Offshore Wind Update Greater Atlantic Regional Fisheries Office

Photo credit: windpowerengineering.com

Pete Burns
Habitat and Ecosystem Services Division, GARFO

Atlantic States Marine Fisheries Commission
August 5, 2021

NMFS Offshore Wind Role

- Cooperating agency for NEPA
- Consulting agency under ESA and MSA
- Adopting agency for MMPA authorizations
- Coordination of environmental reviews and policy issues via the NMFS Wind Team
- Ongoing coordination with BOEM on consultation timelines and information needs for future projects
- Providing comments on project analyses related to NMFS trust resources
- Participating in early coordination meetings with developers

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Recent Activities

- BOEM recently published 6 Notices of Intent (NOI) to develop an EIS for project Construction and Operations Plans (COP)
- 3 NOIs in a 9-day period in June/July. We provided extensive comments on each project (Empire Wind, Vineyard Wind South, Coastal VA Offshore Wind)
- Scoping comments on Revolution Wind (June) and Ocean Wind (late April)
- BOEM expects several more NOIs within the next year

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Recent Activities (cont'd.)

- South Fork Wind Farm (Cox Ledge)
  - Essential Fish Habitat Consultation and Conservation Recommendations (June 7)
  - FEIS comments (July 3)
  - ESA and MMPA consultations underway
- NY Bight Lease Area Public Sale Notice comments due Aug 13
- Interagency Project Kick-off Meetings
- Concurrence on Project Timelines

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Challenges

- Large number of projects being rolled out in a short period of time
- Expedited timelines
- Simultaneous/overlapping consultations and environmental reviews
- Limited early coordination prior to COP
- New or updated COP/EIS after commencement of consultations and reviews
- Limited resources to handle the workload

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Proactive Work

- Benthic fish habitat mapping recommendations
- Checklists to guide EFH assessments, ESA biological assessments, socio-economic analyses for NEPA documents
- Staff to staff work with BOEM to provide information and analyses to support NEPA, EFH, and ESA assessments
- Document templates for streamlining and consistency
- Data query tools

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Offshore Wind Data Query Tools

OSW Socioeconomic Impact Summary Reports

- Standardized reports of socio/econ impacts to fishing operations for each wind project area

OSW Socioeconomic Data Query Tool

- Commercial fishing trip data used to populate impact summary reports

Stock SMART Tool

- Species-based stock assessment results

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Other Useful Data Query Tools

EFH Mapper

- Spatial representations of fish species, their life stages, and important habitats

NROC and MARCO Data Portals

- Fish habitat and distribution data, fisheries data and maps based on VTR and VMS data

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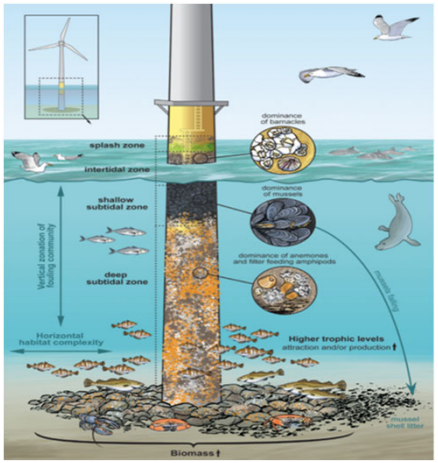
Questions?

Fisheries, Wildlife, & Ecosystem Science
Offshore Wind Energy Updates

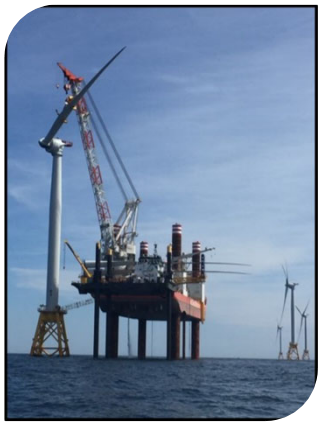
NOAA FISHERIES
Northeast Fisheries Science Center

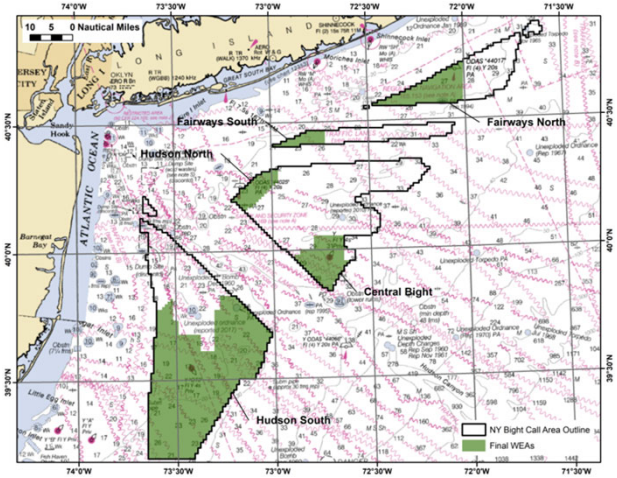
Andy Lipsky, Offshore Wind Lead
Jon Hare, Director
NOAA Northeast Fisheries Science Center

Atlantic States Marine Fisheries Commission Meeting 8/5/21



Degraer et al., 2020





NOAA FISHERIES

NOAA Fisheries Offshore Wind Needs (4 Pillars)

1. Support current regulatory process
2. Scientific support to regulatory process
3. Address impacts of wind energy development on NOAA surveys & scientific advice
4. Understanding impacts of wind energy development on marine ecosystems

Regulatory Process to Integrate Scientific Advice

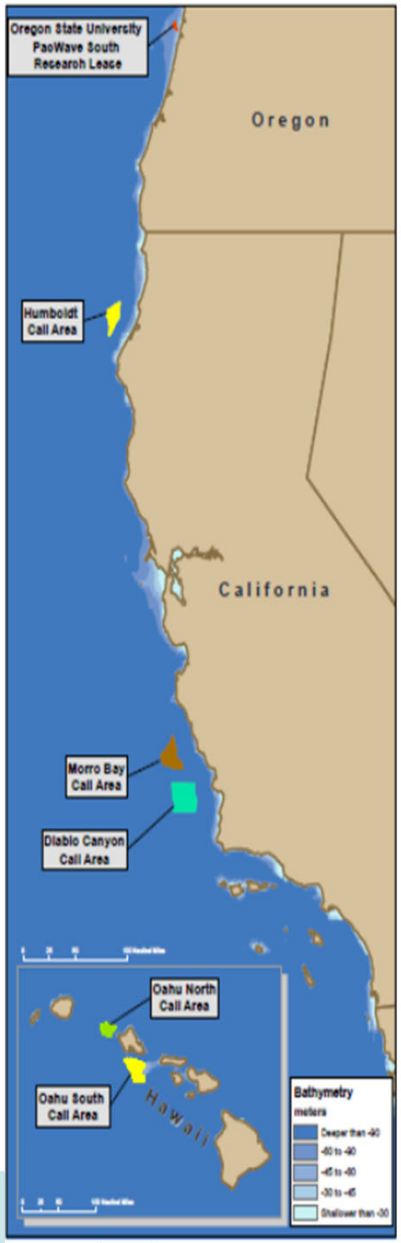
- BOEM is the lead Federal agency and primary decision-maker
- NMFS provides advice to BOEM
- NMFS advice limited to statutory mandates provided by Congress
  - Advice and comments (NEPA, MSFMCA)
  - Incidental Take Authorization (MMPA)
  - Biological Opinion (ESA)
- NMFS advice, recommendations and comments received by BOEM

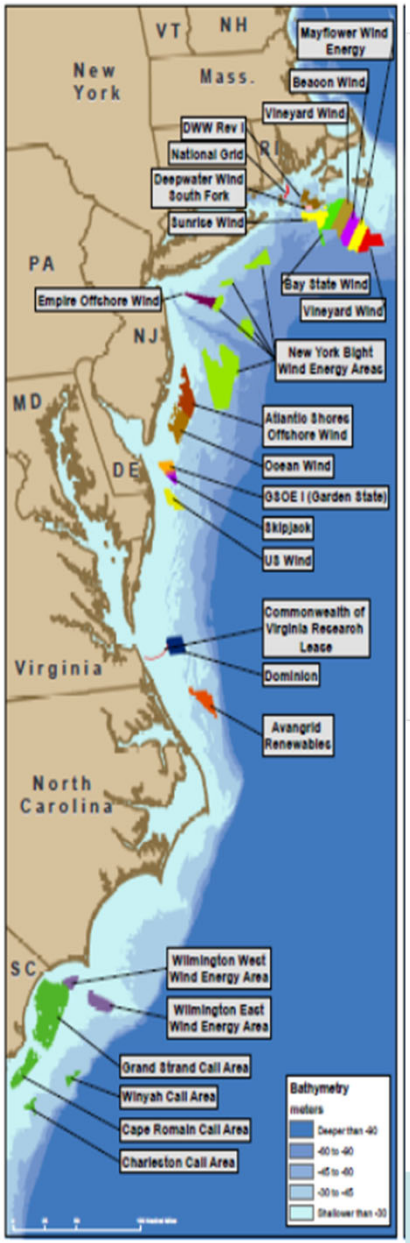
Fisheries, marine mammal, endangered species, and ecosystem science expertise needed to contribute regulatory process

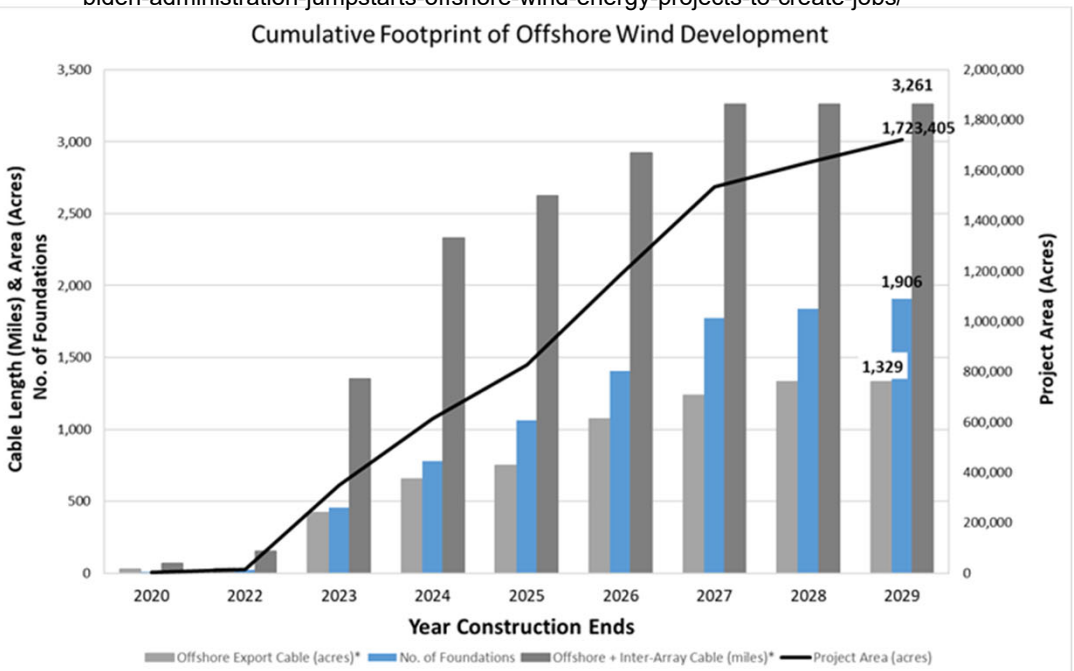
Scientific Support needed for cumulative development

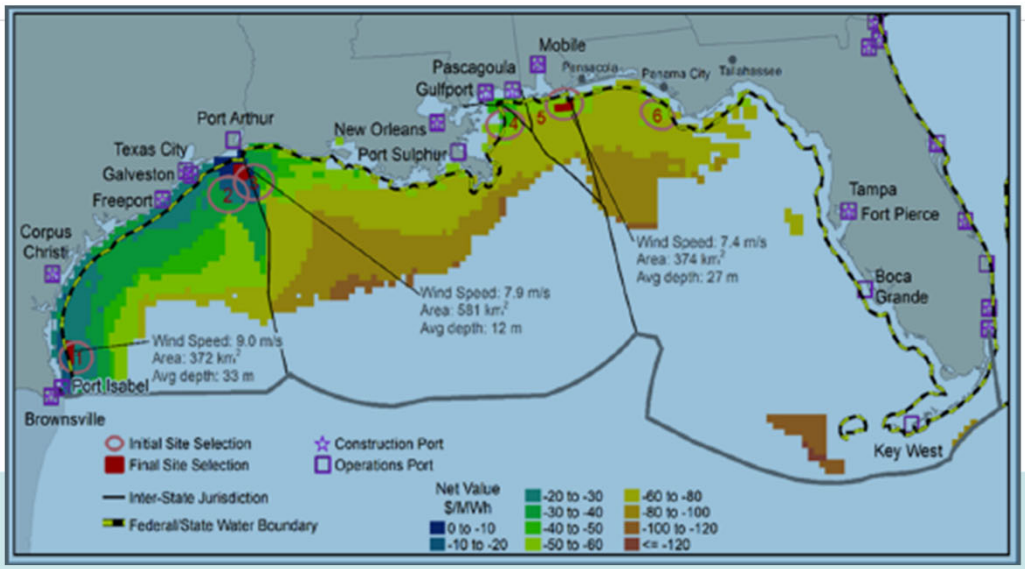
Deploy 30 Gigawatts (30,000 megawatts) of Offshore Wind by 2030

https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/29/fact-sheet-biden-administration-jumpstarts-offshore-wind-energy-projects-to-create-jobs/



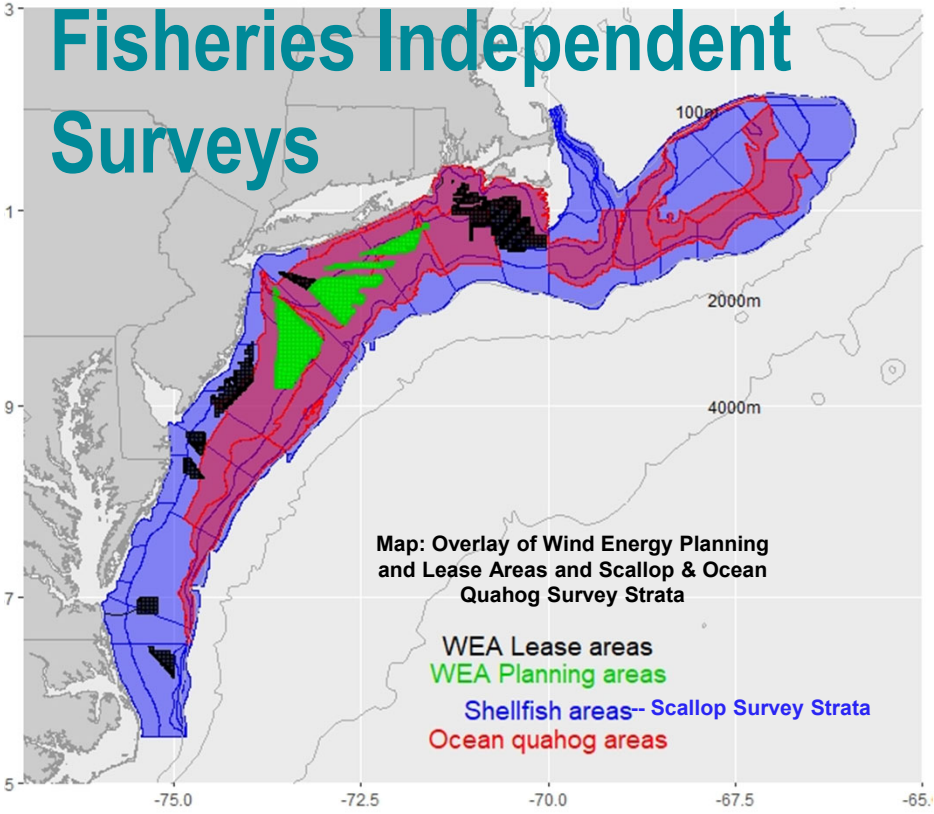






Addressing Impacts of Offshore Wind Development on NOAA Scientific Surveys & Advice (Pillar 3)

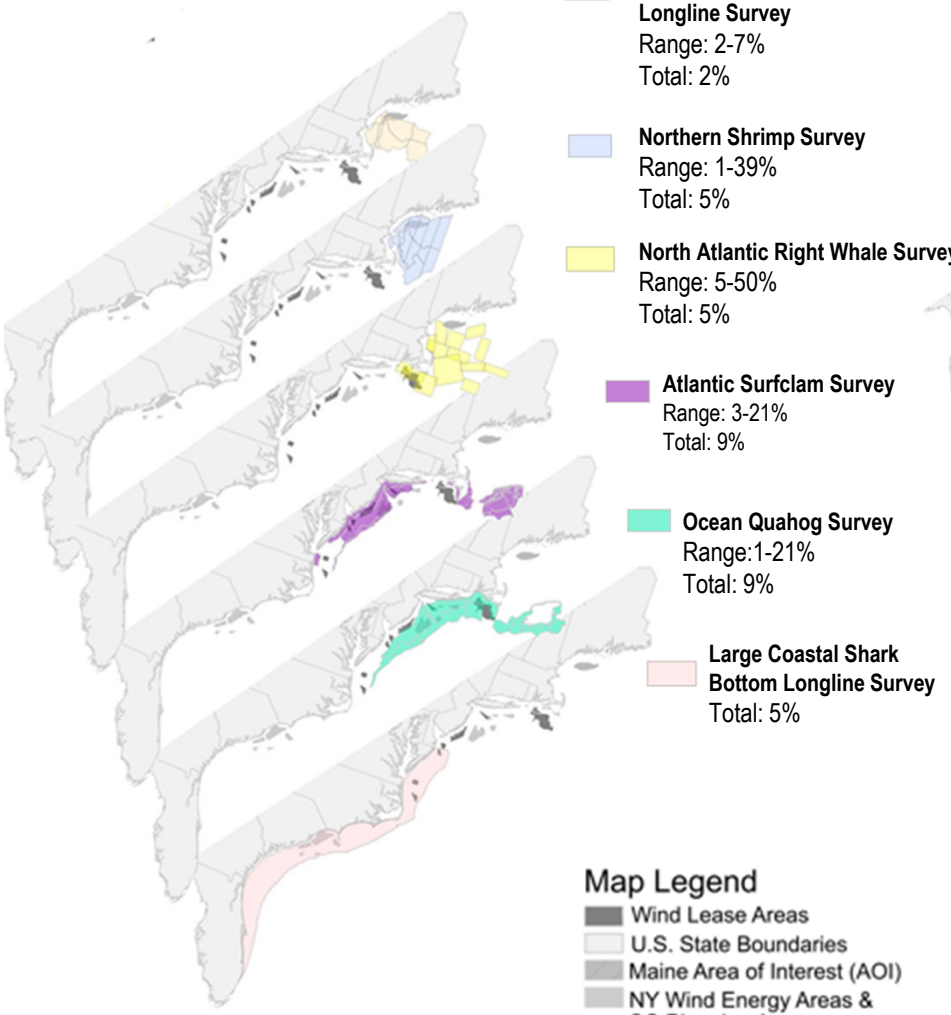
Offshore Wind & Fisheries Independent Surveys

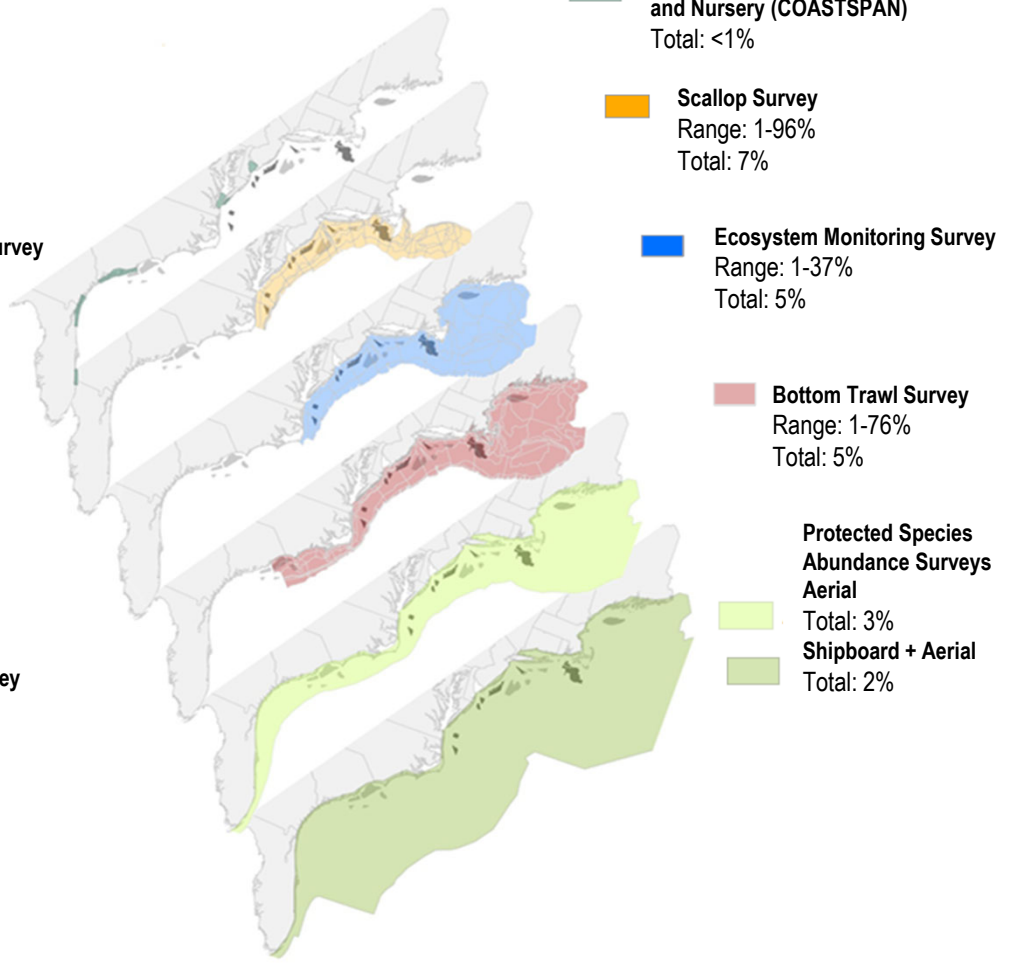


Represents 394 Years of Total Survey Effort
Underpin fisheries valued at $27B/year commercial fisheries & $6.5B recreational fisheries (NMFS, 2018)

Survey	Year Started	Survey Design	Major Applications
Autumn Bottom Trawl Survey	1963	Random Stratified Design - North Carolina to Nova Scotia (bottom trawl)	abundance; length, age, sex, weight, diet, maturity samples, distribution, EcoMon
Spring Bottom Trawl Survey	1968	Random Stratified Design - North Carolina to Nova Scotia (bottom trawl)	abundance; length, age, sex, weight, diet, maturity samples, distribution, components of Ecosystem Monitoring survey
Scallop Survey	1979	Random Stratified Design (dredge); line transect (HabCam)	biomass, abundance, distribution, size and sex of sea scallops and other benthic fauna
Atlantic Surfclam and Ocean Quahog Surveys	1980	Random Stratified Design (hydraulic dredge)	biomass, abundance, distribution, size and sex of Atlantic surfclam and ocean quahog
Northern Shrimp Survey	1983	Random Stratified Design (commercial shrimp trawl)	biomass, abundance, length
Gulf of Maine Cooperative Bottom Longline Survey	2014	Randomly Stratified Design (bottom longline)	abundance, biomass, length, age, sex, weight, maturity samples, distribution, habitat data
Ecosystem Monitoring Survey	1977	Random Stratified Design (linked to Trawl Survey Design); fixed stations embedded in design (plankton and oceanographic sampling)	Phyto/nkton, zooplankton, ichthyoplankton, carbonate chemistry, nutrients, marine mammals, sea birds
North Atlantic Right Whale Aerial Surveys	1998	Aerial line transects	Right Whale population estimates; dynamic area management
Marine mammal and sea turtle ship-based and aerial surveys	1991	Line transects for ship and aerial surveys. biological and physical oceanography sampling	Abundance and spatial distribution of marine mammals, sea turtles, and sea birds
Large Coastal Shark Bottom Long-line Survey	1986	Fixed station design in US continental shelf waters from Fl to DE with stations ~ 30 nm apart	Abund., distribution, migrations (tagging), and bio-sampling for assessment, EFH designations, and life history studies
Coop. Atlantic States Shark Pupping and Nursery Longline/Gillnet Survey	1998	Random stratified and fixed station (longline and gillnet) surveys in estuarine and nearshore waters from Florida to Delaware	Abundance, distribution, migrations (tagging), and bio-sampling for assessment, EFH, and life history studies

Northeast NMFS Survey Interactions with Offshore Wind

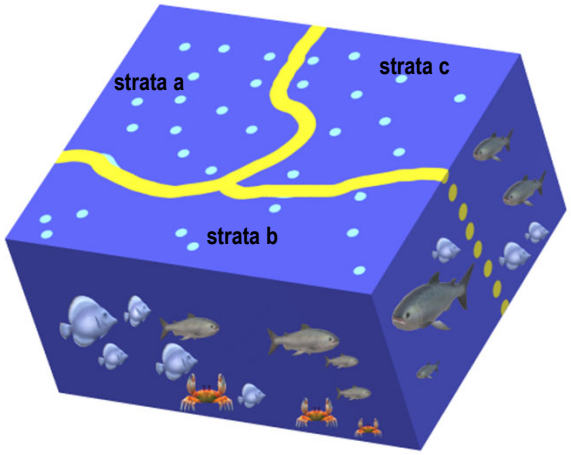


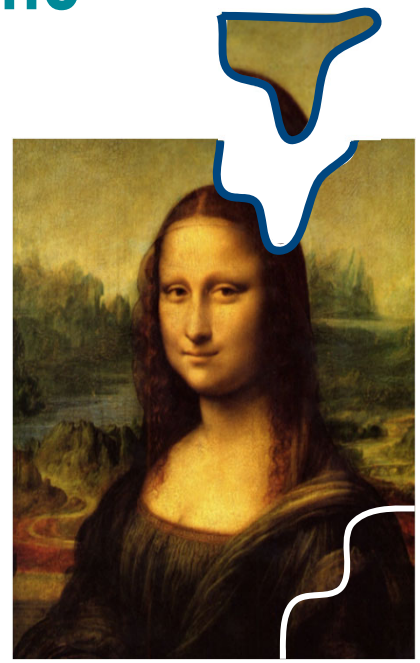


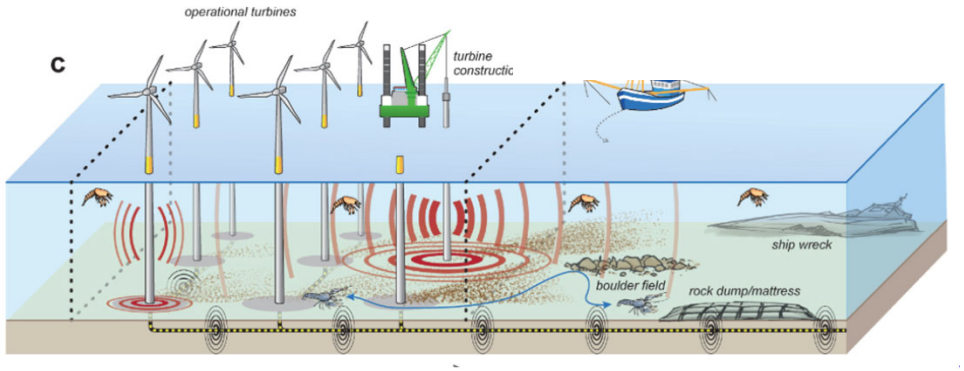
Range= Minimum and maximum overlap with survey strata
Total = Percent overlap of wind development with total survey area

Wind Energy Actuates Impacts to Scientific Surveys in Four Ways:

1. **Preclusion**- displacement by infrastructure
2. **Impacts to Statistical Survey Design**
3. **Habitat Change** that affect species distribution, abundance, and vital rates within and outside wind energy areas
4. **Impacts to sampling** outside of developments by wind energy-induced transit effects that can result in lost sampling time







Gill Methratta al., 2020

Implications of NOAA Fisheries Survey Disruptions

American Public

- Adverse impacts on fishermen and fishing communities and American public who consume seafood and expect recovery and conservation of endangered species and marine mammals

Commercial/Recreational Fishermen & Fishing Communities

- Increase uncertainty in estimates of abundance—through application of the precautionary approach—impacting setting of quotas,
- Increase in more precautionary protected species management measures

Protected Species

- Greater uncertainty in protected species assessments/recovery programs

Non-fishing Sectors-Shipping & Energy

- Uncertainty in protected species information and stock assessments

Federal Agencies

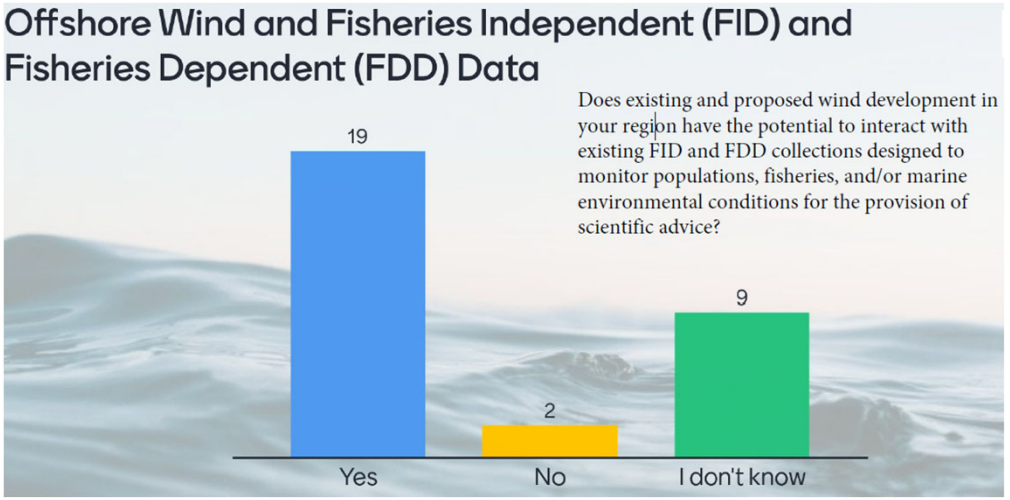
- Harm caused by the need to include more precautionary mitigation measures, e.g., Incidental Take Statements (ITA) through ESA Biological Opinions and MMPA ITAs

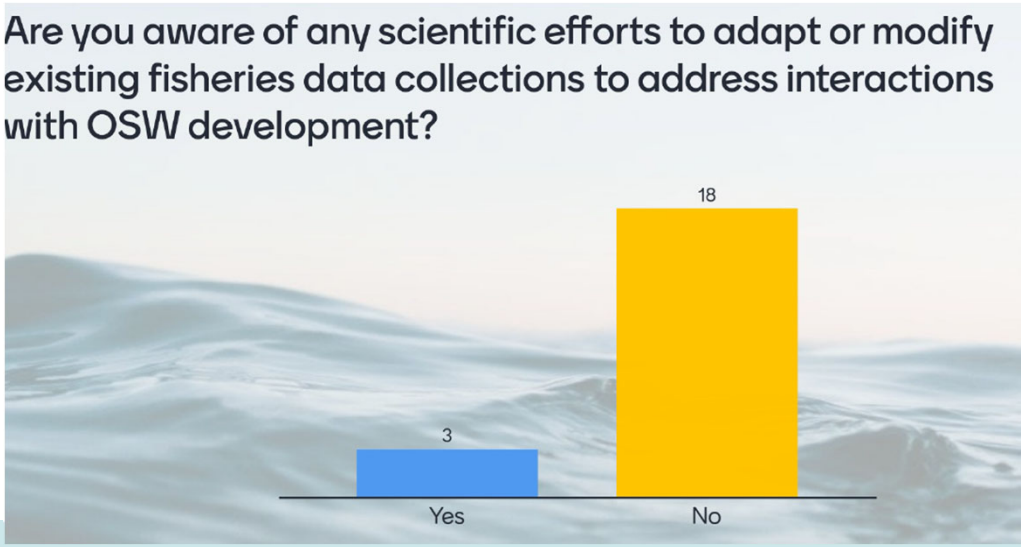
Climate Science

- Disruptions of 60+ year time series decreases ability to understand and mitigate the effects of climate change, impacting American Public

Survey Mitigation Lessons learned from Europe?

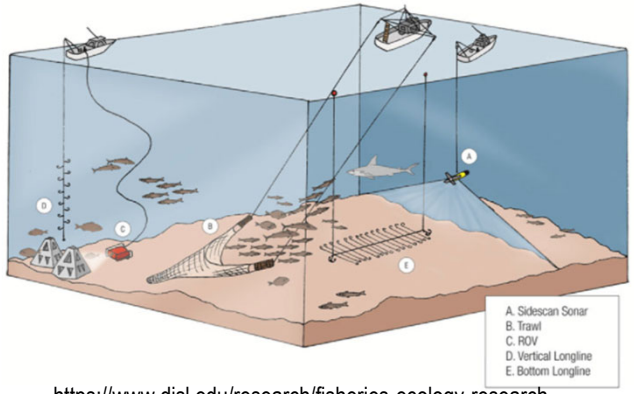
- 2021 Conducted informal questionnaire to International Council on Exploration of the Sea Expert/Advice representatives
- Respondents represented 17 countries, 20 Institutions, and 22 unique ICES Working/Advisory WGs
- "Yes"- we think this is important, "No"-few are working on this



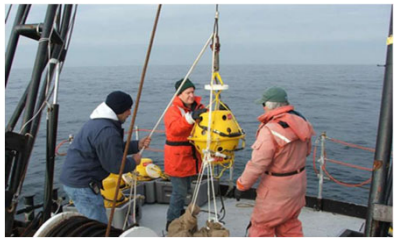


Implementing a Federal Survey Mitigation Program

1. **Evaluate survey designs**: Evaluate and quantify effects and impacts
2. **Identify and develop new survey approaches**: statistical designs, platforms, and methods
3. **Calibrate new survey approaches**: Ensure continuity, interoperability, precision, and accuracy of data collections.
4. **Develop interim provisional survey indices**: Bridge the gap in data quality and availability
5. **Wind energy monitoring** to fill regional scientific survey data needs for the 30 year operational life-span of project developments.
6. **Develop and communicate new regional data systems:** New data analysis, management, dissemination and reporting systems. Collaboration with fishery management, fishing industry, scientific institutions and others



https://www.disl.edu/research/fisheries-ecology-research



Northeast Surveys: Status of Survey Mitigation Steps

NOAA Fisheries Survey Time Series	1.Evaluate designs & impacts	2. Design New methods	3. Calibrate New/Existing Surveys	4.Bridge Solutions	5. Conduct New Surveys	6. Comms. & Data
Fall BTS	Started	Initial	No	No	No	Initial
Spring BTS	Started	Initial	No	No	No	No
EcoMon	No	No	No	No	No	No
Scallop	Started	Grant?	No	No	No	No
Shellfish- (clams)	No	No	No	No	No	No
Right Whale-Air	**Initial**	Pending Grant	Pending Grant	No	No	No
Marine Mammal/sea Turtle Ship/Air	No	No	No	No	No	No
Atlantic Shark Bottom Long-Line	No	No	No	No	No	No
GOM Bottom Long Line	No	No	No	No	No	No
GOM Shrimp Survey	No	No	No	No	No	No
Atlantic Shark COASTPAN	No	No	No	No	No	No

Development of an Adaptation strategy for Multi-Species Bottom Trawl

- **Determine effects of wind development on survey data, stock assessments and management measures.**
  - Evaluate range of impacts (eg. Eliminate all observations from WEAs and recalculate abundance indices)
  - Must look at over 40 assessed stocks for bottom trawl survey

- **Identify potential combination(s) of sampling methodologies and statistical designs for inside WEAs**
  - Results should be able to be incorporated with historical and existing sampling for continuity of time-series

- **Observing System Simulation Experiments (OSSE)** and/or other modeling approaches, e.g. Mgmt. Strategy Evaluation
  - Interagency Agreement with Bureau of Ocean Energy Management
  - **Stakeholder workshops in 2021**
    - Review impacts of offshore wind energy development on fisheries surveys, stock assessment and management advice
    - Define the objectives and questions that OSSE needs to answer
    - Design analytic and empirical framework

- **Build Model, evaluate alternatives, and identify survey mitigation actions**

Essay on the use of Observing System Simulation Experiments in the US published in the Bulletin of the American Meteorological Society

SEPTEMBER 11, 2020

BAMS Essay

Use of Observing System Simulation Experiments in the United States

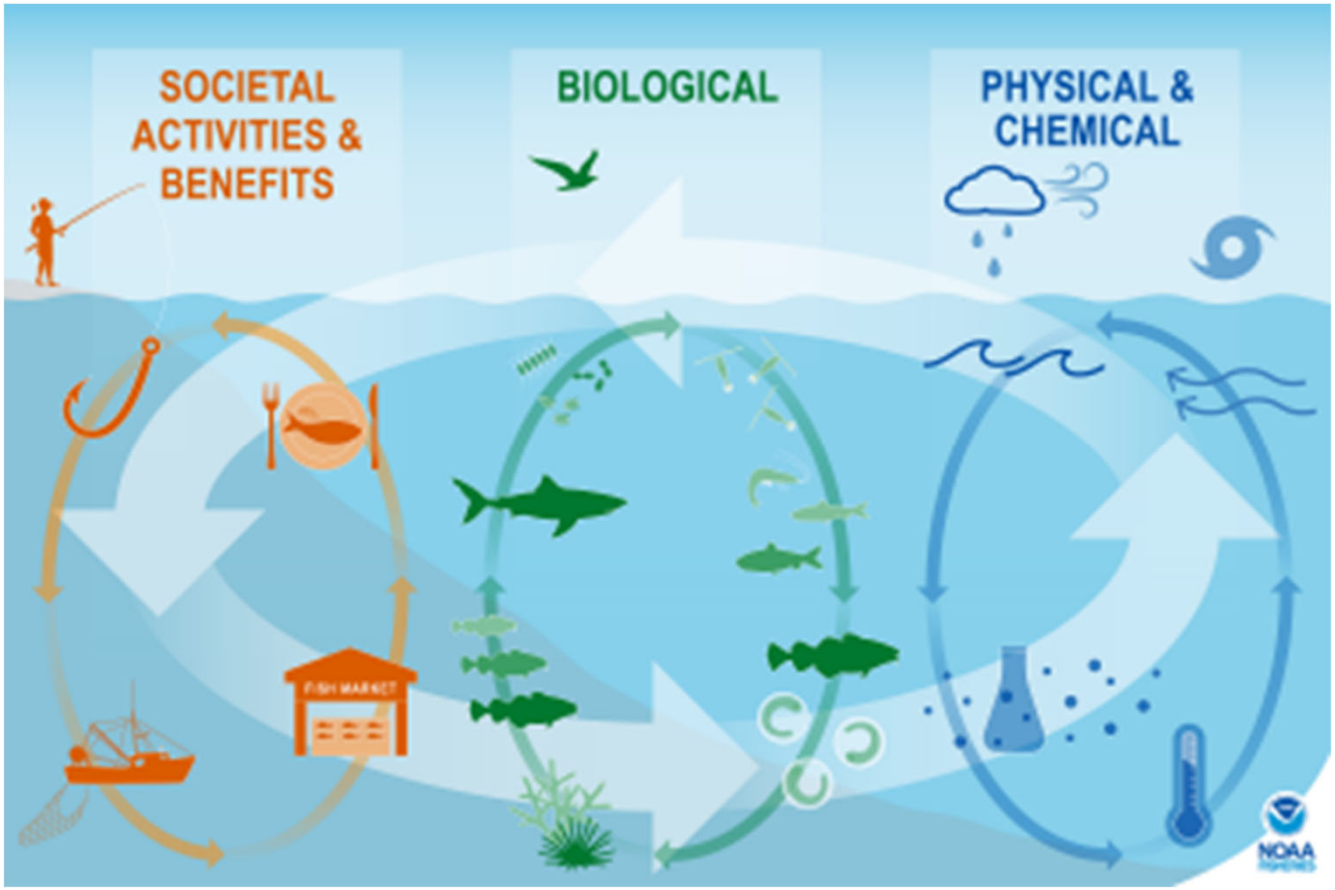
Xubin Zeng, Robert Atlas, Ronald J. Birk, Frederick H. Carr, Matthew J. Carrier, Lidia Cucurull, William H. Hooke, Eugenia Kalnay, Raghu Murtugudde, Derek J. Posselt, Joellen L. Russell, Daniel P. Tyndall, Robert A. Weller, and Fuqing Zhang

CINAR

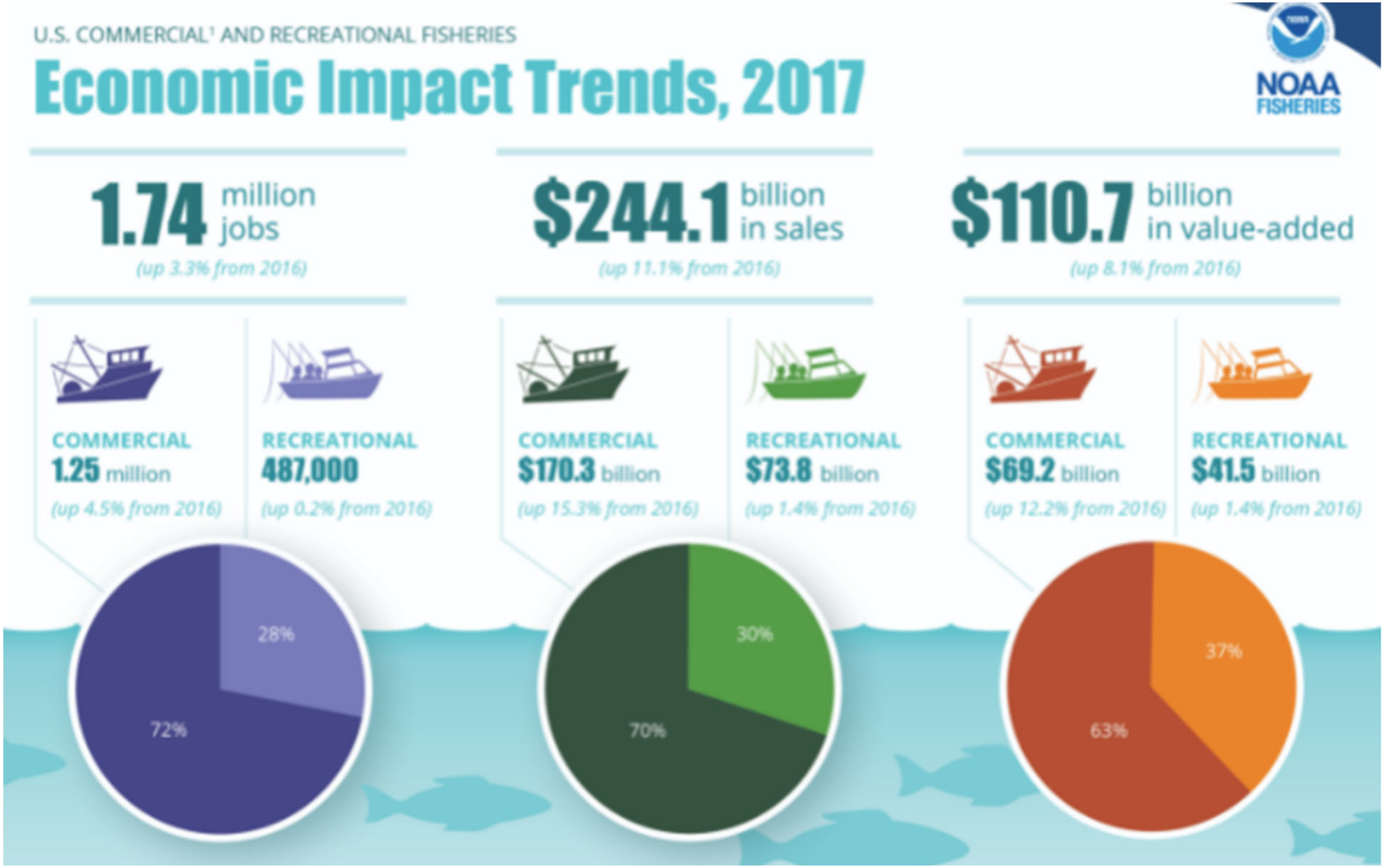
Cooperative Institute for the North Atlantic Region

Understanding impacts of wind energy development on marine ecosystems

Pillar 4



Societal Activities and Benefits



https://www.fisheries.noaa.gov/national/sustainable-fisheries/fisheries-economics-united-states#infographics

Societal Activities and Benefits

Socio-economic Data Tools

Reports summarizing previous fishing activity within wind energy areas

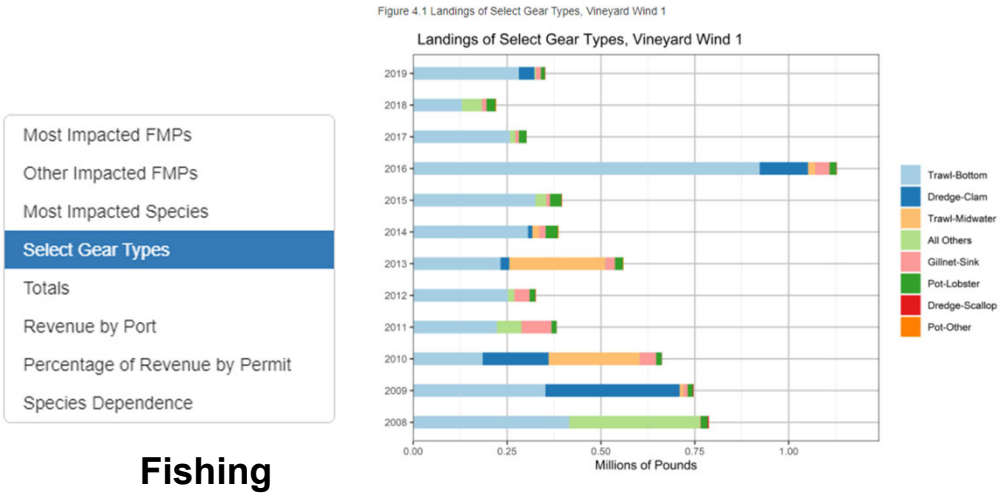
Annualized landings and revenue by species, gear type, ports and fishery management plan

Supports fisheries monitoring plans and socio-economic impact analysis

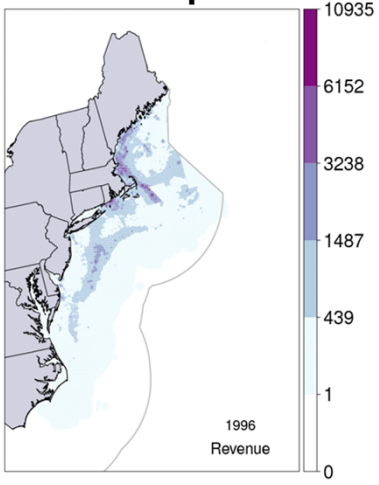
Developing a predictive displacement model for the Atlantic sea scallop fishery

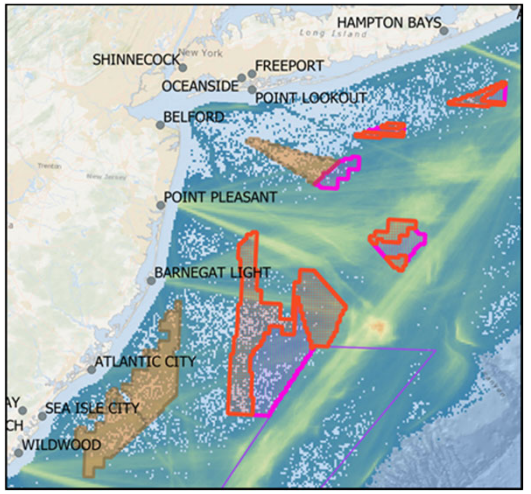
https://www.fisheries.noaa.gov/resource/data/socioeconomic-impacts-atlantic-offshore-wind-development

Vineyard Wind Project Area Reports for Landings by Gear Type:



Fishing Footprint



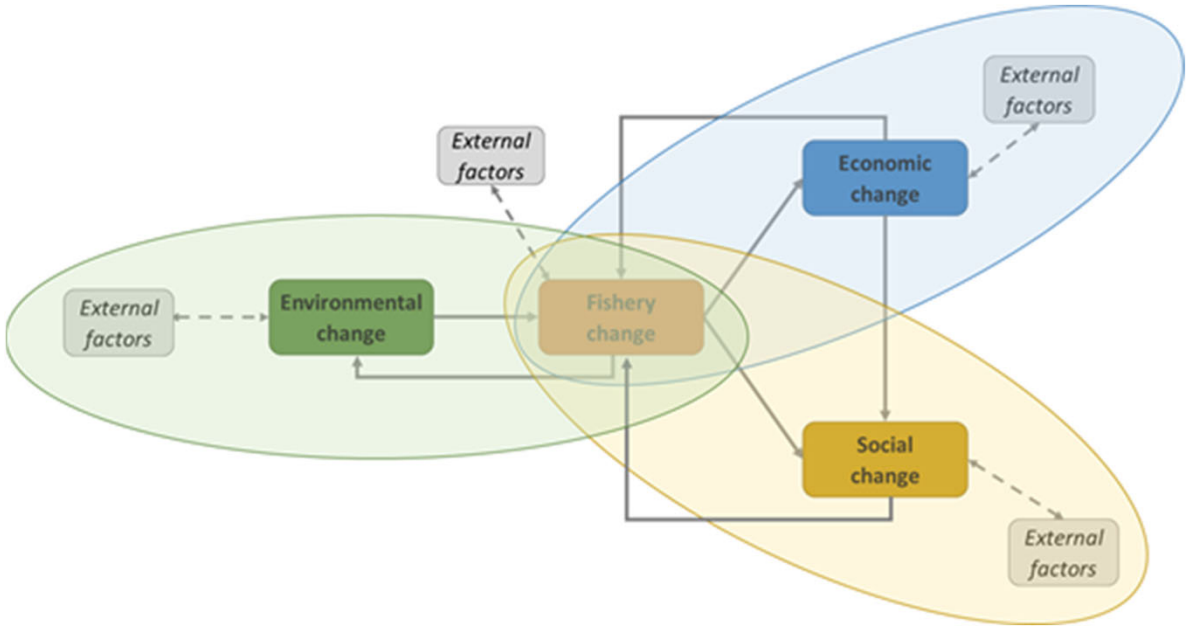


Human Dimensions Research

ICES Workshop on the Socio-economic Implications of Offshore Wind on Fishing Communities (WKSEIOWFC)

Conclusion: *"**no common, consistent, and accepted framework for defining and quantifying socio-economic impacts exist in Europe nor the United States.**"*

Workshop attended by participants from **9 countries** representing policy/regulation, fishing industry, offshore wind industries, consultants and academia



https://www.ices.dk/sites/pub/Publication%20Reports/Forms/DispForm.aspx?ID=37561

Understanding impacts of wind energy development on marine ecosystems

Introduction to the Special Issue on

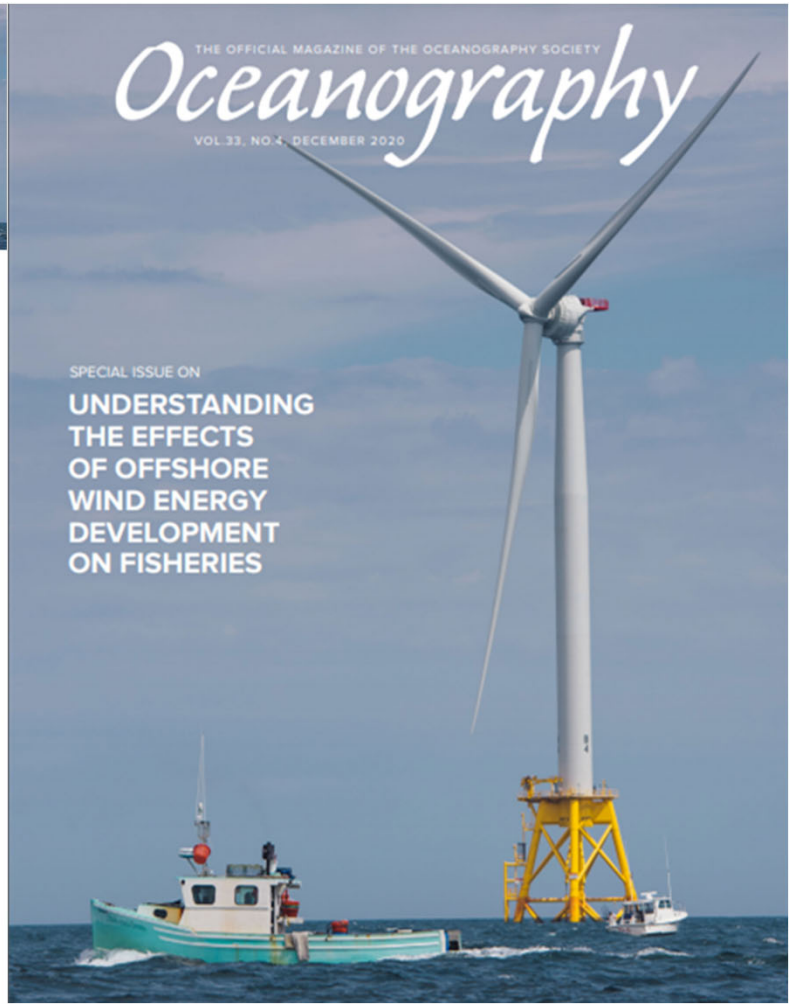
Understanding the Effects of Offshore Wind Development on Fisheries

By Emily Twigg, Susan Roberts, and Eileen Hofmann

Emily Twigg, The National Academies of Sciences, Engineering, and Medicine
Susan Roberts, The National Academies of Sciences, Engineering, and Medicine
Eileen Hofmann, Old Dominion University

A National Academy of Sciences led effort supported by Bureau of Offshore Energy Management

https://tos.org/oceanography/issue/volume-33-issue-4



Offshore Wind in the NE U.S. Shelf Ecosystem

Methratta et al. 2020 *Oceanography* 33: 16-27.

Fisheries surveys and assessments will be impacted

Fisheries resources will be impacted (sound, EMFs, artificial reef effects, hydrodynamics)

Fishing activities and societal benefits will be impacted

Understanding impacts of wind energy development on marine ecosystems

Setting the Context

Gill et al. 2020 *Oceanography* 33: 118-127

Sound

Mooney et al. 2020 *Oceanography* 33: 82 – 95.

Electromagnetic Fields (EMFs)

Hutchison et al. 2020 *Oceanography* 33: 96-107

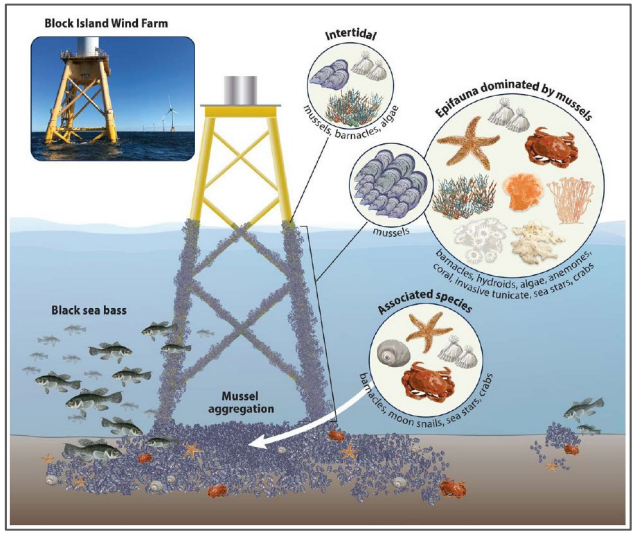
Artificial Reef Effect

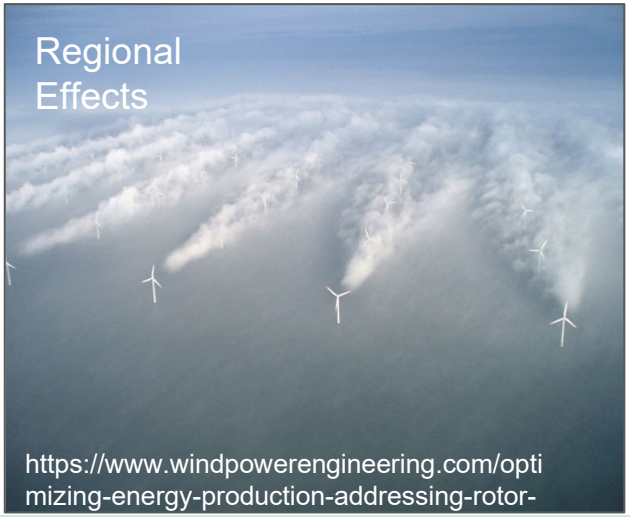
Degraer et al. 2020 *Oceanography* 33: 48-57

Effects of Altered Hydrodynamics

Van Berkel et al. 2020 *Oceanography* 33: 108-117.

phylum, species, population, life stage, region, ecological community





https://www.windpowerengineering.com/optimizing-energy-production-addressing-rotor-wakes-wind-farms/

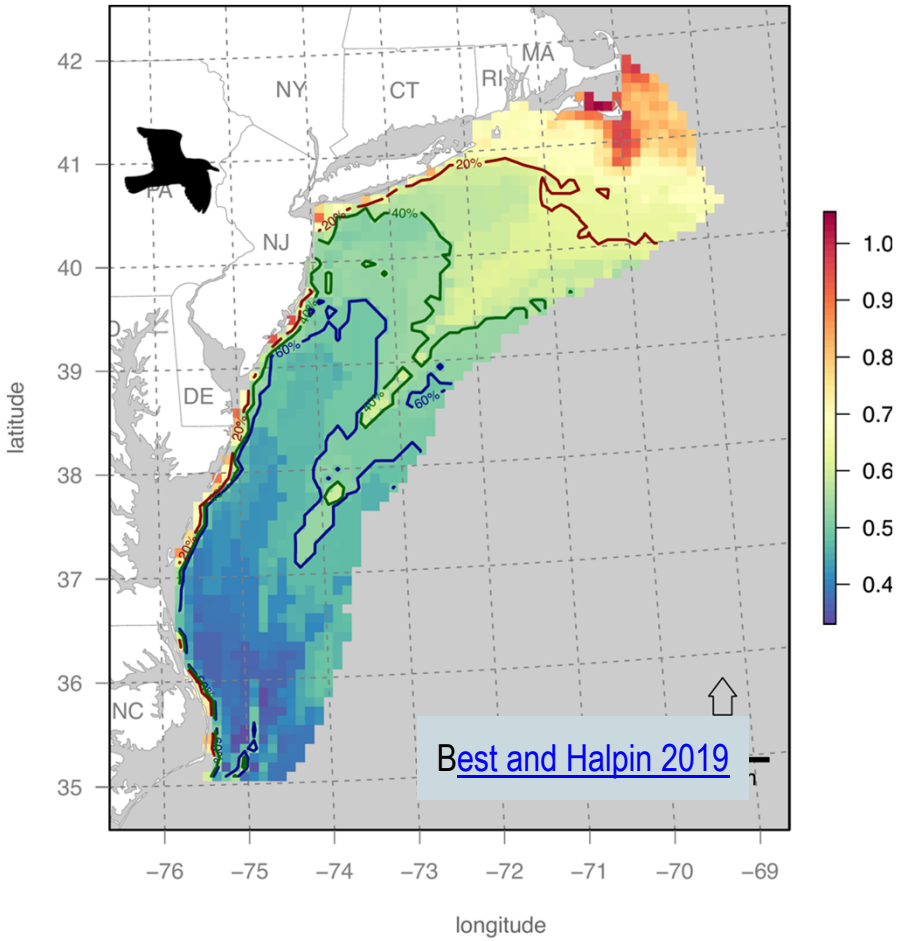
NOAA FISHERIES

Wildlife Conservation (e.g., Right Whales, Migratory Birds)

Important to understand impact of development on wildlife, particularly species that are legally protected

Collecting data on protected species and their habitat and food webs are critical

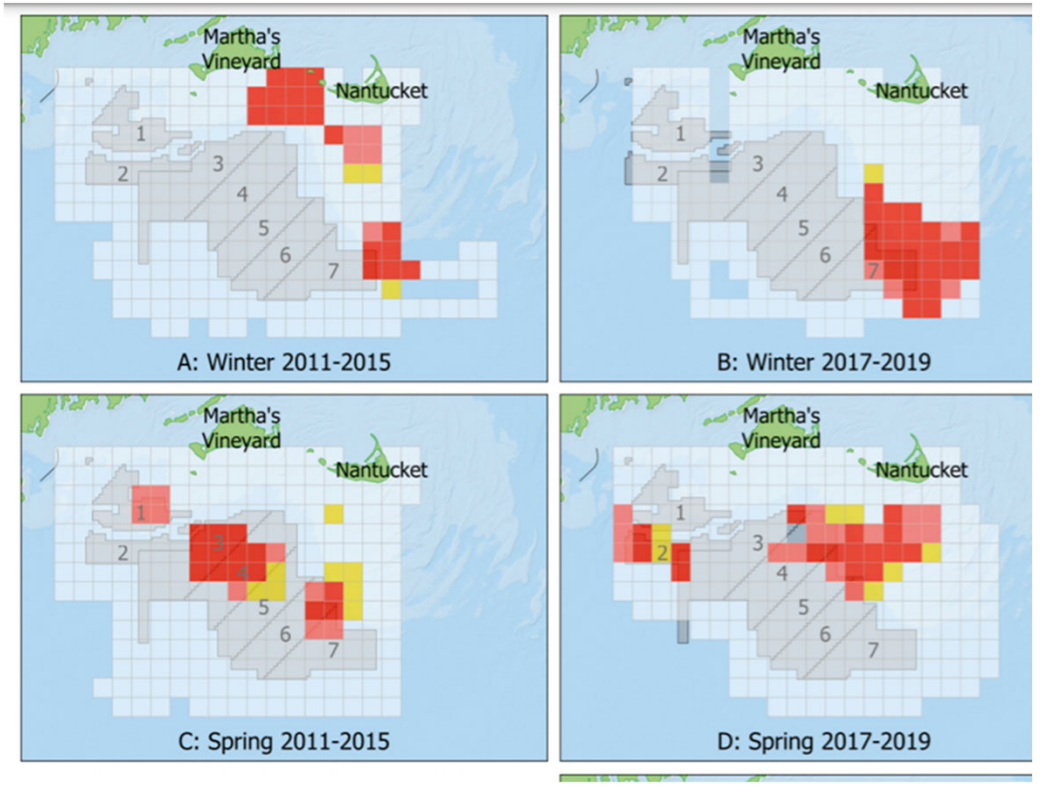
Need to incorporate into population-level understanding of effects and vulnerability



Wildlife Conservation (e.g., Right Whales, Migratory Birds)

Overlap can be substantial (particularly given scale of development)

Science of mitigation



Quintana-Rizzo et al. 2021 *Endangered Species Research 45:251-268*

North Atlantic Right Whales Research & Monitoring

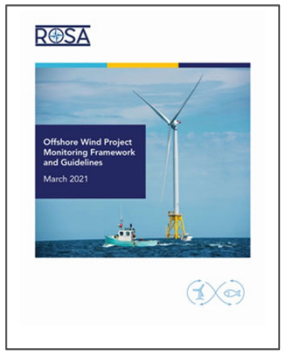
1. NOAA/USGS right whale expert elicitation to develop a population viability assessment examining the potential impact of offshore wind on right whale population
2. Collecting data on zooplankton energy density, species, and concentrations to better understand right whale habitat use in MA/RI WEA
3. Future field work to assess right whale health and demographics in the MA/RI WEA region

Leiter et al. 2017. *Endangered Species Research 34:45-59/*
Habitat use by North Atlantic right whale in wind energy areas

Quintana et al. *2021*. *Endangered Species Research*
Residency, demographics, and movement patterns of North Atlantic right whales in wind energy areas

Regional Science Collaborations

- RODA, BOEM, and NOAA Synthesis of the Science Workshop and Technical Memorandum (***Upcoming***)
- ***Upcoming*** State of the Science-Fisheries and Floating Wind Technology
- ROSA Guidelines for research and monitoring
- Establishing Regional Wildlife Science Entity
- NOAA Sea Grant / NOAA Fisheries / DOE - Research Funding Opportunity
- International Council on Exploration of the Sea Fisheries and Wind Expert Group



Questions

Additional Information

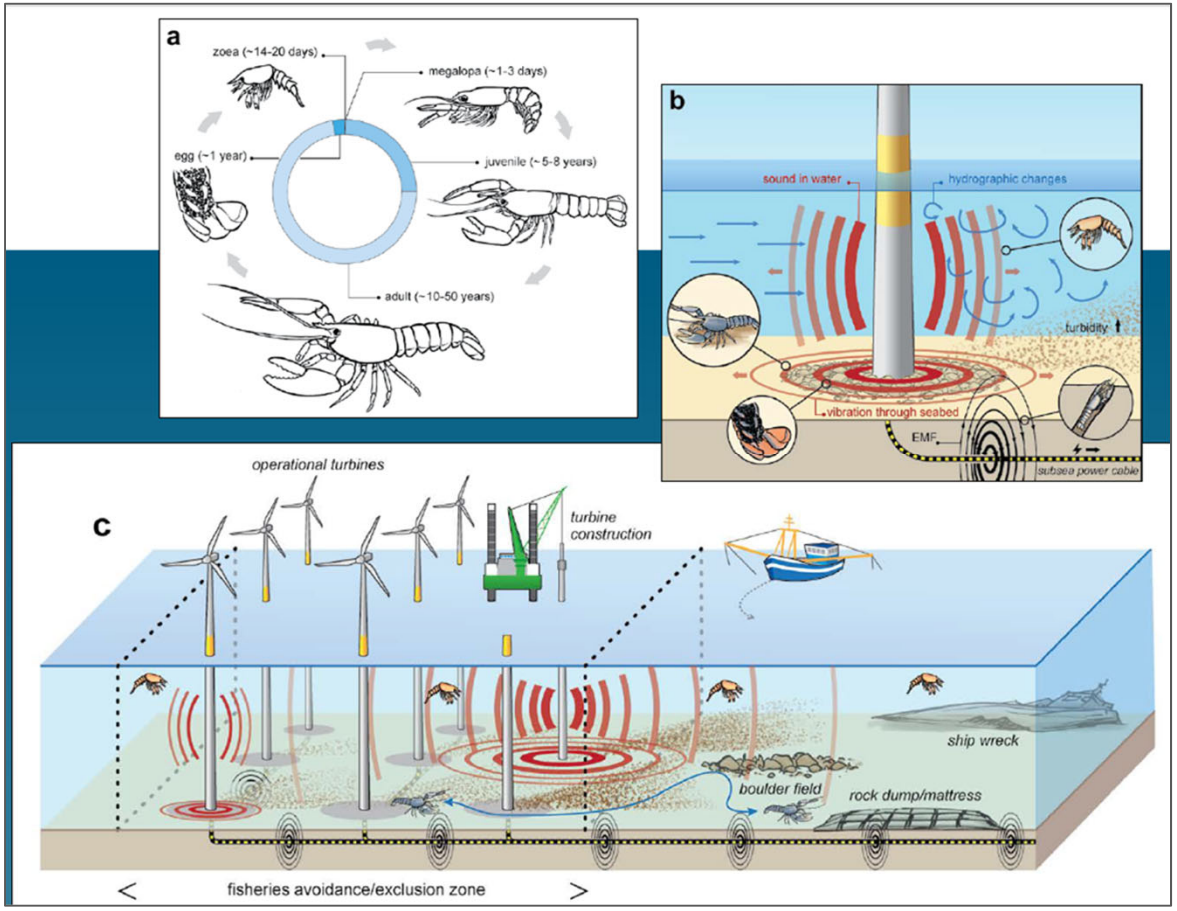
Setting the Context

Gill et al. 2020 *Oceanography* 33: 118-127

Need to consider interactions

Need to improve understanding of economic and societal impacts

Site-specific and regional survey and monitoring data are needed by fisheries managers



Sound

Mooney et al. 2020 *Oceanography* 33: 82 – 95.

All phases of wind development produce underwater sound

Data on acoustic impacts are very limited for most species, populations, and life stages

New understanding needs to integrated into assessments and cumulative impact analyses

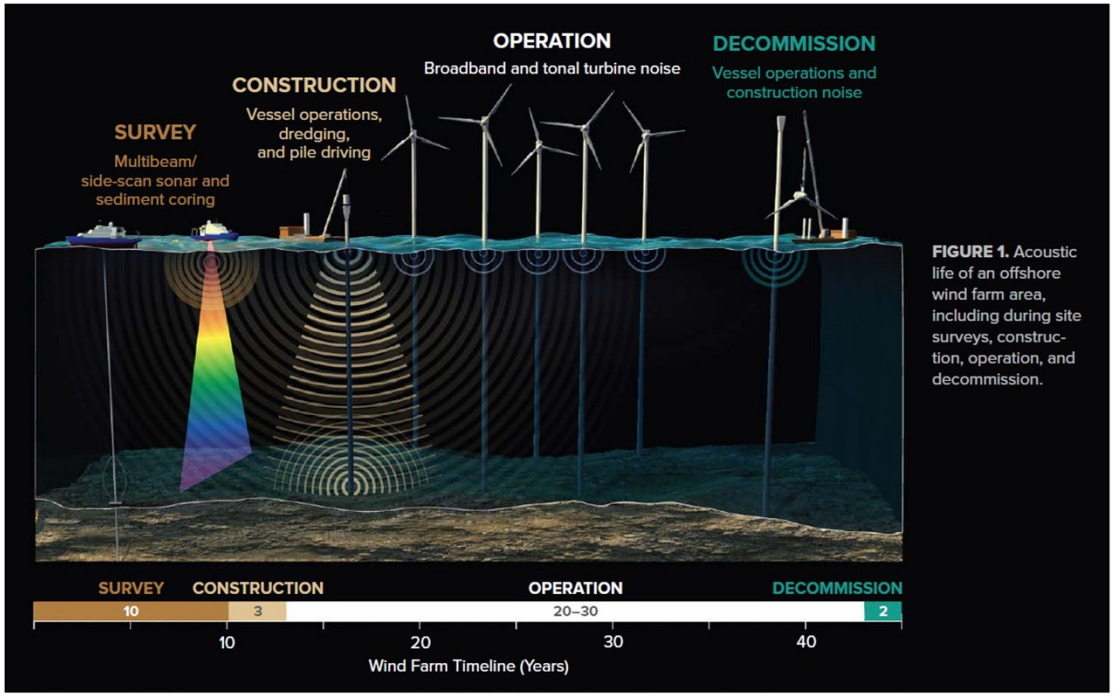


FIGURE 1. Acoustic life of an offshore wind farm area, including during site surveys, construction, operation, and decommission.

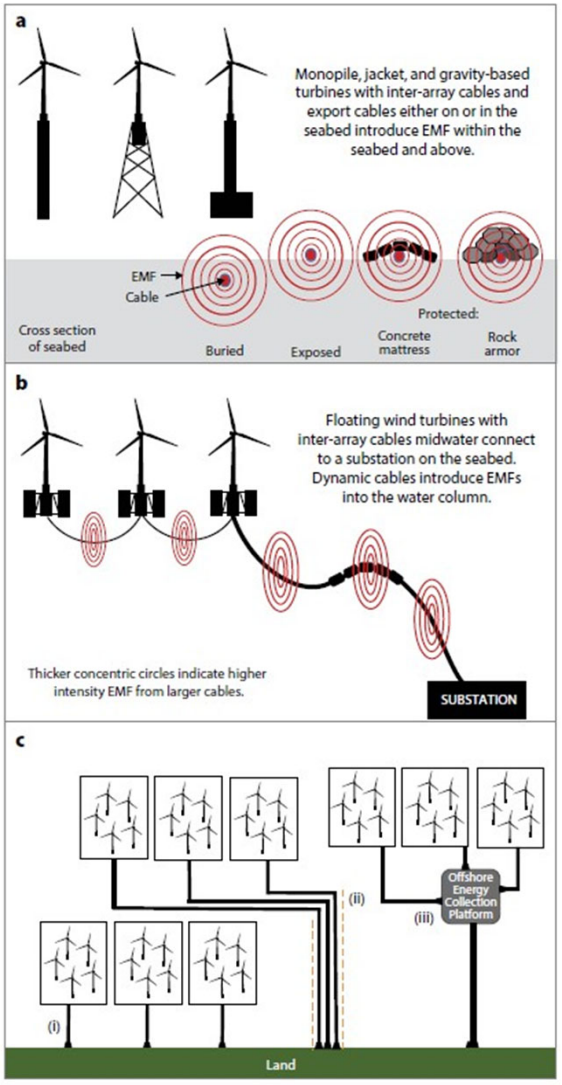
Electromagnetic Fields (EMFs)

Hutchison et al. 2020 *Oceanography* 33: 96-107

Potential for EMFs to affect behavior of finfish and shellfish

Electrosensory species and those that use a magnetic map sense are particularly vulnerable.

More research is needed to understand individual to population level effects



Artificial Reef Effect

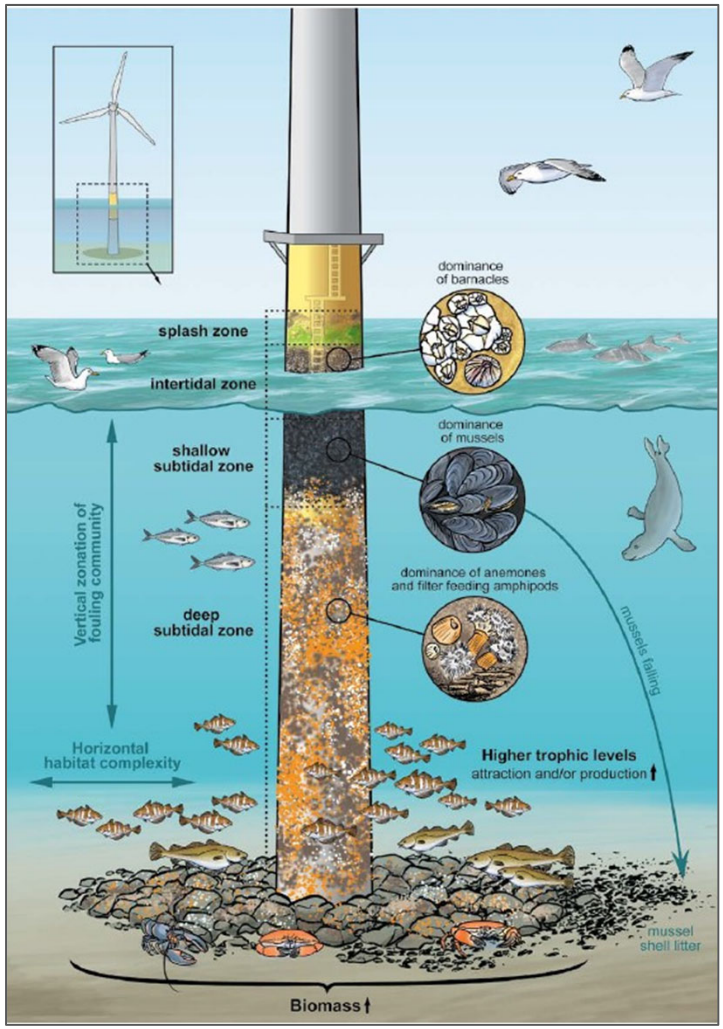
Degraer et al. 2020 *Oceanography* 33: 48-57

Turbines represent habitat alteration and support a diverse and abundant artificial reef community

Population affected by changes in availability of food, predators, and shelter

Need studies across multiple spatial and temporal scales

Need to evaluate population-level effects of artificial reef effect



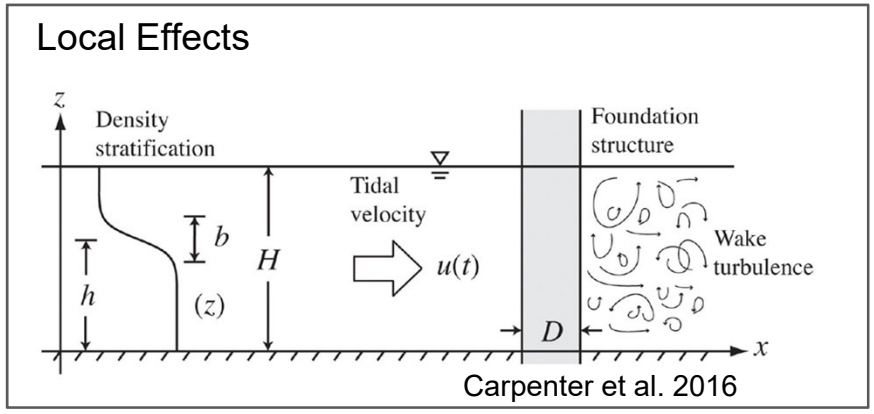
Effects of Altered Hydrodynamics

Van Berkel et al. 2020 *Oceanography* 33: 108-117.

Alter local and regional aerodynamics and hydrodynamics - e.g., turbulence, mixing, vertical stratification.

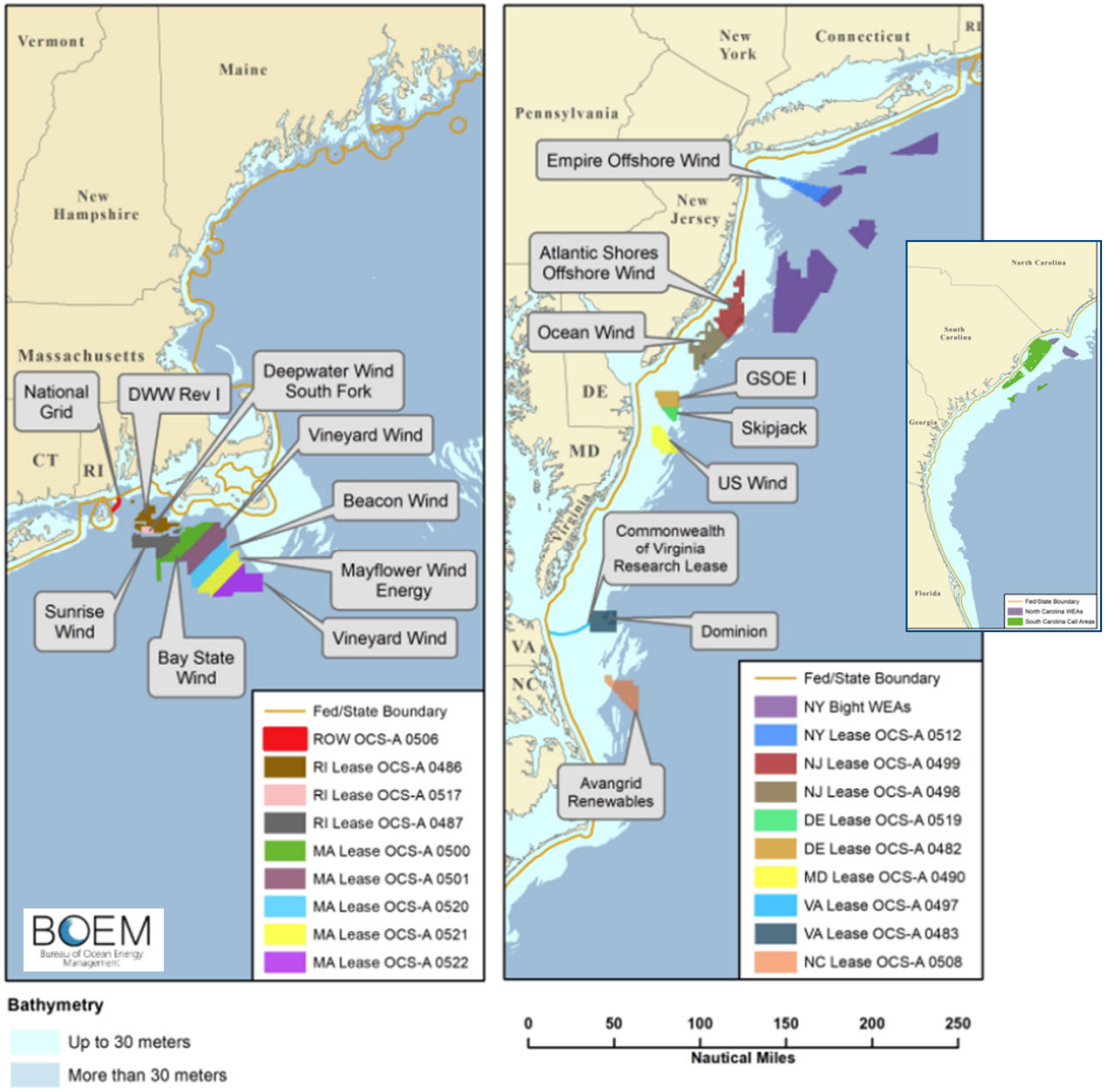
Sediment resuspension and sedimentation, temperature and salinity changes, nutrient transport and exchange

Scale of development related to magnitude of effect



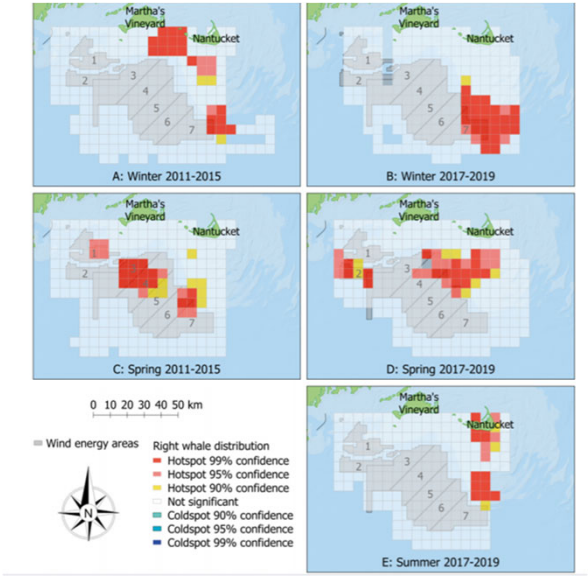
Regulatory scientific demands

- **U.S. Goal Set for 30 GW of offshore wind power by 2030**
- **U.S. Goal Set for 110 GW of offshore wind power by 2050**
- **New Wind Energy Areas** now established in NY Bight- Adds **800,000 acres** to existing **1.7M** acres of leases
- **Notice of Intent to proceed with 16 Construction and Operations Plans/EISs by 2025**
- **16 Record of Decisions by the end of 2024**



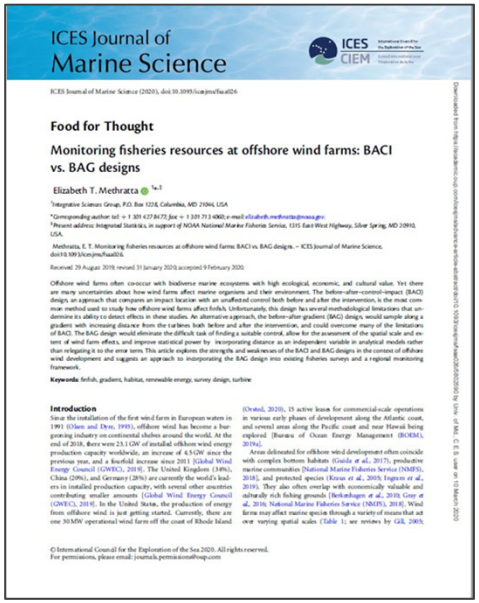
https://www.boem.gov/renewable-energy/mapping-and-data/renewable-energy-gis-data

Peer-Reviewed Papers on Offshore Wind - Fisheries Science Topics



Quintana-Rizzo et al. 2021
Endangered Species Research 45:251-268

Large aggregations of right whales occur in wind energy areas during the winter and spring


ICES Journal of Marine Science

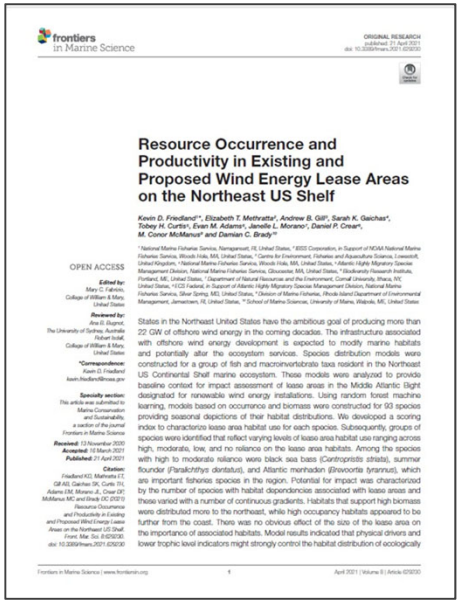
Food for Thought

Monitoring fisheries resources at offshore wind farms: BACI vs. BAG designs

Elizabeth T. Methratta

Methratta 2020.
ICES Journal of Marine Science 77: 890–900.

Exploring the pros and cons of BACI and BAG experimental designs in the context of OW


frontiers in Marine Science

Resource Occurrence and Productivity in Existing and Proposed Wind Energy Lease Areas on the Northeast US Shelf

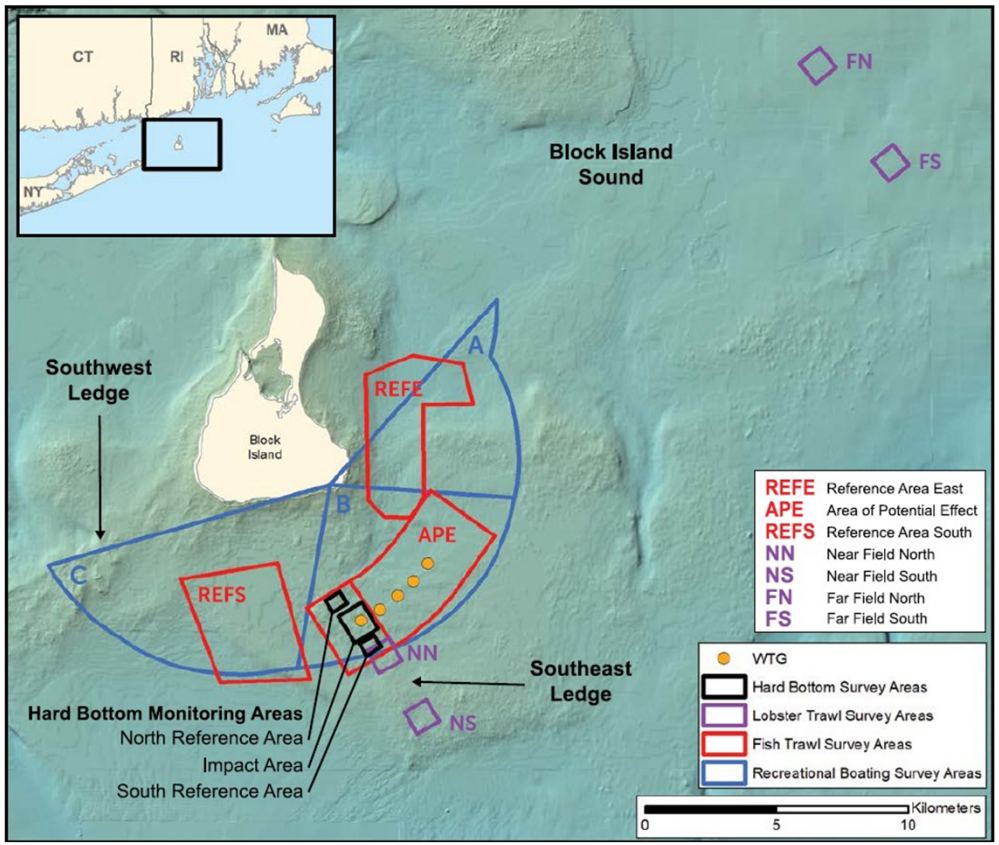
Friedland et al. 2021.
Frontiers in Marine Science 8:629230.

Fisheries resource occurrence in the NE U.S. Shelf wind energy areas

Block Island Wind Farm: Coastal Resources

Carey et al. 2020 *Oceanography* 33: 70-81

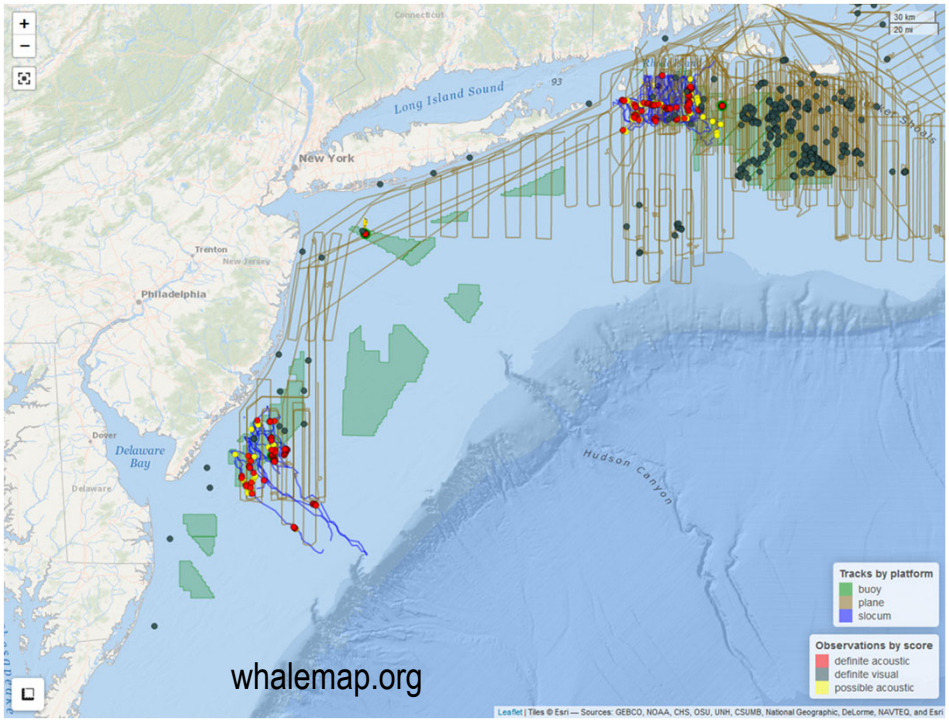
- Designed studies to investigate the effects of construction and operation on hard bottom habitats, demersal fish, lobster and crabs, and recreational boating
- Important study elements included early engagement with fishermen and boaters, adaptive monitoring based on data and stakeholder feedback, and cooperative research
- Use methods that are consistent with regional surveys



Protected Species Research & Monitoring

Aerial Surveys

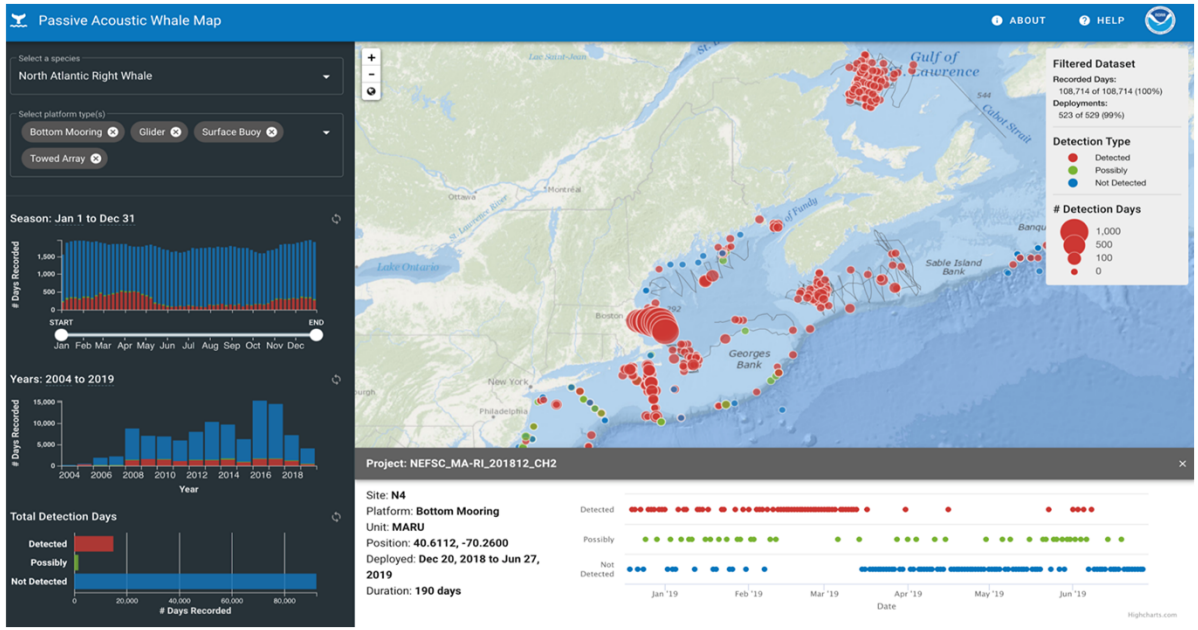
1. Extensive aerial survey effort by NOAA and partners to establish baseline protected species distribution and habitat use
2. Investing in a camera system to for adaptation and calibration of surveys to take into account higher survey heights with the presence of wind farms



Protected Species Research & Monitoring

Passive Acoustic Monitoring (PAM)

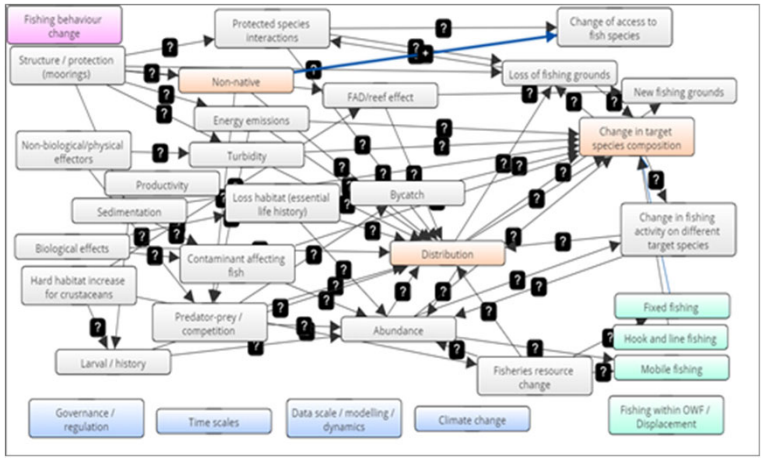
- Developing guidelines for energy developer deployment, dissemination, and storage of PAM data
- Building repository and website for PAM data collection and dissemination
- Deployed PAM devices in WEAs
- Extensive collaboration with partners for baseline data collection



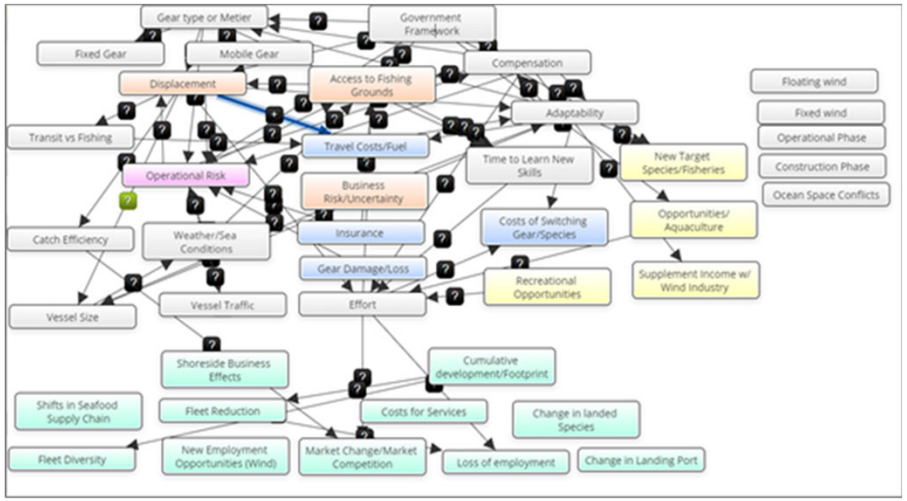
ICES Workshop on the Socio-economic Implications of Offshore Wind on Fishing Communities (WKSEIOWFC)

Workshop Outcomes:

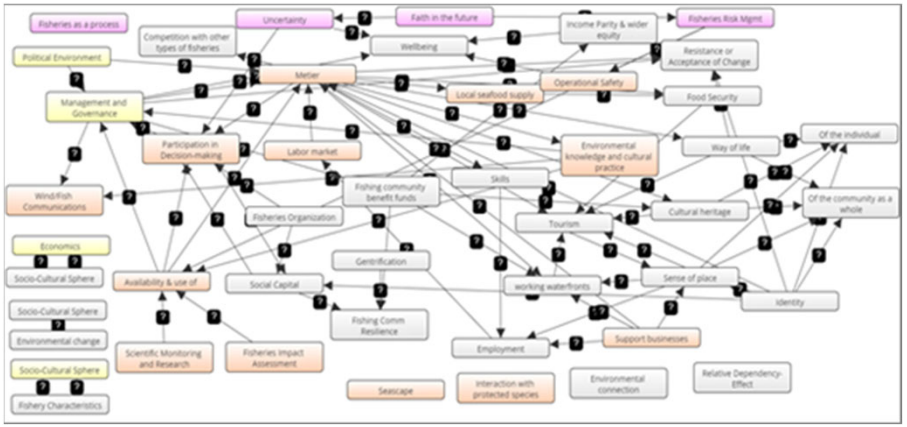
- Sub-group conceptual models on three themes
- Supportive narrative behind ‘nodes’ and the connections was key information collected for identifying gaps and existing evidence
- Identified common issues and differences between the U.S. and Europe



Environmental Model



Economic Model



Cultural Model

Block Island Wind Farm: Benthic Habitat

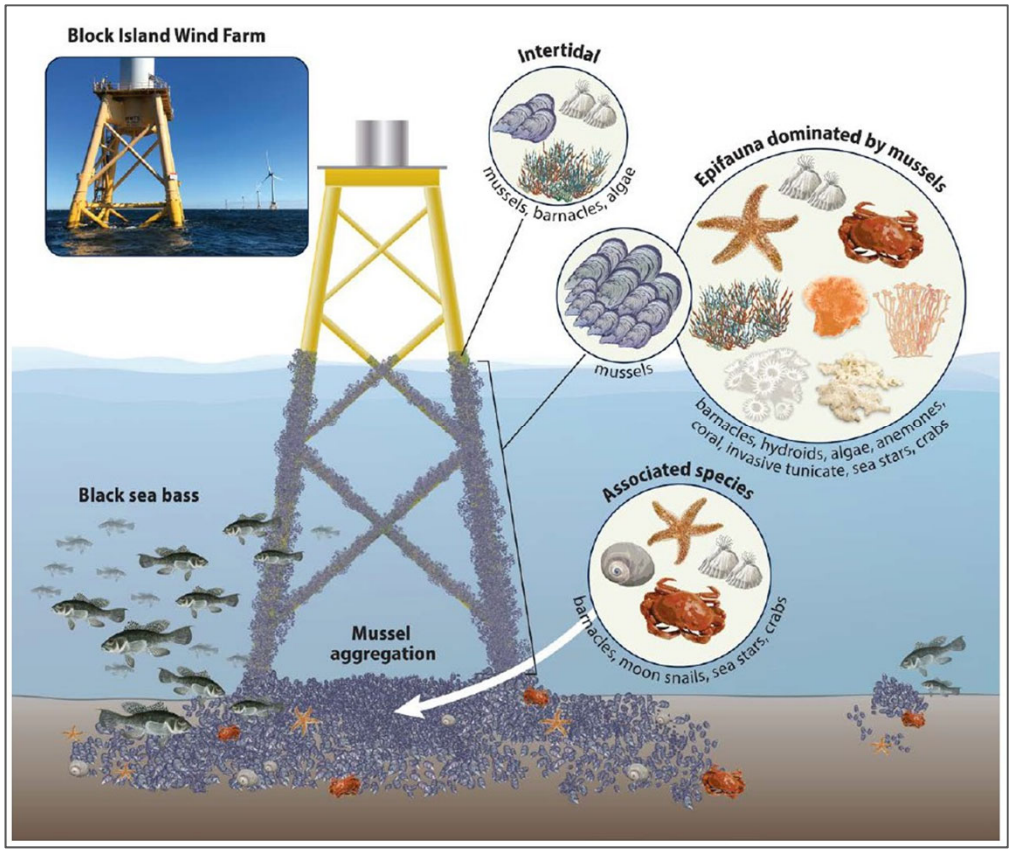
Hutchison et al. 2020 *Oceanography* 33: 58-69

- Monitoring has included sediment grain size, organic enrichment, and macrofauna, as well as the colonization of
- the jacket structures, up to four years post-installation

- After four years, mussel aggregations established within the footprint of the turbines

- Biotypes within 90 m of the turbines were linked to mussel aggregations and included several non-indigenous species

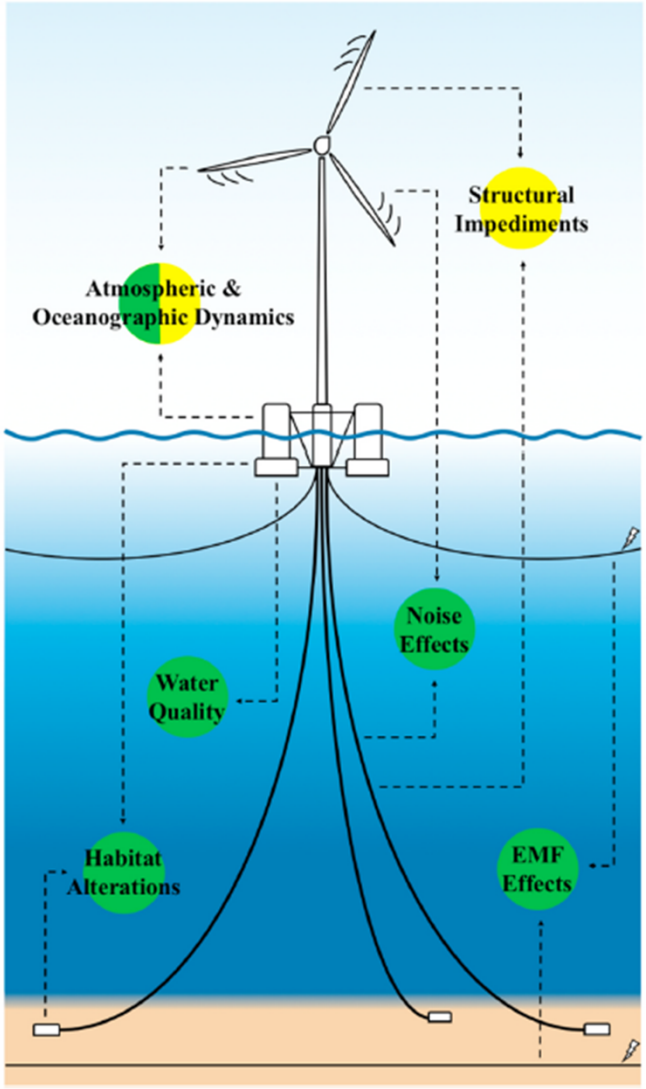
- Coordinated monitoring is needed



Human Dimensions Research Partnership

- "Advancing Research for Co-existence of Fishing, Coastal Communities, and Regional Ocean Renewable Energies"
- Sea Grant, NEFSC, DOE
- Research Priority Areas:
  - (1) Fisheries and Fishing Community Resilience
  - (2) Coastal Community and Economic Resilience
  - (3) Multi-use Maritime Activities

Effects of Floating Offshore Wind



Potential Magnitude of Environmental Effect

Negligible *Minimal* *Moderate* *Major*

Potential Environmental Effect

EMF Effects
- Potential to affect animal behavior, but unlikely to substantially alter survival and reproduction.

Habitat Alterations
- Potential for structures along the seafloor to provide new habitat via the "reef effect", though the installation of artificial substrates may also invite colonization by non-native species.
- Potential for bottom, midwater, and surface structures to act as fish aggregation devices and for OWFs as a whole to act as *de facto* marine protected areas.

Noise Effects
- Unlikely to pose risk to marine species as operational noise of OWFs is low frequency and at low levels.
- Empirical measurements still needed for deepwater, floating OWFs.

Water Quality
- Preemptive measures to prevent biofouling and corrosion may introduce toxins on a local scale, though adoption of environmentally-friendly alternatives can reduce risk to marine species.

Atmospheric & Oceanographic Dynamics
- Expected to reduce downstream wind speed, though existing literature rarely report concordant estimates.
- Potential to alter local wave patterns, vertical mixing, and seasonal stratification, which could have cascading effects on carbon pump, biomass distribution, and sediment dynamics.

Structural Impediments
- Potential to increase avoidance, displacement, collision, and entanglement risk for many marine species.
- Use of promising, albeit minimally tested, mitigation measures may substantially reduce impacts on species' behavior, fitness, and survival.

Farr et al. 2021