

Synthesis of the Science

Interactions between Offshore Wind Development & Fisheries

Plenary Notes | October 16, 2020

Developed by the Consensus Building Institute

Estimated Day 2 [Attendance](#): ~310

I. Day 2 Summary

On 16 October, as many as 310 participants engaged on-line in the second of three full days of Synthesis of the Science (SoS) on interactions between offshore wind development and fisheries. The second day concluded oceanographic and biological topics by discussing zooplankton and phytoplankton. The remainder of the day was dedicated to socio-economic issues. An introductory keynote was presented by Merlin Jackson from the United Kingdom's Thanet Fishermen's Association

For a second 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:

- Fishing operation effects
- Economic effects
- Socio-cultural effects
- Cumulative impacts, resilience and adaptation

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

1. Sharing the Ports: Evaluating Challenges and Opportunities
2. Focus on Floating: Different Structures, Different Conditions
3. Integrating Fisheries and Wildlife, RWSE, and ROSA
4. Dock to Plate: Market Considerations
5. Safety at Sea

The second breakout topics included:

1. New Fisheries, New Entrants, New Gear? The Realities of Adaptation
2. Perspectives from Small Communities
3. Perspectives from Vertically Integrated Businesses
4. What's Perception Got to Do With It? Socioeconomic Research, "Stakeholder & Rightsholder Engagement," and Participatory Governance
5. Case Study: Cumulative Socioeconomic Approaches to Understanding Effort Displacement

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

I. Phytoplankton & Zooplankton

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

Presenter: Kevin Friedland, NOAA Fisheries

Moderator: Elizabeth Methratta, NOAA Fisheries

- Chlorophyll concentrations have changed in recent years, suggesting a new range of variability in primary producers than observed earlier.
- Zooplankton abundance and communities are also variable, in particular a key taxon in the Mid-Atlantic Bight (e.g., *Centropages typicus*).
- Fish habitat models show a high reliance on primary and secondary production predictor variables suggesting lower trophic levels are important to these species.
- Concern w/ foundation effects on water column structure and properties in relation to lower trophic level production.

Plankton | Q&A Session

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

- **Turbidity.** Does turbidity (and/or turbulence and wake impacts) substantially affect the life cycle of phytoplankton and zooplankton?
 - Any turbidity issue has potential to affect phytoplankton primary productivity. Additionally, several fish predators are highly dependent on their ability to see through the water column.
- **Expanded mixed layer impacts.** What is the potential for the OSW structures to bring in nutrient-rich colder water to feed the phytoplankton and increase primary productivity?
 - Yes, it's possible. The mixed layer depth may increase due to the installed structures and nutrient-rich deeper waters may up well into the surface layer; however, not certain how that will affect primary production (e.g., potential negative impacts to primary production if mixing brings phytoplankton down too deep outside of the photic zone).
- **Chlorophyll variation trends.** If the inner vs. outer Mid-Atlantic Bight is more influenced by river discharges vs. wind mixing, is chlorophyll higher in winter months throughout the MAB, or does that pattern vary with distance from shore?
 - Haven't explored that specifically for MAB but expecting that they track each other.
- **Anoxic risks.** Is it possible for chlorophyll concentrations and productivity to be enough to create areas of low oxygen concentrations (O₂ Minimum Zones)?
 - Yes, it's possible and has occurred in the past --- certain areas in MAB (e.g., depressions in the terrain) can retain nutrients and cause low oxygen stress.
- **Red tide and Paralytic Shellfish Poisoning risk.** Is there a possibility for red algal blooms and paralytic shellfish poisoning (PSP)?
 - Under the right circumstances, yes.
- **Seabird impacts.** What is the potential for sea birds to have an impact on nutrient inputs (If turbines and associated structures attract a large number of birds)?
 - Unsure if birds contribute a tremendous input of nutrients or recycling.
- **Filter feeder impacts.** Are the filter feeding organisms that will attach to the turbines likely to reduce the abundance of plankton and significantly affect the system overall?
 - Yes, although it's unknown whether there will be enough substrate and colonized with filter feeders to modify the larger system.
 - [From Participant]: Several papers in Europe talk about an excess of mussels building their structure on wind turbines up taking too much phytoplankton from the food web

"e.g., Slavik et al 2019 The large-scale impact of offshore wind farm structures on pelagic primary productivity in the southern North Sea. *Hydrobiologia* (2019) 845:35–53 <https://doi.org/10.1007/s10750-018-3653-5>

- **Food chain impacts.** How might OSW energy might affect food chains overall?
 - If wind farms and associated structures are high in numbers and density, structures may instigate more mixing in the water column to make a major demonstrative change (unsure if more or less productivity).
- **Habitat dependence.** Of the species identified as more or less dependent on “lease” area habitats, how unique are these species to the lease areas?
 - We used a rating system that looked at 1) habitat importance score for a taxa within the lease area, and 2) habitat score outside of the lease area (help convey balance of the ecosystem). High scores for both emphasized how important the regions or areas are to a particular taxa.
- **Other bottom habitat impacts/considerations.** It is of critical importance to immediately assess the areas of glacial moraine and benthic habitat -- the work on relative importance of the structure v. physics v. productivity. Is it public?
 - [From Day 1 speaker]: The question on glacial moraine is about the value of differences in bottom habitat structure to the larger view that Kevin [Friedland] is investigating. I don't believe it is an input to those models.
- **Examples from Europe?** Do European windfarms show patterns of higher productivity within/around the windfarm?
 - Not much has been done on this topic to date.
- **N Atlantic/MAB vs. other regions.** What is unique about this region to make us think differently from the other regions of the oceans? When we think about this, what jumps out as significant or unique?
 - Unique: Continental seas are unique from the world's oceans (facilitate high productivity) where a relatively small fraction of the world's oceans represents a dominant fraction in seafood production. Similar: Lots to learn much from other areas that have OSW.
- **Thresholds.** Are there thresholds of productivity change that warrant concern?
 - Concern already exists -- the chlorophyll concentrations in the region (previously high concentrations characteristic of high-yield fishery systems) have declined to concentrations more typical of lower yield systems. Underscores the need to track other non-OSW force factors like climate-induced productivity changes.
 - [Participant] Warming is affecting primary and secondary production, and wind farms may as well.
- **Regional data compilation.** Is there an existing region-level data collection system for phyto- and zooplankton (primary AND secondary variables)?
 - For phytoplankton, we can use satellite data to analyze spatial and temporal changes in surface water chlorophyll. For zooplankton, we rely on Northeast Fishery Science Center seasonal net capture surveys. We'd like to continue these methods to support a project's Before-After comparison in the plankton community; several folks have been discussing how to continue the survey work going forward.
- **Inherent complexity.** How these many variables interact is highly complicated, and it's unlikely we'll be able to really know or predict the ecosystem impacts from OSW.

II. Keynote: Socio-Economics, Fishing, and Offshore Wind Energy

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

Merlin Jackson, Thanet Fishermen's Association

Current gaps and challenges

- A major gap that requires attention: cumulative impacts that considers or accurately measures the nuances of commercial fishing (e.g., seasonal variability, different methods, etc.) and potential in-combination effects (e.g., expanding/changing fishing grounds, other OSW projects simultaneously being constructed, number/size of OSW-related vessels post-construction, etc.). Requires better engagement and sharing information between OSW industry, licensing authorities, and fishermen.
- Current gaps/inadequacies in UK's license assessment criteria include: permanent loss of fishing grounds related to certain fishing methods (e.g., impacts of cable exposures); and assuming fishermen have adapted to existing wind farms and therefore existing wind farms are not included in cumulative impact assessments.

Recommendations

- Fishermen and their associations have major difficulties keeping pace with the increased development licenses and proposed projects moving forward. Associations require funding and support to improve engagement and relationships.
- Create accurate data sets for vessels (created w/ fishermen input, review, and buy-in)
- Better leverage fisheries liaisons and fishing industry representatives (FIRs) (engage FIRs early in the planning development phases)
- Create regional cross-sector groups (developers, FIRs, licensing authorities) to review and provide input on proposed projects for wind farms and cable routes (able to apply more strategic and holistic evaluation of the system).

Keynote | Q&A Session

- **Exposed cables.** How often are cable exposures problematic to the fishing community, and are exposed cables going to become the norm in the future?
 - Yes, predicting that cable exposures are a reality and currently are not adequately considered in assessments. Adapting to exposed cables and ensuring fishermen are aware of the cables are important. Encourage developers to include fishermen, particularly when designing remediation options. Most likely certain methods like bottom drift won't be compatible with exposed cables or a rocky berm installed as a remediation measure.
- **Cable buffers challenge.** In Europe, there is a recommendation for a 0.25 nautical mile buffer around the cables, which adds up to a substantial amount of lost fishing grounds.
- **Dredging types.** What kind of dredging activities are the concern you mentioned?
 - Aggregate dredging (multiple active dredging licenses).
- **Qualifications for fishing vessels for research.** Is Europe also facing the challenge of very onerous criteria (list of inspections, equipment, certifications, etc.) for a fishing vessel to qualify and help with monitoring and data gathering?
 - Yes, the criteria have increased. It's almost becoming not a mitigation option.
- **Reflection.** If you travel back in time 15 years, what would you do differently?
 - Advise the fishermen to engage early and stay engaged (especially reviewing cumulative impact assessments). The scale of OSW is much greater than we expected.

III. Fishing Operation Effects

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

Panelists: Mike Conroy, Pacific Coast Federation of Fishermen's Associations | Fred Mattera, CFRF | Tom Sproul, URI | Talya Tenbrink, NOAA Fisheries

Moderator: Angela Silva, NOAA Fisheries

- **Radar Interference.** There is a proposed study w/ Vineyard Wind and US Coast Guard (currently delayed due to COVID); survey conducted at Block Island – potentially limited due to small size of scope. Recommending alternative study occurs in the UK given that there are more turbines, different vessel types and sizes with different radar technology to test. Important to include fishermen in study design.
- **Insurance.** two types (Hull & machinery and protection & indemnity) that should be adapted for OSW (e.g., policy exclusions)
- **Navigation Safety Risk Assessments for OSW.** Need to improve ability to evaluate insurance claims more rigorously and establish system of standards with clear reporting requirements for developers & policy improvements. Recommend as near-term approach – better modeling of accident probabilities. Bottom-up modeling that better estimates vessel's risk at closer distances to turbines. Recommend a longer-term approach – explicit consideration of loss of life and probability, (search and rescue costs) and how will vessels adapt.
- **Integrating social and ecological research (Block Island Wind Farm. BIWF example).** Integration of social science with biological data is important but includes several challenges – integrating qualitative and quantitative data; mismatch of temporal and spatial scales; mismatch in targeted fish species; and framing of the issues. Benefits include: aligning goals aided study design (including identifying focus of specific analyses) and building relationships (can be built upon and leveraged in the future for other projects).
- **West Coast.**
 - **What we know** – We know there will be major impacts from OSW, there will be closures for certain gear types, and expecting there will be more floating OSW designs on the West Coast.
 - **What we need to know** – More specifics on the design and impacts of floating OSW including cables design; what fisheries, gear types, and operations will be compatible; potential for fish aggregation (potentially negative impact if fishing prohibited near OSW structures); impacts to long-running surveys (because many west coast fisheries' catch limits are based on long-running surveys); and infrastructure impacts (include portside infrastructure repurposing).

Fishing Operations | Q&A Session

- **Incorporate diverse fishing activities into the navigation risk assessment.** Can you incorporate different fishing activities, particularly recreational fishing (e.g., rod & reel) occurring along with commercial fishing into the risk assessments?
 - Ideally, we should include recreational fishing activity, but it is very difficult to do so. We are working on micro-level vessel (large vessels) tracking to better model vessel movements. Virtually no data exists on small vessels though.
 - [Comment from participant]: Consider looking at how recreational vessels interact with current artificial reefs.

- **Other ocean activities into navigation risk assessment.** How do you incorporate other boat traffic (e.g., construction, maintenance, etc.) into the navigation risk assessment model?
 - It is a known source of risk (1-2 accidents have occurred in Europe), but also difficult to address. Current assessments aren't able to incorporate this more micro-level of detail.

IV. Economic Effects

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

Panelists: Ben Galuardi, NOAA Fisheries | Guy Simmons, Sea Watch International | Daphne Munroe, Rutgers University | Eric Thunberg, NOAA Fisheries

Moderator: Angela Silva, NOAA Fisheries

- **Economic Effects for Commercial Fishing.**
 - *Business:* (loss of access to wind energy areas (WEAs) reduced fishing areas, potentially more conservative management due to uncertainty, reduced jobs)
 - *Environmental:* (impacts to Cold Pool, EMF, and turbidity)
 - *Operational and Safety:* (turbine spacing, interaction with certain gear types, and transit around WEAs)
- **Developing framework for spatial data support and fishery impacts.** Framework needed to address the large number of varying data requests from developers for proposed projects. NOAA and partners developed a framework for standardized data support and standardized metrics of economic impact: R-Package (allows for replicability and reproducibility, ensures standardization, is shareable, and supports confidentiality of proprietary information). Involves a model that incorporates gear and trip duration to estimate the spatial extent of fishing trips and associated revenues. Currently only have commercial fishing data; next steps include adding recreational fishing and developing predictive models of fishing effort redistribution.
 - Example end product: reports and downloadable datasets of previous fishing activity to help estimate socioeconomic impacts of OSW projects and inform monitoring plans: <https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development>
 - Advantages to this broad-scale approach include the ability to analyze cumulative effects (e.g., more informed analyses of adaptation in response to displacement)
- **Assessing economic impacts, Atlantic surf clam fishery example.** The surf clam fishery is vulnerable to OSW impacts (incompatible gear methods - hydraulic dredging, large vessels needing to navigate around wind farms and extended travel time, etc. Research team used spatially explicit, Ecological, agent-based Fisheries and Economic Simulator (SEFES) to simulate the ecology, fishery activity, management decisions, captains' considerations and decision-making, and market behavior under different scenarios. Currently adding data and validating the model. Input from fishermen is key to support a holistic view on the economic impacts and fisheries vulnerability.

Economic | Q&A Session

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

Economic Impacts

- **Positive impacts.** Suggest studying the positive impacts of wind farms, particularly for recreational fisheries.

- **Telecommunication cables.** Have there been incidents of the fisheries dredging telecommunication cables?
 - Possibly. Certainly an issue to be aware of and incorporate into the science.

Standardized data framework and reports

- **Translating point data to likely spatial extent.** How did you account for fishing activity variability with the VTR data (which captures course center point)
 - We used information from observed trips to develop a predictive model of where the fishing trip footprint likely occurred. We chose VTR data because we could use this for every fishery and across all regions.
- **Landing data from a small number of vessels.** Do you incorporate landing data from trips involving less than three dealers/harvesters/vessels?
 - If reported, falls into the “All Other” category.
- **Tool availability.** How can interested entities like developers access the R-package tool?
 - The R-Package tool is internal, but the results are publicly available.

V. Breakout Session 1

1. Sharing the Ports: Evaluating Challenges and Opportunities
2. Focus on Floating: Different Structures, Different Conditions
3. Integrating Fisheries and Wildlife, RWSE, and ROSA
4. Dock to Plate: Market Considerations
5. Safety at Sea

See Appendix C for Breakout Summaries

VI. Socio-Cultural Effects

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

Panelists: Monique Coombs, Maine Coast Fishermen’s Association | Madeleine Hall-Arbor, Fisheries Anthropologist | Talya Tenbrink, NOAA Fisheries
Moderator: Angela Silva, NOAA Fisheries

- **Impacts to Fishing Communities.** Shoreside communities and fishing support industries/businesses are also vulnerable to OSW-fisheries impacts. Important to remember communities and the groups within the communities are unique and have diverse values and perceptions to consider; one major risk is the potential for inequitable distribution of costs and benefits across the fishing industry and shoreside community. Recommend supporting diverse stakeholder engagement in participatory decision-making (e.g., advisory groups that capture diversity of interests, build trust, address conflicts, leverage knowledge and experience, and help address inequity) through a transparent process with the goals of building resilient and equitable communities.
- **Fishermen Associations (Maine Coast FA example).** Working waterfronts are also diverse (Maine has large lobster dealers as well as smaller discrete working waterfronts -- small piers, often most susceptible to climate change impacts and lacking funding for adaptation, etc.). Important for industry and others to understand and consider the entirety of a fishery’s supply chain for thoughtful and realistic conversations about working together to occur. Also mental health support and resources needed to support commercial fishermen (fishing isn’t an industry, but a way of life). Important to validate the challenges associated with the fishing industry

(industry volatility, job insecurity, etc.), and that OSW is just one of many concerns for fishermen.

- **OSW projects and fisheries: conflict & engagement in UK and US examples.** Multiple examples of successful co-location exist (particularly with fixed gear methods); barriers still include concerns with liability and safety, access loss, and developers' demands for licensing. Two major aspects for helping communities adjust to OSW transition include 1) compensation (e.g., opportunities to diversify or supplement income) that also acknowledges and addresses deeper meanings and tradeoffs (e.g., concerns with loss of skills, heritage, way of life, etc.), and 2) participation in decision-making processes (e.g., marine spatial planning discussions and considering scale and cumulative effects of wind projects). Meaningful engagement includes eliciting input from diverse perspectives early in the process, continuing/maintaining engagement, building relationships (personal interactions), visiting ports, and providing easily available and understandable information and outputs. Compensation for participation (e.g., payments) helps address several barriers to engagement (e.g., differences in power dynamics). Multi-stakeholder institutions like RODA exemplify innovative approaches for improved engagement, but not 100% guarantee to solve problems (therefore, discussion needs to be ongoing).

Socio-Cultural | Q&A Session

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

- **Disproportionate participation and limited capacity.** In the UK, observed that developers have done due diligence to invite fishermen to discuss a potential OSW project license, but fishermen frequently lack the ability to participate (time, expertise, opportunity cost of not fishing). Often rely on fishery liaisons or association representatives, who also are having capacity constraints to keep up with the growing number of proposals.
- **Differences in equitable participation.** What lessons learned or research is available that can give insight on how to balance the economic inequality to participate (e.g., not paid or compensated for engaging)?
 - Perennial issue. Fisheries liaisons and RODA help represent fishermen interests who are unable to fully participate in some efforts. Some information booklets and guidelines exist to help educate and encourage fishermen's engagement.
- **Appropriate communities to engage.** The closest onshore community is not always the appropriate and/or only community to engage – need to identify and engage the affected fishing community.
- **Sustaining long-term engagement.** Any advice on how to sustain engagement over longer periods of time (~10+ years)
 - Behave in ways that build relationships and trust (e.g., follow through on promises, continuing conversations, clearly communicate information needs and purpose, report back to fishermen to foster accountability and transparency, etc.). Go to where the fishermen are (e.g., go to meetings they already attend). Clearly and honestly communicate sideboards/limitations (e.g., not the decision-maker).
 - [Participant]: Very important but challenging to get the younger generation of fishermen to participate on boards or in meetings (reasons vary: lack of time, experience, confidence, etc.).
- **Meaningfully incorporate input.** Fairly common that fishermen have little trust and willingness to engage with developers due to past experiences where fishermen input had little to no

impact on the final outcome. More honesty may help, but not a guarantee for productive engagement and co-existence.

- **Including decision-making authorities.** Important to include the regulatory authorities early in the process to help ensure the options and negotiated agreements are compliant with regulations and policies.
 - Agree that it's been an ongoing challenge for a diverse group to advise on a solution, and a different entity retains decision-making authority that may not align with the advisory group's recommendations.
- **Analyzing community and commercial fishermen impacts.** Any study to date or planned on impacts that create diminished infrastructure and supply chain function and the feedback effect.
 - It has been an issue of discussion, but unsure about exact studies.
- **Multi-generational.** several fishing-related businesses also concerned with ensuring business viability for the next generation. Seeing the younger generation currently struggling.
- **Impacts of aggregated regulations and policies.** Several other existing and expected rules/restrictions/regulations compile and pose a major risk for fishermen to run out of viable areas for fishing (particularly in the mid-Atlantic). Need developers to be flexible in project designs to minimize impacts on fisheries.
- **Priority concerns.** How do fishermen/port communities/fishing communities perceive/rank the risks of climate change vs. OSW vs. regulations, etc.?
 - Climate change is a major issue, but it's one of many concerns. The issues also manifest as concerns using different language or perspectives (e.g., mylar balloon pollution).

VII. Cumulative Impacts, Resilience, & Adaptation

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

Panelists: Teresa Johnson, UMaine | Tim Novotny, Oregon Dungeness Crab Commission | Carrie Pomeroy, University of California Santa Cruz | Ron Smolowitz, Fisheries Survival Fund
Moderator: Fiona Hogan, RODA

Marine space use considerations

- **What we know** – Ocean is a busy place. OSW and fisheries consider many of the same parameters (e.g., oceanographic conditions, space to operate, regulations, etc.), but in different ways. Fisheries are diverse, complex, dynamic, and interrelated.
- **What we need to know more about** – Reliability, validity, and utility of existing data. Characteristics of valued spaces and uses. Factors that influence where, when, and how people fish (within and across fisheries). How OSW scenarios affect fisheries and communities (individually and cumulatively).

Other non-OSW concerns

- Several non-OSW concerns (and often interrelated) that fishermen are tracking (west coast focused): aging (and sometimes unsafe) infrastructure, fishery temporary closures, increase in whale gear entanglement, proposed efforts to restore marine mammal predators (MMPA limits ability to adapt and manage populations), algae blooms and domoic acid toxicity, COVID, etc.
- One affected fishery often cascades to affect the other fisheries.
- Crucial for people to establish and maintain an open line of communication from the beginning, ensure sharing information, better understanding of each other.

Fisheries Development

- Renewable energy advancing quickly. Need adaptive management approach as it will be challenging for science to adequately predict OSW impacts. Shellfish fisheries need future support (expecting these fisheries won't be allowed in the same areas as the OSW project area).
- Need to establish funding sources for fisheries development. More support for the survey technologies and monitoring to assess the marine resources. Need resource-wide stock assessments (NMFS can play a role in leading that effort); fisheries and developers can help advocate to help ensure NMFS is adequately funded.
- Additional predicted concerns - Potential social justice issue for those who can't afford fishing vessels etc. and lose ability for fishing from shore/piers (if fish attracted to OSW structures); potential redistribution of predators like seals (followed by sharks) attracted to the structures and the area, which may impact recreation/tourism industry.

Social License to Operate (SLO)

- SLO is a similar concept as social carrying capacity to identify the amount of development that a community is willing to allow. Developing and establishing SLO is dynamic and requires substantial effort; however, it is widely recognized that social/public acceptance is important, as it's a critical factor constraining renewable energy development. Need to consider under what conditions might communities more likely grant a SLO, what/how to maintain a SLO, and if/how incorporating SLO in the decision-making process. Also, does the community view the decision-making process as fair, costs and benefits are fairly distributed, and level of trust among the entities involved (developers, decision makers, researchers, etc.). process example: Maine Tidal Power Initiative – transdisciplinary research framework and diverse stakeholder groups

VIII. Breakout Session 2

1. New Fisheries, New Entrants, New Gear? The Realities of Adaptation
2. Perspectives from Small Communities
3. Perspectives from Vertically Integrated Businesses
4. What's Perception Got to Do With It? Socioeconomic Research, "Stakeholder & Rightsholder Engagement," and Participatory Governance
5. Case Study: Cumulative Socioeconomic Approaches to Understanding Effort Displacement

See Appendix C for Breakout Summaries

Plenary Notes | DAY 2 | October 16, 2020
Appendix A: Full Mentimeter and Zoom Chat Entries

I. Phytoplankton & Zooplankton

Mentimeter Questions

- Does Turbidity affect the production or life cycle of Phytoplankton and Zooplankton?
- I am very interested to know if introduction of the foundations will cause a persistent phytoplankton bloom due to enhanced mixing as seen in the wake images.
- A lot of new references here, it would be good to get a list of relevant citations.
- Kevin's research suggests that primary and secondary production variables should be integrated in offshore wind monitoring programs.
- Could Kevin speak to the impact of wind farms on NMFS abilities to continue to collect critical regional ecosystem data such as presented?
- Kevin showed a ranking of species that are more or less dependent on "lease area habitats" -- how unique are they to the lease areas?
- It is of critical importance to immediately assess the areas of glacial moraine and benthic habitat, the work on relative importance of the structure v. physics v. productivity. Is it public?
- Do European windfarms show patterns of higher productivity within/around the windfarm?
- Are there potential benefits of the installation of structure on phytoplankton and zooplankton?
- Would it be fair to summarize Kevin's presentation as: warming is affecting primary and secondary production, and wind farms may as well?
- Are the filter feeding organisms that will attach to the turbines likely to reduce the abundance of plankton and significantly affect the system overall?
- Are there thresholds of productivity change that would make you say, "Stop building wind farms!"
- If the inner vs. outer MAB is more influenced by river discharges vs. wind mixing, is chlorophyll higher in winter months throughout the MAB, or does that pattern vary with distance from shore?
- If we do see greater productivity/blooms from wind mixing, would it be possible to see lower oxygen concentrations and even OMZs?
- This is all complicated. We do not know what will happen. We may have increased mixing > increased productivity (local and in the large wakes [km]) > increased consumption of phytoplankton coming in +
- "What is unique about this region to make us think differently from the other regions of the oceans? When we think about this, what jumps out as significant

Zoom Chat Questions/Comments

- **CBI:** A comment we have received and will definitely take up in the writing of the Report in the months to come is to include citations.
- **Participant:** Do seabirds add important nutrients for plankton?
- **Speaker/Team:** The question on glacial moraine is about the value of differences in bottom habitat structure to the larger view that Kevin [Friedland] is investigating. I don't believe it is an input to those models.
- **Participant:** (Cann you) Make some educated guesses of how offshore energy might impact food chains?

- **Participant:** Several papers in Europe talk about an excess of mussels building their structure on wind turbines taking too much phytoplankton from the food web - I apologize I missed your talk - are you familiar with those papers?
- **Participant:** e.g., Slavik et al 2019 The large-scale impact of offshore wind farm structures on pelagic primary productivity in the southern North Sea. *Hydrobiologia* (2019) 845:35–53 <https://doi.org/10.1007/s10750-018-3653-5> compared to historic (2003-2013) observations: accumulation of epifauna (blue mussel) on turbine structures affects pelagic primary productivity in the southern North Sea. It is to be expected that filtration sustains a longer bloom through faster nutrient recycling and also supports higher productivity in regions that receive nutrient-enriched and phytoplankton reduced water masses from OWF areas by currents. Even though the decrease in primary productivity is relatively small, it extends over a large area and intensifies in close proximity to OWFs, reaching a maximum reduction in annual net primary productivity of 8%.
- **Participant:** Ecosystem impacts of the changes in physics brought about by wind energy development at scale are likely to be complex and can be non intuitive. What Kevin is saying is that we know a lot but not enough. A large scale professional whole system simulation is required before doing this ecosystem scale “empirical experiment”
- **Participant:** What about the possibility of increasing red tide and PSP?

II. Keynote: Socio-Economics, Fishing, and Offshore Wind Energy

No Mentimeter Questions

Zoom Chat Questions/Comments

- **Speaker/Team:** Please see Jens Floeter's paper, which links empirical data on physical oceanographic variables with the pelagic community.
- **Participant:** Can you clarify what you mean by dredging? Like harbor maintenance or something else?
- **Speaker/Team:** Homarus Strategies : If you could travel back in time 15 years what would you do differently?
- **Speaker/Team:** Jens Floeter's paper: <https://www.sciencedirect.com/science/article/abs/pii/S0079661117300381>
- **Participant:** Do you find the crew members lost to wind energy are the more experienced?
- **Participant:** Great keynote, thank you.
- **Speaker/Team:** [To Participant] I think he is referring to dredging for aggregate
- **Participant:** Thanks for a great insight into your experiences. What has been the experience in terms of finding fishing industry representatives both regionally and project-specific?
- **Participant:** "Offshore wind transmission export cable failures.pdf" at: <https://documentcloud.adobe.com/link/track?uri=urn:aaid:scds:US:e3100642-3321-46b0-b0a6-baedc7ce7988>
- **Participant:** What is the burial depth of the cables that are exposed?
- **Participant:** 80% of insurance claims are due to cable exposure
- **Participant:** Curious to know more about intended or actual burial depth of the cables that Merlin is speaking of.
- **Participant:** Explain better the comment about fishery liaisons at a regional level
- **Participant:** How have fishermen felt about these supplemental OSW opportunities?
- **Participant:** [To a previous commenter] could you explain more? Here in US? Mid Atlantic? By damaged vessels?

- **Participant:** [To a previous commenter] from the report European report with consultant firm and insurance actuary that link you can download from"

III. Fishing Operation Effects

Mentimeter Questions

- Question for Merlin - how much spacing between turbines does he think is needed for safe navigation and fishing?
- USCG said radar issues in wind farms can be resolved with a bit of training and perhaps moving the radar head. Can we consider the topic settled and move on to other critical issues?
- There was a series on RADAR interference by the US DOE. Fred there? In one of the sessions, Ed Leblanc and another USCG person showed results from a study in Europe wind farms. Any comments on this study?
- Fred: Is insurance required for commercial fishing like in other activities?
- The recreational and for hire community have concerns about the spacing of the units and safely fishing or operation in the arrays as well as fishing for large pelagics in arrays with spacing < 1.5 m
- Far more issues than toggling on the gain
<https://www.energy.gov/eere/wind/downloads/offshore-wind-turbine-radar-interference-mitigation-wtrim-webinar-presentations>
- WTRIM Wind Turbine Radar Interference Mitigation webinars by the DOE with outstanding not-solved issues listed on comment above
- Tom: Why would the statistical distribution be a bell curve (strike risk models) when there are bias due to wind and surface current?
- How many vessels tend to be at the WEA working on the turbines (for example)? If there are more vessels out there close by that could help a vessel in distress change risk? Is this part of the model?
- BIWF has one to two (or more) trips on average out to the 5 WTG farm, with 1000's of wind turbines, many more support vehicles are going to be in the water, is this included in the assessments?
- rod and reel could have safety issues if the spacing is less than 1.5 miles if hooking into a large pelagic. less concerns with groundfish
- Re. Mike's comment on "safety zones" restricting access around the turbines--who would have authority to establish these?
- What is the typical spacing between turbines in existing UK wind farms?
- There was an excellent presentation on engineering aspects of floating wind technologies presented at Maine Fishermen's Forum in March. Akers Offshore WInd 101.
<https://mainefishermensforum.org/wind-s>
- Do cables running through the water column to anchor floating turbines concern fishermen more than fixed turbine foundations?
- Will floating cables be buried at any point or will they float the entire way to shore landing?
- Talya, Is 25 fishermen a statistically significant sample of the fishing effort in the area?
- For Fred - how can those of us in the fishing industry on the West Coast help support the radar studies you proposed?
- Also, for those of us in the fishing industry that have taken multiple days away from our jobs to participate, this section has been incredibly helpful, and I wish there was longer time allotted
- With respect to science, Do the fishermen feel they are adequately engaged in the US development process? If not, what can be done better and by whom?

- Block Island nearshore species is different than offshore with large pelagics
- How much does adverse weather get weighted into these risk assessments?
- It would be good if RODA could compile a comprehensive list of concerns seen by the Fishermen and categorize them with meta data for easy searching, so all stakeholders know, and fishermen have consensus
- Getting a framework that Fishermen can enter their trusted data in an anonymous way would be a huge resource to compliment the surveys by the developers and give a much better scientific baseline.

Zoom Chat Comments/Questions

- **CBI:** Please use this Q&A bank for Fishing Operation Effects:
<https://www.menti.com/i5h1dnbfko>. By opening and clicking “Ask a question,” you can submit questions or upvote those from others. We will reopen chat for the discussion portion.
- **Speaker/Team:** From Mentimeter: Question for Merlin - how much spacing between turbines does he think is needed for safe navigation and fishing?
- **CBI:** Link: <https://www.energy.gov/eere/wind/downloads/offshore-wind-turbine-radar-interference-mitigation-wtrim-webinar-presentations>: On April 20, 2020, the U.S. Department of Energy’s (DOE’s) Wind Energy Technologies Office presented the first in a series of live webinars to discuss offshore wind turbine radar interference mitigation strategies and research needs for offshore wind development that may impact sensitive radar systems. The webinar was hosted by the Wind Turbine Radar Interference Mitigation (WTRIM) Working Group—a consortium of federal agencies composed of DOE, the U.S. Department of Defense (DOD), the Federal Aviation Administration, National Oceanic and Atmospheric Administration (NOAA), the Bureau of Ocean Energy Management (BOEM), and the Department of Homeland Security (DHS).
- **Speaker/Team:** Turbine spacings and how they impact Fishermen are going to be very site specific. The size of vessels that work an area, and the type of fishing they pursue, would determine spacings suitable. In the UK this would also be dictated by how far offshore the windfarm is. Potters and netters will contend with smaller spacings than trawlers for example, how they can maneuver and the potential to come fast are big factors.
- **CBI:** From Menti: There was an excellent presentation on engineering aspects of floating wind technologies presented at Maine Fishermen’s Forum in March. Akers Offshore Wind 101.
<https://mainefishermensforum.org/wind-s>
- **Participant:** In re Talya’s study: argument for doing similar survey with fishermen prior to designing the trawl survey?
- **Speaker/Team:** Sharing a couple of European SES studies that may be of interest. “How to model social-ecological systems? – A case study on the effects of a future offshore wind farm on the local society and ecosystem, and whether social compensation matters”
<https://www.sciencedirect.com/science/article/pii/S0308597X19306530>
- **Speaker/Team:** [To participant], excellent suggestion for incorporating these recommendations in developing monitoring guidelines that ROSA is working on.
- **Speaker/Team:** Agree [Speaker] and [Participant]!
- **Speaker/Team:** Here's another one..."Assessing cumulative socio-ecological impacts of offshore wind farm development in the Bay of Seine (English Channel)”
<https://www.sciencedirect.com/science/article/abs/pii/S0308597X1730444X>
- **Speaker/Team:** [To Participant] - we will work with you and everyone from the industry to make sure we get all your questions answered including through a follow-up meeting if need be!

- **Speaker/Team:** [To RODA] thanks for leading that effort. I'm happy to contribute if folks have questions that we don't get to today.
- **Speaker/Team:** We are insisting that more fishing surveys in this area are undertaken by the Fishermen who actually work the ground. While the vessel criteria have made it difficult for fishing vessels to undertake generic surveys, things such as trawl surveys and drift netting surveys are now being designed and undertaken by the fishermen from the area.

IV. Economic Effects

Mentimeter Notes

- VTR data is coarse (center point of fishing area, rather than specific two locations) and may misrepresent distribution of fishing activity. How did you account for this?
- Did you use the data generated by Jeff Kneebone, PHD on the Vineyard Wind project that summarized the historical rec fishing in this area and elsewhere?
- Could developers be asked pre-construction to fund AIS for all vessels that fish an area so that better data can be developed?
- Wonder if you checked your model with the work that Kevin St. Martin did (using VTR data) some years ago?
- How can a developer access this tool? Written letter request to NOAA or will the tool be available for use by developer and consultants on a NOAA web page? thank you.
- Observer data is only the start and end of tow, not tow path.
- Also, hope that when you are looking at effort redistribution of the recreational fishermen, you will compare the impact on existing commercial fishermen
- Can we get a link to Eric's tool? Or is it internal to NOAA?
- Is Eric's data going to be part of the NE Data Portal?
- Do these socioeconomic reports include all the data requests filled in response to developer data requests?
- Is it possible to update the models to use depth contours or other likely fishing targeted spatial strategy vs kernel method?
- Can the impact model be used to look at cumulative impacts?
- For Ben - do you know if the SWFSC or NWFSC are doing something similar for Pacific OSW Development?
- Can this data be formatted in ways that allow the fishermen to fish more efficiently and thus spend less time on the water and increase the community safety and lower insurance risk and costs?
- The ACCSP policy for confidentiality requires that any data summary that is publicly disclosed must include landings from at least three dealers, three harvesters and three vessels to be considered -
- Ben - How do you set a boundary for Vineyard Wind in lease area OCS-A 501 as it is yet undetermined as to the layout.
- What about less than three of the above, are they still listed on your maps- or is it left off?
- Keep in mind there is a major difference with safety issues for hook and line ground fishing vERY large pelagics. Nearshore vs offshore species are much different
- To ACCSP policy for confidentiality requires that any data summary that is publicly disclosed must include landings from at least three dealers, three harvesters and three vessels to be considered

- If the cables are properly buried, is the surf clam industry still at risk? What is a proper burial depth for surf clam dredging? Should cables be 2 m below the seafloor or 2 m below your dredge depth
- Surf clam effort looks like it overlaps many, many telecom cables. How often do they dredge these up?
- Will these new data sets and data products be sufficient to produce a fishery mitigation plan for projects in the Mid Atlantic?
- How do fishing leases figure into all this? Are fishermen only allowed to fish in certain small areas or regions? Is there an economic impact to switching leases or licenses?
- Daphne and team's scientific collaboration is an excellent model for how to work with industry expertise to design and carry out research. There are other ones as well like NOAA, CFRF,
- If commercial fisheries are dredging and trawling, how much does this alteration to the benthos compare to the proposed development? Are both temporary and persistent disturbances included in analysis
- Can the amount of turbidity produced by clam dredge effort be compared to project levels of turbidity from turbines?
- Are there interactions with mats now? Are there any preferred/optimal mat designs that are more trawlable?
- It would be useful if the RODA results give enough info to compare the magnitudes of things like EMF, sound ... to be compared to other articles like the electric probes to evict clams from the bottom
- Does Fish abundance = fish landings? Look at the number of scup in Narragansett Bay but there is little adoption of this species in the market. Any discussion?
- With cascading development, does this disadvantage the developers who go first and as asked to upgrade fishing systems? How does the mitigation need to be equitably distributed on both sides?
- Are there going to be changes at the council and NMFS that will ease current fishing restrictions that exist outside of the wind farm areas? We are fast running out of places to fish now without farms

Zoom Chat Questions/Comments

- **CBI:** Q&A bank for Economic Effects: <https://www.menti.com/hbx4ibbnbp>
- **Speaker/Team:** Link: <https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development>
- **CBI:** This is URL providing access to tool outputs Eric just spoke of: https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development?utm_medium=email&utm_source=govdelivery
- **Speaker/Team:** Do you know if the SWFSC or NWFSC are doing something similar for Pacific OSW Development?

V. Socio-Cultural Effects

Mentimeter Notes

- Would the effects of climate change be distributed more or less equally than the effects of wind farms? How do we weigh any difference?
- Climate change poses an existential threat to our fisheries, especially our 'traditional' fisheries with cultural significance. We need to consider that offshore wind can help mitigate climate change.

- Can floating offshore wind and lobstering coexist?
- How can we make sure society, and the regulatory authorities are well informed in order to make decisions around the tradeoffs of losing parts of the fishing industry and fishing community loss?
- For Monique - how much do the fishermen care about sea level rise or warming water?
- recommendations on how to fill the gap on fishermen's well-being studies?
- We need a realistic view of how much climate change wind farms will really mitigate climate change and more importantly the time scales the relative changes will occur on.
- What is the potential for offshore wind to have at sea fuel stations for electric or hydrogen filled fishing vessels. High risk high collaborative reward or just crazy?
- If a stakeholder benefits from delay, how do we know they are honest brokers in moving forward with wind?
- As in all things; clear communication is key. If this effort can compile, digest and summarize all these issues in a third-party trusted environment, that would have immense value.
- Currently, input from fishers, fisheries managers (councils and nmfs) and even USCG is advisory only. How do we make this a more effective engagement? Not just check the box?
- How do we know a stakeholder is actually willing to consider other industries if they directly benefit from wind development?
- For Ms. Hall-Arber: As to community and commercial fishermen impacts
- Any study to date or planned on impacts that create diminished infrastructure and supply chain function and the feedback effect."
- Who should be in charge of engagement with fishermen--federal agencies, state agencies, NGOs, industry groups, developers?
- How do we balance the economic inequality that developer representatives are paid for these engagements, but fishermen do this on a volunteer basis and look at a lot of time from their business?
- Patrick asked about sustaining engagement. You haven't got engagement from fishermen now. You have engagement from people that represent some fishermen. Most that have the time to engage don't fish.
- How to address the fact that developers take years to develop pallets of documents and then require the fishermen to review and commit to these in a matter of days at a particular time they choose?
- How do you address the liaisons that exert the least amount of effort to conduct authentic and meaningful outreach?

Zoom Chat Comments/Questions

- **CBI:** Q&A bank for Social and Cultural Effects: <https://www.menti.com/n3yv59f4k5>
- **Participant:** Link: <https://www.maineoastfishermen.org/working-waterfront>
- **Participant:** Good point, [Participant]. One long-term impact is the loss of fishing-related infrastructure.
- **Speaker/Team:** To follow-up on [Participant's] comment. After the Call Areas off of the Central Coast of Ca were announced (much to the surprise of many in the fishing industry) - the DoD came in and wielded their power and indicated those areas were important to national security. They were eventually forced back to the table via the Congressional power of appropriations - but the sitting process needs to be revisited to ensure ALL voices have a seat at the table at the outset.
- **Participant:** Great segue to the next topic!

- **Participant:** The current regulatory burden we have in fisheries now is currently still more worrisome for survivability than windfarms. When you add lost opportunities from windfarm placement it becomes insurmountable. I agree 100% with Greg.
- **Participant:** This question is like asking which of your children you love the most. All of these issues are impt to fishermen.
- **Participant:** [Participant] did not mention sand mining... another threat in the MidA
- **Participant:** Great panel! Lots of great insight!

VI. Cumulative Impacts, Resilience, & Adaptation

Mentimeter Questions

- Do we have a way to understand scientifically what will happen to a mobile resource when we insert fixed boundaries with the threat of species competition and change? (On top of climate change too.)
- Good point: Are there lessons learned from the pandemic changes in catch to help understand the economic / other impact on the entire industry? Although market closures would not be included with wind
- Can species that like to live near structures be introduced within the wind farms that have commercial value with the goal of creating a concentrated resource, use the foundations to Denmark zones?
- How does one get engagement when the activity is far-off and new, like OSW was once?

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Appendix B: Acronyms Glossary

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 liason officer
FMC	Fishery management councils
FR	Fishery representative
G&G surveys	Geological and geophysical surveys
HMS	Highly migratory species
IEA	Integrated Ecosystem Assessment
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	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?

Sharing the Ports: Evaluating Challenges and Opportunities

Question 1

- Safety issues (navigation, risk of collisions) with facilitating port access by both small fishing vessels and larger wind construction/support vessels.
- Degree of vessel displacement on land (within ports) and at sea or with science (eliminating the ability of fishing vessels to conduct research)
- Research into appropriate mitigation and compensation for any displaced fishing vessels or shoreside infrastructure is needed.
- What kinds of craft/facilities are needed for installation and operations
- Spatial needs of various wind construction/support vessels and if there is space available to accommodate such vessels in various ports.
- Effective range of various types of wind construction/support vessels; how close do they have to be to intended wind development locations?
- Existing port capacity and potential future needs to accommodate anticipated port use

Question 2

- There is an opportunity to use licensed operators and repurposing fishing assets (vessels) as platforms for non-fishing activities such as research
- Space is at a premium in some ports, with limited space available for new users
- Transparency in decision making (public hearings regarding proposed activities, possible impacts, and revenue sharing) and additional outreach are needed
- Northeast has lot of small and medium size ports that are really busy, and large ports are very busy and fully occupied
- Fishermen don't want to be converted to guard vessels for offshore wind – they want to be fishermen
- Fishermen don't have certifications and USCG licenses to operate larger vessels and could not transition into other jobs supporting wind development. A challenge is to document a fishing captain's sea time and experience to prove they may be qualified to operate support vessels.

Question 3

- Research into appropriate mitigation and compensation for any displaced fishing vessels or shoreside infrastructure is needed.
- What does a community want in its ports? Would a community prefer to emphasize fishing and tourism, or would it want an industrial feel?
- Explore workforce development and retraining opportunities
- Port capacity and feasibility/planning studies

Additional Resources

- Gloucester, MA Port Study <https://gloucester-ma.gov/DocumentCenter/View/2757/Dockage-Study---Final-report?bidId=>

Focus on Floating: Different Structures, Different Conditions

Question 1

- Radar impacts, safety & perimeter zones, understanding failure rates (and acceptable failure rates), details for U.S. floating projects, interaction with marine mammals, aggregation effects, impacts to big game fisheries (GOM, Pacific Islands, etc.), understanding midwater cables connections,
- A number of BOEM informational resources were shared (see below).
- Some lessons learned from proposed floating wind off Coos Bay (project not completed) and oil and gas.

Question 2

- Footprint of anchoring/cables and entanglement (and secondary entanglement by gear) big concern for fleets.

Question 3

- Convene a similar meeting with experts in floating wind technology and others such as NREL, BSEE, Schatz Energy Center, etc.
- Better understanding of technology, impacts from European projects as they are developed, better visualization of a project at scale, how structure interact with derelict fishing gear and other marine debris, understanding aggregation effects.

Additional Resources

- Hywind spar buoy <https://www.equinor.com/en/what-we-do/floating-wind/hywind-scotland.html>
- Windfloat <https://www.edp.com/en/news/2020/01/02/windfloat-atlantic-starts-supplying-clean-energy-portugal>; <https://www.principlepowerinc.com/en/windfloat>
- <http://schatzcenter.org/pubs/northcoastwind-session1-jacobson.pdf>
- Schatz Energy Research Center <http://schatzcenter.org/publications/>
- <https://www.boem.gov/current-environmental-studies-pacific>
<https://www.boem.gov/west-coast-renewable-energy-science-exchange>
<https://www.boem.gov/environment/environmental-studies/renewable-energy-research>
<https://www.boem.gov/california>
<https://www.boem.gov/sites/default/files/documents/renewable-energy/Selected-BOEM-Research-Renewable-CA.pdf.pdf>
<https://www.boem.gov/Oregon>
https://www.boem.gov/sites/default/files/documents/regions/pacific-ocs-region/environmental-science/Selected-BOEM-Research-Renewable-OR_0.pdf
- <https://www.boem.gov/renewable-energy/state-activities/windfloat-pacific-offshore-wind-pilot-project-0>
- <https://www.nrel.gov/news/video/overview-of-floating-offshore-wind-text.html>
- <https://www.nrel.gov/news/program/2020/pdfs/floating-offshore-wind-101-webinar-qa.pdf>

Integrating Fisheries and Wildlife, RWSE, and ROSA

Question 1

- Effort should be to fill our knowledge gaps with these entities and cut down on duplication of effort. Standardization of data will benefit all groups.

- Once gaps are identified (such as through the Synthesis of the Science effort) how to prioritize and then implementing research projects to answer them can be difficult.
- Organizations should focus on making connections and improving coordination. Do not just rush out to collect data without a plan to understand or use the data.

Question 2

- How will the Marine Mammal Protection Act be applied to wind development? Fear that fishermen will bear the burden here and it will close down fisheries but not be applied to OSW.
- Fishermen's knowledge often does not get into the literature, potential to use this knowledge to inform decision-making.

Question 3

- Ocean observing community has a lot of partnerships and can be a great resource. They have data standards and can look regionally or locally. These groups should consider working with IOOS.
- Communication across regional science groups should increase. This will help cut down on redundancies and improve understanding of available resources and data, particularly in shared areas such as ecosystems and habitat.

Dock to Plate: Market Considerations

Question 1

- Whether or not changes in supplies will be large enough to change availability in seafood at the consumer level.
- How to track supply chains from the time they are caught up until when it is consumed.
- How participation fits together so we can find out what the implications are if one area/fishery is affected.
- Data systems are not in place to find out weak points in the supply change to track the changes that occur over time
- Research of Food service, Industrial, Retail (3 primary) and some export

Question 2

- Access is the biggest problem; fleets are not able to fish where they used to be able to, displacement is an issue for scallops particular are cables which stop you from fishing within the area
- Delay of getting product to market because of lack of efficient transit lanes
- Conditions may change on the ocean mother nature plays a big role in shortages and number of product
- May lead to selling off of permits to foreigner investors which may be less knowledgeable
- If we lose grounds people will stop eating US caught and processed seafood which will be replaced by cheaper and lower quality
- It will be difficult to decide how much product fisheries have, catch, and process availability

Question 3

- US regulation to increase seafood sold domestically
- Qualitative data is also critical numbers we can use these to “map” out to get a rough idea of who is involved along the way and what are the key points in the systems of vulnerabilities, strengths etc where if changes are made in different environments change in a qualitative sense

- Overlap of impacts across fisheries and business models are interconnected and effects of one will span across into others so you need to talk to all fisheries; include everyone so we can find out what all the overlap is
- Mentioned seafood traceability and how that has helped although only a little portion

Safety at Sea

Question 1

- How turbines and their spacing will impact radar
- There is guidance and recommendations from Europe that are not being implemented here: 20 degree rule for corridors, ice, radar, sleep deprivation are all factors that should be considered.
- Difference between developing standards and if standards are applied.
- Variation in vessel length and width needed for maneuverability, unknown how hazards and other vessels may allow rescue vessels to operate.
- Opportunities for wind support vessels to be the first on the scene during SAR.

Question 2

- Fisheries resources are often patchy and vary inter-annually (for example clam fishery is patchy, areas can be poor for harvesting commercially followed by having clams that can last a boat a month.
- EW orientation is good but 1 nm is not enough for transit. Increases fatigue on captain and crew, and there are still unknowns about how this will impact insurance.
- Likely will interact/bump up to a hazard, rungs up the foundation and call box should be provided.
- Insurance is big, potentially costly, unknown. Do not know if there will even be available policies to fish within a WEA, if they will be too costly, or if they will change when an accident happens.
- Autopilot is simply one tool and does not replace a human.

Question 3

- Work with insurers to better understand what will happen and what mitigation measures may improve insurance coverage.
- Opportunities for safety at sea training with supplemental information about WEAs.
- Preparation of a risk assessment.
- More research on crew fatigue.
- Use of VTR data to look at distances traveled by vessels to better understand transiting. AIS can also supplement this for vessels >65ft but will omit small recreational boaters.

Additional Resources

New Fisheries, New Entrants New Gear? The Realities of Adaptation

Question 1

- Spatial and gear changes
- What the offshore wind farm will end up looking like to fisherman
- How climate will change during this time
- How increased costs will effect fisheries under an already stressful situation
- How insurance and funding/small loans will change if they do at all (what is the management strategy)
- New species / Changes to current species
- Safety for fisherman and loss of life in adverse conditions
- Interpretation of VMS data to reduce impacts of OWF on fisherman

Question 2

- There is a concern that fishing product will be on the decline
- Climate change maybe a larger area of concern
- Developers will probably not work with commercial fisherman to fish in these development are
- Some believe it will be a net negative and others think it will be a net positive
- Managing the needs of a migratory industry with those of the stationary industry
- Current management restricts access to fisheries through permits and by forcing people into gear choices
- Financial disparity
- Lack of trust
- Permit requirements may introduce unnecessary strain
- Limited funding

Question 3

- Look into funding which could be a positive aspect
- Focus on clearing up a lack of trust and building that trust up to increase adaptability and in turn stability
- Look into ways to increase collaboration in the industry
- Ensure that there is a consistent level of transparency
- Spend time educating consumers
- Make sure funding and direction of research is given to fisherman directly
- Innovation fund would be helpful to expand potential fishing areas and therefore addressing spatial competition
- All fees collected by the state go into the general fund - we need a state law to re-allocate these funds to a specific cause

Perspectives from Small Communities

Question 1

- How to best communicate with small communities and ensure that they are taken into account?
- Open and honest communication is key, but should also be fully recognized and inputs taken into account/design.
- Some tribes are recognized and some are not. In WA, tribes have treaty rights but in CA tribes have experienced hard fights.
- Variation in the practice and recognition of community benefit agreements make relationships between small communities and developers challenging.
- Concept of distributional justice is difficult here. Three components of social license are important. Who constitutes as a “stakeholder”, how is timing just, how can different size communities have equal power?
- Leases are sold before communities get involved. Financial interests have already been initiated, diminishing the power of small communities and fishermen.

Question 2

- Nearly every port is a small community. Small communities up and down the (west) coast need to work together to deal with this crisis.
- Cannot apply an engineering analysis to a biological issue/resource.
- Inconsistency in who small communities work with, such as opening lease areas for competitive bids or transfer of ownership, terminates trust with community members. Should put mitigation

measures in place prior to sale or ensure they are implemented through the lifetime of the project.

- Fishermen (in the past) have been less interested in mitigation, would rather just keep fishing.
- Fishermen and communities do not want to offer to lose more than they will have to.
- Need to recognize geographic communities and each individual industry.

Question 3

- Development of a policy statement to minimize the impacts to small communities and fisheries. How to give them respect and power.

Additional Resources

- Guide for consultation with west coast tribes for ocean issues:
<https://westcoastoceanalliance.org/tribal-engagement>

Perspectives from Vertically Integrated Businesses

Question 1

- Vertically Integrated Businesses are in the minority but can be huge by tonnage in certain fisheries and are often highly connected to the community.
- Lack of understanding of value-added, vertically integrated business structures and shoreside infrastructure, and how OSW will impact all of these.

Question 2

- Biggest concern is access to product (example fisheries: surf clam, mid-water trawl, scallop). For safety and operability reasons, the ability to catch will be diminished and processing facilities will then be impacted.
- Developers have misunderstood financial investment, personal sacrifice and sweat equity fishing families have put into these fisheries. No way to compensate for that type of investment.
- Competition from aquaculture also expected to occur soon.
- As resources become less available or further away, there will be more uncertainty/precautionary measures built into management plans (reduce quotas). Many businesses became vertically integrated to improve control.
- Past compensatory mitigation frameworks only looked at ex vessel value, did not take into account shoreside infrastructure and vertically integrated businesses.
- Fishing industry wants to provide advice and have historic ground taken into consideration.
- Fisheries management is slow and often not flexible. This is unequal balance as OSW does not seem restricted to the same type of management/regulations and yet it will have impacts to FMPs and quotas.
- Businesses can't change fisheries or access other areas if their resource is impacted or inaccessible.
- Vertically integrated businesses operate at volume. If they are unable to provide their goods, they will lose market share (in world markets) and business plans will be heavily impacted. Things such as MSC certification are expensive and long investments and should also be considered.
- Don't want OSW jobs to compete with fishing jobs, there is already a shortage of good fishermen.

Question 3

- Improve understanding of value passed on and shoreside infrastructure investments when framing compensatory mitigation. Do not only look at ex vessel values.
- Improving flexibility in fisheries management to address some of these new issues.
- Seafood promotion for US product to rebuild local markets
- Look into what happens to vessels and facilities when they are no longer needed.

What's Perception Got to Do With It? Socioeconomic Research, "Stakeholder & Rightsholder Engagement," and Participatory Governance

Question 1

- What is the importance of perception? For understanding or for persuasion? How can we bring diverse voices to the table?
- Need to understand how the ocean is currently used before you start to integrate new users.
- Some of the early questions have been skipped: should we develop this space, what is our goal, how are we balancing this use with food production.
- Communication does not necessarily lead to coexistence.
- Often we disconnect our thinking about natural resource management from the food system, decisions should not be made in a vacuum.
- New group on the west coast with an elected tribal leader is looking to engage all stakeholders to evaluate if OSW is good for our area.

Question 2

- Resulting from Covid is an increase in discussion on seafood's role in the nation's food security and direct relationships between consumers and commercial harvesters. This should not be diminished during OSW discussions.
- Focus now is responding and reacting rather than being part of the process from the beginning. Authentic relationships are needed and trust needs to be built.
- It is difficult to build trust with someone who is not giving any concessions, and the track record on safe transit, radar, etc. is not good. Even the BOEM Task Forces do not allow non-governmental agencies to participate beyond public comment when discussing call and lease areas.

Question 3

- How to successfully use trusted liaisons and informal relationships to engage in a positive manner on a big scale.
- How to have localied conversations that fit into a broader understanding and broader process.
- For non-leased areas, there may be opportunities for informal engagement, collecting information, funding research and discretion in soft decisions. THis space could be used to develop better practices.
- Key research questions: 1) when is engagement most important (the idea of early and planning and framing the key questions and assumptions up front); 2) how do we engage and in what ways at scale given the breadth of actors, space, and issues; 3) whose "in charge" of engagement — who is driving it, to what end, in what way?

Additional Resources

- <https://sustainingcommunity.wordpress.com/2017/02/14/spectrum-of-public-participation>

Case Study: Cumulative Socioeconomic Approaches to Understanding Effort Displacement

Question 1

- Lots of fishery dependent data but uncertainty between transit and fishing activity/where effort is occurring.
- Data sets related to VTR, VMS, and AIS were designed for enforcement and not for understanding where effort is occurring.
- Understanding of the future impacts to fisheries from a) displaced fishermen and b) new users.
- Poor understanding of how other markets will be impacted by disruptions (negative feedback when supply chains are disrupted).

- Weather can impact effort displacement and give seasonal effects, any correlation between weather patterns and fishing activities? How fishermen make decisions about weather is poorly described.

Question 2

- Certain fisheries that use industry partners (example: surf clam and ocean quahog) do not see how surveys would look like if they exclude wind areas. Should be researching how analyses will be impacted by these changes to survey effort.
- Determine what needs to be part of mitigation packages to help with design of data collection.
- What is the costs of increase data collection/requirements and who is responsible?

Question 3

- Better informed and use of models of site choice, such as closed area models, operation research models, statistical models, random utility models, etc.
- Literature review on displacement from MPAs to understand how and what data was collected.
- Poor information and characterization of behavioral responses. Displacement calculations should consider this.
- Need more information regarding shoreside processors, businesses, and how landing ports are impacted.