

Synthesis of the Science

Interactions between Offshore Wind Development & Fisheries

Plenary Notes | October 30, 2020

Developed by the Consensus Building Institute

Estimated Day 3 [Attendance](#): ~297

I. Day 3 Summary

On 30 October, as many as 297 participants engaged on-line in the third of three full days of Synthesis of the Science (SoS) on interactions between offshore wind development and fisheries. The third day was dedicated to overall scientific approaches and methodologies and fisheries management.

The third full day agenda was broken out into panel or speaker presentations, followed by questions and answers. Such Q&A was conducted verbally, via the Chat function in Zoom, and via an on-line tool called Mentimeter. The results of all such dialogue are captured below for the plenary discussions and additional written comments are captured in an appendix for all comments made in the Chat or Mentimeter. A glossary of acronyms is also included in an appendix.

The substantive topics covered on this day included:

- Sampling design and methods
- Cumulative impacts
- Integrated ecosystem assessment
- Fisheries dependent data
- Fisheries independent data
- Impacts in fisheries management

The day also included breakout discussions. The breakout topics included:

1. Fishery Independent Surveys
2. Crossroads: Where Fisheries Management Meets OSW
3. Other Fish in the Sea: Improve OSW Planning re: Data-Limited Fisheries
4. Fisheries Information Modernization: Big Data or Big Brother?
5. Beyond Data Collection: Cooperative Research
6. How to Prioritize Research?

The day is summarized below including appropriate links by major theme or agenda topic.

I. Sampling Design and Methods

[\[Link to Recording\]](#)

Panelists: Mike Jech, NOAA Fisheries | Kevin Stokesbury, UMass Dartmouth | Sofie Van Parijs, NOAA Fisheries

Moderator: Elizabeth Methratta, NOAA Fisheries

- The questions should drive the technologies, not vice versa (i.e., the data/information needs should drive which technology or methodology is employed).
- Sampling volume is directly related to the “scale” of the measurement. Often there’s a tradeoff between range and resolution (narrow range sampling technologies can produce high resolution data, whereas broad range technologies like LiDAR can capture long spatial ranges, but typically have lower resolution).
- Data management is essential, and a data management approach must be developed early on to enable efficient and effective use of data.

Types of Technologies

- **Active Remote Technologies:** e.g., visual and acoustic methods. All remote technologies are an indirect measure of what you actually want to measure (why direct sampling and verification are important).
- **Passive Technologies:** e.g., passive acoustic monitoring (PAM), which can be used at night and in bad weather, capture soundscape (e.g., both animals and anthropogenic noise); and serves as a cost-effective method for long-term monitoring. PAM limitations include: can’t tell when animals are around but silent or sound is not in the detection range; often difficult to determine number of individuals present; and many sounds are still unknown and sound interference can be a problem. When considering using PAM, important to ask: 1) species of interest; 2) PAM data collection types; 3) PAM recording technologies; 4) PAM design; 5) PAM system requirements; and 6) reporting/archiving data.
- **Capture Technologies:** e.g., nets, trawls, spearfishing, etc. Capture technologies provide verification of the remote signal.
- **Platform Technologies:** e.g., human-operated or autonomous methods (like Saildrone). Human-operated vessels aren’t constrained by power source limitations, but mobility may be an issue.

Example: Vineyard Wind Monitoring Plan.

- Worked with the wind industry and fisheries to design monitoring plans to capture fish abundance, distribution, and population structure in and around the wind farm areas before and after wind farm construction. Also wanted to use similar monitoring methods as others to help capture regional trends and to be consistent with existing survey methods.
- Within the wind farm area, they’re using bottom trawl surveys, ventless traps, plankton tows (larval lobster), black sea bass surveys, and drop camera surveys.
- Outside of the wind farm, they’re analyzing the scallop larval distribution w/ oceanographic modeling; monitoring spawning cod dynamics (via telemetry tagging); and analyzing ecosystem-based management utilizing several modeling approaches.

Sampling | Q&A Session

- **Acoustic-based species identification.** How well can acoustic technologies identify species?
 - Several species readily identifiable include Atlantic cod, haddock, several grouper species, and black drum. Clams and scallops tend to not make noises; other invertebrates like lobsters and urchins may make certain sounds (but not sure if sounds are species-specific). Fish sounds tend to occur during spawning periods and possibly during aggressive encounters but not necessarily at all times.
- **Methods within/near wind farms.** What technologies and methods would work best in wind farms and very close to turbines?

- Optics for sampling close to turbines (laser technologies can produce larger ranges than cameras). High-frequency ultrasound types of acoustics for larger ranges. PAM could work depending on the noise produced by the turbines and the target species. The Vineyard Wind Monitoring Plan used ventless trap and drop cameras to detect before and after effects of wind farm construction. Towing and trawls will likely be a challenge after construction within an array, depending on spacing.
- **Utilizing turbine structures.** Can the turbines themselves be utilized for supporting acoustic monitoring?
 - Yes, that could be an opportunity (if other sounds > the turbine-specific sound don't interfere).
- **Rod and reel method.** Have you considered more rod and reel surveys (common method used by rec fishermen)?
 - Yes, for example, has been used in conjunction with other methods like active telemetry and passive acoustics at Cox's Ledge.
- **G & G Surveys.** Has the acoustic monitoring detected G&G surveys, and have animals responded?
 - Yes, we've detected G&G survey activity but have not focused on animal responses (would require a baseline to know the soundscape of animal behavior absent of G&G surveys).
- **Fishermen collaboration.** How can we foster fishermen to participate in these studies and draw on their knowledge?
 - Vineyard Wind monitoring heavily relies on collaborating with fishermen. The monitoring plan design was developed and implemented in collaboration with fishermen. Involving fishermen will be crucial (e.g., more resources like vessels and knowledge of area). For example, heavily relying on fishermen to deploy and retrieve technology during COVID.

II. Cumulative Impacts

[\[Link to Recording\]](#)

Panelists: Silvana Birchenough, CEFAS | Ian Slayton, BOEM

Moderator: Elizabeth Methratta, NOAA Fisheries

CEA Components and Considerations

- Marine renewable energy developments (MRED) cumulative effects assessment (CEA) are challenging as they must take the broader setting into account, along with many different sectors, pressures/activities, and ecological receptors to consider at different scales.
- Key CEA considerations include temporal accumulation (changing functions); spatial accumulation (changing structures); various stressors and combination thereof, connectivity/cascading impacts, and impact significance.

CEA Benefits

- Cumulative Effects Assessments offer several benefits to industry and regulators, including: reduce long-term cost, improve monitoring, support transparency, improve consistency and standards, support greater access to information and research, and support regional assessment and management.

Looking Ahead

- Improving and integrating environmental impact assessments (EIAs) (often government-driven) and cumulative effects assessments are important for understanding regional, cumulative impacts.

Example approach in US: Vineyard Wind

- Vineyard Wind NEPA EIS (and supplemental EIS), impacts were considered using two approaches:
 - 1) developed potential cumulative impacts of the proposed wind farm; and then
 - 2) described a projected max case scenario for the region based on what is reasonably expected in the foreseeable future (e.g., States' capacity planned commitment for existing Atlantic leases, and assumed aspects of future projects like turbine size and layout), which can be updated as new information becomes available.

Cumulative Impacts | Q&A Session

- **Larval stages.** What information exists for analyzing cumulative impacts on larvae?
 - In Europe, some information exists from oil and gas platforms as well as some lab experiments focused on larvae.
- **Oceanic/Atmospheric transport.** How much was ocean and atmospheric transport included in the BOEM cumulative impacts analysis (e.g., Coastal Virginia Offshore Wind Project [CVOW] and the Block Island Wind Farm [BIWF])?
 - There are [ongoing hydrodynamic studies and modeling](#) related to that.
- **Longer term variables.** How do you fold information for longer term trends like climate change?
 - We have been combining several models to capture changes that may occur over longer time scales.
 - CEFAS did a [study for UK regulators/planners that looked at climate change layers](#) to identify activity opportunities and threats and environmental impacts.
- **Missing baselines.** How do you conduct these cumulative impact assessments when baselines are often missing?
 - Often have to take what is known of current conditions as the starting point while acknowledging the assumptions and unknowns using that approach.
- **Non-linear actions.** How do you address nonlinear interactions in cumulative impact assessments (e.g., where there may be tipping points, or the magnitude of impacts are disproportionate)?
 - Challenging to fully predict those impacts. Relying on frequent stakeholder consultation and support shared responsibility to understand as we learn more to at least qualitatively assess continuous versus discontinuous possible functions of impact.
- **Applying CEA.** UK examples of cumulative impact assessments that have provided useful information that led to shifts/changes in project design, surveys, adaptive management, etc.?
 - Yes, a project near London implemented recommendations and season restrictions for pile driving during herring spawning due to a CEA.

III. Integrated Ecosystem Assessment

[\[Link to Recording\]](#)

Panelists: Sean Lucey, NOAA

Moderator: Fiona Hogan, RODA

NOAA's Integrated Ecosystem Assessment (IEA) Program

- Aims to provide a science-based process for conducting ecosystem-based management (EBM); provide decision-support information in ecosystem context by integrating all components including human activity and impacts; and support a scalable, collaborative, and iterative/adaptive process.

IEA process

- Includes: 1) scoping: define EBM goals and targets; 2) develop indicators that will help give a representation of the status of the system; 3) assess the ecosystem, like a synthesized status report of the indicators or State of the Ecosystem (SOE) reports; 4) analyze uncertainty and risk; and 5) conduct management strategy evaluation (MSE) then iteratively refine and adapt as needed.

IEA in the northern Atlantic region

- Much of the IEA work has been in collaboration with the fishery management councils. (Currently 5 IEAs in the US). Mid-Atlantic Fisheries Management Council (MAFMC) used an ecosystem approach to guide fisheries management decisions very similar to the IEA process.

IEA in the Gulf of Mexico region

- Another example: Mid-barataria sediment diversion project in Louisiana also using the IEA process. The project is using participatory modelling and scoping to engage subject matter experts and stakeholders into the process that considers social, ecological, and biophysical variables. OSW projects will likely benefit from using a similar collaborative, diverse engagement approach.

Ecosystem Assessment | Q&A Session

- **Timing and Effort.** How long does it take to develop an IEA and what is the level of effort to maintain it?
 - It can be a heavy lift, particularly at the beginning. For the MAFMC, the infrastructure for developing annual SOE report updates exists, so the maintenance is relatively low. Initially developing the SOEs may take a couple years. Gathering broad participation would be a big challenge, particularly with COVID.
- **Indicator Criteria.** How do we identify and vet which fisheries indicators should be embedded with OSW in an IEAs? What are the criteria for a good indicator?
 - Should involve stakeholders and benefiting from local knowledge as well as subject matter expertise. For example, part of the SOE we did was to bring in stakeholders to develop conceptual models of how they perceived the system worked and incorporated that information with data.
 - Develop SMART indicators (Specific, Measurable, Achievable, Relevant, Timely) that would react to the perturbations in the system without varying wildly (unrelated data “noise”).

IV. Fisheries Dependent Data

[\[Link to Recording\]](#)

Panelists: Ben Galuardi, NOAA Fisheries | Anna Mercer, NOAA Fisheries | Mike Palmer, NOAA Fisheries | Kevin Wark, F/V Dana Christine

Moderator: Doug Christel, NOAA Fisheries

Fisheries Dependent Data (FDD) types

- Vessel Trip Report (VTR) – most ubiquitous but limited location/sub-trip info
- Dealer Reports – accurate landings and revenue info but no operational info
- Vessel Monitoring System (VMS) – more accurate than VTR but not used by all fisheries and hard to identify fishing v. transit
- Others (observers or research fleets) may be more precise, but often low or variable coverage
- Other information outside of the fisheries federally required information (e.g., Traditional Ecological Knowledge and socioeconomic data) also have strong value

Uses and Benefits of FDD

- FDD are extremely important sources of information. FDD are heavily used for fisheries science and management (basically the backbone for stock assessments), monitoring protected species, and addressing data requests. Related to OSW, FDD can be used to evaluate socio-economic impacts, impacts on fishery resources, and impacts on active fishing communities.

FDD Limitations or Challenges

- Several dynamic factors affect fishing operations and FDD collection and are hard to quantify (e.g., management like quotas and closures = “no fishing, no data”; biological factors like fish availability and distribution; and economic factors like market price, fuel, permit price, etc.).
- One additional FDD challenge is the confidential nature of that information, much of which is protected by law and requires several steps to access confidential data.

FDD and OSW

- Multiple FDD sources are used (to leverage the data type’s strengths and accommodate for its limitations) to more fully understand OSW impacts. UMass Dartmouth study at Vineyard Wind is currently exploring how the FDD affects our estimates of OSW impacts on fisheries.

Fisheries Dependent Data | Q&A Session

- **Limitations per FDD type.** What are the most important constraints/limitations to keep in mind when utilizing these FDD?
 - The MAFMC web page has a list of FDD limitations. Next summer, we plan to have a workshop to discuss several of the FDD limitations and how they should be used in combination to get a comprehensive picture.
- **Study fleet.** Study fleet has “low and variable coverage?” How many vessels are currently in that program, and what types of data do they collect? What transmission method do they use?
 - “Low and variable coverage” refers to that coverage varies depending on the fishery (e.g., high coverage for a squid fishery because of high vessel participation). Study fleet currently has approximately 50 commercial fishing vessels participating in the program across the region (no recreational fishing vessels). Collected data can include variables like catch, bycatch, gear, temperature, depth, GPS tracking of tow path, etc. NOAA science centers and others have a program that then combines the various data sources.
- **Study fleet and stock assessments.** Study fleet’s catch rate information and bycatch estimates have been considered in stock assessments.
 - Yes. In recent years, there has been more use of that information in assessments.

- **Camera monitoring.** How could wide scale deployment of camera-based monitoring, EM, change the use or value of FDD?
 - NOAA is working on a few pre-operational EM (electronic monitoring) pilot programs in the region for the groundfish fishery. A similar pilot program is expected to rollout in the spring for the herring fishery. EM is a promising tool for future suites of monitoring approaches. One EM advantage is it can run 100% of the time (can help address observer bias) and could be a cost effective option for monitoring. One challenge is that EM footage is not capturing the full complement of other FDD (e.g., not getting “retain catch” estimates or gear parameters).
- **Lobster and crab fisheries.** Is it true that lobster and crab fisheries have the largest footprint on the Atlantic Coast, yet the least amount of spatial coverage through these FDD collection methods (VTR and VMS)?
 - Lobster and crab fisheries have a significant footprint on the northeast continental shelf. There has been concern that the footprint and impact of those fisheries may be underestimated due to the lack of spatial information from those fisheries. Use of VTR and VMS varies across states, so there has been efforts to standardize and increase the level of reporting.
- **FDD estimating socioeconomic impacts.** Is the resolution of FDD sufficient enough to understand the socioeconomic impacts of OSW (across a region, specific to a project or site, etc.)?
 - No one FDD type exists that addresses all the data needs, but we have several FDD types at multiple scales to help understand socioeconomic impacts. Some FDD are more precise regarding spatial resolution, while others give broader coverage. There are ongoing efforts to determine how to utilize all the FDD sources to understand the socioeconomic impacts.
- **Calculating economic downstream impacts.** Ex-vessel revenues are fairly easy to calculate. How have economic multipliers been utilized to determine downstream impacts per pound of fish?
 - That has been an overall challenge. Most of the data that NOAA collects stops at the first transaction at the dock. Members of the social science branch and at the science center are exploring this issue to develop cost estimates for some revenue impacts: see link for [fishing community work](#) and [mapping tool](#). Past University of Rhode Island study involved collecting detailed business data from many fishing businesses across the state. Developing an accurate multiplier requires very detailed information about the supply chain.
 - [From NEFMC participant]: Social Sciences Branch (SSB) can use IMPLAN to estimate downstream impacts of revenues.
- **Revenue assessments.** Are there any fisheries revenue assessments for the wind energy areas that have broad agreement, or is the uncertainty too great in those models?
 - NOAA’s Northeast Fisheries Science Center and Greater Atlantic Regional Office are using the fisheries footprint approach to take VTR to help make better estimates in their models. There are also several other past/current/forthcoming efforts and projects that will help better estimate OSW impacts on fisheries.

V. Fisheries Independent Data

[\[Link to Recording\]](#)

Panelists: Wendy Gabriel, NOAA Fisheries | Capt. David Goethel, F/V Ellen Diane | Dave Rudders, VIMS
Moderator: Andy Lipsky, NOAA Fisheries

What is FID Monitoring

- Fishery independent data (FID) monitoring aims to use standardized time series data collection to monitor abundance, distribution, and demographics of stocks over their ranges. It supports maintaining quality of information flow for stock and ecosystem assessments and fishery management.
- Fishery independent surveys provide one perspective into a broad range of species-specific and ecosystem-wide processes and help understand changes in the dynamic system on a more consistent basis across time.

Challenges for FID due to OSW

- OSW development may pose a challenge to traditional modes of operations for some survey operations (especially bottom trawl surveys), which will, among various impacts, disrupt historical sampling design.
- Fishermen are concerned they'll be "penalized twice" – closure to fishing areas as well as inability to conduct trawl surveys, resulting in greater scientific uncertainty, in turn most likely leading to lower quotas. Thus, it is very important to establish a baseline before construction and calibrate survey design and gear.

Looking Forward

- NOAA and BOEM are working together to better understand how wind energy areas (WEAs) will affect monitoring/assessments/management/etc. and to identify and evaluate the optimal combination of sampling methodology and statistical designs for WEAs (using simulation models to help evaluate combinations).
- After this, next steps include integrating into ongoing survey data streams; calibrating methodologies; identifying interim provisional indices to bridge gaps; implementing new methods/designs; and setting up the data processing/analysis infrastructure to support ongoing implementation.

New Opportunities.

- Challenges may be an opportunity to innovate to support continuity of information (will need collective will and investment though).
- Agencies are also utilizing opportunities to leverage and partner with entities like ROSA.

Fisheries Independent Data | Q&A Session

[Links: [Zoom Chat](#) | [Full list of Mentimeter Questions](#)]

- **Time and cost to adapt.** How long will it take NOAA surveys to adapt to the OSW development? How much will it cost (compared to your baseline)?
 - NOAA's currently trying to develop cost estimates for alternative approaches. Uncertain on the number of years it will take to adapt to development (process includes identifying and calibrating new methodologies, and optimal combinations thereof, for 40+ species and operationalizing). Currently NOAA has no dedicated funding to address this challenge; however, collaborative opportunities like the NOAA-BOEM interagency agreement and interested partners will help this issue – it's a resource problem, but it's still a solvable problem.

- **Prioritizing survey methodologies.** With 40+ species evaluated using bottom-trawl surveys, which vary in their vulnerability to different survey methods, how will you prioritize species/gear surveys first for developing/calibrating?
 - We're expecting that to emerge from simulation exercises that will try to identify the optimal combination of methodologies that will do the best job for the most species.
- **BACI design considerations.** The surveys described this morning were BACI designs, so they won't be easily integrated with stock-wide surveys. How do we rectify this?
 - Specific to the survey's objective. BACI design is important if exploring the impact of OSW to an area. These stock monitoring surveys are more focused on what is happening over the entire stock range and how to adapt the methodology given the constraints of the WEAs in a way that maintains the long-term monitoring data.
- **COVID impacts.** How has COVID impacted independent monitoring and would a greater reliance on cooperative surveys make our data collection more resilient?
 - Several surveys had to be cancelled or delayed because of COVID. Both vessels and scientific parties have been learning and modifying protocols to mitigate the effects of COVID while minimizing health risks. There are various ways to address lapses in coverage though (e.g., cooperative surveys).
- **Detecting stock impacts and varying responses.** The overlap (% area) unavailable to survey is one aspect of impacts to the survey, but the consequences will also depend on how much of a given stock is in the area of overlap. Has that been explored?
 - It's species specific and how each uses the habitat. Based on trawl surveys, we collect around 46 different stock assessments (commercial and managed species). The overlap may change over the lifetime of the turbines as stock distributions possibly change.
 - Kevin Friedland has been looking at historical trawl data to evaluate stocks and species presence in the areas without wind farms.
- **Accounting for untrawlable areas.** How does the trawl survey currently account for "untrawlable" bottom within the strata? How do you account for hard bottom, shoals, fixed gear, etc.?
 - Will move a station if there's fixed gear or untrawlable bottom (find a different path close by).
 - One challenge with losing trawlable areas within WEAs is substantially reduced ability for random sampling designs.
- **Alternatives for the large vessels.** Can the large vessels like the Bigelow be replaced by smaller vessels, or mitigate the challenges for large vessels navigating through WEAs (e.g., arrange for a tug to stand by in case of loss of propulsion)?
 - Smaller vessels are possible (and may be more appealing than mitigating w/ a tugboat). There is a tradeoff with efficiency (Bigelow able to process a lot more data). Also, there is a concern that larger vessels' height profiles may not allow it to be close to the spinning turbines.
- **Developers' survey protocols.** Could developers implementing NEAMAP, state-run lobster survey, and scallop survey protocols as part of their monitoring plans supplement the stock assessments?
 - Yes, it's possible. Needs to be designed to do so (standardized methodology that's consistent across multiple years and calibrates the developers' programs), and those conversations need to occur ASAP, not after construction begins. ROSA is a good example of where those discussions have begun and could support a standardized approach among developers to ensure a robust statistical design.

VI. Impacts on Fisheries Management

[\[Link to Recording\]](#)

Panelists: Julia Beaty, MAFMC | Jason McNamee, RI DEM | Chris Orphandies, NOAA Fisheries | Dave Secor, University of Maryland | Nick Sisson, NOAA Fisheries | Mary Beth Tooley, O’Hara Corporation
Moderator: Fiona Hogan, RODA

OSW Impacts on Fisheries Management.

- OSW impacts may impact fishery management decisions (who can fish where, when, with what gear, and for what species); ability to understand and measure changes in fisheries to inform management decisions; and effectiveness of fisheries management to meet legally mandated management objectives.
- It will be important to be flexible and holistically evaluate current management systems as conditions change and consider complex future scenarios, including cumulative effects. Impacts will differ depending on the fishing activity (recreation v. commercial; gear type; size/age/species; reporting; etc.).
- Need to understand how fishing effort might change before considering how fisheries management might need to adapt.
- Acceptable biological catch (ABC), which sets the upper cap on quota allocations, depends on assessed stock biomass and a deliberated uncertainty level. OSW will likely increase uncertainty (e.g., by affecting data quality, retrospective performance, ecosystem considerations, etc.). Reducing uncertainty will involve sustaining investments into monitoring, iterative improvements in use of existing data, prioritizing key linchpin research, and model elaboration/flexibility.

What we need to know more about

- Very little is known about how fishing efforts will shift in response to OSW, and how that may impact interactions between protected species and fishing gear (however, we do have the tools to assess impacts once we better understand fishing effort shifts).
- We need to know potential changes in fishing patterns; manner in which fisheries sampling/protected species monitoring will occur within WEAs; potential protected species’ prey shifts due to wind farms; and improve understanding of entanglement rates of pot/trap gear.

Case Example: Block Island Wind Farm

- Based on the Block Island Wind Farm project, some lessons learned from a state-level perspective: need to consider the inshore components (e.g., cable routes displacing fixed gear locations, hesitancy for fisheries investments given uncertainty, and mixed reactions among fishing constituencies).
- Need to figure out impacts on fishery surveys (which states rely heavily on to inform their state fisheries management and operations).

Equity and Trade Off Considerations

- Need to balance other needs and activities in addition to fishing grounds (access for transit as well as fishing access too).
- New England development won’t likely affect scallops’ location too much, but we may see a big change with winter herring who are quite migratory. The bigger concern is that decisions about

management changes to fisheries take 12 to 18 months for any change, and there are always competing demands on Fishery Management Councils' limited time.

Fisheries Management | Q&A Session

[Links: [Zoom Chat](#) | [Full list of Mentimeter Questions](#)]

- **Analytical tools.** What tools are scientists/managers using to evaluate how effort (both commercial and recreational) might change with the advent of offshore wind?
 - NOAA's social science's branch has recently begun to analyze this (e.g., impacts of effort displacement). Currently working on existing activity (major data gap), which can be a challenge if fishermen are hesitant to share information about their fishing activity. We have some data (e.g., observer data and VTS) for federally managed species.
- **Adaptation Ability.** Management addresses changes all the time, so will it just adapt as it adapts to other changes as wind development expands? Or do things need to happen now (council and committees for example)?
 - In general, we'll likely always be behind given resources and time demand. Some data may become easier to obtain – e.g., the turbine arrays provide observation platform systems.
- **Floating OSW.** How will the management impacts differ for fixed wind infrastructure vs. floating?
 - Will depend on a number of factors such as which fisheries co-occur where the floating OSW farms will be. Other potential issues include potentially greater entanglement issues and more elasmobranch interactions due to more conducting cables.
- **Vessel trips' impacts.** A number of people expressed concerns about the increase in vessel trips due to OSW, G&G surveys, etc., potential collisions as well as impacts to organisms, and need to analyze the overall impacts.
- **Larger turbines.** Current trend is for larger wind turbines, which would be spaced further away from each other. How would this impact survey methods?
 - Impacts are TBD depending on the area and OSW developers. Developers in New England have collectively agreed to use uniform spacing; however, generally there has not been a collective agreement or commitment on spacing.
- **North Atlantic right whales.** What impacts do you think OSW will have on North Atlantic right whales?
 - Concerns exist for right whales, including vessel strikes, noise during construction, impacts to prey density/distribution (whales need plankton in high concentrations), and shifts in fishing gear (entanglement concerns). Right whales have been observed to use the southern New England area during longer periods in the year than previously thought.
- **Preparing the FMCs.** For NMFS - what national conservations have taken place to prepare the various FMCs for what is coming and how to best participate, respond, and inform the OSW development process(es)?
 - Council members are members with RODA and ROSA . We submit comments to BOEM and the Coast Guard. Councils don't have much authority in OSW development processes, so primarily currently tracking and commenting on proposals and staying abreast of the issues so we can have informed discussions in the future. Councils haven't really discussed how things may need to change in the future.
- **Block Island reef effect.** The BIFW has had a positive reef effect on habitat, fish, and recreational fishing. What might be the method used to assess enhanced fish abundance, enhanced fishing activity, and recreation/commercial quotas?

- For BIWF, there was effort to do BACI with before and after surveying and sampling to track potential changes. Not definitive on how sport fishing has changed. In general, it's very difficult to know how things changed without surveying beforehand and to compare to the during and after construction/operations information. Hopefully we can leverage opportunities such as using structures for installing sampling equipment.
- **BIFW species impacts.** Did you see changes in benthic species composition at BIWF?
 - Not sure on the specific answers (much of the BIFW information is expected to be published later in the year).
- **BIFW cable routes.** What impacts did the cable routes have in BIWF?
 - For example, BIWF had to adjust a floating fish trap site in one instance. At the new location, it wasn't as productive. In another example, there was no alternative option for burying the cables in some areas, and had to build a concrete structure (therefore, a dragger cannot go into this area). There are some technologies under development to help mitigate these issues, but points to the potential impacts and strong need for coordination to occur to minimize impacts.

VII. Breakout Session

1. Fishery Independent Surveys
2. Crossroads: Where Fisheries Management Meets OSW
3. Other Fish in the Sea: Improve OSW Planning re: Data-Limited Fisheries
4. Fisheries Information Modernization: Big Data or Big Brother?
5. Beyond Data Collection: Cooperative Research
6. How to Prioritize Research?

See Appendix C for summary notes.

Plenary Notes | DAY 3 | October 30, 2020

Appendix A: Full Mentimeter and Zoom Chat Entries

I. Sampling Design and Methods

Mentimeter Questions

- How well can these acoustic technologies (ARIS and DIDSON) identify fish to the species level?"
- With the AIS imaging, how do you know what you see are actually the species you state like the salmon?
- How do you survey for clams?
- How would these technologies interact with turbine structures?
- Which of these technologies would be best for sampling very close to turbine structures?
- Which of our managed fish species are soniferous and thus good candidates for PAM?
- Agree that question needs to drive what technology is used. Can you give a few examples of what types of questions have been addressed with these technologies?
- How can the turbines themselves be used to help do acoustic monitoring (can active and passive devices be attached to the turbines)?
- Sampling methods have generally not included rod & reel surveys, yet this is the primary method the recreational angling community catches fish. Why have more rod & reel studies not been done?
- Sofie--are you picking up from existing recorder signals from wind developer G&G surveys. Can you determine animal behavior responses from this monitoring?
- With acoustic tags on animals, what kind of tag is being used? Some types of tags used on sharks & whales have caused severe stress to the animal, infections (fungal) and ultimately death.
- How can we incorporate these technologies into cooperative research efforts?
- How is PAM data accessed in NCEI? Is it an information request? Able to be queried?
- Any such acoustic signature to identify Herring spawning?
- How do we get the on the ground knowledge of the fishermen into the academic studies that researchers are doing for the developers, often fishermen know things about the species behavior than the sci
- How can you identify, study and monitor larvae and early state fisheries? Many surveys deal only with catch, but for every 10 fish caught, about 3 million eggs are spawned. We must protect early life
- Are PAM systems designed to monitor for vocalizing animals also collecting background noise levels (e.g. vessel propeller cavitation, storms, geophysical surveys)
- Kevin, can your drop camera detect growth on hard substrates like barnacles and young corals?
- Is there a passive way to detect vessel activity over time?
- Baseline Rod and Reel studies conducted at Gordons Gully plus tagging of pelagics that is ongoing
- Can you measure the sound of wind survey boats DB thrusters?
- For Kevin--so the trawl survey may not be able to continue its current sampling method and design once turbines are in?
- If you shift your sampling methods before and after construction, are you planning how to mate those data together?
- Have you explored using stereo Baited Remote Underwater Video for fish surveys?
- What is the estimate of the loss of the monitoring studies due to the 1 nm mile spacing? What will be lost and due to what? Weather included in the estimate?

- Is anyone working on projecting changes to important, productive ocean currents, like the Cold Pool, from the planned buildout of wind farms in the Southern New England, Mid-Atlantic Regions?
- Should we be shifting to more fixed gear to collect baseline data-fish pots, longline, gillnets that are less likely to be impacted by turbine spacing?
- Mike showed a nice picture of a menhaden school. What can we tell about the fish in the school with existing technologies?
- Don't forget the recreational sector and for hire fleet"
- Have the researchers used data from wind developers? Seems like there's a gap between MG&G data and other types of data.
- Why are the "For-Hire" fishing industry not included in the studies? Hook and Line specifically?"
- In other regions (Alaska, Europe) fishing vessel acoustics (fish finders) have been calibrated to do scientific research-should we be doing this here too?"Why are the "For-Hire" fishing industry not included in the studies? Hook and Line specifically?

Zoom Chat Questions/Comments

- **CBI:** Q&A bank for Sampling Design & Methods: <https://www.menti.com/7p8r1izjn1>
By opening and clicking "Ask a question," you can submit questions or upvote those from others.
- **Speaker/Team:** Regarding other hydrodynamic studies in addition to Dr. Chen's RSA work is a BOEM-funded hydrodynamic modelling study:
<https://www.boem.gov/sites/default/files/documents/environment/environmental-studies/NSL-19-04.pdf>

II. Cumulative Impacts

Mentimeter Questions and Comments

- Has an estimation of the total decibels generated per turbine been expanded for the entire turbine area to model decibels generated and impact in ambient air /water column to assess env impacts
- OSHA regulates 70 to 80 decibels for humans.
- I feel that the cumulative impact on the larval stage is not well considered with the science around MRED. I agree with Silvana that this needs to be studied in greater detail sooner rather than later."
- Do we have a catalog of the existing baselines that exist prior to development, prior to site investigation? If not, can we make one and include the sensitivity of the target to other pressures; CC ,FP
- Warning that SPL [DB] impacts are different in the different fluids.
- Silvana - in the research results, there only seemed to be one of the 5 variables that had a significance of 2, can you discuss, was the work not significant?
- Can someone put a clickable link to this IPF BOEM report in the chat?
- The decibels per turbine, there is a range based on wind speeds, has that been taken into account? Monopile, Tripod?
- Recent changes to NEPA regulations made substantial changes to the requirements to analyze cumulative effects. How will these impact the preparation of EIS's for future wind farms?
- How and where do large-scale physical environmental changes (i.e. inter-annual variability, climate change) fit into studies on cumulative impacts?
- Ian - can you define transmission range - what does this include (AC/ DC/ booster stations/ ...)?

- For Silvana, are there examples of CEAs that have provided practically useful information, e.g. led to changes in project design, surveys, adaptive management?
- Will the 1nm x 1 nm grid layout be maintained if turbine size increases significantly before full buildout?
- Does the assumption of transmission infrastructure problems being solved contradict the exclusion of consideration of projects that were out of range in the SEIS?
- Given that technologies and project design will evolve over time, how and at what frequency are cumulative impact assessments updated?
- Current turbine layouts still have problems, they shouldn't be viewed as accepted by the fishing industry. The fishing industry was not involved in that layout decision.
- For next NEPA analyses---will BOEM update definition of likely foreseeable wind activities? The wind industry and the states (requirements) plus planning in GOM all indicate a much larger footprint?
- Note that the 1 x 1 nm grid is suggested by several sources but is not yet accepted and this is ONLY in the NE WEA.
- How is the knowledge of the commercial fishing community incorporated into these analyses?
- For the cumulative impacts that BOEM did, how much was ocean and atmospheric transport included? For example, there is probably no cumulative impact of CVOW on the BIWF area or are these areas connected?
- Doesn't it seem logical (If it is actually not yet quantified) that State demand is going to increase greatly as they shut down their carbon-based power generation?
- When is there too much impact? EISs often result in modification of a project to make it less impactful, but it's fairly rare that the No Action Alternative is selected.
- Some or most of construction will take place on/near spawning grounds for squid. We had asked for that to be avoided, but it was not.
- The biggest problem is that we just don't know. We don't have the proper baseline and basic research to be able to predict cumulative impacts. We are developing in the dark scientifically here.
- What about non-linear interactions?
- how do US/UK approaches differ – what can we learn to make each approach better?

Zoom Chat Comments/Questions

- **CBI:** Q&A bank for Cumulative Impacts: <https://www.menti.com/7pyts9qw6h>
By opening and clicking “Ask a question,” you can submit questions or upvote those from others.
- **Speaker/Team:** In response to several mentimeter questions regarding "baseline acoustics" and operational noise, BOEM has funded several studies that document pre construction noise levels in southern new England and the mid-Atlantic (see: <https://www.boem.gov/renewable-energy-research-completed-studies>). Regarding operational noise, this is modelled in plans and has been monitored at the Block Island Wind Farm and the Coastal Virginia Offshore Wind project (https://espis.boem.gov/final%20reports/BOEM_2019-028.pdf)
- **Speaker/Team:** The cumulative effects "white paper" referred to and asked for in mentimeter is here: <https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/IPFs-in-the-Offshore-Wind-Cumulative-Impacts-Scenario-on-the-N-OCS.pdf>
- **Speaker/Team:** See the final report ...
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/506458/MM

[O1077 Potential spatial effects of climate change in the South and East Marine Plan A reas.pdf](#)

- **Speaker/Team:** ICES. 2020. Working Group on Cumulative Effects Assessment Approaches in Management (WGCEAM). ICES Scientific Reports. 2:101. 20 pp.
<http://doi.org/10.17895/ices.pub.7561>

III. Integrated Ecosystem Assessment

Mentimeter Questions

- How long does an IEA take to get started and what is the effort to maintain it?
- Has NOAA or BOEM defined EBM goals? Who gets to decide what those are?
- What risk is the agency willing to take as it pertains to the undesirable effect of windmill development?
- How do we go about identifying and vetting indicators for fish/fisheries in the context of offshore wind? What are the criteria of a good indicator?
- What is the time interval over which the IEA loop occurs?
- Should IEA development for offshore wind occur in tandem with IEA for aquaculture?
- Both the NE (EBFM) and MA (EAFM) Council decided to move in two different directions. How will that be taken into consideration? Especially since fish know no boundaries.
- I'm guessing these efforts are biased toward English speakers who can attend and "do" meetings effectively. Has that bias been explored in terms of outcomes? Entire communities may be missed.
- How would an IEA fit within the BOEM timeline for OSW leasing?
- There are two steps to getting various stakeholder involvement, identifying their desires to be heard then actually getting them to participate

No Zoom Chat Comments or Questions

IV. Fisheries Dependent Data

Mentimeter Questions

- Is the resolution of fishery-dependent data good enough to understand the socioeconomic impacts of offshore wind?
- How well can current fisheries data get the actual location of harvest? Does it include length??
- How many boats have observers and at sea monitors? All commercial and recreational fishing effort?
- What are the most important caveats you'd put on this data? Meaning - what limitations are there to this data that people might not understand.
- Does NMFS maintain records of AIS data? For how long? How is it used?
- Is there a link to the new NOAA fisheries catch value portal somewhere? If someone has that can they provide the link and when it actually came online? Within the past 10 days?
- Ex-vessel revenues are easy enough to calculate - how have economic multipliers been utilized to determine the downstream impacts of that pound of fish?
- Study fleet has low and variable coverage?? How many vessels are currently in that program and what types of data do they collect and what is the transmission method they use?
- What data do you have on rec fisheries and how is it collected?
- Tough to evaluate recreational or commercial fishing when climatic shift has moved the stocks
- VTRs are utilized for fishery mgt purposes not for sighting wind turbines

- How could wide scale deployment of camera-based monitoring, EM, change the use or value of FDD?
- "Some states have virtually zero AIS data. How is NOAA NMFS planning on augmenting the data for those fisheries lacking AIS so they aren't left high and dry?"
- will all participants get the sensors for temp collection? What about salinity?
- Are there any fisheries revenue assessments for the wind energy areas that everyone agrees on? Or is the uncertainty too great in those models?
- How will we account for changes in fishing behavior and operations in our FDD data streams?
- Offering socioeconomic data for the WEAs only & not the OSW transmission cable corridor to the landing site leaves a HUGE hole in the socio-econ data 4 trawlers, gillnets & pot fishermen can lose grounds. Fix?
- If we are asking fishermen to divulge their data, we are going to ask the developers to also share their raw data that goes into the slides and reports that we are seeing (COP appendices lack transparency?)
- Can the panel please comment on FDD issues in fixed gear fisheries?
- What about lobster and crab harvesting?
- In the reports and analysis can we be very careful to include the assumptions and estimates of the uncertainty in the results as well as sources of the uncertainty. Thank you.
- Is it true that the lobster and crab fisheries have the largest footprint on the Atlantic coast, yet the least amount of spatial coverage through these collection methods (VTR and VMS)?
- How might you get position information from recreational fishing? They have neither AIS nor VMS.
- With this SOS, we are learning that there are a lot of studies and data that actually exist, but they are archived in many different places. A portal that links to these data in categories has value
https://scemfis.org/wp-content/uploads/2020/03/LFS_EI_Report.pdf
- Economic Impacts Associated with the Commercial Fishery for Longfin Squid (*Doryteuthis pealeii*) in the Northeast U.S. - Scemfis report
- Can some of the sampling data (i.e. Study Fleet, Observer/ASM) data be used to examine biological impacts?
- FDD is traditionally collected to set catch limits, if catch is lower after the development of OFW will this compensate fishermen or reduce catch limits?
- With SAR data is used to update assimilative models in near-real time to improve outcomes. Can fisheries impact models be made with assimilated data, so we need not wait for analysis and reports?
- For FDD, describe your ideal data set, your realistic data set and compare to your current data set. What would it take to attain these? How will changes due to siting change your future data?
- Are the studies on the economic input of recreational fisheries, including for-hire and private anglers, being considered in the ongoing studies? Or are they primarily focused on commercial fisheries?

Zoom Questions/Comments

- **CBI:** Q&A bank for Fisheries Dependent Data: <https://www.menti.com/sxf9oh9mvk>
- **Speaker/Team:** Mentimeter question regarding new NMFS soc-econ data portal: https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development?utm_medium=email&utm_source=govdelivery

- **CBI:** NOAA: Could someone answer the following in chat here: “Is there a link to the new NOAA fisheries catch value portal somewhere? If someone has that can they provide the link and when it actually came online? Within the past 10 days?”
- **CBI:** Thanks! Agencies working together as we speak.
- **Speaker/Team:** NOAA's socioeconomic impact summary reports can be found here, and you can access an online data query tool by scrolling to the bottom of that page: <https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development>. SSB can use IMPLAN to estimate downstream impacts of revenues.
- **Speaker/Team:** For a quick summary of fishery dependent data caveats, see Appendix A on page 20 of NOAA's comments on the New York Bight call for information: <https://static1.squarespace.com/static/511cdc7fe4b00307a2628ac6/t/5b1a879888251ba2e4530e9c/1528465312985/NY+Bight+Call+For+Information+NMFS+Comments+June+2018.pdf>
- **Participant:** Study Fleet is a good tool, however is it used or impactful on the overall science impacts for OSW? Because it is not used for modeling on stock assessment.
- **Speaker/Team:** we're looking into that as part of our efforts looking into various data streams. It's one of the ongoing research projects being developed by the Cooperative Research Branch.
- **Speaker/Team:** In reference to Doug's mention of fishing community work being done at Social Science Branch: <https://www.fisheries.noaa.gov/national/socioeconomics/social-indicators-fishing-communities-0>
- **Speaker/Team:** and the mapping tool here: <https://www.st.nmfs.noaa.gov/data-and-tools/social-indicators/> feel free to reach out with any questions angela.silva@noaa.gov

V. Fisheries Independent Data

Mentimeter Questions

- How has COVID impacted independent monitoring, and would a greater reliance on cooperative surveys make our data collection more resilient?
- Can the Bigelow and other large ships be replaced by smaller vessels?
- how does the trawl survey currently account for 'untrawlable' bottom within a strata? How do you account for hard bottom, shoals, fixed gear, etc...
- If the major concern is risk of Bigelow collision with a turbine, has there been any consideration of arranging a tug to stand by in case of loss of propulsion?
- The advent of lease areas has been considered for a long time, what efforts has NMFS made to calibrate and introduce smaller vessels?"
- The overlap (% area) unavailable to survey is one aspect of impact to the survey, but the consequences will also depend on how much of a given stock are in the area of overlap. Has that been explored?
- Change is an economic and innovation driver but detrimental to science, what will the cost to adapt to the development of this be to the US taxpayers or will this cost be mitigated by the developers?
- "How long will it take NOAA surveying to ADAPT to the development? How much will this cost (compared to your baseline)?"
- Could developers implementing NEAMAP, state-run lobster survey, and scallop survey protocol as part of their monitoring plans supplement the stock assessment?
- How will the change in the methods impact the ecological baseline as the development proceeds? Time and / or data gaps?

- With 40-plus species evaluated using the bottom-trawl survey, which vary in their vulnerability to different survey methods, how will you prioritize which species/gear surveys to 1st develop/calibrate?
- The surveys described this morning were BACI designs, so they won't be easily integrated with stock-wide surveys. How do we rectify this?
- If RODA puts up information, we have many specialists in various niches, it would be valuable to have a 201-level summary / primer on each topic along with the links to the data and reports.
- Making sure that all this various data is available as a time series on portals such as the NE Data Portal is very valuable.
- Will the upcoming workshop between BOEM and NEFSC to do the model simulation also come up with a budget plan/goal for appropriations or to accept money from outside sources?
- There is a question suggesting that BACI designs used by OSW projects could not be integrated into stock-wide surveys. Can someone speak to whether that is an accurate reflection of the different sur
- Is there a link to the BOEM NEFSC meeting and is it open?
- If NOAA gets money from the developers to mitigate this can it be actually applied to the intended cause or does it go into a general fund?
- Re a turbine obstructing Bigelow tows, each randomly selected location is defined by a single lat and lon point. A 1 nm radius around the point defines the area in which survey operations commence.
- When random tows fall within a WEA, can that be treated as 'untrawlable ground' or 'fixed gear' and shift the tow according to the existing survey protocol?
- Still not clear why NFMS is just now addressing an issue that could have been identified years ago
- There is a ship division (OMAO?) under NOAA that works with the Centers. Have they been put in the loop on the potential survey impacts?
- How can we help NOAA adapt this valuable resource? Please let us know.
- Has there been a review, using the decades of time series data, of how many of the randomly generated tows would fall within these energy areas annually? Is it a significant % of the planned tows?

Zoom Chat Questions/Comments

- **CBI:** Q&A bank for Fisheries Independent Data: <https://www.menti.com/79xzeknt8n>
- **Participant:** is the bigelow too tall to get under a windmill?
- **Speaker/Team:** Just wanted to correct my previous statement--this is the 64,000-dollar question not the 67,000-dollar question. Thank you to my fishing industry friends for helping us get this right!
- **Speaker/Team:** Just a reminder to folks---At 2:45 we can continue the dialogue on fisheries independent surveys breakout session--the science and the solutions
- **CBI:** Q&A bank for Impacts on Fisheries Management: <https://www.menti.com/yz1pjkkdvi>
-

● VI. Impacts on Fisheries Management

Mentimeter Questions

- What tools are scientists/managers using to evaluate how effort (both commercial and recreational) might change with the advent of offshore wind?
- Management addresses change all the time. So, will it just adapt as it adapts to other changes as wind development expands? or do things need to happen now (council wind committees, for example)?

- What impacts do you think offshore wind farms will have on northern right whales?
- Will the increased CTV and CVS traffic have a significant impact on fish behavior? We have no test bed for these multiple daily trips back and forth. Do we know how much time CSV is at each WTG?
- No doubt there is climatic shift of our fishery stocks and marine mammals
- The BIFW has had a positive reef effect on habitat, fish and recreational fishing, What might be the method used to assess enhanced fish abundance, enhanced fishing activity, and rec/comm. quota?
- Is it possible to predict potential management changes by looking at the historical management changes in Europe due to offshore wind?
- It's pretty hard to get management to adapt to changes. It concerns me that management will take way too long to actually make the necessary changes and industry will lose out.
- How will the management impacts differ for fixed wind infrastructure vs. floating wind infrastructure?
- For NMFS folks - what national conversations have taken place to prepare the various Councils for what is coming and how to best participate, respond and inform the OSW development process(es)
- Reef effect/interactions by the council should also be directed at the possible loss of benthic species to the area as steel in the water changes the fish food webs and also looking at biofouling
- What impacts did the cable route had in BIWF (cable to BI and the sea to shore cable to Narragansett routes)
- For the Vineyard Wind 887 Round trips per year for O&M, how many WTGs is this for? How many hours with engines on are expected? What is the potential disturbance profile and what is the baseline traffic?
- It has taken 4 years to even get a view of the Block Island research, and more time to digest this. By the time we do any science most of the Projects will be through the ROD process.
- Were the floating trap fishermen in RI who had to move their site compensated?
- Of all/most of the developers choose larger wind turbines, which is the trend, and therefore the distances between turbines would be greater, potentially much greater than 1 km, would this change thing
- Were the mobile gear fishermen that were unable to work areas due to cable depth issues compensated?
- WTGs will have to exceed 25 MW prior to the spacing optimization being challenged
- Rule of thumb is optimal spacing for energy production is 7 diameters spacing.

Zoom Chat Questions/Comments

- **Speaker/Team:** Regarding a menti question about the impacts of offshore wind on marine mammals, NMFS has published the proposed incidental harassment authorization and the ESA consultation Biological Opinion has been completed:
<https://www.fisheries.noaa.gov/action/incidental-take-authorization-vineyard-wind-llc-construction-vineyard-wind-offshore-wind>
- **Speaker/Team:** Regarding menti question about vessel traffic resulting from construction and operations of an offshore wind facility. This information is provided as part of a construction and operations plan Table 4.3-2 :https://www.boem.gov/sites/default/files/documents/renewable-energy/Vineyard%20Wind%20COP%20Volume%20I_Section%204.pdf
- **Speaker/Team:** Regarding menti question about observations of cable installation at BIWF, BOEM has the following report: <https://espis.boem.gov/final%20reports/5596.pdf>

- **Participant:** Results of seven years of demersal trawl (NEAMAP compatible) and ventless trap surveys at BIWF will be vetted and released by the end of the year and late in peer-reviewed publications. The benthic effects are in recent BOEM report
- **Speaker/Team:** The just-released-report on observations from benthic and epi-benthic monitoring at BIWF is posted here: https://epis.boem.gov/final%20reports/BOEM_2020-044.pdf

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Appendix B: Glossary of Acronyms

Acronym	Definition
BACI	Before After Control Impact study
BIWF	Block Island Wind Farm
BOEM	Bureau of Ocean Energy Management
CEA	cumulative effects assessment
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CVOW	Coastal Virginia Offshore Wind Project\
CZMA	Coastal Zone Management Act
DOI	Department of Interior
EBM	ecosystem-based management
EIA	Environmental Impact Analysis
EIS	Environmental Impact Statement
EM	electronic monitoring
EMF	electromagnetic fields
ESA	Endangered Species Act
FDD	fishery dependent data
FID	fishery independent data
FIR	fishing industry representatives (UK terminology)
FLO	fishery liasion officer
FMC	fishery management councils
FR	fishery representative
G&G surveys	geological and geophysical surveys
HMS	highly migratory species
IEA	Integrated Ecosystem Assesment
LiDAR	Light detection and ranging (type of remote sensing)
MAB	Mid Atlantic Bight
MAFMC	Mid Atlantic Fisheries Management Council
MMPA	Marine Mammal Protection Act
MOU	memorandum of understanding
NEAMAP	Northeast Area Monitoring and Assessment Program

NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act
NMFS/ NOAA Fisheries	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OSW	offshore wind
OWF	offshore wind farm
PAM	passive acoustic monitoring
PSP	paralytic shellfish poisoning
QA/QC	Quality assurance/quality control
RODA	Responsible Offshore Development Alliance
ROSA	Responsible Offshore Science Alliance
RWSE	Regional Wildlife Science Entity
SLO	social license to operate
SOE	state of the ecosystem (component of IEA)
SSB	Social Sciences Branch
VMS	vessel monitoring system
VTR	vessel trip reports
WEA	wind energy areas

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Appendix C: Breakout Session Summaries

All breakout sessions were asked to answer the following three questions:

1. **Question 1:** What are the major gaps in our knowledge? What topics would benefit from additional or expanded research despite the studies that have been conducted, due to conflicting results, limitations of scope, or lack of integration with other topics?
2. **Question 2:** What are the perspectives of commercial and recreational fishing communities on this topic? (e.g., anticipated impacts or consequences, suggested research topics and approaches) How can the knowledge of the commercial and recreational fishing communities be gathered and included to address this topic?
3. **Question 3:** What are the recommendations for future directions/studies on this topic?

Fishery Independent Surveys: Impacts and Solutions

Question 1:

- How to use collaborative (industry and NMFS) survey efforts to adapt to data collection in wind farms?
- Who is going to monitor and for how long? Need to ensure consistency and continued experience in the survey. Will also need to calibrate the gear with the Bigelow.
- On the West Coast, BOEM is working proactively with NOAA. Expectation that WC groundfish fishery will experience the largest impact. There are some analogues for floating technology but operationally the footprints are bigger and will pose bigger challenges.
- Are there other additional platforms beyond white boats and private studies? (autonomous sampling)
- How can we engage the fishing community in designing new systems?
- If you were to design turbines to allow for particular sampling methods, what would that look like? Platform itself and below surface.
- What opportunities are there to bring vessels of certain size with certain gear new wind installations? How would this impact turbine spacing and sampling capacity?

Question 2:

- Concern that the design of floating installations on the West Coast, Gulf of Maine, and Hawaii is still unknown, so it is difficult for fishermen to begin to think about what to expect. Ideally, a high-tech solution could be developed and used in all situations, but for this to happen we need to start developing it now and thinking about the implications of moored installations.
- Not all fishermen will want to participate. Additionally, when resources are short and fishermen are asked to participate voluntarily, you lose participation.

Question 3:

- Look at other successfully adapted surveys, for example scallop survey. How can new technologies bridge the gap?
- Bring together and work on restoring broken trust with commercial and recreational fishermen to use their knowledge. This will be costly, and not all fishermen will be interested and/or qualified to participate in survey and research activities.
- Bioeconomic models of behavior will need insight from fishermen.
- Need regional monitoring frameworks (ROSA) to coordinate at a federal level and reduce the state-by-state approach.

Additional Resources

- ENGIE commissions the first floating wind turbine in Portugal October 30,2020
<https://www.engie.com/en/groupe/first-floating-wind-turbine-continental->

europe#:~:text=WindFloat%20Atlantic's%20first%20of%20the,follow%20in%20the%20coming%20months

Crossroads: Where Fisheries Management Meets OSW and the Regulatory Changes Needed for Harmony

Question 1

- What is the role for the Fishery Management Councils in OSW permitting and planning? Currently mostly information sharing, interpretation of fisheries data, starting to look at cumulative effects, adaptation (gear, management, fishing behavior, targeted fisheries, etc.). Need for a structured approach to address issues through the Council, this will also require resources.
- OSW impacts to gear conflicts and competition for space. Still do not know how much mobile gear fishing will take place in wind farms, making predictions about fixed gear difficult.
- Structures may aggregate recreational behavior and may lead to exceeding limits. Will require some behavior modeling.

Question 2

- Biggest issue is industry's access to fishing grounds.
- Struggle for industry to get a seat at the table early on in the siting process. Want to make sure that they have an effective role in the process and participation can be real. Need for strong partnerships with state and federal agencies, Councils, etc. to achieve this.
- Fishermen did not agree to the 1x1 grid. How will we be compensated for loss of grounds whether that is financially or having other grounds opened up to us? That invites habitat issues.
- On the issue of gear innovation—will there be some sort of funding avenue for new gear and new gear experimentation?
- How do we ensure those species like black sea bass or scup are still going to be accessed and not shut off by a further limited access system?
- Reef effect and aggregation may reduce CPUE for rec fisheries, getting to limits faster. Need to understand if species are aggregating or if biomass is increasing.
- Gear changes creates new problems, is not very nimble and may not be productive. And may not be realistic for many regions.
- Understanding the relationship of OSW on onshore infrastructure, coastal communities and jobs is important.
- A lot

Question 3

- S-K grants may provide funding sources to explore gear types.
- Could we develop partnerships to conduct research that not only determines conflicts but also provides useful information to fisheries?
- Fishery dependent data from recreational fishing is not widely available. What are the research needs for rec anglers?

Additional Resources

Other Fish in the Sea: How to Improve OSW Planning in the Context of Data-Limited Fisheries?

Question 1

- ME lobster fishery is very data limited.

- CA catch records are in a 10x10 square mile block, this is not discrete enough to inform OSW planning process. CA Ocean Protection Council (OPC) is providing some support to the state by funding projects and studies that could support policy development and regulations within state agencies.
- What is spatially “too discrete” to adequately inform regulatory and siting decisions?
- How do protected species regulations play into this? Particularly for the North Atlantic Right Whale.
- Data ownership, confidentiality and trust are big issues.

Question 2

- Increase in reporting in some of these historically data-poor fisheries is coming (100% reporting in ME lobster fishery by 2023, increase use of technology similar to VMS, etc.)
- Building trust with harvesters is important because that data will help the fishery.
- Over reliance on AIS data. In some fisheries most boats are <65 ft and AIS can be turned off past 12 nm. Also AIS is publicly available, which means fishermen lose control over their proprietary business information of how and where they fish.
- Fishermen should own data. Agencies should have limited window to review data for a specific purpose. Creation of ways to consolidate data within an industry group.
- Cost to fishermen of AIS and VMS should not be overlooked.
- Concern that data poor fisheries will be where wind farms are sited (similar to what happened with the monument and lobster fishery). Fishermen should collect and own their own data now so they can prove their historic grounds
- MLA did a mapping project with fishermen in 2012 but there was no buy in from management and did not pass NEPA.

Question 3

- OPC is working with CA agencies and academics to address data gaps and include relevant data on fishing activities.
- Opportunities for CA SeaGrant to serve as a connector as they have in the past with wave energy proposals.
- Cumulative and future look of fisheries that may be impacted by climate change.
- How to make qualitative social-scientific derived tools for mapping fisheries in the interim while we get data collection tools modernized? And how can we ensure agency buy-in?
- Recreational fishery on West Coast is not characterized.

Additional Resources

- MLA mapping project <https://www.whoj.edu/page.do?pid=126462&tid=3622&cid=133370>
- Fishing effort data paper: <http://dx.doi.org/10.1080/00330124.2014.883956>

Fisheries Information Modernization: Big Data or Big Brother?

Question 1

- A tech solution cannot always be applied to a systematic social problem. Systematic problem is ensuring accuracy of reporting in fisheries. Should separate the use of data between science and enforcement to ensure we get the accurate information for the science.
- A lot of “small data” could be collected and stored with devices held by industry. Processing that data is a big lift as well as how to get that data to the right place (which requires trust).

Question 2

- Industry puts in a lot of effort to provide information, but it doesn't lead to meeting their needs in management decisions. Often fishermen get “punished” for good behavior when data collected is used against them.
- Knowledge trust is critical. There are select individuals/academics who fishermen trust.

- There have been big shifts in thinking by fishermen to collect data. Previously fishermen did not want anyone to know where they were fishing; now there's incentive to be able to claim OSW has an impact.
- Trust is the biggest hurdle.
- Need to separate data collected for enforcement and science.

Question 3

- Industry data can tell us a lot about ecology that may not be evident in FID. Working with industry to develop hypotheses about what is occurring can be analyzed by "big data" and used to inform our understanding.
- Collaborative research can be very successful. Doesn't work for all fisheries (such as hook and line), but there may be opportunities for 3rd party data holders to act as intermediary.
- Need to involve stock assessment people and managers early in the process.
- Develop peer-reviewed, repeatable analysis with OSW developers to ensure data is aligned and to avoid "dueling science".

Additional Resources

- https://www.researchgate.net/publication/233160771_Description_of_a_Simple_Electronic_Logbook_Designed_to_Measure_Effort_in_the_Gulf_of_Mexico_Shrimp_Fishery
- <https://www.tandfonline.com/doi/abs/10.1577/M02-105>

Beyond Data Collection: Best Practices in Interpretation through Cooperative Research

Question 1

- The list of potential research questions is daunting. Need to have clear regional priorities of what monitoring we want to see and how we want to see it executed.
- Collaboration between developers for surveys and data collection could improve.
- How can we account for differences and understand the impacts of OSW when looking at fishery dependent data going forward? This will be hard to track when management changes.

Question 2

- Zoom is not a great way to get fishermen involved. Meet fishermen at the docks and council meetings.

Question 3

- Shift towards a collaborative approach. Cooperative research can help fill the gaps.
- Fishermen involved in the prioritization process (research and monitoring)
- ROSA development of interim guidance on monitoring. Need to use sampling gear and sampling protocols to enhance comparability of the data as much as possible.
- When interpreting data, take time to discuss your results with fishermen and get their perspectives to help you with your interpretation.
- Adhere to protocols for existing surveys.
- Priorities for cooperative research in relation to OSW:
 - Access (how it might be impacted) & fishing within a WEA
 - Collective single set of monitoring priorities is a huge challenge
 - Economic impacts
 - Threshold for safety when fishing in WEA
 - Conflicts between fishermen and gear types that are going to be used.
 - Managing mental health of fishermen.

How to Prioritize Research?

Question 1

- Drive research using social needs, with reality checks throughout and a thoughtful beginning and end of the process.
- Need to understand the factors and effects before making investment in determining priorities (rather than just asking questions).
- “Voting” on priorities does not mean the consensus aspect is considered; different levels of involvement/informed voters.
- Priorities at different time scales: short-term basic research studies that can potentially identify causal effects and long-term operational monitoring programs that need to collect consistent time series data to be successful.
- Baseline time period is disappearing quickly.
- Are there lessons and/or processes from Hurricane Sandy or the BP oil spill that are relevant?
- Are identified knowledge gaps and research needs/recommendations in comparable industries (such as wave and tidal energy) transferable?

Question 2

- Fishermen are left out of the conversation, so there needs to be a separate fund and set of priorities for independent research making impacted fishermen a priority.

Question 3

- Use a risk assessment process to help with prioritization.
- Use ROSA to vet overarching priorities and then others to develop projects.
- Models to consider: 1) multi-sectoral RFP process that is highly transparent and inclusive (Ri-MA-BOEM approach); (2) a vulnerability and risk assessment approach (like climate vulnerability analysis); and (3) a crowdsourcing approach.
- Want to be consistent with information collected for long-term research needs, and improve data sharing. Even for a specific area, it would make it easier to integrate the data into future projects.

Additional Resources

- Species vulnerable to climate change:
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0146756>
- Northeast habitat climate vulnerability assessment:
<https://www.fisheries.noaa.gov/national/climate/climate-vulnerability-assessments>
- Gaps and needs for wave and tidal energy: <https://tethys.pnnl.gov/publications/state-of-the-science-2020>