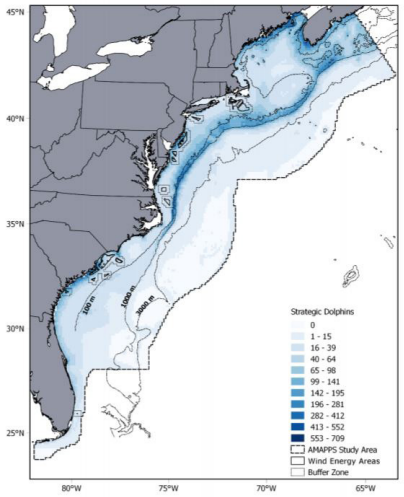
ESPIS Link: https://marinecadastre.gov/espis/#/search/study/100019
Conducted by: National Oceanographic and Atmosphic Administration/ National Marine Fisheries Service, in partnership with the U.S. Fish and Wildlife Service, the Bureau of Ocean Energy Management, and the U.S. Navy, 2010–2015
National Studies List: AT-10-x11

Purpose:

- To assess the abundance, distribution, ecology, and behavior of marine mammals, sea turtles, and seabirds throughout the US Atlantic OCS,
- To place them in an ecosystem context, and
- To provide spatially explicit density estimates to inform marine resource management decisions.

Findings:

- Higher abundance estimates for many marine mammal species than previously estimated due to improved calculation techniques; more than 32 cetacean species studied; wealth of new data on dolphins and Sowerby's Beaked Whales
- Persistent higher concentrations of marine birds identified off the Outer Banks, off eastern Long Island, and in the Martha's Vineyard/ Nantucket region
- Relatively high densities of loggerhead turtles found in coastal waters from Cape Hatteras, North Carolina, to Long Island, New York, during the summer
- Potential new spawning area for Atlantic bluefin tuna identified off the U.S. northeastern continental shelf, an area called the Slope Sea



Spring abundance hot spot index for dolphin species defined as strategic under the Marine Mammal Protection Act.

How BOEM Will Use This Information

To inform BOEM decisions on offshore renewable energy, conventional energy, and marine mineral resource development on the Atlantic coast.

Study Products

Atlantic Marine Assessment Program for Protected Species: 2010-2014 Palka DL, Chavez-Rosales S, Josephson E, Cholewiak D, Haas HL, Garrison L, Jones M, Sigourney D, Waring G, Jech M, Broughton E, Soldevilla M, Davis G, DeAngelis A, Sasso CR, Winton MV, Smolowitz RJ, Fay G, LaBrecque E, Leiness JB, Dettloff, Warden M, Murray K, Orphanides C. 2017. 230p.

Atlantic Marine Assessment Program for Protected Species: 2010-2014; Supplement to Final Report BOEM 2017-071; Appendix I. 412p., and Appendix II – V. 128.

Determining Fine-scale Use and Movement Patterns of Diving Bird Species in Federal Waters of the Mid-Atlantic United States Using Satellite Telemetry

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/100060
Conducted by: U.S. Fish and Wildlife Service, 2011–2016
National Studies List: AT-12-02

Purpose:

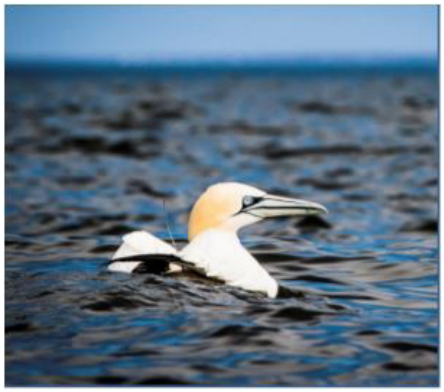
To determine fine scale use and movement patterns of three diving bird species (red-throated loon, surf scoter, and northern gannet) in the mid-Atlantic. From 2012 to 2015, the U.S. Fish and Wildlife Service, in partnership with the Sea Duck Joint Venture, US Geological Survey, Biodiversity Research Institute, and Memorial University of Newfoundland, captured and tracked 239 adult birds with satellite transmitters.

Findings:

- During winter, all species exhibited largely near-shore, coastal, or in-shore distribution. Habitat use was concentrated in or around large bays (e.g., Delaware, Chesapeake, Pamlico Sound), mostly at the bay mouths. During migratory periods, they used federal offshore waters more than in winter.
- Northern gannets ranged much farther offshore than the other species and overlapped with the Wind Energy Areas and Lease Areas. Surf scoters were the closest to shore.
- Northern gannets were the first to arrive in early October, followed by surf scoters in mid- to late October, and red-throated loons in mid-November. Departures began by mid-April, with the majority leaving by mid-May.
- Solar-powered cellular-network dataloggers provided location data with greater precision and frequency than the standard satellite tags. This new technology shows promise but requires further refinement before widespread use.

Study Products

Spiegel, C.S., A.M. Berlin, A.T. Gilbert, C.O. Gray, W.A. Montevecchi, I.J. Stenhouse, S.L. Ford, G.H. Olsen, J.L. Fiely, L. Savoy, M.W. Goodale, and C.M. Burke. 2017. Determining Fine-scale Use and Movement Patterns of Diving Bird Species in Federal Waters of the Mid- Atlantic United States Using Satellite Telemetry. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-069. 293p.



A northern gannet. Photo courtesy of J. Fiely, U.S. Geological Survey.

How BOEM Will Use This Information

Identification of high use areas during the marine birds' critical life stages can inform the siting of offshore facilities, and provide baseline data for understanding broad changes in distributions occuring after construction of offshore wind facilities in specific areas.

Developing and Applying a Vulnerability Index for Scaling the Possible Adverse Effects of Offshore Renewable Energy

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/26959
Conducted by: U.S. Geological Survey, 2012–2017
National Studies List: PC-12-01

Purpose:

To evaluate marine bird species at the population level in the California Current System (CCS) for their collision and displacement vulnerability from offshore wind energy infrastructure (OWEI).

Double-crested cormorant. Photo courtesy of David M. Pereksta, BOEM.

Findings:

- Provides the first quantitative evaluation of vulnerability of marine birds inhabiting the CCS to offshore wind energy infrastructure. Researchers assessed 81 marine bird species.
- Pelicans, cormorants, gulls, jaegers, and terns have the greatest population collision vulnerability due to low avoidance rates, and a high percentage of time flying at the height of turbine blades.
- Alcids, terns, grebes, loons, and Ashy Storm-Petrels have the greatest Population Displacement Vulnerability due to high avoidance rates and low habitat flexibility.
- Terms and gulls are vulnerable to both displacement from, and collision with, OWEI.
- Distributions can be integrated with information on wind patterns to create a density-distribution analysis of locations in the CCS where the impacts of OWEI on marine birds would be greatest.

How BOEM Will Use This Information

- Results can be combined with recent marine bird at-sea distribution and abundance data to evaluate bird vulnerability to offshore renewable energy site locations in the CCS.
- Estimates of vulnerability can be used to help inform decisions that could impact seabird conservation.

Study Products

Adams, J., E.C. Kelsey, J.J. Felis, and D.M. Pereksta. 2017. Collision and displacement vulnerability among marine birds of the California Current System associated with offshore wind energy infrastructure (ver. 1.1, July 2017): U.S. Geological Survey Open-File Report 2016-1154, 116 p., http://dx.doi.org/10.3133/ofr20161154.

Data for calculating population, collision and displacement vulnerability among marine birds of the California Current System associated with offshore wind energy infrastructure (ver. 2.0, June 2017) USGS ScienceBase

Expansion of West Coast Oceanographic Modeling Capability

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/100170
Conducted by: University of California, Los Angeles, 2014–2017
National Studies List: PC-14-01

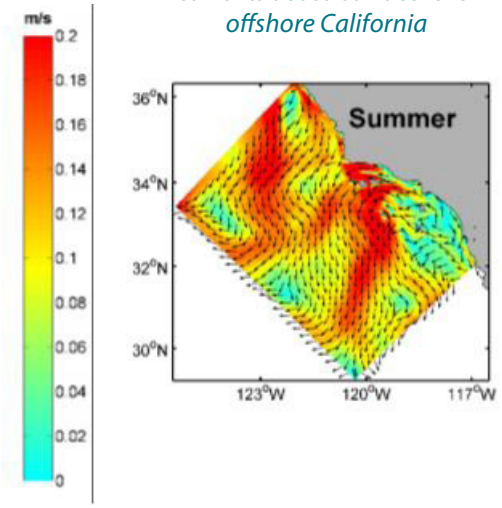
Purpose:

To extend and update the oceanographic models used for oil spill risk analysis in the Southern California Bight (SCB) by extending the region to north of Point Conception including Morro Bay. The new models combine hindcast data with observational data.

Findings:

- Weather Research and Forecasting (WRF) simulation generally captures the spatial pattern of the winds at 10 meters above the sea surface, wind speed, and wind curl in all four seasons. The WRF simulation particularly reproduces the nearshore wind features well, and the precipitation reasonably well.
- Overall, the Regional Ocean Modeling System (ROMS) captures well the primary characteristics of the tides, significant surface height, water temperature, salinity, and currents.
- The Simulating WAves Nearshore (SWAN) simulation (significant wave height) generally captures the spatial pattern of the wave height and wave direction in all four seasons. The simulation also shows the effect of the islands on waves, demonstrating the ability of SWAN to simulate the reflection and diffraction of waves in the SCB region.

(Below) 10-year (2004–2013) seasonal mean currents at sea surface level offshore California



Study Products

Dong, C., L. Renault, Y. Zhang, J, Ma, and Y. Cao, 2017: Expansion of West Coast Oceanographic Modeling Capability. US Department of the Interior, Bureau of Ocean Energy Management, Pacific. OCS Study BOEM 2017-055. 83 p.

Data Products

- Current Observation Dataset
- Numerical output from WRF, ROMS, and SWAN models

How BOEM Will Use This Information

This more accurate, high-resolution, 10-year hindcast model of atmospheric and oceanographic parameters will help improve BOEM's oil spill risk analysis in the Southern California Planning Area.

Human Dimensions of Climate Change in Coastal Oregon

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/100093
Conducted by: U.S. Geological Survey, Fort Collins Science Center, 2015–2017
National Studies List: NT-14-x15

Purpose:

To investigate the social effects associated with environmental change in the counties of Coos and Lincoln, Oregon, focusing on the communities of Coos Bay and Newport.

Findings:

The study compared measured and projected climate trends with stakeholder *perceptions* of environmental change and associated effects. Stakeholders discussed the following *current and potential future issues:*

Six key environmental changes:

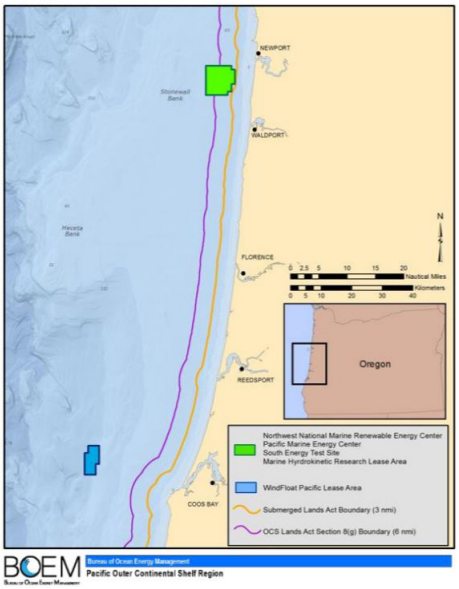
- Increasingly warm, sunny climate
- Longer, drier summers
- Increased frequency of high volume rain events in winter
- Higher water temperatures
- Increasing acidity (decreasing pH) of ocean waters
- Increasing sea levels and storm intensities

Secondary environmental changes:

- Forest fires
- Drought
- Changes in species distribution and survival
- Pest and disease dynamics

Social, cultural and/or economic impacts to communities perceived to be associated with these environmental changes:

- Shifting patterns in migration and settlement of people
- Changes in risk associated with extreme weather events
- Economic impacts on key livelihoods and activities
- Diminished access to natural resources
- Changes in environmental policy
- Increasing resource management challenges
- Human adaptations in response to climate-related environmental change



Map of proposed BOEM OCS renewable energy projects offshore Oregon (2014)

How BOEM Will Use This Information

To prepare environmental reviews for potential offshore renewable energy projects off Oregon's central coast.

Study Products

Hoelting K, Burkardt N. 2017. Human Dimensions of Climate Change in Coastal Oregon. Washington, DC: US Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters. (OCS Study BOEM 2017-052). 216 p.

Development of a Decision Support Tool to Reduce Sea Turtle Dredging Entrainment Risk

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/100095
Conducted by: Quantum Spatial for the National Oceanic Atmospheric Administration, Office for Coastal Management, 2016–2017
National Studies List: NT-15-02

Purpose:

To develop a standardized geographically and temporally based decision support tool for U.S. Atlantic and Gulf of Mexico practitioners to use in assessing project-specific dredging entrainment risk for sea turtles within a common framework.

ASTER
Analyzing Sea Turtle Entrainment Risk

Findings:

- The "Analyzing Sea Turtle Entrainment Risk Decision Support Tool" (ASTER DST) was developed to identify relative sea turtle entrainment risk within selected dredging areas.
- More than 850 references were gathered to provide background information and inform the development of the ASTER DST, including information on sea turtle biology, sea turtle telemetry and environmental datasets, decision support tools, and input from sea turtle researchers and the dredging industry.
- A four-step process guides resource managers to select relevant data variables within an area of interest, define risk ranges, review mitigation options, and generate a report that can inform risk-based planning.
- Two priority risk areas need additional data: temporal and spatial relationships of sea turtle behavior within the water column relative to draghead operations; and borrow area design relative to the effectiveness of current mitigation measures.

How BOEM Will Use This Information

- Guide future mitigation decisions within marine mineral resource areas in order to minimize impacts to sea turtles, per the Endangered Species Act.
- Help refine dredging windows and reduce down-time associated with entrainment.

Study Products

Ramirez, A, Kot, CY, Piatkowski, D. 2017. Review of sea turtle entrainment risk by trailing suction hopper dredges in the US Atlantic and Gulf of Mexico and the development of the ASTER decision support tool. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-084. 275 p.

Marine Arctic Ecosystem Study (MARES)—Pilot Program Task 2: Marine Mammals Tagging and Tracking

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/27037
Conducted by: Stantec Consulting Ltd., co-funded by Office of Naval Research, the Royal Dutch Shell Alaska Venture, and BOEM, on behalf of the National Ocean Partnership Program. 2015–2017
National Studies List: NT-13-05-03

Purpose:

- To study deployed satellite-linked tags on three juvenile spotted and two juvenile bearded seals on the north slope of Alaska by testing instrumentation, sensors, and tag communication protocols; refining methods for animal capture, tag deployment and data recovery; analyzing tag data; and inferring movement and habitat use patterns.
- To investigate whether oceanographic data collected with this methodology could be used to characterize water masses in which seals prefer to forage.

Spotted seal with CTD-fluorometer tag (Photo by Rowenna Gryb)

Findings:

- These data can provide helpful insights on key environmental parameters at the surface and at depth, potentially influencing foraging decisions by spotted and bearded seals.
- Oceanographic sensors on marine mammal satellite tags provide an opportunity to explore habitat selection by marine mammals at the scale of identifiable water masses.

How BOEM Will Use This Information

- To understand foraging and migration habits of spotted and bearded seals in the Bering, Chukchi and Beaufort Seas.
- To characterize water masses in which seals prefer to forage.

Study Products

Wiese, F.K., R. Gryba and B.P. Kelly. 2017. Marine Arctic Ecosystem Study - Pilot Program: Marine Mammals Tagging and Tracking. US Dept. of the Interior, Bureau of Ocean Energy Management, Alaska Region, Anchorage, AK. OCS Study BOEM 2017-017. 78 p.

Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals

ESPIS Link: https://marinecadastre.gov/espis/#/search/study/100096
Conducted by: National Academies of Sciences; co-founded by BOEM and other Federal agencies, 2015–2017
National Studies List: NT-15-04

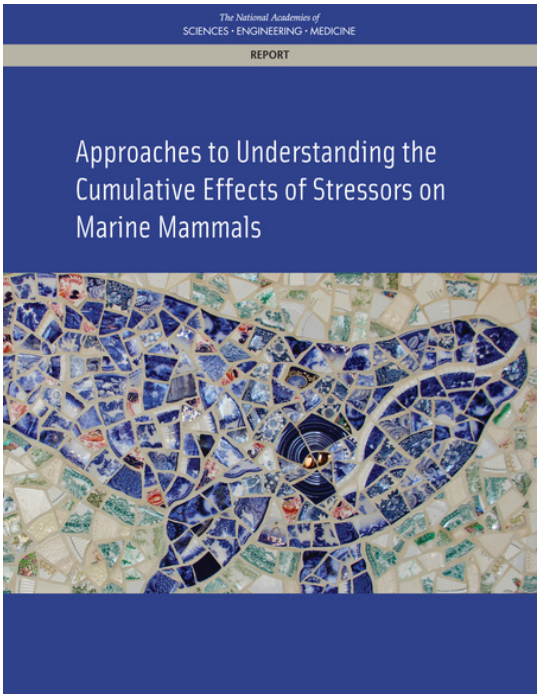
Purpose:

To develop a framework for assessing the cumulative effects to marine mammals from environmental impacts associated with development activities.

How BOEM Will Use This Information

To understand cumulative effects for marine mammal populations, particularly relevant to activities that produce sound in the ocean.

Findings:



- The "Committee on the Assessment of the Cumulative Effects of Anthropogenic Stressors on Marine Mammals" developed a nomenclature for cumulative effects based on well-established concepts from relevant literature and from related scientific disciplines, such as the environmental health, toxicology, and marine mammal veterinary medicine.
- The framework, called Population Consequences of Disturbances (PCoD), built upon previous work at the NAS on the Population Consequences of Acoustic Disturbance (PCAD) framework.
- The main focus remains on acoustical disturbances that produce sound in the ocean, including offshore oil and gas development, which is particularly relevant to activities permitted by BOEM and after the National Marine Fisheries Service issues incidental harassment authorizations.
- The study framework was generalized to include other stresses on marine mammals such as exposure to toxic substances.
- The committee assessed the state of knowledge on cumulative effects and recommended ways in which the scientific community can better understand and model how the various exposures affect individual animals and to extrapolate from there to the effects on populations.

Study Products

National Academies of Sciences, Engineering, and Medicine. Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals. 2016. Available From: http://doi.org/10.17226/23479. See also BOEM Study Profile.

BOEM's Environmental Studies Program

develops, funds, and manages rigorous scientific research specifically to inform policy decisions on the development of energy and mineral resources on the Outer Continental Shelf (OCS).

Research covers physical oceanography, atmospheric sciences, biology, protected species, social sciences (such as economics and submerged cultural resources) and environmental fates and effects of oil and gas in the sea. Mandated by Section 20 of the Outer Continental Shelf Lands Act, the Environmental Studies Program is an indispensable requirement informing BOEM's decisions on offshore oil and gas, offshore renewable energy, and the marine minerals program for coastal restoration.

The ESP has provided over $1 billion for research to this end since 1973.

Visit our webpage @ www.boem.gov/studies/

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