

## Environmental Studies Program: Ongoing Study

Title	Initiating an Arctic Marine Biodiversity Observing Network (AMBON) for Ecosystem Monitoring (AK-15-01)
Administered by	Alaska Regional Office
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Conducting Organizations(s)	University of Alaska Fairbanks
Total BOEM Cost	\$1,750,000 plus Joint Funding (~\$4,200,000)
Performance Period	FY 2015–2021
Final Report Due	January 2021
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PICOC Summary	
<i><u>Problem</u></i>	The Arctic has ongoing and prospective energy activities, coupled with natural environmental variability that may disrupt ecosystem function and services, a cost-effective system is needed to determine the type and magnitude of these impacts and the resiliency of the ecosystem to change.
<i><u>Intervention</u></i>	Long-term studies that monitor marine ecosystems are necessary to distinguish between changes caused by natural processes and those caused by human activities. By leveraging existing datasets and building upon previous work, select indicator species from microbes to whales will be assessed at scales appropriate for impact analysis.
<i><u>Comparison</u></i>	Potential effects will be identified by integrating and synthesizing past and ongoing research programs in the Chukchi Sea to assess natural variability to provide a backdrop to assess impacts from development. The range and patterns of natural variability, and relationships to environmental drivers can only be discerned from long term data collection.
<i><u>Outcome</u></i>	Study products will assist BOEM in performing NEPA impact analyses and address stakeholders' concern about potential ecosystem consequences from offshore energy development and natural resiliency during great environmental change.
<i><u>Context</u></i>	Chukchi Sea

**BOEM Information Need(s):** BOEM needs a more rigorous monitoring system to improve information about the health of biodiversity in the Chukchi Sea as a means to enhance environmental impact assessments and develop better metrics for cumulative impact analysis. Biodiversity measures for the marine environment need to be acquired through systematic and comprehensive methodology.

**Background:** Biological diversity is defined as the variety of life, encompassing variation at all levels of complexity – genetic, species, ecosystems, and biomes – and including functional diversity and diversity across ecosystems. A growing body of research demonstrates that: (1) the maintenance of marine biodiversity (including coastal biodiversity) is critical to sustained ecosystem and human health and to

resilience in a globally changing environment; and (2) the condition of marine biodiversity offers a proxy for the status of ocean and coastal ecosystem health and the ability to provide ecosystem services. Thus, managing our marine resources in a way that conserves existing marine biodiversity would help address other ocean management objectives. For example, it would provide information to enhance management against threats such as invasive species and infectious agents, enable predictive modeling, better inform decision-making, and allow for adaptive monitoring and Ecosystem-Based Management.

The overarching goal of the AMBON project is to build an operational marine biodiversity observing network from microbes to whales. AMBON is a 5-year research partnership (2015-2020) between university and Federal investigators that integrates with the Alaska Ocean Observing System (AOOS) as the central data node to provide a publicly accessible and user- friendly database. AMBON is funded through the National Ocean Partnership Program, with contributions from the National Oceanographic and Atmospheric Administration (NOAA), the Bureau of Ocean and Energy Management (BOEM), and Shell Exploration and Production Company. AMBON is primarily focused on the continental shelf in the Chukchi Sea, but through these partnerships, AMBON will make biodiversity data available to a broad audience of users and stakeholders, from local to pan-Arctic to global. The AMBON project samples two of the Distributed Biological Observatory (DBO) lines.

The assessment of possible adverse risk from OCS energy development hinges on being able to differentiate human-induced effects from natural variability. Given the complexity of marine ecosystems and the possible effects of global climate change, this often requires making observations over large ocean areas, seasonally, and over multiple years and even decades to acquire reasonable statistical confidence.

**Objectives:** The AMBON has four principal objectives to develop a sustainable model of continuous biodiversity observation including all levels of diversity from genetic to organismal to ecosystem:

- To improve taxonomic and spatial coverage in biodiversity observations on the Chukchi shelf.
- To integrate and synthesize past and ongoing research programs on the US Arctic shelf into an Arctic biodiversity observation network with publicly accessible data.
- To demonstrate how a sustainable observing network could be developed for this and other regions and ecosystems.
- To link with international programs on the pan-Arctic level.

**Methods:** AMBON has had two field seasons – one in 2015 and one in 2017. During those field efforts, AMBON collects ecosystem level biodiversity information along five cross-shelf and one along-shelf transect in the Chukchi Sea. State of the art genetic techniques complement traditional taxonomic approaches to include the small size fractions (microbes, nano- to microplankton, meiofauna) into biodiversity assessments.

Through working with the Alaska Ocean Observing System (AOOS), the program creates open access data and coordinates with other national BON demonstration projects. Outreach is pursued through a website (through AOOS), and interactions with local communities, specifically the Native Alaska communities of the north that are most directly affected by the changes in the Arctic. Various stakeholders are engaged through direct communications (e.g., BOEM, Shell, IOOS), workshops, database, scientific meetings, etc.

**Specific Research Question(s):** What are the regional patterns of biodiversity on the Alaska Arctic shelves, how do they influence ecosystem complexity and function, and how do they inform energy resource management?

**Current Status:** Completed

**Publications Completed:**

Kuletz K, Cushing D, Osnas E, Labunski E, Gall A, Morgan T. Seabirds as Indicators for the Distributed Biological Observatory and Other Long-term Marine Monitoring Programs . Oral presentation at Alaska Marine Science Symposium, January 2018, Anchorage AK

Mendoza-Islas H, Hopcroft RR. Hydromedusae and ctenophores of the northeastern Chukchi Sea during 2017. Poster presentation at Alaska Marine Science Symposium, January 2018, Anchorage AK

Iken K, Mueter F, Danielson S, Cooper LW, Grebmeier JM, Bluhm BA. Epibenthos and Demersal Fish Community Structure in the Chukchi Sea in Relation to Environmental Variables. Poster presentation at Arctic Frontiers, January 2018, Tromso Norway

Kuletz K, Cushing D, Osnas E, Labunski E, Gall A, Morgan T. What the Distributed Biological Observatory Can Tell Us About Seabirds, and Vice Versa. Oral presentation at Ocean Sciences Meeting, February 2018, Portland OR

Mendoza-Islas H, Hopcroft RR. Hydromedusae and ctenophores of the northeastern Chukchi Sea during 2017. Poster presentation at Ocean Sciences Meeting, February 2018, Portland OR

Iken K, Mueter F, Danielson S, Cooper LW, Grebmeier JM, Bluhm BA. Epibenthos and Demersal Fish Community Structure in the Chukchi Sea in Relation to Environmental Variables. Poster presentation at Ocean Sciences Meeting, February 2018, Portland OR

Hopcroft RR, Questel JM, Smoot CA, Clarke-Hopcroft C. Inter-annual Variability of the Zooplankton Communities in the Northeastern Chukchi Sea: a Decadal Perspective. Poster presentation at Ocean Sciences Meeting, February 2018, Portland

Sutton L., Iken K., Bluhm B., Mueter F. Comparison of functional diversity of two Alaskan Arctic shelf epibenthic communities. *Mar Ecol Prog Ser*. Vol. 651: 1-21, 2020

**Affiliated WWW Sites:**

<http://www.boem.gov/akstudies/>

<https://marinecadastre.gov/epis/#/search/study/100075>

<http://ambon-us.org/>

<http://oceanservice.noaa.gov/news/apr16/mbon.html>