Workshop on Advanced Non-Extractive Techniques for Resource Assessment for Offshore Wind

July 26, 2022| Workshop Summary

Workshop-In-Brief

On July 26, 2022, the Responsible Offshore Science Alliance (ROSA) held a workshop in conjunction with the NYSERDA State of the Science meeting in Tarrytown, New York to identify and to share the state of the art in non-extractive advanced sampling techniques for fisheries resources in wind energy areas. Sixty-three online and in-person attendees plus four ROSA staff heard five scientific presentations related to this topic, followed by a discussion.

Purpose

Assessment of wildlife and fishery resources with proposed and permitted wind energy areas is an expected requirement for offshore wind development. Common techniques for assessing presence and abundance of fishery resources include many forms of extractive techniques, such as gillnets, otter trawls, and ventless traps. These techniques may expose protected species in wind lease areas to risk of takes or other interactions. Consequently, the application process for sampling permits may be extended and even lead to reduced sampling prior to construction activities.

Researchers tasked with measuring resource abundance have in some cases modified sampling strategies to focus on non-extractive techniques with lower risk to protected species. Often, these techniques employ advanced or less-familiar techniques. This workshop aims to identify and to share the state of the art in non-extractive advanced sampling techniques for fisheries resources in wind energy areas.

Welcome

Attendees were welcomed by Lyndie Hice-Dunton, Executive Director of ROSA. Mike Pol, Research Director of ROSA introduced the meeting agenda and the reason for the meeting. Lyndie then reviewed ROSA's objectives and the history of the organization.

Presentations

Five presentations were shown to the online and in-person audience.

- Acoustic methods for monitoring fish behavior and abundance at or near wind energy development areas – *Joseph Warren, Stony Brook Univ.*
  - Abstract: Active acoustic technologies provide a non-invasive way to monitor and measure pelagic and near-bottom organisms. These instruments include scientific echosounders, side-scan sonars, and imaging sonars each of which can be deployed from a variety of mobile or stationary platforms depending on the research question(s) of interest. In addition to measurements of fish distribution and abundance, these systems can also be used to assess the behavior of individuals or groups of fish in response to changes in their environment or other stimuli.

- Fisheries monitoring of an offshore windfarm off New Jersey: Non-extractive sampling of structured habitat – *Jason Morson, Rutgers Univ.*
  - Abstract: It is critical that fishery monitoring plans (FMP) are established to evaluate impacts of offshore wind development on natural resources. Extractive techniques like trawl, trap, and dredge surveys are well-established for sampling natural resources in the ocean; however, there is potential for these gears to interact negatively with protected species. The process to get permits to conduct extractive surveys can therefore take a year or more and lead to delays in project timelines. Our team is implementing a comprehensive FMP for the Ocean Wind 1 windfarm off New Jersey using several different extractive (trawl, trap, hook-and-line, dredge, acoustic tagging) and non-extractive (eDNA, baited remote underwater video, towed camera, autonomous gliders) fisheries surveying methods. Surveying will occur for six years (2022-2028) with two years of surveying before, during, and after construction of the windfarm. Deploying extractive and non-extractive sampling gear at similar spatial and temporal scales will allow our team to evaluate the efficacy of the less traditional, non-extractive approaches to surveying. This talk will focus primarily on a survey we designed to evaluate the impact of wind farm installation on fish and shellfish that typically associate with structure. This survey simultaneously deploys two extractive gears, chevron traps and hook-and-line, and one non-extractive gear, baited remote underwater video (BRUV), within the wind farm lease, at an adjacent open bottom control area, and at established reefs adjacent to the lease. We will discuss the design of this survey and share some preliminary results.

- Fisheries monitoring of an offshore windfarm off New Jersey: Utilizing Autonomous Platforms – *Josh Kohut, Rutgers Univ.*
  - Abstract: Traditional ecological and environmental monitoring programs are increasingly at risk due to more limited resources to support costly ship time and event-based disruptions such as the recent COVID pandemic, limiting

opportunities for vessel-based biological and environmental observing efforts (Reiss et al. 2021). Additionally, the placement of planned offshore wind platforms off the coast of the Mid-Atlantic overlays historic vessel-based fisheries surveys that may need to be modified, or augmented, once the platforms are built and in operation. Therefore, there is a need to test the potential for autonomous platforms, such as underwater gliders, to augment/replace current vessel-based efforts, including pelagic and trawl fish surveys. This presentation will share examples of how autonomous platforms are already being used to associate physical oceanographic features with various fishery related metrics. Additionally, we will share more recent examples that highlight the integration of newly developed sensors including active and passive acoustic sensors for zooplankton, fish and marine mammal mapping and detection. These new advances will be put in the context of fisheries monitoring and research goals associated with the introduction of offshore wind facilities to the coastal waters of the US.

- The potential of environmental DNA as a low equipment, non-extractive technique for fisheries assessments of offshore wind – *Shannon O'Leary, St. Anselm College, and Keith Dunton, Monmouth Univ.*
    - Abstract: With offshore wind energy projected to play a critical role in meeting climate mitigation targets there is a rapidly increasing number of offshore wind farm projects in various stages of development. Real-time monitoring of the impact of these structures on the biological communities is critical to understand the interactions between these structures and the ecosystems in which they are being built. We will present preliminary results of using environmental DNA (eDNA) metabarcoding during the pre-construction phase of a wind farm off New Jersey to gather information on species presence, abundance, and overall diversity of benthic fish communities in turbine and control sites and discuss advantages of eDNA monitoring compared to traditional extractive techniques such as trawling. Notably, environmental DNA sampling is non-extractive, thus minimizing stress to the organisms that are captured both intentionally and unintentionally and eliminating sampling related mortality and can be performed without damaging benthic habitats. Additionally, eDNA samples can be taken in areas not easily accessible to traditional sampling methods and require less ship time, equipment and can be performed on smaller vessels. In conclusion, eDNA holds significant potential as an efficient, low-equipment, non-extractive technique for fisheries assessments.

- Build Fisheries Resource Assessment Capabilities into Sustained Ocean Observing Systems – *Jake Kritzer, Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS)*

Abstract: The U.S. Integrated Ocean Observing System (IOOS) aims to provide a wide variety of data to meet the research, planning, regulatory, and operational needs of all ocean users. NERACOOS implements U.S. IOOS in the Northeast, with a long-running buoy array spanning Long Island Sound and the Gulf of Maine as the backbone of the system. The buoy network operated by NERACOOS and other partners provides information from multiple sensors and is used by a broad spectrum of stakeholders. Real-time data on sea state conditions are especially important for mariner safety, but data and models generated by NERACOOS have also contributed to more than 300 scientific publications to date. Despite the system not being explicitly designed for fisheries science, many of these publications focus on the effects of environmental conditions on fish biology and distributions. Buoys also support fisheries as platforms for tagging and telemetry studies, and as a source of environmental covariates for stock assessments and data inputs for habitat suitability models and ecosystem assessments. Increasingly, buoys are providing direct observations of marine life through passive acoustic detection and plankton monitoring, and can be paired with resources surveys and eDNA sampling. Despite the many ways in which buoy networks can support fisheries assessments, there are relatively few sustained observing buoys in and around the Massachusetts-Rhode Island Wind Energy Area (MA-RI WEA), primarily measuring a modest number of variables at the surface. However, partners with diverse interests spanning navigation safety, contaminant and pollution response, tracking climate signals, and wildlife conservation are recognizing the opportunity to design and deploy a purpose-built buoy array for the MA-RI WEA and others to meet the needs of many users in a coordinated, cost-effective, and sustained manner. Fisheries science should be an important consideration in order to promote coexistence of the two industries.

Outcomes

Attendees developed a list of sensors and techniques considered to be advanced and non-extractive:

Environmental DNA
Acoustic telemetry
Passive acoustics
Active acoustics
Acoustic imaging
Visual census

Optical imaging
- Above water
- Below water
- In sediment

Satellite tagging
Archival tagging

A list of challenges common to the use of these techniques was also developed:

- Data collected by these techniques do not align with traditional fishery-independent data streams and data sets.

- Advanced non-extractive techniques are less familiar and thus may be less acceptable to the fishing industry.
- In general, needed biological data cannot be collected by these techniques.
- Many of these sensors and techniques are likely applicable to both fixed and mobile platforms (e.g., salinity, pH, temperature).
- The use of non-lethal fishing gear- such as traps- would likely still require a protected species consultation.
- These techniques are not currently included in BOEM guidance for offshore wind monitoring but could be.
- Use of these techniques should be driven by the questions that need to be answered.
- Some of these techniques can be expensive, and their costs and efficiency should be considered.
- With multiple lease areas and monitoring projects, reducing removals and mortality of marine organisms is a good idea.
- Non-extractive tools can be a good means to study fish behavior.

Other Points

- The research question to be answered is the most important consideration for which technique might work best. Potential questions might focus on changes in species and abundance, and informing adaptive management or stock assessment processes.
- A regional, cohesive set of goals or framework is needed for impacts of offshore wind development.
- Projects are moving quickly and the pace of research or research planning may not be keeping up.
- Opportunities to calibrate non-extractive techniques to extractive data should be developed.
- A role for ROSA is to communicate challenges from different perspectives- developers, fishermen, scientists, regulators , etc.
- The need to direct research to commercial and recreational fishing fleets- to work cooperatively – continues.
- BOEM is very supportive of a regional monitoring approach.

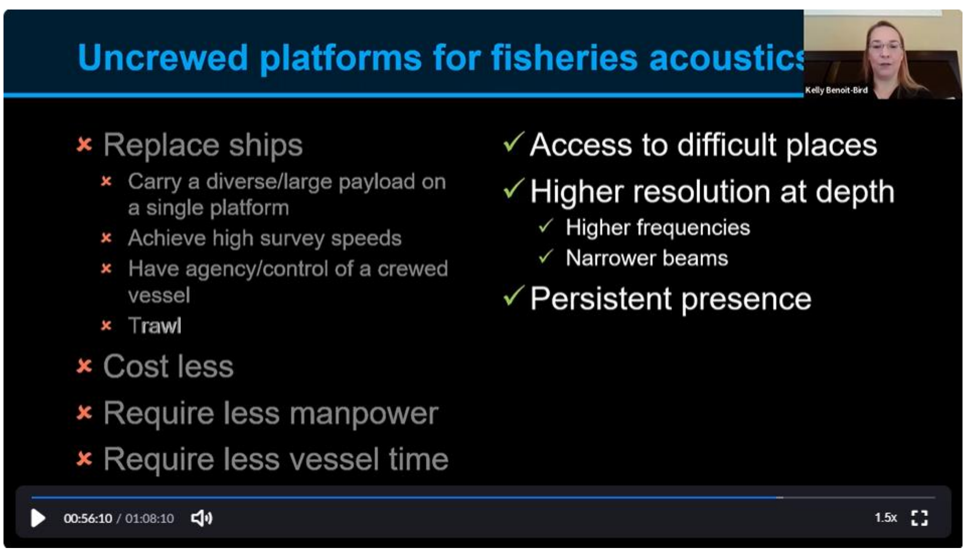
Attendee Suggested Resources

Hemery LG, Mackereth KF, Tugade LG. What's in My Toolkit? A Review of Technologies for Assessing Changes in Habitats Caused by Marine Energy Development. Journal of Marine Science and Engineering. 2022; 10(1):92.

Abstract: Marine energy devices are installed in highly dynamic environments and have the potential to affect the benthic and pelagic habitats around them. Regulatory bodies often require baseline characterization and/or post-installation monitoring to determine whether changes in these habitats are being observed. However, a great diversity of technologies is available for surveying and sampling marine habitats, and selecting the most suitable instrument to identify and measure changes in habitats at marine energy sites can become a daunting task. We conducted a thorough review of journal articles, survey reports, and grey literature to extract information about the technologies used, the data collection and processing methods, and the performance and effectiveness of these instruments. We examined documents related to marine energy development, offshore wind farms, oil and gas offshore sites, and other marine industries around the world over the last 20 years. A total of 120 different technologies were identified across six main habitat categories: seafloor, sediment, infauna, epifauna, pelagic, and biofouling. The technologies were organized into 12 broad technology classes: acoustic, corer, dredge, grab, hook and line, net and trawl, plate, remote sensing, scrape samples, trap, visual, and others. Visual was the most common and the most diverse technology class, with applications across all six habitat categories. Technologies and sampling methods that are designed for working efficiently in energetic environments have greater success at marine energy sites. In addition, sampling designs and statistical analyses should be carefully thought through to identify differences in faunal assemblages and spatiotemporal changes in habitats.

Benoit-Bird, K. 2021. Acoustical Ocean Ecology in the Era of the Robot Revolution, URI Ocean Engineering Seminar Fall 2021 (video).PWD: 1NPu7Kw*

Screengrab showing negatives and positives of advanced sampling platforms



Schlesinger, M. D. and L. A. Bonacci. 2014. Baseline monitoring of large whales in the New York Bight. New York Natural Heritage Program and New York State Department of Environmental Conservation, Albany and East Setauket, New York.

From p. 25:

Table 6. Summary of key features of seven possible approaches to broad-scale baseline monitoring of SGCN whales in the New York Bight. We use "distribution" as shorthand for other facets of animal occurrence such as daily, monthly, or seasonal occupancy.

Approach	Likely data yields	Key shortcomings
1. Aerial only	Abundance and distribution of fin whales; distribution of humpback and right whales	Little information on sperm, sei, blue whales; winter data sparse
2. Shipboard only	Abundance and distribution of fin whales; distribution of humpback and right whales; with towed hydrophone, distribution of sperm whales	Little information on sei whales; without hydrophone, little information on sperm and blue whales; winter data sparse; no round-the-clock data closer to shore
3. Passive acoustics only	Year-round, relatively coarse-scale distribution and relative abundance of baleen whales, depending on the number and configuration of recorders; migration timing and patterns	Somewhat imprecise location data throughout most of the Bight (depending on the number and configuration of recorders); no abundance estimates possible in most places (although new methods are being developed); sperm whale data would be provided primarily by AMAPPS shipboard surveys with towed arrays
4. Aerial with shipboard	Improved estimates of abundance and distribution of fin whales; distribution of humpback and right whales; distribution of sperm and maybe blue whales; better chance at distribution of sei whales	Winter data sparse; no round-the-clock data closer to shore
5. Aerial with passive acoustics	Abundance and fine-scale distribution of fin whales; fine-scale distribution of humpback and right whales; year-round, coarse-scale distribution of all six species; winter abundance in key areas with arrays; migration timing and patterns	Likely little information on sei whales
6. Shipboard with passive acoustics	Abundance and distribution of fin whales; distribution of humpback and right whales; distribution of sperm and maybe blue whales; year-round, coarse-scale distribution of all six species; winter abundance in key areas with arrays; migration timing & patterns	Likely little information on sei whales
7. Aerial with shipboard and passive acoustics	Abundance and fine-scale distribution of fin whales; fine-scale distribution of humpback and right whales; year-round, coarse-scale distribution of all six species; winter abundance in key areas with arrays; migration timing and patterns	Possibly little information on sei whales (but best chance)

Appendix A | Attendees

Name	Organization
Abigail Halterman	Saint Anselm College
Amalia Harrington	Maine Sea Grant
Amber Fandel	University of Maryland Center for Environmental Science
Amina El-Ashmauz	Collin College
Anne McShea	OW Ocean Winds
Anthony DiLernia	DiLernia Marine Services, Inc.
Anthony Dvarskas	Orsted
Ben Eberline	Dominion Energy
Brian Dresser	Tetra Tech
Carl LoBue	The Nature Conservancy
Casey Personius	New York State Department of Environmental Conservation
Casey Yanos	Maine Department of Marine Resources
Chris McGuire	The Nature Conservancy
Colleen Brust	New Jersey Department of Environmental Protection
Crista Bank	Vineyard Wind I
Dara Wilber	INSPIRE Environmental
David Ciochetto	Rhode Island Coastal Resources Management Council
David Hedgeland	BP
Doug Christel	NMFS Greater Atlantic Regional Fisheries Office
EJ Marohn	Equinor
Emma Martin	Xodus
Greg DeCelles	Orsted
Gwen Gallagher	New York Sea Grant
Helen Henderson	Responsible Offshore Science Alliance
Jake Kritzer	NERACOOS
Jason Morson	Rutgers University
Jennifer Couture	New England Fishery Management Council
Joe Warren	Stony Brook University
Joel Southall	Mayflower Wind
Josh Kohut	Rutgers University
Julia Beaty	Mid Atlantic Fishery Management Council
Julia Livermore	RI Department of Environmental Management
Julika Voss	BioConsult SH
Kalid Kamhawi	Ithaca Clean Energy
Kate Wilke	The Nature Conservancy
Kathleen Reardon	Maine Department of Marine Resources
Kathy Vigness-Raposa	INSPIRE Environmental
Katy Bland	NERACOOS & New Hampshire Sea Grant

Kaycee Coleman	Rutgers University
Kaylan Randolph	California State University Maritime Academy
Keith Dunton	Monmouth University
Kevin Wark	Endeavor Fisheries
Kimberly Durham	Atlantic Marine Conservation Society
Laura Morse	Offshore US
Laura Nazzaro	Rutgers University
Lauren Wahl	A.I.S., Inc.
Lenaig Hemery	Pacific Northwest National Laboratory
Lesley Baggett	AKRF
Lyndie Hice-Dunton	Responsible Offshore Science Alliance
Merry Camhi	Wildlife Conservation Society
Michelle Bachman	New England Fishery Management Council
Michelle Bromschwig	Bureau of Ocean Energy Management
Mike Crowley	Rutgers University
Mike Pol	Responsible Offshore Science Alliance
Morgan Brunbauer	New York State Energy and Research Development Authority
Peter Himchak	Cooke, Inc.
Robert DiGiovanni	Atlantic Marine Conservation Society
Ron Larsen	Sea Risk Solutions
Sarah Courbis	Advisian/Worley
Sarah Hudak	Invenergy LLC
Scott Ambrosia	Vineyard Wind I
Scott Curatolo-Wagemann	Cornell University Cooperative Extension
Sebastian Velez	Attentive Energy
Shannon O'Leary	Saint Anselm College
Ursula Howson	Bureau of Ocean Energy Management
Will Shoup	Responsible Offshore Science Alliance
Yong Chen	Stonybrook University