THE

RESPONSIBLE OFFSHORE DEVELOPMENT ALLIANCE

Research Priorities 2022

INTRODUCTION

Responsible Offshore Development Alliance (RODA) is a broad membership-based coalition of fishing industry associations and fishing companies—across the United States—committed to improving the compatibility of new offshore development with their businesses. The alliance works to directly collaborate with relevant regulatory agencies (e.g., National Marine Fisheries Service, Bureau of Ocean Energy management, U.S. Coast Guard, fishery management councils, and state agencies), offshore developers, scientists, and others to coordinate science and policy approaches to managing development of the Outer Continental Shelf in a way that minimizes conflicts with existing traditional and historical fishing. The Responsible Offshore Development Alliance (RODA) has repeatedly asserted that too little is known about the impacts offshore wind energy (OSW) development will have on the marine ecosystem and the existing industries reliant on it. RODA has compiled a list of research priorities identified by the fishing industry.

PURPOSE

Fishermen have long been considered trusted research partners in fisheries management activities, and enormous advances in scientific knowledge have been achieved through their valuable roles in hypothesis development and testing. Research activities in OSW planning have lagged behind those of established marine ecosystem science with regard to the inclusion of fishermen's knowledge. Therefore, a comprehensive list of research priorities developed by the fishing industry is essential for predicting and evaluating socioeconomic and environmental impacts and interactions among fisheries, fish stocks, and OSW. RODA encourages all agencies and academic institutions to use these research priorities as a resource, especially for cooperative research opportunities. RODA will consider this to be an action plan for its staff, other industry groups, scientists, and government agencies, to use to identify and propose essential cooperative research projects.

METHODS

RODA staff developed a survey for the fishing industry to identify perceived gaps in knowledge related to OSW and fisheries. The survey was not restricted in scope; answers could focus on any topic related to OSW and the marine environment/fisheries. RODA circulated the survey to its members, published it on the RODA website, provided it to regional fishery management councils for distribution, and requested the fishing industry circulate the survey throughout their networks to maximize the number and diversity of responses. The responses were compiled and synthesized into draft summary tables then circulated to fishing industry reviewers to verify completeness and accuracy.

CAVEAT

Except where specifically noted, research needs should be considered for both fixed and floating offshore wind infrastructure. Obviously, some impacts may differ depending on the type of facility. Given the lack of operational floating offshore wind facilities world-wide, there may be fewer available "lessons learned" regarding this technology.

SUMMARY

A total of 88 survey responses were received from the fishing industry participants from across the United States. The research priorities were not ranked. In addition to the specific research topics listed herein, a number of respondents suggested general considerations relevant to the role of research in OSW planning.

The research recommendations evidenced a clear perception that meaningful interaction has not occurred with the fishing industry during OSW siting processes. The fishing industry has appealed to regulatory authorities to create regional environmental monitoring plans to address a large number of outstanding questions, but observe that research approaches remain piecemeal. Monitoring alone is also considered insufficient to constitute a mitigation practice. Once necessary datasets are gathered, and the scale of potential environmental and socio-economic impacts identified and better understood, adequate strategies must be identified, established, and implemented that would effectively reduce impacts. These mitigation actions should be designed in consultation with the fishing industry and OSW developers to maximize their chances of adoption and success. The fishing industry suggested enhancing opportunities to learn from established OSW projects abroad and recommended analyzing fisheries data from operational projects. Lessons can be learned on a large scale of topics including sedimentation and scour. Respondents recommended that alternative siting strategies be developed that avoid key fishing grounds while benefiting OSW programs, reflecting the general preference to reduce significant negative impacts to both industries. There were also several suggestions to develop and clarify science-based decommissioning strategies from the earliest OSW planning stages.

CUMULATIVE IMPACTS

The fishing industry expressed clear concern over the lack of cumulative impacts analysis identifying fishery and ecosystem-level impacts from compounding impact factors and across multiple projects. The introduction of human made structures to the ocean will affect every aspect of the ecosystem, as seen in the numerous research priorities identified below. At present, limited or no cumulative impact analyses exist at regional levels. A detailed analysis should address all scales as well the effects of project distance to the cumulative impact intensity.

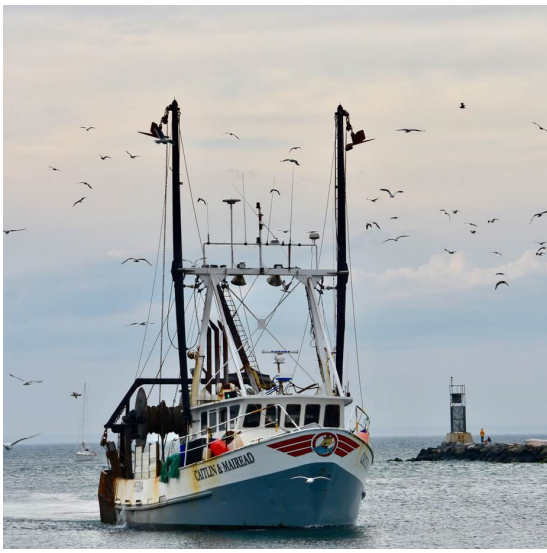


Photo provided by Long Island Commercial Fishing Association.

ONGOING RESEARCH

Fishing industry respondents indicated support for several existing studies and identified a partial list of cooperative research projects they considered beneficial. They strongly suggested the need to build this list into a comprehensive, living, database of ongoing or completed relevant research to better track existing efforts, and to highlight research gaps for prioritization. This should be a collaborative effort amongst all public and private research entities.

NOTE

A number of the responses to the survey were interrelated between topics - e.g., it is difficult to isolate the socio-economic impacts from the environmental impacts for an industry that relies on a healthy and sustainable ecosystem and access thereto.

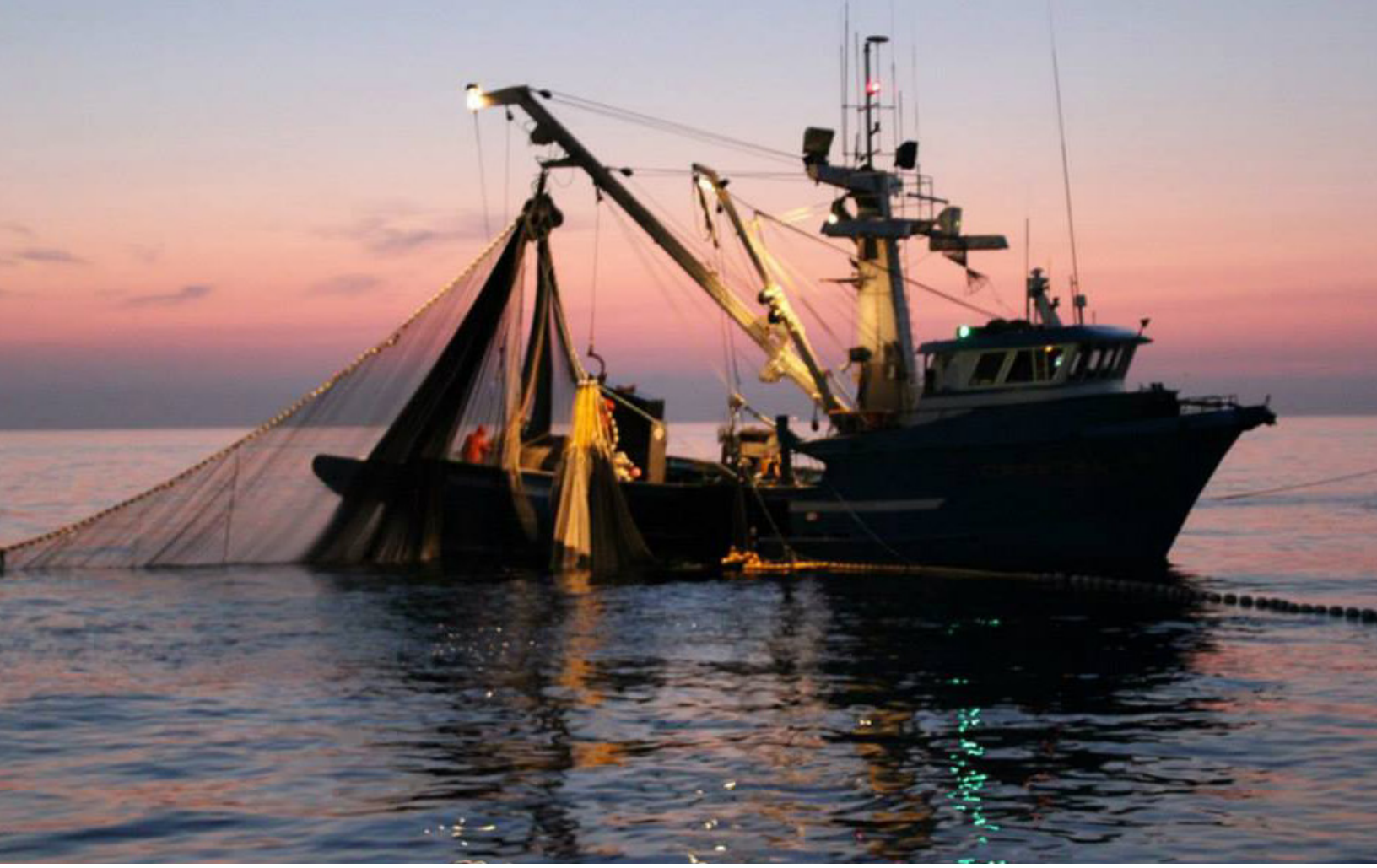


TABLE OF CONTENTS

The following list describes specific research recommendations gathered from the surveys, categorized by broad topic area.

Photo provided by Mike Conroy.

BUSINESS, COMMUNITIES, AND SOCIOECONOMICS

ECONOMICS

- Compensation for lost fishing grounds
- Direct and cumulative impacts to seafood supply, cost, and markets
- Net economic impacts from loss of fishing-related revenues compared to OSW
- Economic analysis of impacts of OSW accounting for regulatory restrictions on switching to other target fisheries or locations
- Economic viability of legally harvesting an "alternative" stock by season if a vessel loses access to its primary species
- Cost to fleet and public of losing access to more fishing grounds to closures or other factors such as interarray cable connections for floating OSW turbines limiting access to those areas to surface gear types
- Financial impact to future generations of family-owned fishing businesses, from OSW and in combination with other challenges to fishing communities
- Expected economic losses to each potentially impacted coastal community, statewide, and regionally

BUSINESS IMPACTS

- Seafood industry shoreside infrastructure losses
- Increased OSW vessel maintenance activities crowding or usurping existing harbor infrastructure, thus impacting fisheries operations, transit and offloading activities
- Higher fuel costs and resulting effects to fishermen, gear suppliers, fish markets, dock workers, and ice suppliers
- Changes in fishing industry's fuel consumption and vessel maintenance due to transit and fishing impacts
- Changes in insurance costs, including resulting shoreside economic and market effects

SEAFOOD PRODUCTION

- Direct and cumulative impacts to domestic seafood production and supply
- Importance of seafood in sustaining domestic food security through climate-related anticipated disruptions, such as water shortages and drought, in other food production sectors
- Increased reliance on imported seafood
- Societal costs of OSW and displacement of protein provision in light of recent food security experiences associated with the COVID-19 pandemic
- Changes in greenhouse gas emissions and net carbon footprint resulting from increased imported seafood, and increased transit times compared with domestic production

Photo provided by Mike Conroy.

BUSINESS, COMMUNITIES, AND SOCIOECONOMICS

DISPLACEMENT EFFECTS

- Impacts of loss of access and higher levels of localized overfishing
- Impacts of increased competition from loss of fishing grounds
- Creation of additional fishing closures
- Impacts of exclusion in cases where an individual fishing permit only allows access to an area slated for development
- Economic and societal impacts of relocating fishing effort due to closure of historic fishing grounds by OSW siting and no-fishing zones established around the lease sites
- Ecological and socioeconomic impacts of shifting fishing effort due to increased fishing pressure on alternative/remaining fishing grounds
- Socioeconomic impacts resulting from stock assessment survey impacts

**Specific examples raised on this topic: Atlantic surfclam fishery out of Atlantic City, NJ, Northwest pink shrimp fishery*

CULTURE AND HERITAGE

- Analysis of equity and the effects of displacing fishermen from public fishing grounds for private entities
- Impacts to traditions and fishermen's displacement from historic grounds they have fished for over a century
- Role of fishing in coastal tourism economy
- Diversity and environmental justice in fishing communities
- Environmental and social justice for the vast majority of Americans whose only access to the living marine resources off the US coast is through the products the fishing industry provides

EMPLOYMENT

- Potential benefits to traditional fishermen, including alternative occupations for fishermen approaching retirement or new entrants to the industry
- Loss of experienced crew to OSW operations
- Net job losses to the seafood industry and dependent businesses, by community, state, and in total

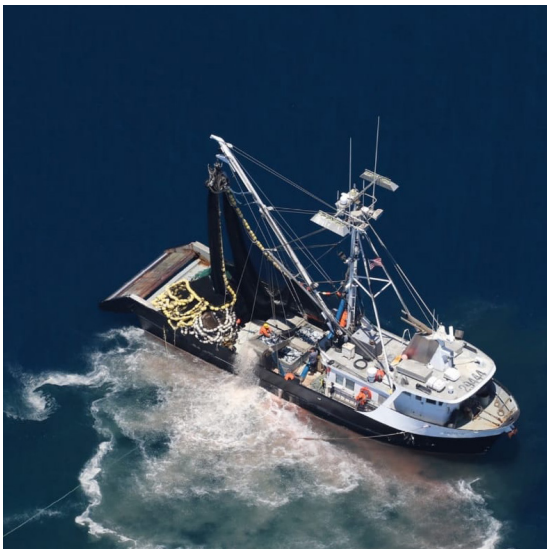


Photo provided by Mike Conroy.

ENVIRONMENTAL IMPACTS

BIOLOGICAL RESOURCES: PROTECTED RESOURCES

- Impacts of strikes, sound, and EMF on protected resource migration patterns and mortality or serious injury
- Impacts of cables tethering floating wind turbines on protected resource migration patterns and mortality or serious injury
- Interactions between seabird life, offshore wind, and fisheries
- Effects of climate/ecosystem change to species that constrain fisheries
- Effect of mooring lines to whale migration, feeding, behavior, entanglement
- Impacts to migratory patterns of protected resources such that those species may be more likely to co-occur with other gear types
- Socioeconomic impacts from potential mitigation measures, directed at the fishing industry, to reduce further mortality or serious injury, due to move immobility of turbines

**Specific examples raised on this topic: salmon in the whiting fishery, whale entanglements in sablefish and Dungeness crab pot fisheries, Pacific flyway, species protection of short tailed albatross, humpback whales, blue whales, and grey whales*

BIOLOGICAL RESOURCES: FISH STOCKS AND ECOSYSTEMS

- Presence of structures on local environment, especially where overlapping with EFH and HAPCs
- Impacts to plankton, krill, and lower trophic level marine life
- Effects to bait fish
- Effect of turbine size on magnitude or extent of impacts sizes
- Recolonization timelines after benthic disturbance
- Impacts to benthic feeding, other fish behaviors, and full life history cycles
- Ability to assess stocks using impacted state and federal surveys

**Specific examples raised on this topic: scallops, whelk, squid, squid larvae, eggs, clams, lobster, spawning fish, salmon, crab, whiting, black sea bass*

SPAWNING AND MIGRATION

- Interactions with fish that use benthos for various life stages
- Effects of climate change/changing ocean ecosystems to movements of target stocks
- Mortality due to turbine installation, armoring, and operations
- Impacts from turbines and installation and maintenance vessels to marine life and seafood
- Impacts on fishing ground composition and productivity
- Effects on shellfish and fish recruitment and population
- Predator/prey relationship changes (including from hardening of sea floor and introduction of armoring or scour) and increase in prey species

**Specific examples raised on this topic: crabs, sole, groundfish, sea stars, octopus, scallops, whelk, squid, squid larvae, eggs, clams, lobster, spawning fish, salmon, whiting*

ENVIRONMENTAL IMPACTS

PHYSICAL OCEANOGRAPHY

- Effect on vertical motion of the ocean (upwelling/downwelling) and water column stratification
- Impacts to sea surface and water column temperatures
- Atmospheric impacts associated with energy removal
- Impacts to currents due to energy removal
- Turbine-induced microclimatic effects, including localized warming or cooling
- Interactions with hypoxic areas and/or ocean acidification

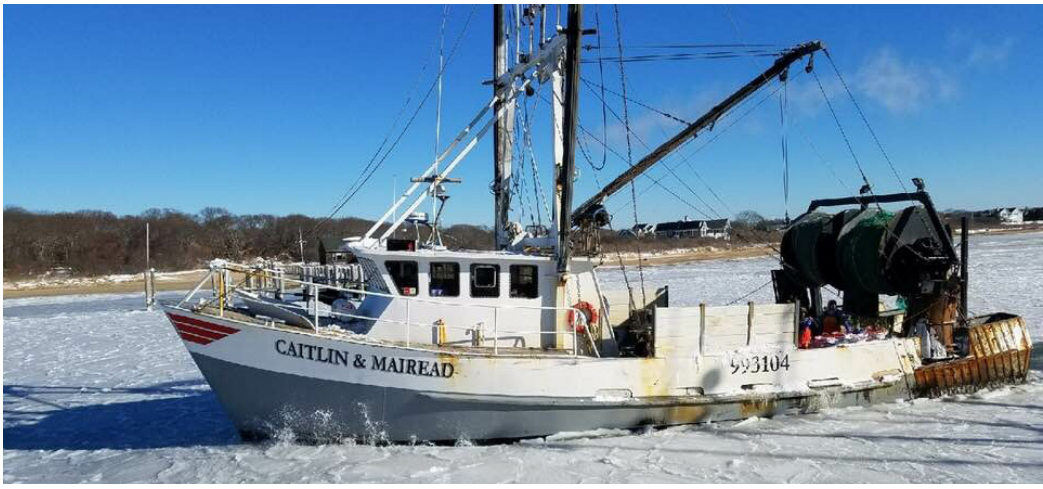
**Specific examples raised on this topic: Mid-Atlantic Cold Pool, West Coast upwelling, wind speeds, coastal and inland weather patterns, extent and impacts of wake disturbances, reduction in surface winds off Northwest coast*

HABITAT

- Changes and conversion of bottom type due to flow and current changes and introduction of structure in the form of foundations and cable routes
- Effects of bottom attachments and foundations
- Loss of benthic habitat of sand shoaling species, associated effects to species distribution, and resultant impacts to commercial landings in different states based on fishing grounds and top landed catch
- Siting considerations based on effects to specific habitats from structure in the water
- Effects of anchors (may attract species that constrain fisheries or displace target species at various life stages)
- Identify and avoid hard substrates and other sensitive habitats
- Impacts when co-located in protected areas
- Impacts of the use of cooling stations on local water temperatures, larval populations, and local food webs

**Specific examples raised on this topic: eelgrass, Shuster sanctuary for horseshoe crabs, anchoring, rock piles, mattressing, black sea bass*

Photo provided by Long Island Commercial Fishing Association.



ENVIRONMENTAL IMPACTS

STUDIES BY IMPACT FACTOR

EMF

- Fish and shellfish behavior, spawning, and migratory patterns
- Effects at individual, population, and ecosystem levels

**Specific examples raised on this topic: Pacific coast salmon , finfish, shellfish, squid, whelk, HMS stocks, crabs*

LIGHT

- Impacts to photosensitive demersal and infaunal species, including those that bury to varying depth in soft substrate
- Impacts to photosensitive pelagic species, including water column movement

**Specific examples raised on this topic: whelk, squid*

NOISE, VIBRATION, PRESSURE

- Impacts of pile driving on marine species
- Pressure to shellfish
- Effects of operational sound on marine species
- Noise and other impacts impacts derived from geophysical and technical surveys on invertebrates, fish, and marine mammals
- Effect of the operational noise from OSW facilities on marine species
- Impacts of above water and sub-surface noise from turbine operations on fish stocks – behaviorally and otherwise

**Specific examples raised on this topic: squid, scallops, whelk, fish, lobsters, marine mammals*

SEDIMENTATION AND SCOUR

- Sediment plume and settlement effects on mollusc, invertebrate, and finfish populations, including filter feeding and recruitment
- Impacts of silt migration from structures on the seafloor
- Effects on scouring on sediment around turbines

**Specific examples raised on this topic: clam, scallop*

- Effect to harmful algal blooms that result in domoic acid and other health toxins
- Role of OSW structure as fish aggregating devices (FADs) resulting in the potential to inhibit access to fishery stocks, effects to migration patterns, stop-over points, etc. for fished species
- Effect of mussel buildup on structures and cleaning strategies

Photo provided by Hooked Up Seafood.

FISHING REGULATIONS AND MANAGEMENT IMPACTS

- Ability to achieve optimum yieldImpacts to sea surface and water column temperatures
  - » Catch allocation among fisheries including commercial, recreational, state by state, etc.
  - » Inshore and offshore commercial and recreational regulations and allocations
  - » Availability of commercial and recreational fish in harvestable areas
  - » Magnitude of unnecessary (from a fisheries management perspective) reduction of fishing grounds
- Cumulative impacts of changing fisheries regulations and OSW to fisheries, both retrospectively and projections of future states estimate landings and revenue projections, using historical data as baseline
- External changes to fisheries management processes to accelerate wind leasing, such as NMFS or Councils changing fishing regulations to reduce fishing in potential lease areas
- Impacts to, and resulting from, regulations relevant to fisheries and marine mammal interactions
- Impacts to existing longstanding federal and state fishery surveys informing stock assessments
- Impacts to quotas resulting from inability to conduct existing surveys increasing uncertainty in stock assessments
- Impacts to rebuilding programs
- Explore mechanisms to lease ocean grounds to fishermen equitably with OSW
- Fisheries management actions to protect fishermen and fishing communities from OSW impacts

**Specific examples raised on this topic: west coast, northeast multispecies, international stock assessments which include US harvest as a model input, coastal pelagic species*

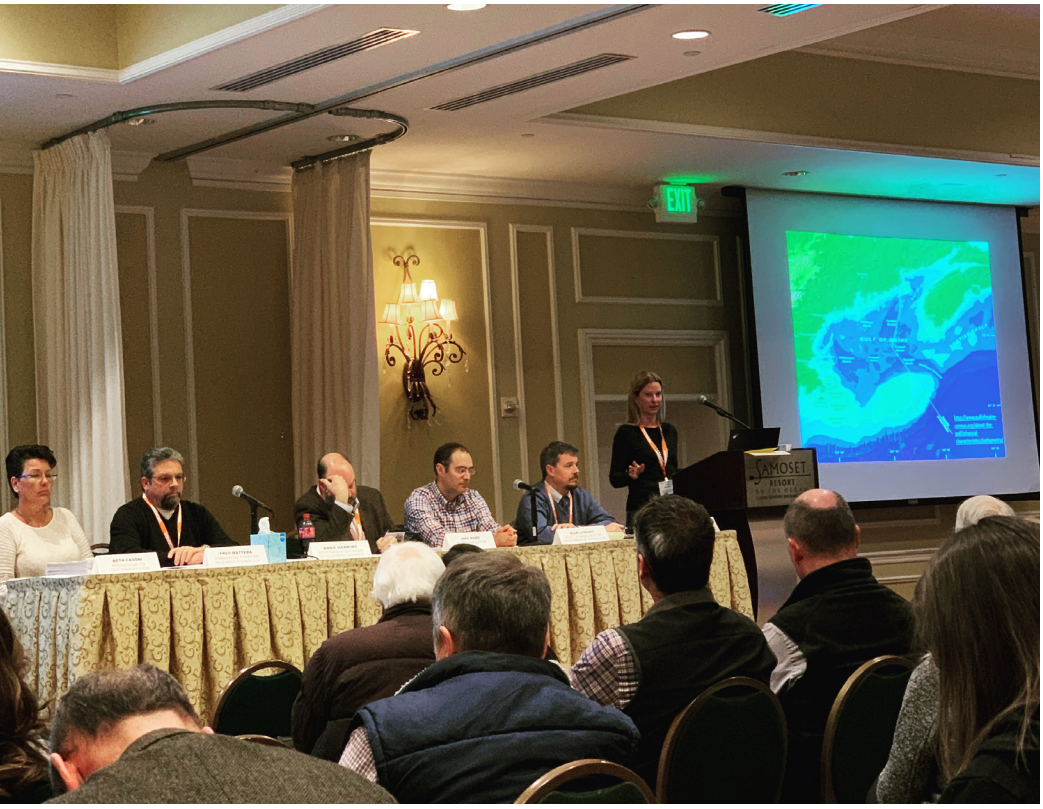


Photo provided by RODA.

MONITORING AND REVIEW RECOMMENDATIONS

SITING-RELATED ANALYSES

- Highest available resolution effort, catch, landings, and geographical data from all fisheries operating in areas under consideration for OSW development before siting occurs
- Highest available resolution abundance and distribution data of all marine species in areas under consideration for OSW development before siting occurs

PRE-CONSTRUCTION MONITORING TO ESTABLISH BASELINE

Conduct comprehensive surveys in lease areas prior to construction covering:

- State and federally managed commercial and recreational fish species
- Habitat characterization of project sites, including cable routes
- Acoustic characterization and acoustic modeling to anticipate construction noise levels and determine appropriate mitigation measures
- Presence of protected species, with maps of seasonal abundance, migration routes, and known breeding and feeding areas
- Baseline study of ocean circulation patterns/current speed, along with hydrodynamic modeling to predict how circulation and currents may change
- Water quality conditions
- Monitoring programs designed to adequately sample all species with appropriate gear and timing to detect spawning or migrating activities
- Develop and initiate monitoring programs utilizing the recreational fishing industry to evaluate baseline conditions

BEFORE AND AFTER-RELATED ANALYSES

- Detect any changes in presence/absence of adult, juveniles, and eggs after construction
- Detect any changes in species composition after construction
- Evaluate CPUE pre/post construction

**Specific examples raised on this topic: ventless lobster/Jonah crab trap abundance survey, squid*

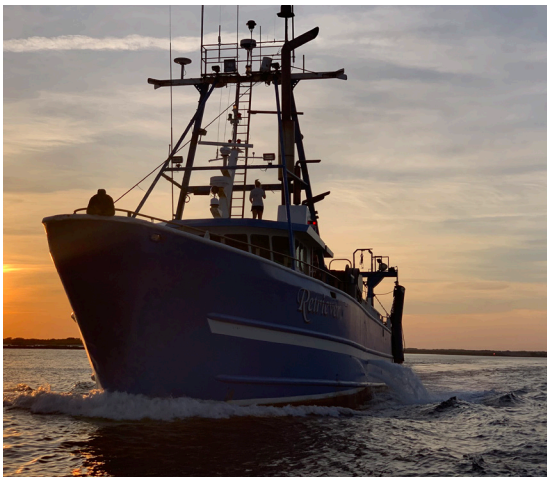


Photo provided by Hooked Up Seafood.

MONITORING AND REVIEW RECOMMENDATIONS

CONSTRUCTION

- Detect any changes to pelagic and demersal species migration and/or behaviour during cable deployment and turbine construction using acoustic tagging
- Determine any acoustic impacts, marine mammal noise response, oceanographic processes, entanglement, invasive species, bird and bat collisions, fish and fishery impacts occurring during construction phase

OPERATIONAL

- Determine any acoustic impacts, marine mammal noise response, oceanographic processes, entanglement, invasive species, bird and bat collisions, fish and fishery impacts occurring during operational phase
- Monitor larvae and juvenile abundances and distribution
- Analyze recreational CPUE data within and around lease areas to identify emerging issues

DECOMMISSIONING

- Impacts associated with decommissioning activities
- Long-term impacts of abandoned infrastructure on fishing grounds and fish populations

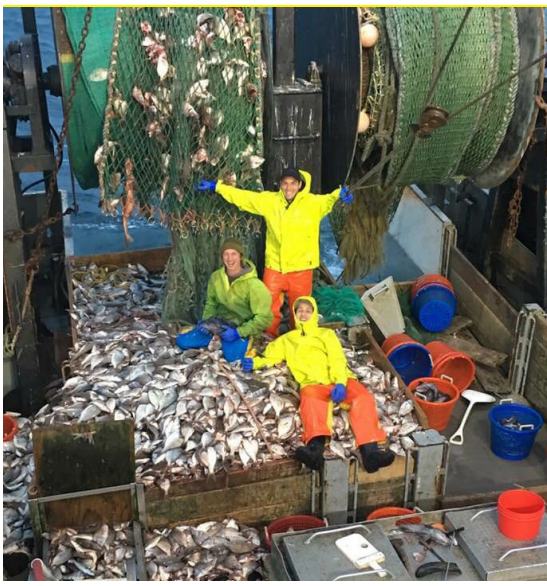
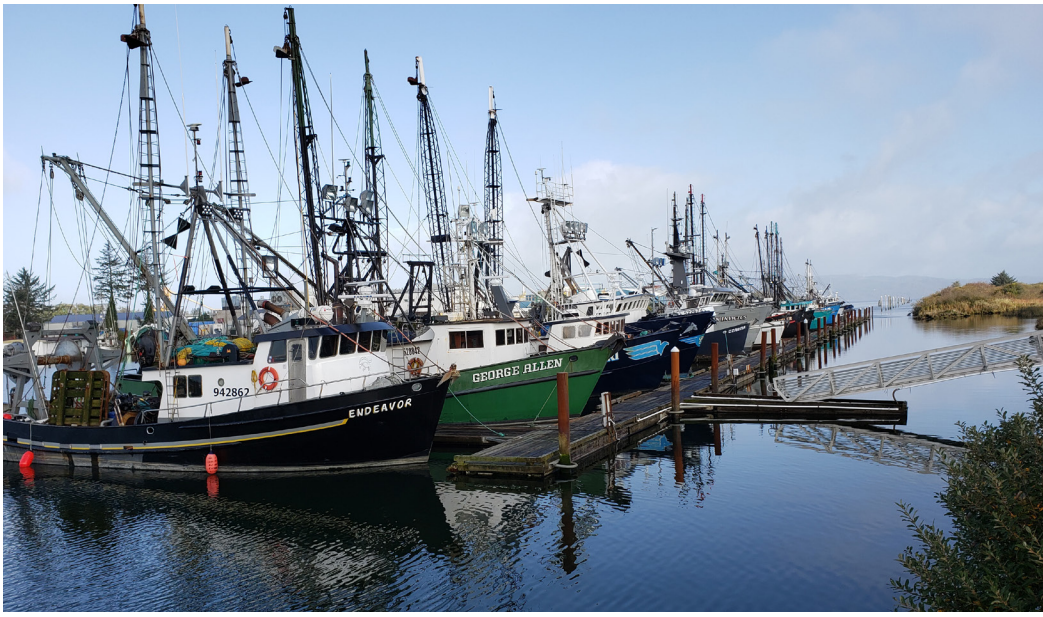


Photo provided by Long Island Commercial Fishing Association.

Photo provided by Oregon Dungeness Crab Commission.



SAFETY

RADAR

- Aspects of radar that cannot be replaced by AIS
- Clutter or interference, particularly in poor weather
- False targets
- Impacts to HF Codar OOS radar used for SAR in case of person overboard
- Impacts to NEXRAD and weather condition forecasting
- Impacts of noise, above water and sub-surface, on radar, sonar, fathometers or other electronics integral to fishing safety

PHYSICAL LOSS OR ABANDONMENT OF TURBINES OR OTHER MATERIALS

SPATIAL OPERATIONAL NEEDS OF MOBILE AND FIXED GEAR FISHERIES

- Extent to which planned turbine configurations will limit mobile gear fisheries in normal operating conditions

RADIO

- Interference of current safe channels entering and leaving port
- USCG ability to communicate on radio channels

SAR

- Ability of fishing vessels to assist each other in times of difficulty
- USCG ability to provide assistance to fishing vessels in distress in or around arrays

TRANSIT LANES

- Systemic approach to design and safety
- Allision risk correlation with number and position of turbine, and appropriate transit lane scenarios

TRAFFIC

- Impacts from project maintenance traffic
- Effects of changes in vessel traffic to surrounding fishing areas

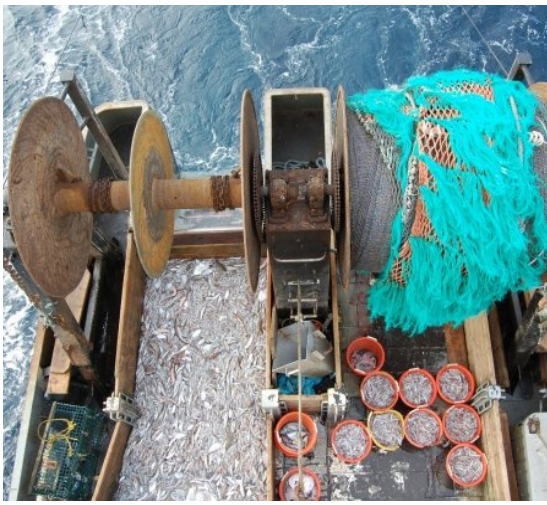


Photo provided by Long Island Commercial Fishing Association.

SUPPLY CHAIN

COSTS AND BENEFITS

- Cost and economic impact of energy production overall and to the consumer, including government subsidies
- Cost of long-term maintenance
- Cost-benefit of OSW vis-a-vis other energy sources, including climate and environmental impacts
- Net energy production considering energy costs of supply chain
- Net climate benefits and carbon footprint of OSW given environmental costs of production, operation and decommissioning
- Economic and environmental impacts of downstream project challenges such as insolvency, unforeseen maintenance, pollution, or excessive removal cost

TECHNOLOGY

- Effect of seismic activity on turbines and infrastructure harbors
- Lifespan and maintenance plans
- Impact of local contamination resulting from routine maintenance or mechanical failure
- Feasibility and associated risks of floating and fixed turbine technology in specific, occasionally extreme, weather and ocean conditions of areas under consideration
- Potential responses to equipment failure
- Operational effects of changes in wind
- Maximum depth of floating OSW deployment, specifically feasibility of siting deeper than 1300 meters
- Differing impacts of floating substations compared to fixed substations

**Specific examples raised on this topic: tsunamis, Crescent City Harbor, specific conditions of California coast from Cape Mendocino northward*

Photo provided by Massachusetts Lobsterman's Association.

TRANSMISSION

ENVIRONMENTAL IMPACTS OF CABLES ALONG THEIR ROUTES

- Fish and protected resource movement (localized and migration patterns) over transmission and inter array cables
- Impacts of cable burial techniques, including jet plowing, on benthic and demersal species
- Impacts to the marine environment of turbine failure or cable breach
- Ecological and socioeconomic impacts associated with transmission
- Effects of cable placement in sensitive habitats
- Impacts to nearshore benthic habitat

**Specific examples raised on this topic: shellfish and fish species, conch, Vineyard bay scallops and clams, sole, flounder, halibut, whelk, estuaries, squid spawning habitat*

OPERATIONAL INTERACTIONS BETWEEN FISHING ACTIVITIES AND CABLES

- Ability to anchor amongst turbines, including considerations for floating cables and mooring lines
- Mobile bottom tending gear
- Probability of cables becoming unburied
- Monitoring options for cable burial based on local and regional conditions including currents and sediment types.
- Minimum safe cable burial depth, including analyses of exposed cables off Block Island and Europe

CABLE TECHNOLOGY

- Differing impacts of AC and DC transmission cables
- Impacts of transmission cables running long distances to land

**Specific examples raised on this topic: shellfish and fish species, conch, Vineyard bay scallops and clams, sole, flounder, halibut, whelk, estuaries, squid spawning habitat, very large potential west coast cable routes*

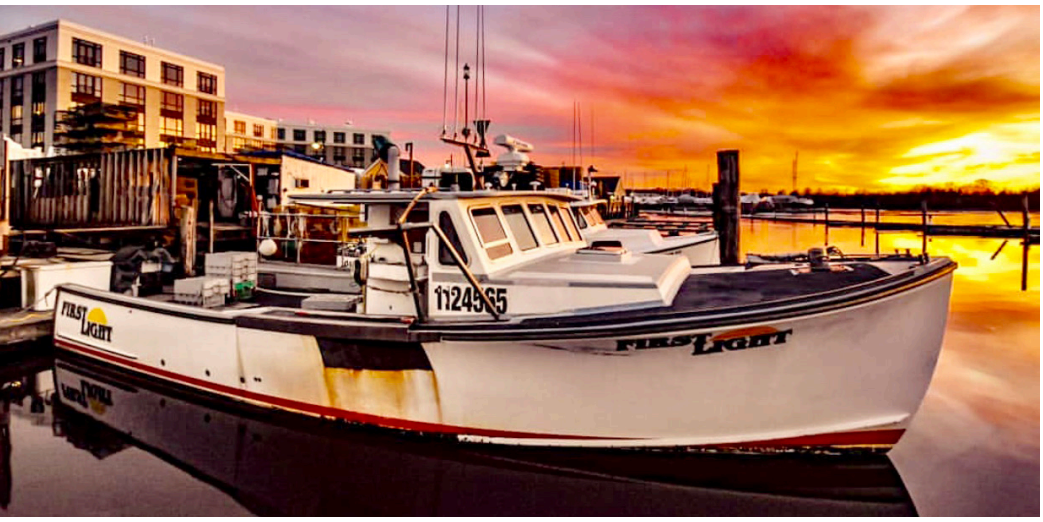


Photo provided by Massachusetts Lobsterman's Association.

CONTACT INFORMATION

Fiona Hogan
Research Director
fiona@rodafisheries.org
(914) 712-8683