

BOEM OCEAN SCIENCE

THE SCIENCE & TECHNOLOGY JOURNAL OF THE BUREAU OF OCEAN ENERGY MANAGEMENT

VOLUME 17 ISSUE 1 • 2020

Field Work at BOEM

The Importance of Field Work

Assessing New England Sand Shoals

Deep SEARCH's On-Going Mission

**Understanding Oil Spill Impacts
Using Archaeology, Geochemistry,
and Microbial Ecology**

**BOEM-NASA Offshore Air
Quality Program**

**MARINe Celebrates 10 Years
of Surveying Oregon's Coast**

**Deepwater EXPRESS Operation
Hits Its Stride**

**Arctic Integrated Ecosystem
Survey of the Chukchi Sea**

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ON THE COVER

Cover depicts BOEM, Federal and Academic scientists collaborating in the field. Russell Yerkes, BOEM

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FREQUENTLY USED ABBREVIATIONS

AMAPPS	Atlantic Marine Assessment Program for Protected Species
BSEE	Bureau of Safety and Environmental Enforcement
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NOPP	National Ocean Partnership Program
NPRB	North Pacific Research Board
TROPOMI	TROPospheric Monitoring Instrument
ROV	Remotely Operated Underwater Vehicle
USFWS	United States Fish and Wildlife Service
USGS	United States Geology Survey

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FOR MORE INFORMATION

Check out the Bureau of Ocean Energy Management website at <https://www.boem.gov/>



THE ACTING DIRECTOR'S MESSAGE

As a reader of BOEM's *Ocean Science Journal*, you know how integral science is to everything that we do. All of our activities are underlain by our robust environmental program, which ensures that science-based environmental protection is at the forefront of our decision-making. This is intentional: Section 20 of the Outer Continental Shelf Lands Act mandates that BOEM conduct environmental studies to inform its decisions. Simply put, we cannot exist as a bureau without environmental research. In this issue, Dr. Rodney Cluck, Chief, Division of Environmental Sciences, explains how BOEM's Environmental Studies Program strives to become the "first-in-class"—the best research program there is in the context of BOEM's mission and constraints. BOEM relentlessly pursues that goal every day.

How will we do this? By allowing our scientists to be scientists. In part, this means freeing them from the confines of a desk and letting them get their hands dirty—literally, in many cases—by doing fieldwork.

That's why this issue of *Ocean Science Journal* takes you out in the field with BOEM's researchers as they conduct the scientific studies that will help inform our decisions. We highlight just a sampling: in Alaska to learn about the beluga whales and Arctic ecosystems; over the Atlantic in search of top-level marine predators; in Gulf of Mexico waters to study shipwrecks and their biological communities, and on the rocky West Coast to collect data and monitor biological species over many decades.

These articles not only reflect the bureau's broad range of disciplines; they also give readers insight into the hard work and often unglamorous effort our research entails, while keeping our skills sharp.

We hope you enjoy venturing into the field with BOEM's scientists. We also hope that you learn more about the important work we are doing to ensure that environmental protection informed by science is a foremost concern in our decision-making.

—Walter D. Cruickshank



Field crew for SCHEMA July 2014 cruise. Photo provided by BOEM.

The Importance of Field Work

In 2023, BOEM's Environmental Studies Program (ESP) will celebrate its 50th anniversary, representing remarkable longevity in the realm of federally funded research. The ESP was established in 1973 under revisions to the Outer Continental Shelf Lands Act to protect the environment relative to offshore conventional energy development. Today, the program includes BOEM's mandate to oversee renewable energy and marine minerals development.

Initially, opportunities for BOEM's environmental scientists to participate in fieldwork was limited, and most were in the Gulf of Mexico. We depended on the private sector and academic contracts, but there were few federal partnerships. The creation of the National Oceanographic

Partnership Program in 1997, however, catalyzed more BOEM partnerships.

Following the 2010 Deepwater Horizon oil spill, BOEM's predecessor agency and employees faced major questions about the future and sought to determine how to turn a challenge into an opportunity. After several change management meetings, staff members identified four priorities: at BOEM they could work as scientists, their science would be use-inspired, inform decisions, and have the utmost levels of credibility and integrity. They wanted to engage properly in partnerships, leverage funding where possible, and ramp up outreach to educate and inform people about the program's value.

To have a first-in-class science program, we had to allow our scientists to be scientists: deeper engagement through fieldwork took on greater importance and the ESP had to move beyond managing its entire Outer Continental Shelf (OCS) science portfolio from the desk. Here's why:

BENEFITS OF FIELDWORK

First — Fieldwork maintains professionalism. Conducting research on a research vessel or in the lab, making aerial observations and engaging with other scientists are ways of engaging that allow our scientists to stay in touch with science. There is more to managing contracts than just dollars and cents. Fieldwork ensures scientists see the most effective and efficient means to acquire the needed information.

Second — Fieldwork helps maintain credibility and integrity. Seeing firsthand that work is done properly creates confidence that the results will be credible and have integrity. Although we manage portfolios from afar, hands-on fieldwork allows deeper engagement.



Kwanza Johnson, one of three NOAA/ Sea Grant mapping interns, receives instruction from one of the officers on the bridge. Photo courtesy of NOAA.



Lionfish, sedation before and tagging. Photo by Richard Sidey, Galaxiid Media.

Third — Fieldwork grows relationships. Working alongside academics, private sector scientists and engineers, and other federal scientists help grow relationships and understanding of other people’s knowledge base and skills. One of the most important ingredients to maintaining a science program is establishing long-term relationships across sectors.

Fourth — Fieldwork maintains skills and keeps one current. Keeping skills sharp requires practice. Through fieldwork, our scientists stay abreast of new developments, new methods, and new technology, while documenting change and gaining perspective. Maintaining professionalism evolves with every new relationship. Our expertise continues to evolve with science, technology, and the state of knowledge.

Ultimately, without this type of engagement, relationships, integrity, and credibility, as well as up-to-date knowledge, BOEM science could not be first-in-class.

Building Capacity with Appreciating Assets

BOEM does not have ships, aircraft, or satellites, but we have the most important thing—great scientists—and we invest in our people. By maintaining the highest levels of professionalization, it is possible to preserve a good understanding of what is going on with the science. The decisions we make will have a real impact. Whales could be injured, fish could be killed, fishermen could be affected economically, and air or water quality could be diminished. Given these possibilities, we must get the science right to be sure that we are minimizing impacts to the environment as we regulate the exploration and development of energy and marine mineral resources.

To use a business analogy, our people are appreciating assets, and we invest in their participation in the science. That cannot be achieved solely by sitting a cubicle. You’ve



Mark Mueller, BOEM, (on right) working a water sampling rosette. Photo courtesy of Ivan Hurzeler, Woods Hole Oceanographic Institution.

got to get out and experience it.

The future will see increased use of remote-operated vehicles, satellites, artificial intelligence, and other emerging technologies. That does not take away from the need for scientists to be out on ships, where they might be involved in gathering *in-situ* air quality data to compare with satellite data or collecting environmental DNA (eDNA) from the ocean. In science, if you use a single methodology, you can find out quite a bit. If you triangulate methodologies, your error rates go down, your accuracy goes up, and the knowledge base expands.

Some of these traditional methods coupled with some emerging technologies will catapult our understanding to a whole new level. We need to use every asset at our disposal, including our greatest asset, our scientists.

Our scientists realize we care about their careers and their ideas. We strive to make our program a great place to work with opportunities for growth, engagement, and discovery. If we maintain this essential investment in our people, I am optimistic ESP will remain strong for another 50 years.

— Dr. Rodney Cluck, Chief, Division of Environmental Sciences, BOEM Office of Environmental Programs

By Land, Sea, and Air



BOEM avian biologist Dr. Timothy White participated in several field surveys for the AMAPPS. In June 2017, aboard the NOAA ship *Gordon Gunter II* flying bridge, he was on the lookout for top-level predators. In August, he prepared for low-level AMAPPS aerial surveys off the Northeast Atlantic in the USFWS *Kodiak Quest*. Prior to the survey, Tim trained USFWS employees to identify seabirds, cetaceans and sea turtles during in-flight exercises over the mid-Atlantic.



Timothy White conducting observations for AMAPPS on NOAA ship *Gordon Gunter II* flying bridge.



Photo taken by Timothy White from a low-level AMAPPS aerial survey off the Northeast Atlantic.

Assessing New England Sand Shoals

BOEM and NOAA are conducting a joint study to investigate the ecological drivers of productivity at northeast sand shoals. Specifically, they seek to examine the role of sand lance in sand shoal ecological processes. Sand lance requires a similar sand grain as to what is used for beach renourishment. The study aims to better understand the potential impact to fisheries which may occur should sand extraction happen in the Northeast. The study involves monitoring the abundance and distribution of sand lance and documenting their diets, feeding success, and nutritional condition to identify bottom-up drivers of abundance and distribution. The project includes synthesizing more than twenty years of data and culminates in a decision-support tool that allows maximum efficiency in borrow area design while minimizing impact to fisheries dependent on sand shoal forage productivity. In the summer of 2019, to test how data from highly migratory species could impact the decision support tool, we integrated past telemetry and innovative new methods not available in past studies of these species.

Simultaneously studying sand lance, grey seal and white sharks afford an understanding of an entire ecosystem dynamic rather than focusing on one species. Understanding how other species' interactions are impacted by sand lance distribution is key for understanding how this element of the food web uses space over time. Do the movements of other species that have been studied and white sharks mirror independently derived maps of prey distribution and density? Is this species' cohort concentrated in traditional areas and migratory corridors, or are they facile in moving to wherever the feeding opportunities are good? Many fishes are fitted with acoustic tags detected using stationary arrays or by operating gliders equipped with special receivers; however, gliders are costly and do not shed information on interspecies behavior that may be impacted by BOEM activities. Leveraging large marine animals such as white sharks as mobile observation receivers enable observation of ecological interactions while understanding movements of tagged animals.

— Jacob Levenson, BOEM

FOR MORE INFORMATION

Marine Mineral Studies

<https://www.boem.gov/marine-mineral-studies>



A white shark, feeding on a dead whale, swims under an ROV cable at the Southwest Corner of the Stellwagen Bank National Marine Sanctuary, one of 44 sampling sites for this study. Photo by Kelly Link, Georgia Aquarium.



Deena Hansen reviews donning a survival suit with a new crew member. Photo by Jacob Levenson, BOEM.



USGS SEABOSS is built specifically for sampling and photographing seabed features for sediment monitoring. Photo by contractor Steve De Neef.



BOEM biologists Jacob Levenson and Michael Rasser deploy an ROV to observe white sharks feeding on a whale carcass. Photo by Deena Hansen, BOEM.

Deep SEARCH's On-going Mission

Deep Sea Exploration to Advance Research on Coral/Canyon/Cold seep Habitats (Deep SEARCH) is a study to characterize the deep-sea ecosystems of the U.S. Mid- and South Atlantic. The study is funded through an interagency partnership between BOEM, NOAA and USGS, and is sponsored by the NOPP.

Deep SEARCH's primary goal is to improve the ability to predict the location of sea floor communities off the southeast coast of the United States that are potentially sensitive to disturbance. This area encompasses a variety of habitat types, including submarine canyons, cold-water coral mounds and gardens, methane seeps, and soft sediments. Concluding in 2022, Deep SEARCH seeks to explore and characterize the biological communities in this area; examine their sensitivity to natural and human disturbance; and describe the oceanographic, geological, geochemical, and acoustic conditions associated with each habitat type.

Beginning in 2017, Deep SEARCH's team has spent 65 days at sea on five different research vessels. They have completed three Autonomous Underwater Vehicle *Sentry* dives, 11 High Occupancy Vehicle (HOV) *Alvin* dives, and 11 ROV *Jason* dives for more than 259 hours of total time on the bottom of the ocean. Discoveries include 85 linear miles of *Lophelia* coral reef about 160 miles southeast of Charleston, SC. and tubeworms growing on carbonate rock at the Kitty Hawk seep offshore North Carolina—the first-time tubeworms have ever been observed in this part of the Atlantic. BOEM scientists Michael Rasser, Kate Segarra and Mark Mueller have participated in one or more research

cruises, assisting in the collection and processing of some of the more than 2,800 biological and geological samples from the seafloor and water column.

— Michael Rasser, BOEM

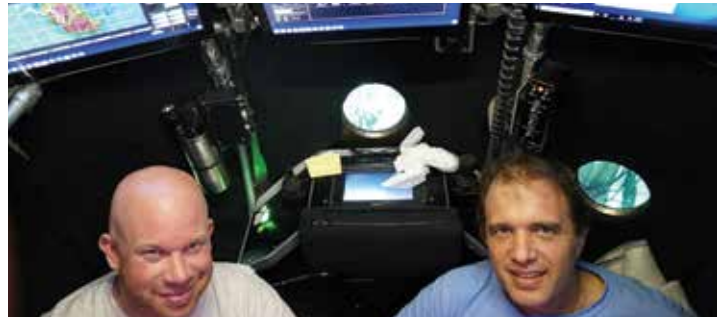
FOR MORE INFORMATION

Exploring Coral, Canyon, And Cold Seep Habitats Off the Mid- And Southeast Atlantic Coast: The Deep SEARCH Study

<https://www.boem.gov/newsroom/exploring-coral-canyon-and-cold-seep-habitats-mid-and-southeast-atlantic-coast-deep-search>

Deep SEARCH 2019: Deep Sea Exploration to Advance Research on Coral/Canyon/Cold seep Habitats

<https://oceanexplorer.noaa.gov/explorations/19deepsearch/welcome.html>



BOEM's Michael Rasser (right) and Jay Lunden, Temple University, aboard the HOV *Alvin* at 380 meters depth off the coast of North Carolina in some fierce currents. Photo courtesy of Bruce Strickrodt, Woods Hole Oceanographic Institution.



Aboard the Nancy Foster NF 19-09 scientific team group. Photo by Ivan Hurzeler.

Understanding Oil Spill Impacts Using Archaeology, Geochemistry, and Microbial Ecology



BOEM marine archaeologist and GOM-SCHEMA co-Principal Investigator Melanie Damour retrieves a copper sheathing sample collected by the ROV.

After the 2010 Deepwater Horizon oil spill in the Gulf of Mexico, I began collaborating with scientists at the U.S. Naval Research Laboratory (NRL) to design a study to examine the impacts of the spill and chemical dispersants on deepwater historic shipwrecks. No other spill-related investigations addressed this topic, which resulted in a substantial information gap for BOEM's historic preservation-related responsibilities.

In 2013, the Gulf of Mexico Shipwreck Corrosion, Hydrocarbon Exposure, Microbiology and Archaeology Project (GOM-SCHEMA) was funded by BOEM and NRL to examine spill impacts on the micro to macro scales. Nearly a

dozen partners participated in the interdisciplinary project, from Federal agencies and academic institutions to contractors and a non-profit organization dedicated to outreach and education. My role as co-Principal Investigator allowed me to participate not only in the study's design and concept, but also in data collection, analysis, and peer-reviewed journal publications. As a marine archaeologist, I was responsible for overseeing the ROV investigations and selecting locations for sediment sampling and placement of in situ biofilm recruitment experiments. In 2017, the GOM-SCHEMA team was honored to receive the National Oceanographic Partnership Program's award for Excellent in Partnering. The key to the study's success was a collaboration, not only between different partners, but between scientists from different disciplines including archaeology, geochemistry, and microbial ecology.

— Melanie Damour, BOEM



Placement of biofilm recruitment experiments near a shipwreck during the 2014 GOM-SCHEMA study. Photo by Deep Sea Systems International's Global Explorer ROV.

FOR MORE INFORMATION

GOM-SCHEMA Study

<https://www.boem.gov/GOM-SCHEMA/>

<https://hamdanlab.com/gom-schema/>

BOEM-NASA Offshore Air Quality Program

BOEM and NASA performed a field campaign during May 10-18, 2019, off the coast of Louisiana in the Gulf of Mexico (GOM) as part of the Satellite Continental and Oceanic Atmospheric Pollution Experiment (SCOAPE). This is the first time an offshore scientific experiment aimed to validate remote sensing data for air quality management in the GOM. BOEM scientists participated in instrument deployment and measurements onshore and offshore. Jose Hernandez, BOEM-GOM office, helped the onshore team to develop the offshore sampling vessel track based on NASA Global Modeling and Assimilation Office (GMAO) Goddard Earth Observation System (GEOS) Composition Forecast (CF) and to determine periods and areas unaffected by land-based pollution activities.

The onshore team sampled NO_2 along the coast and at transportations hubs in Louisiana, such as Venice, Port Fourchon and Grand Isle. They reviewed and discussed preliminary pollutant concentrations. V.J. Maisonet-Montanez, BOEM-AK Office, was a part of the offshore science team aboard the R/V Point Sur. The vessel was equipped with air quality monitors measuring various pollutants, including methane: and total column nitrogen dioxide in real-time. Aboard the R/V Point Sur, the team targeted various offshore platforms in both shallow and deep waters off the Louisiana coast. The science team also released weather balloons with one-time-use ozone monitors daily. The goal of the balloon launches was to time the releases with the TROPOMI air quality satellite overpasses. This ongoing goal of the study is to ground truth the feasibility of remotely monitoring air quality in the GOM.

— Jose Hernandez and
V.J. Maisonet-Montanez, BOEM



V.J. Maisonet-Montanez offshore of Louisiana with an oil rig in the distance.

FOR MORE INFORMATION

Air Quality Study

<https://opendata.boem.gov/BOEM-ESP-Ongoing-Study-Profiles-2018-FYQ2/BOEM-ESP-GM-14-01.PDF>



Jose Hernandez in Venice, LA with an air quality monitor.

MARINe Celebrates 10 Years of Surveying Oregon's Coast

In July, two BOEM scientists were joined by researchers from the University of California, Santa Cruz (UCSC) to spend a week on the coast of Oregon. During this time, they collected their 10th year of long-term data on biological species on the rocky shores (e.g., tide pools). BOEM was there to see if we could detect biological community changes near and far from a proposed



BOEM Scientist Lisa Gilbane sampling at Seal Rock, Oregon. Photo by Susan Zaleski, BOEM.

BOEM research lease and Federal Energy Regulatory Commission license for a marine hydrokinetic testing facility offshore of Newport, OR called PacWave South. MARINe protocols started to key species over time as a response to the *Exxon Valdez* oil spill in 1989.

By 1996, academic, state and Federal agencies were using one database and the same protocols and, were meeting annually to sample rocky shore biology consistently over time. The

need for long-term data on rocky shores has expanded, along with the number of partners. Today, MARINe has more than 200 sites from Alaska to Baja, CA. This partnership model is exemplified in Oregon, where members of the Oregon Department of Fish and Wildlife participated earlier in the week (not pictured), sampling at sites to assess their Marine

Protected Areas. Both agencies funded this team of experts, and, because we use the same protocols, the data are easily combined and both agencies benefit.

— Lisa Gilbane, BOEM



As part of its ongoing monitoring effort, the Multi-Agency Rocky Intertidal Network conducted biodiversity surveys in 2019 at Otter Rock, located within Oregon's Otter Rock Marine Reserve. Long-Term Monitoring and Biodiversity Surveys conducted by MARINe occur throughout the year at coastal sites from Southeast Alaska to Mexico. Photo provided courtesy of University of California Santa Cruz.

FOR MORE INFORMATION

Environmental Studies Program: Multi-Agency Rocky Intertidal Network (MARINe)

<https://espis.boem.gov/final%20reports/5081.pdf>



Sampling the rocky shore of Bob Creek, Oregon. BOEM Scientist Lisa Gilbane and Susan Zaleski working with University of California, Santa Cruz. The Santa Cruz team, which included Melissa Miner, Maya George, Nathaniel Fletcher, David Lohse, Christy Bell, and Laura Anderson. Photo courtesy of Laura Anderson, UCSC.

Deepwater EXPRESS Operation Hits Its Stride

In October 2017, federal scientists and managers had no idea what one day of multibeam mapping offshore the United States west coast would generate. Two years later, that single day of work on NOAA Ship *Rainier* to support prospective offshore wind decisions has led to a major interagency collaborative effort to map and characterize deepwater areas off California, Oregon, and Washington. The EXpanding Pacific Research and Exploration of Submerged Systems (EXPRESS) campaign, co-led by BOEM, NOAA, and USGS, is now at more than 260 days-at-sea and counting. The joint initiative is designed to inform: 1) wise use of living marine resources; 2) potential offshore energy and mineral resource decisions; and 3) coastal and submerged hazard mapping and assessment.



BOEM scientist Jennifer Miller (on right) aboard NOAA's *R/V Rainier* with USGS scientists. This was one of the first EXPRESS cruises launched to understand the geology offshore central California. Photo courtesy of BOEM.

BOEM scientists have come aboard on four different cruises that includes several studies: Cross-shelf Habitat Suitability Modeling; California Deepwater Investigations and Ground truthing (Cal DIG I); and Cal DIG II; and Sand Resource Study. With a total of five cruises happening between August and November 2019, EXPRESS has resulted in an unprecedented level of coordination among federal partners in the Pacific.

— Jeremy Potter, BOEM



BOEM scientist Lisa Gilbane and Monterey Bay Aquarium Research Institute's mini ROV waiting to deploy aboard *R/V Bold Horizon* in September 2019. Photo provided courtesy of Linda Kuhn, USGS.

FOR MORE INFORMATION

Pacific OCS Environmental Studies

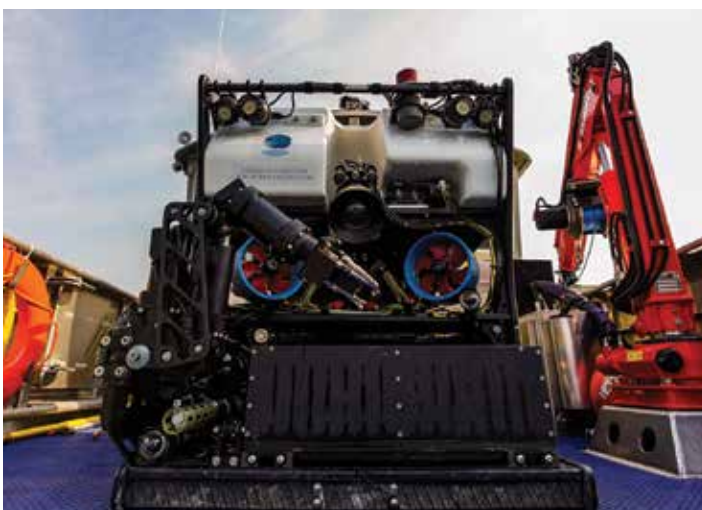
<https://www.boem.gov/environment/environmental-studies/pacific-ocs-environmental-studies>

EXPRESS: Expanding Pacific Research and Exploration of Submerged Systems

<https://www.usgs.gov/centers/pcmssc/science/express-expanding-pacific-research-and-exploration-submerged-systems>

Pacific OCS Region:

<https://www.boem.gov/regions/pacific-ocs-region>



EXPRESS partners deployed *Yogi* and *Guru*, a two-body ROV system, from NOAA *R/V Reuben Lasker* during a fall 2019 cruise to survey deep-sea corals, sponges and fish habitat off the U.S. West Coast. Operating in tandem, *Yogi* worked along the bottom of the ocean collecting samples, high-resolution video and still images while *Guru*, a camera and lighting sled, hovered above allowing pilots to maintain visual contact with *Yogi* below. Both vehicles sent all data they collected back to the ship via a fiberoptic tether. *Yogi* photo provided courtesy of Daniel R. Rogers. *GURU* photo provided courtesy of Josh Carlson, GFOE.

Arctic Integrated Ecosystem Survey of the Chukchi Sea



Deploying a benthic trawl in heavy seas on board the R/V *Sikuliaq*. Photo provided by Brendan Smith, North Pacific Research Board Arctic Program.

During the open water seasons of 2017 and 2018, a group of scientists conducted a research cruise in the Chukchi Sea to document fish communities and their ecology—an important undertaking as sea ice and habitat change. The project, called an Arctic Integrated Ecosystem Survey, was one component of the North Pacific Research Board’s Arctic Integrated Ecosystem Research Program, which examines all levels of the Arctic food web, from the smallest of seafloor creatures up to whales and humans.

As part of the benthic invertebrate and fish trawling team, I anticipated every trawl like Christmas morning. Each day our net pulled up something different—a gallon of small shrimp, a bucket of sea stars, a giant ball of mud or even a cluster of rocks covered in huge barnacles! We captured fish of all sizes alongside every imaginable shape and color of invertebrate. The small poacher pictured below was a particularly handsome specimen. Our hard work and long days in the field will pay off; this study will provide a trove of data to more fully understand the ecosystem that could

be impacted by BOEM’s activities and allow for appropriate management of the delicate Arctic ecosystem.

— Lorena Edenfield, BOEM



Niskin water sampling rosette deployment on board the R/V *Sikuliaq*. Photo provided by Brendan Smith, North Pacific Research Board Arctic Program.



A small Veteran Poacher (*Podottheicus veternus*) captured in a benthic trawl in 2018. BOEM photo by Lorena Edenfield.

FOR MORE INFORMATION

Alaska Environmental Studies

<https://www.boem.gov/about-boem/alaska-environmental-studies>

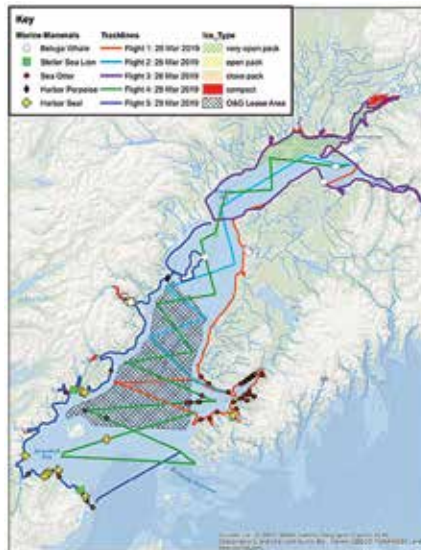
Beluga Whale Winter Aerial Survey

BOEM has teamed up with NOAA Fisheries to conduct a four-year (2018–2021) aerial survey program in Cook Inlet, AK to update our knowledge on a small population (<400) of endangered beluga whales inhabiting the inlet near OCS waters. This program will document sighting locations and count beluga whales in Cook Inlet during each fall (October/November) and spring (March/April) to gain a broader understanding of beluga whale distribution outside of the summer season.

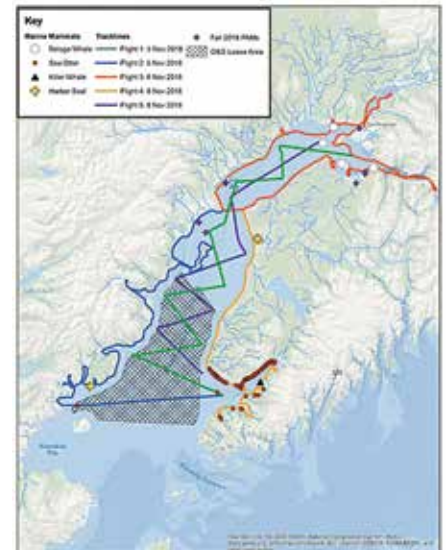
Initial results from fall 2018 found over 100 belugas in the relatively ice-free upper inlet and none in the lower inlet. In contrast, spring surveys from 2018 and 2019 observed belugas outside of the OCS in the lower inlet (22 whales in 2018 and 31 whales in 2019), while only a few whales were observed in the upper inlet (2 whales in 2018 and 5 whales in 2019). Light sea ice concentrations were present in the upper inlet in both March surveys, with much less ice observed in 2019. One explanation for the notable difference between the spring and fall whale counts is that white beluga whales are harder to spot in broken ice conditions during spring aerial surveys. In addition, the whales dive deeper and for longer periods in the spring, making them less visible on the surface.

NOAA Fisheries and BOEM plan to continue aerial surveys for belugas throughout Cook Inlet during 2019–2021. Updated information on the spatio-temporal distribution of Cook Inlet beluga whales will allow NOAA Fisheries and BOEM to better manage industrial activities—including development of possible mitigation measures—that could impact these whales.

— Craig Perham,
BOEM



On-effort trackline and marine mammal sightings the March 2019 beluga whale aerial survey, Cook Inlet, Alaska.



On-effort trackline and marine mammal sightings the November 2019 beluga whale aerial survey, Cook Inlet, Alaska.

FOR MORE INFORMATION

Effects of Noise on Fish, Fisheries, and Invertebrates in the U.S. Atlantic and Arctic from Energy Industry Sound-Generating Activities. Workshop Report

<https://espis.boem.gov/final%20reports/5361.pdf>

Sound Exposure Guidelines for Fishes and Sea Turtles. Springer Briefs in Oceanography

<https://link.springer.com/book/10.1007/978-3-319-06659-2>

National Research Council's Population Consequences of Disturbance (PCoD) model

<https://onlinelibrary.wiley.com/doi/full/10.1002/ece3.4458>



A view of Mount Spurr during the March 2019 beluga whale aerial survey, Cook Inlet, Alaska.

Hidden Ocean Cruise to the Chukchi Sea



Kate Segarra, Expedition Coordinator, Chukchi Borderlands Expedition 2016 cruise. Photo by Kate Segarra, BOEM.

In the summer of 2016, I had the opportunity to join an international team of scientists and explore the Chukchi Borderlands in the Arctic Ocean aboard the USCGC *Healy*. I was detailed to NOAA's Office of Ocean Exploration and Research from BOEM to serve as the expedition coordinator for the Hidden Ocean 2016: Chukchi Borderlands Expedition. I worked very closely with the science party to track mission progress and communicate detailed updates to our colleagues back on shore.

The primary focus of the Hidden Ocean 2016 cruise was to explore this rapidly changing and poorly understood ecosystem. This research will also serve as a comparison for past and future surveys of the region to enable scientists to examine how the ecosystem is changing over time. Using both traditional oceanographic methods (such as nets, CTD package, box cores) and a ROV equipped with 4K video, the science party explored the pelagic and benthic biodiversity of the Chukchi Borderlands. The science party collected at least six jellyfish and ctenophores that may represent "new" (i.e., undescribed) species.

The Arctic is warming at a rate around twice that of the global average. The year 2016 is tied with 2007 for the second-lowest extent of Arctic sea ice on record; the lowest was in 2012. Low sea ice, however, does not mean the absence of sea ice, and there was plenty for the ice breaker to cut through. The science party was able to observe the microbial communities within sea ice and several polar bears that hunt on it.

As a marine biologist at BOEM, I gather and interpret information to support agency decisions. Participating in cruises like The Hidden Ocean enhances my work at BOEM. First-hand observations and experiences bring life to learning done through journal articles, textbooks and policy papers.

This expedition gave me a new perspective on the Arctic research performed through our Environmental Studies Program. For example, Hanna Shoal on the Chukchi Plateau is frequently described as a "walrus hotspot" in environmental assessment documents. When we neared Hanna Shoal during the cruise, I saw what I thought were patches of dirty ice on the horizon. As we came closer, those patches turned into a herd of at least 100 walrus foraging in the water and resting on ice floes.

The methods of the science party were typical for oceanographic studies seeing these techniques and instruments in action has helped me better understand and interpret the research we fund. Experiences like exploring the Chukchi Borderlands demonstrate the importance of getting away from your desk and into the field.

— Kate Segarra, BOEM

FOR MORE INFORMATION

Exploring the Borderlands of the Chukchi Sea

<https://www.boem.gov/newsroom/exploring-chukchi-borderlands-boem-oceanographer-kate-segarra>

Hidden Ocean 2016: Chukchi Borderlands

<https://oceanexplorer.noaa.gov/explorations/16arctic/welcome.html>



Ice coring from the US Coast Guard Cutter (USCGC) *Healy* Photo by Kate Segarra, BOEM.

Spotlight on a Scientist - Jacob Levenson

1. What is your job at BOEM?

I'm a Marine Biologist for the *Division of Environmental Sciences*. My role involves understanding the drivers of animal movement, behaviors and acoustic ecology; it's my job to coordinate scientific research projects that monitor how energy and mineral related activities impact animals that inhabit U.S. Outer Continental Shelf.

2. Why did you decide to work for BOEM?

I liked that the vacancy announcement said it was a mix of science and policy related to marine animals. My interest grew when I met the team I would be working with, a team that is committed to doing good work for the environment and for society. The role has been a great mix of that work.

3. What role do you play in BOEM's Environmental Program?

I work closely with colleagues in the Division of Environment Assessment, the Marine Mineral Program, and our regional offices to understand the impact that activities permitted by BOEM can have on marine life.

When the environmental assessment division needs data on animal and ecosystem impact, I coordinate the scientific projects that collect and analyze that data. This allows us to answer important questions, such as how sea turtles, marine mammals, and fisheries are affected by energy exploration, vessel traffic, and sand mining.

4. How has your educational background and experience prepared you for the work you do?

I was one of those kids whose parents probably took him to the aquarium and zoo one too many times. I was always interested in science, constantly taking things apart and mixing things together. I'm an experiential learner, so over my life I've always gravitated towards field work. At BOEM, I'm able to keep a hand in the work that I love—understanding how things in the natural world work—while helping to inform environmental policy to conserve ocean life, upon which we all depend.

5. What are some of the research partnerships you've been involved in?

I like to think outside the box and bring unlikely partners together. I'm always looking for innovative work that can help us push the envelope for technology and science.

Working with the folks at *Wildme.org* has been fascinating. *Wildme.org* leverages artificial intelligence (AI) to manage catalogues of whale sightings, giving scientists abundant and accurate data on whale movements across the globe. It's an exciting concept that could be valuable for monitoring wild animal populations in every biome. The resulting data are very impressive.

Another is working with *Oceanography for Everyone*, which can bring open source oceanographic hardware to anyone and lower the cost. They host workshops teaching scientists how to build oceanographic tools for a fraction of the normal price, allowing more people to be involved in science and collect data on the natural world.

6. What are some of the most exciting innovative and emerging technologies you are using, and why are they exciting?



Three come to mind: automated detection systems; open source technology; and small, open source, inexpensive satellites.

AI and autonomous hardware solutions allow us to detect individual animals throughout their lifetime almost automatically. In the early days, scientists had to visually compare photos of individual animals from research trips to track sightings and movements. Now, we can submit a photo and the AI will match an animal's unique markings to known records. Photos can come from anywhere, making this a viable option for citizen scientists to contribute to movement tracking. It's inexpensive, utilizes existing photos, and is remarkably accurate.

Open source technology like the *OpenCTD* is really exciting as it allows anyone to contribute to oceanographic data by bringing down the financial barriers to entry.

Finally, there's open source satellites. In animal population monitoring, there's no guarantee that tags will transmit viable data. That's because when an animal has a satellite tag, the individual must surface at the precise time that a satellite is orbiting overhead.

With only a few appropriate satellites orbiting Earth, a satellite isn't always overhead when an animal surfaces. This means that we're only catching a small portion of an animal's movement.

A study titled *Developing the Next Generation of Animal Telemetry* - a partnership between BOEM and NASA - is an initiative to develop an open common communications framework across small satellites to help monitor ocean animals. (<https://www.boem.gov/CubeSat-video/>)

7. What do you find most exciting or rewarding about your work?

I'm excited by the opportunities that abound at BOEM. There's always something happening in each of the regions, and there's no shortage of unanswered questions important to address.

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New Waves

Late-Breaking News & Information

Committee on Offshore Science and Assessment Meets in New Orleans

In 2015, BOEM and the National Academies of Sciences, Engineering, and Medicine established the Committee on Offshore Science and Assessment (COSA). Several times a year, BOEM and COSA convene experts from academia, industry, and other organizations to provide independent, technical input on issues of interest to BOEM. COSA may conduct workshops, commission studies or provide peer review documents relevant to BOEM's environmental programs. The work is purely advisory in nature and is limited to relevant independent and objective advice. COSA provides independent, scientifically credible and objective information on offshore energy-related issues that are relevant to BOEM's environmental programs. The committee meets several times a year.

On November 7-8, 2019, COSA met in the New Orleans Office with BOEM, BSEE and scientists from the Offshore Operators Committee. Mike Celata, New Orleans Office Director, and Bill Brown, Chief Environmental Officer, gave opening remarks regarding BOEM's Environmental Studies, Environmental Assessment, and Marine Minerals Programs. More in-depth discussions between the COSA members and BOEM's scientists followed. Focus groups examined a wide range of topics related



Opening Session of COSA Meeting. Mike Celata and Bill Brown are speaking.

to the role that science and technology plays in the applied environmental studies and assessment programs in BOEM.