Focal Fisheries Requirements for Floating Offshore Wind Co-Design in the Gulf of Maine and the Mid-Atlantic Bight

Everett J. Rzeszowski,[1] Damian C. Brady,[1] Mike Pol,[2]
Ericka Lozon,[3] Ryan Davies,[3] and Kristen Ampela[3]

1 University of Maine
2 Responsible Offshore Science Alliance
3 National Renewable Energy Laboratory

Produced under direction of National Offshore Wind Research and Development Consortium by the National Renewable Energy Laboratory (NREL) under Agreement 192902-135.

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated under Contract No. DE-AC36-08GO28308

Strategic Partnership Project Report
NREL/TP-5000-92666
July 2025

This report is available at no cost from
NREL at www.nrel.gov/publications.

Focal Fisheries Requirements for Floating Offshore Wind Co-Design in the Gulf of Maine and the Mid-Atlantic Bight

Everett J. Rzeszowski,[1] Damian C. Brady,[1] Mike Pol,[2]
Ericka Lozon,[3] Ryan Davies,[3] and Kristen Ampela[3]

1 University of Maine
2 Responsible Offshore Science Alliance
3 National Renewable Energy Laboratory

Suggested Citation
Rzeszowski, Everett J., Damian C. Brady, Mike Pol, Ericka Lozon, Ryan Davies, and Kristen Ampela. 2025. *Focal Fisheries Requirements for Floating Offshore Wind Co-Design in the Gulf of Maine and the Mid-Atlantic Bight*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-92666. https://www.nrel.gov/docs/fy25osti/92666.pdf.

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated under Contract No. DE-AC36-08GO28308

This report is available at no cost from NREL at www.nrel.gov/publications.

Strategic Partnership Project Report
NREL/TP-5000-92666
July 2025

15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nrel.gov

NOTICE

This work was authored in part by NREL for the U.S. Department of Energy (DOE), operated under Contract No. DE-AC36-08GO28308. Support for the work was also provided by National Offshore Wind Research and Development Consortium under Agreement 192902-135. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

This report is available at no cost from NREL at www.nrel.gov/publications.

U.S. Department of Energy (DOE) reports produced after 1991 and a growing number of pre-1991 documents are available free via www.OSTI.gov.

Cover photos (clockwise from left): Josh Bauer, NREL 61725; Visualization from the NREL Insight Center; Getty-181828180; Agata Bogucka, NREL 91683; Dennis Schroeder, NREL 51331; Werner Slocum, NREL 67842.

NREL prints on paper that contains recycled content.

Acknowledgments

This report was developed as part of the project *Co-Design Solutions for U.S. Floating Offshore Wind Farms and Fishing Compatibility,* funded by the National Offshore Wind Research and Development Consortium (NOWRDC). The authors thank Rebecca Green and Matthew Hall for project conception. The authors also thank members of the project's external advisory board for their feedback and recommendations as well as Kori Groenveld for managing the project at NOWRDC. Finally, this project would not be possible without the cooperation, insights, and support provided by our fishing industry collaborators. Thank you to all involved.

List of Acronyms

ALWTRT	Atlantic Large Whale Take Reduction Team
BOEM	Bureau of Ocean Energy Management
fa	fathoms
LMA	Lobster Management Area
MeRA	Maine Research Array
MILCA	Monhegan Island Lobster Conservation Area
nm	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NREL	National Renewable Energy Laboratory
UMaine	University of Maine

Executive Summary

Floating offshore wind is an emerging renewable energy technology in U.S. waters and globally. The floating offshore wind turbine support structure is more complex than fixed-bottom installations, requiring buoyant platforms, moorings, and power cables that take up a larger footprint, both in the water column and along the seafloor. This complexity affects opportunities for compatibility between floating offshore wind and other ocean users, particularly fishermen, whose fishing gear also takes up space in the water column and along the seafloor.

This report describes the results of semi-structured interviews with key fishing informants from two focal fisheries: (1) Gulf of Maine lobster (fixed gear) and (2) Mid-Atlantic Bight pelagic longline and recreational tuna (mobile gear). A total of six fishermen were interviewed: four from the Gulf of Maine and two from the Mid-Atlantic Bight. The interviews were designed to elicit information and opinions on the co-design of marine space for particular fishing gear and floating offshore wind infrastructure. Here, we provide an overview of participant fishing experience, the spatial requirements of specific gear types, self-reported comfort levels in different fishing scenarios, and concerns about accessing and operating within floating offshore wind arrays.

This summary of fishermen's concerns around floating offshore wind infrastructure can guide future coexistence conversations. In the Gulf of Maine interviews, key informants emphasized issues with transiting or fishing within arrays during inclement weather and the need to mark mooring lines to fish effectively in the space. They also provided examples of safety issues and potential solutions. Mid-Atlantic Bight fishermen also noted the need to mark mooring lines in a way that can provide real-time positioning information on chart plotters. There was a notably lower emphasis on safety concerns related to recreational fishing, and the key informant generally saw the offshore wind projects as a potential opportunity for increased catch.

There is wide variation in the spatial requirements of the gear types considered in this study. Pelagic longlining gear stretches for more than 20 miles, and the drift patterns are extremely unpredictable. The size of lobster fishing gear depends heavily on the number of traps per trawl, which is subject to National Oceanic and Atmospheric Administration regulations in certain areas. Recreational fishing has the smallest footprint and largest possibility of co-use within a floating wind farm. The spatial footprints of the various gear types correlate with the reported comfort levels of fishing within a wind farm.

The information gathered through interviews about the spatial requirements of fishing gear and the comfort levels of fishermen is being used to parameterize a hypothetical floating offshore wind array as part of a suite of array design solutions that improve accessibility for fisheries. The analysis aims to balance optimizations that maximize both the levelized cost of energy and the fishable area within the array. Comfort levels will be used to understand the relative likelihood that fishing will occur within a floating offshore wind array and scale the fishable area accordingly. Following the development of wind array design solutions, initial key informants and an expanded group of fishermen will provide feedback on the feasibility of accessing or actively fishing within the designs.

Table of Contents

List of Figures

List of Tables

1 Introduction

The offshore wind industry in the United States has experienced rapid growth in recent years, and in certain regions the focus has shifted from fixed-bottom to floating offshore wind development (McCoy et al. 2024). Offshore wind capacity under construction in the United States has tripled from 2023 to 2024 but has featured exclusively fixed-bottom installations (McCoy et al. 2024). Although initial development has focused on shallower water depths suitable for fixed-bottom wind turbines, 65% of the U.S. offshore wind resource is over depths that require floating solutions (Lopez et al. 2022). The potential for floating offshore wind energy development is reflected in the proposed Bureau of Ocean Energy Management (BOEM) leasing schedule, in which 7 of the 12 future offshore wind lease auctions include sites that will require floating offshore wind turbines (McCoy et al. 2024). Floating offshore wind installations allow for the development of deep-water sites that are located further from shore, which reduces the visual impact and improves the quality of the wind resource. However, offshore wind sites incur more spatial impacts compared to fixed-bottom sites due to the additional required subsea infrastructure, such as mooring lines, anchors, and dynamic power cables. These components of floating offshore wind present operational barriers for existing industries such as commercial and recreational fisheries.

Offshore wind has historically faced opposition from commercial fisherman in Europe, Asia and the United States (Mackinson et al. 2006; Methratta et al., n.d.; Tsai et al. 2022). The European offshore wind industry is the most mature and thus has the most well-defined approach to offshore wind and fisheries interactions. There are two approaches commonly employed: (1) the right to access leases for fishing activities, like in the United Kingdom, or (2) prohibition from entering wind lease areas, like in Germany (Schupp et al. 2021). In either case, fishermen report concerns including socioeconomic impact due to incompatibility of their gear with wind infrastructure and subsequent displacement from farms (Szostek et al. 2025). Additionally, perceived risk is high when operating in wind farms where collision with turbines is a concern, particularly at night or when weather conditions change (Szostek et al. 2025). In some cases, fishermen have cited benefits to development such as improved fishing opportunities for certain species (Roach et al. 2018; Roach, Revill, and Johnson 2022) or novel job opportunities (Gray, Stromberg, and Rodmell 2016). Additional research has suggested that offshore wind farms may provide artificial habitat that enhances local productivity (Bicknell, Gierhart, and Witt 2025). With the possible exclusion of commercial fishing activities, offshore wind farms have the potential to act as marine protected areas that may impact local abundance across a wide-variety of species (Ashley, Mangi, and Rodwell 2014).

The first step in mitigating impacts to preexisting marine users like commercial fishermen is deconfliction through responsible lease siting. One approach BOEM has used in the past attempts to mitigate impacts related to siting by developing spatial suitability models in collaboration with the National Oceanic and Atmospheric Administration (NOAA) (Carlton et al. 2023; Randall et al. n.d.). The NOAA's National Centers for Coastal Ocean Science spatial modeling process is complemented by outreach meetings in communities where individual stakeholders can comment on aspects of the system that are not captured (Jylkka and Feinberg 2024). Deconfliction and impact mitigation through careful siting avoids the largest impacts that floating offshore wind development may have on existing industries. Despite these efforts, some concerns remain about the impacts of floating offshore wind leasing on other marine users. Additional impact mitigation requires some level of planning with specific co-users such as commercial fishermen or aquaculturists, with floating offshore wind infrastructure options in mind (Green et al. 2023).

This project engages commercial fishermen in a co-design exercise in which their assessment of the spatial requirements of their fishing gear will be used to parameterize a generalized floating offshore wind array to improve the potential accessibility of offshore wind for the fishing industry. While the fisheries considered here are location-specific, the floating array designs are hypothetical and not associated with any specific offshore wind lease. We engaged with two focal fisheries—(1) Gulf of Maine lobster (fixed gear) and (2) Mid-Atlantic Bight pelagic longline and recreational tuna (mobile gear)—to co-design suites of solutions for improving accessibility for multiple gear types within floating offshore wind arrays. The floating wind turbine design is the International Energy Agency Wind Technology Collaboration Programme 15-MW reference wind turbine on the University of Maine (UMaine) VolturnUS-S semisubmersible platform along with various mooring and cable configurations (Gaertner et al. 2020; Allen et al. 2020). Array co-design solutions will be analyzed in the next phase of the project for their impact on the levelized cost of energy and fishable area to determine the costs and benefits of accommodating fisheries within a floating wind farm. These co-design solutions will then be presented to a larger group of fishermen to determine participant attitudes toward the developed solutions designed with their respective fishing gear in mind. Outcomes of this work will include a suite of design solutions for our focal case study fisheries, a framework for engaging commercial fishermen in a co-design activity that encourages co-use of marine spaces, and an array design tool that allows for optimization while maximizing fishable volume. Developing a more inclusive array design process will allow project developers to consider co-use activities during the planning stage of floating offshore wind projects and will ultimately result in wind farms that are more accessible to fisheries. The fishery regions of focus—the Gulf of Maine and the Mid-Atlantic Bight—are shown in Figure 1.

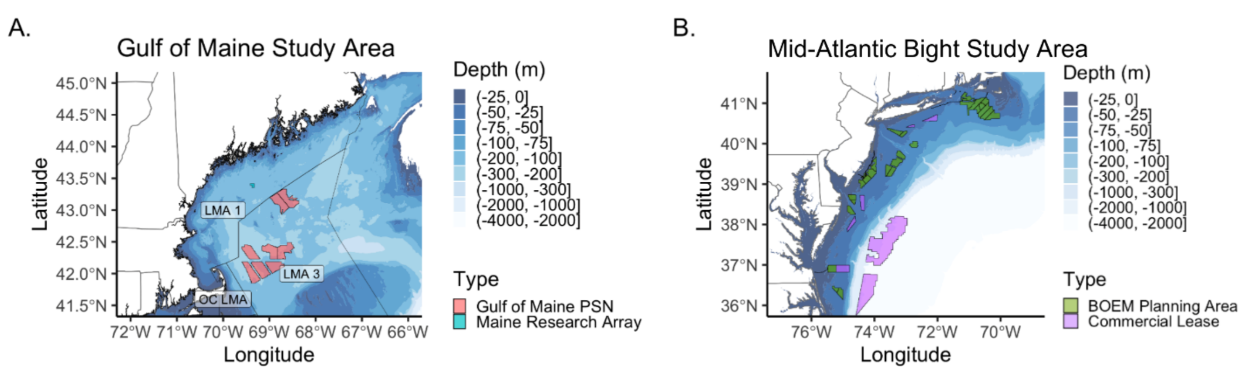

Figure 1. (A) Gulf of Maine and (B) Mid-Atlantic Bight study areas with bathymetry from NOAA and overlain BOEM lease blocks (proposed Final Sale Notice blocks and 29 April 2024 Maine Research Array [MeRA] in the Gulf of Maine)

This report summarizes the initial semi-structured interviews we conducted with fishermen. We provide demographic information, spatial requirements for fishing gear, comfort level ratings associated with fishing near floating wind farm components, and a general themes analysis generated from interviews with key informants from both focal fisheries.

2 Methods

Focal fisheries were chosen based on several factors, including the likelihood of impact of floating wind farms to the fishery, importance to the region, and potential for accommodation in floating offshore wind farm design. The Gulf of Maine lobster fishery is perennially one of the most critical fisheries by volume and value. The fishery supports thousands of jobs in working waterfront communities across the Gulf of Maine and for decades has provided an alternative fishing opportunity in the face of declining groundfish stocks. Reliance on a single-species fishery can create a situation referred to as the "gilded trap" where coastal communities may be less socioeconomically resilient in the face of changing resource abundance or access (Steneck et al. 2011). At the time of the project proposal, it was unknown whether the Gulf of Maine offshore wind lease areas would conflict with the most productive lobster fishing grounds. Similarly, the deeper-water lease sites proposed by BOEM in the Central Atlantic (defined by BOEM as off the coasts of New Jersey, Delaware, Maryland, Virginia and North Carolina, i.e., part of the Mid-Atlantic Bight) were seen as potentially drastically affecting the pelagic longline fleet that targets tunas and swordfish. The recreational fishery for tunas and swordfish was also included to offer a different perspective on the same target species. Because other mobile gear, such as pelagic and demersal trawls, was considered unlikely candidates for coexistence with floating wind farms, it was not included.

Through semi-structured interviews, key informants from the focal fisheries were asked for information regarding the spatial requirements of their fishing gear and anticipated comfort levels operating in and around floating offshore wind infrastructure. Interviewees were recruited in several ways: They were recruited using outreach material at public meetings, such as the Maine Fishermen's Forum; they were known to one or more of the authors; or they were recommended by fishing industry leaders (such as members of the Responsible Offshore Science Alliance Advisory Council). The interviewees were then privately contacted via email or phone to organize in-person interviews.

To ensure that high-quality information was gathered, initial interviews (called scoping interviews) targeted expert fishermen who have the potential to interact with floating wind farms. This approach allowed us to characterize general fishing behavior for a gear type, though it must be acknowledged that individual fishermen's preferences may not be fully represented in the standards reported. The diversity of spatial requirements within a gear type can be exacerbated between fishery management units within a region. Environmental conditions such as differences in current and deviation in management actions, i.e., different minimum trap per trawl requirements, combine to shape fishery behavior and gear construction (McCarron and Tetreault 2012; NOAA 2021). Following the development of case study solutions, additional interviews will be conducted with a broader group of fishermen to determine the acceptability of results across individuals who may have additional spatial requirements.

2.1 Semi-Structured Interviews

Semi-structured interviews were selected as an information-gathering method because they are less restrictive than surveys, where questions are preselected, but they are more structured than a conversation, which ensures specific information is gathered through planned questions. The nonrigid structure allows for interviewees and interviewers to develop a trusting atmosphere, expand on interesting conversations, and ask clarifying questions, and it can be used to generate quantitative, semiquantitative, or qualitative data.

The interviews in this project were designed with three sections: (1) fishing demographics, (2) spatial requirements and comfort ratings, and (3) additional comments. The general structure allowed us to first get to know our key informants as individual fishermen and then ask about the spatial requirements of their gear and their risk-taking behavior (comfort level) in different floating offshore wind scenarios within the context of the first section. The third section provided a catchall where fishermen could comment on fishing gear or floating offshore wind coexistence research that was not effectively captured by the questions. It also provided a space for comments on floating offshore wind unrelated to fishing gear or coexistence, which generated significant information on general concerns from the fishing industry. Interview questions were initially inspired by a previous project that focused on minimizing the mooring footprint of a single floating turbine to better accommodate fishing activities (Green et al 2023). The questions were adapted to suit the array-level focus of the present project, with minor variations to reflect the differences in gear types. After a draft was developed, the questions were shared with focal fishery key informants for their review.

The review step allowed fishermen to add questions that would capture important information and flag questions that may be confusing or hard to answer. Thus, the commercial fishermen we selected were able to play an influential role in the development of our co-design process. The final interview questions included a cartoon graphic of a floating offshore wind array (shown in Figure 2) that labels which design variables can be controlled. The interview questions are listed in Appendix A.

Key informants were interviewed in person at locations convenient for them. Interviews were recorded with the informants' expressed consent. A short explanation of the project was included and read to informants prior to the formal start of the interview (see Appendix A).

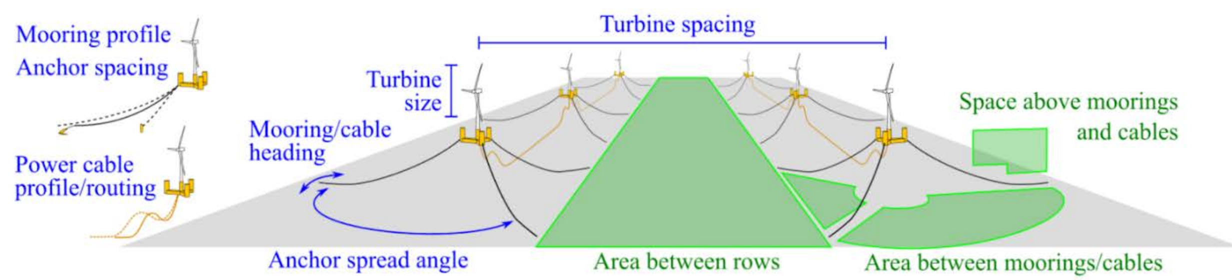

Figure 2. NREL floating offshore wind array design parameters

2.2 Analysis

The semi-structured interviews generated quantitative, semiquantitative, and qualitative data for analysis. Analysis of interview transcripts was completed separately for the Gulf of Maine and Mid-Atlantic Bight case studies. Each interview was recorded and then (where possible) transcribed with the aid of Microsoft Word's voice-to-text tool; the transcriptions were checked by a project team member as they were read off (Vanover, Mihas, and Saldana 2021). Transcript data were then converted to spreadsheet data by identifying questions, assigning an identification number, and copying both question and answer transcript data into the spreadsheet. This allowed the same question to be easily identified between interviews during analysis.

For questions targeting quantitative or semiquantitative data, the extraction of actual values from within individual answers was done manually. Feet (ft), fathoms (fa), and nautical miles (nm) are used as the primary units of measurement in reporting, as these are the units most commonly used by fishermen.[1] For semiquantitative responses, the Likert scale was used to score responses. Data from quantitative and semiquantitative responses will be used to inform the optimization of hypothetical wind arrays to improve fishery accessibility. Qualitative data were generated from each question-answer pair by assigning general categories to questions, like Fishing Demographics, Gear (Spatial), Risk-Taking, and Coexistence, and assigning more specific categories to answers. This processing of responses allowed us to draw out recurring comments and concerns. We also report categories highlighting risks to operating in a floating offshore wind array that represent potential barriers to coexistence.

Fishermen show wide variation in their fishing habits and often participate in multiple fisheries using a variety of gear types. Thus, our interviews generated data for a variety of fisheries beyond those that we initially intended to target (lobster trap, pelagic longline, recreational hook-and-line). Specifically, we generated data for fish pots, demersal longline, and gillnet fisheries, all of which were outside the initial project scope. The requirements of these additional fishing activities are reported and summarized.

Six scoping interviews were conducted with focal fishery key informants, four from the Gulf of Maine and two from the Mid-Atlantic Bight, as summarized in Table 1. These interviews occurred during August and September of 2024.

Table 1. Interview Coverage by Focal Fishery

Region	No. Key Informants	Interview Time	Gear Types Discussed	Target Informants (Stage 2)
Gulf of Maine (Fixed Gear)	4	60–125 minutes	Lobster trap, hook-and-line tuna	10–15
Mid-Atlantic Bight (Mobile Gear)	2	135–180 minutes	Pelagic longline, hook-and-line, gillnet, demersal longline, and pot (fish trap)	5–10

[1] 1 foot = 0.35 meters, 1 fathom = 1.83 meters, 1 nautical mile = 1.85 kilometers

3 Gulf of Maine (Fixed Gear)

Round one of the Gulf of Maine interviews focused on fixed-gear fisheries with an emphasis placed on the offshore American lobster (*Homarus americanus)* fleet. The Gulf of Maine lobster fishery is perennially one of the largest fisheries by volume and value in the country (National Marine Fisheries Service 2022). The state of Maine, where lobster and supporting bait fisheries account for four of the nine most valuable fisheries, typically accounts for 80%–90% of U.S. lobster landings (Waller et al. 2023; American States Marine Fisheries Commission 2020). The fishery has expanded in recent decades to encompass more offshore fishing in response to improved habitat suitability and subsequently increased lobster abundance offshore (Tanaka et al. 2019). Gulf of Maine working waterfront communities rely on this single resource at a disproportionate level, even though larval settlement trends have fallen since 2010, landings volume peaked in 2016, and fishery value peaked in 2021 (Steneck et al. 2011; McManus et al. 2023; State of Maine Department of Marine Resources n.d.). However, recent monitoring data indicates that the Gulf of Maine lobster fishery is still robust. There has been an expansion of inshore and offshore habitat use in recent decades, and while the resource is changing distribution the 2020 Stock Assessment found that the fishery "is not overfished and overfishing is not occurring," and both the 2023 and 2024 settlement index numbers were high (ASMFC, 2020; Goode and White 2023; Jarrett et al. 2024).

A typical lobster trap trawl, shown in Figure 3, is constructed with either one or two endlines (locally referred to as a buoy line or warp line), which consist of a flotation buoy that keeps the line at the surface, and a tide toggle buoy that indicates the direction of the current and position of the line. The endline descends to either an anchor or an end trap. Traps are attached to sinking groundline at regular intervals by a gangion or attached directly to the trap bridle. The number of traps per trawl varies widely and is subjected to regulations. Specifically, the NOAA Atlantic Large Whale Take Reduction Team (ALWTRT) "trawling up" regulations require a minimum number of traps per trawl in different areas to reduce the number of overall endlines used by the fishery.

In the current BOEM leasing schedule, the Gulf of Maine is in Phase 1 of 2. Phase 1 commercial and Maine Research Array (MeRA) lease sites overlap with NOAA ALWTRT "trawling up" regulations such that lobster trap fishing within lease areas will require 25 trap trawls in lobster management area (LMA) 1 and 45 trap trawls in LMA 3. It is necessary to consider this context to understand how fixed fishing gear regulations will drive fishing spatial requirements at actual lease sites. Minimum trap-per-trawl limit areas are colored in Figure 4.

Additional information was opportunistically collected during interviews on historic bottom gillnet and hook-and-line tuna spatial requirements. Figure 5 shows a diagram of bottom-tending gillnet.

Figure 3. Cartoon representation of lobster "trap trawls" with added labels.

Image from NOAA fisheries (https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-traps-and-pots)

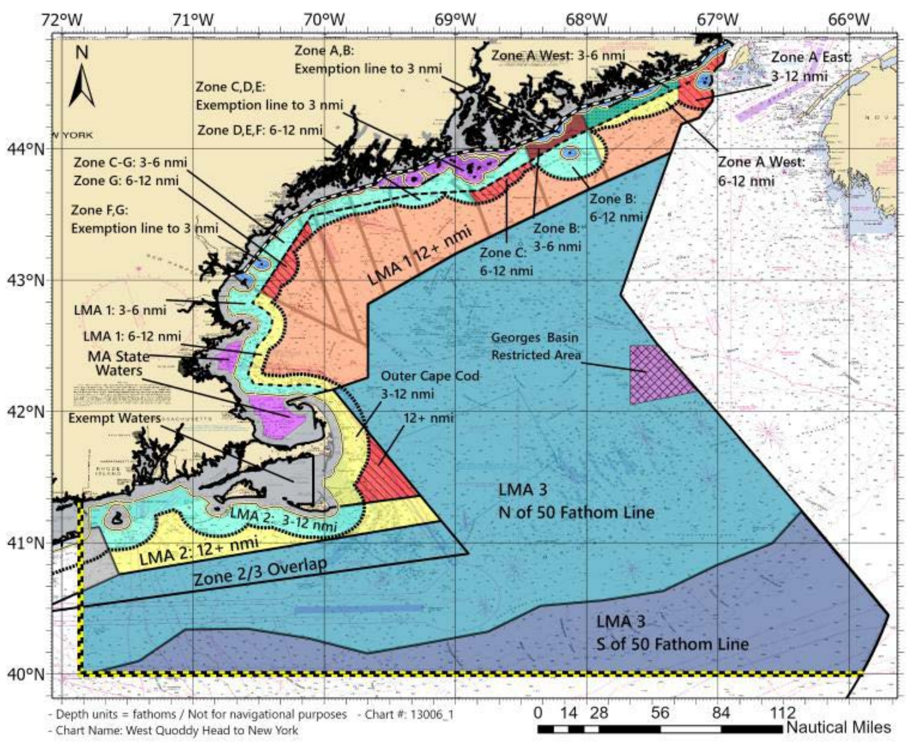

Figure 4. Map of NOAA ALWTRT minimum trap-per-trawl requirements, i.e., "trawling up" regulations. BOEM lease areas overlap with minimum trap-per-trawl requirements of 25 traps per trawl (the orange area overlapping with MeRA in LMA 1) and 45 traps per trawl (the blue area overlapping with commercial lease sites in LMA 3, north of the 50-fathom line). Full minimum trap-per-trawl requirements are tabulated at the map source.

Map from NOAA fisheries (https://www.fisheries.noaa.gov/resource/map/lobster-jonah-crab-minimum-traps-trawl-northeast-region)

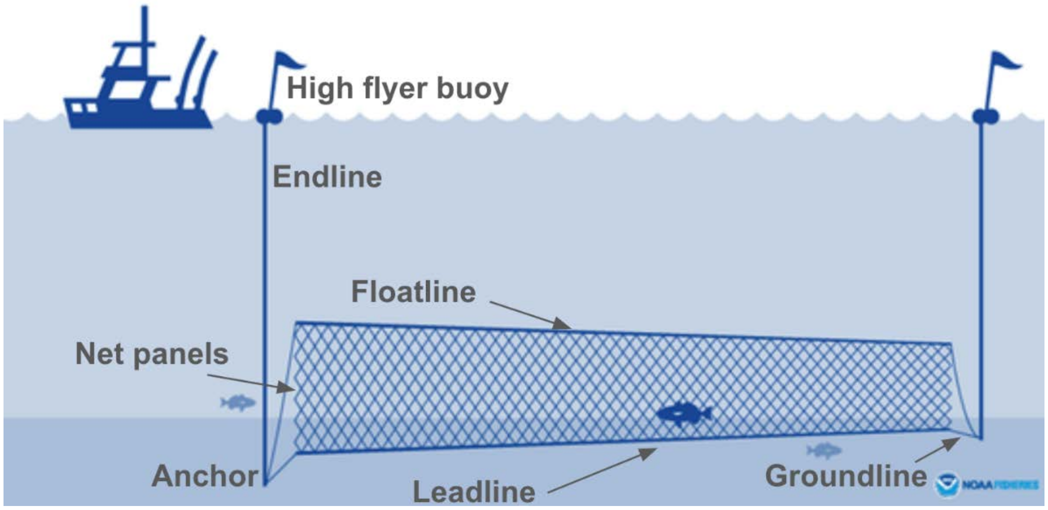

Figure 5. Cartoon representation of bottom-tending gillnet with added labels.

Image from NOAA fisheries (https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-gillnets)

3.1 Participant Overview

Fishery key informants were targeted based on fishing experience with fixed gear, involvement in offshore wind fishery coexistence conversations, and their potential to experience impact from floating offshore wind development. The informants provided varied experiences and viewpoints, with some having more fishing experience inshore than offshore or more current information. The interviewees were anonymized and are referred to as F1, F2, F3, and F4. For example, F4 provided the caveat that he had less experience fishing with lobster gear than gillnet and hook-and-line and his information was likely to be dated. The home port, years of fishing experience, and general floating offshore wind involvement of the participants are summarized in Table 2.

The participants represent varied experiences engaging with offshore wind. F1 was engaged with the planning process and baseline surveys for a floating demonstration project (New England Aqua Ventus) off the coast of Monhegan Island, Maine, for 15 years and represents a unique viewpoint as a State of Maine water fisherman fishing shorter trawls. F2 is a board member for an organization staunchly opposing offshore wind development in the Gulf of Maine. He has historically fished the proposed MeRA research lease site. F3 has previously fished near the future site of the proposed MeRA. He stopped fishing there following NOAA ALWTRT "trawling up" regulations but would like to fish there in the future if he had a bigger boat to accommodate the longer trawl requirements. F2 and F3 represent typical midcoast Maine offshore lobster fishing business models but operate with different maximum trawl lengths due to their respective boat sizes. F4 has retired from a wide-ranging career as a commercial fisherman (targeting groundfish, lobster, scallops, tuna and charter fisheries), a Northeast Fisheries Management Council member, and a former fishery liaison for an offshore wind developer in southern New England. He remains active in attending offshore wind meetings and commenting on the process. Each of the interviewees has thought deeply about floating offshore wind development and how it could impact their fishing activities.

Table 2. Gulf of Maine Key Informant Overview

Key Informant	Home Port	Fishing Experience	Involvement With Floating Offshore Wind
F1	Monhegan, Maine	28 years	15 years
F2	Friendship, Maine	22 years	"Pretty heavily" – board member of an anti-offshore wind organization
F3	Cundy's Harbor, Maine	32 years	"As involved as you can be—I don't miss many meetings."
F4	Portsmouth, New Hampshire	22 years full time, 20+ years part time	Ex-fishery liaison for an offshore wind developer

3.2 Participant Background

Fishermen were asked "fishing demographic" questions to characterize their business models and scale up the spatial requirements of individual fishing gear components over a gang, which is the total number of traps deployed. To further understand the potential to overlap with floating offshore wind development, fishermen were additionally asked about fishing grounds within licensed areas. Participant fisheries, lobster license, gang size, depth range fished, vessel length and width, and general set times are summarized in Table 3.

F1 is licensed to fish exclusively in the Monhegan Island Lobster Conservation Area (MILCA) within Maine Lobster Zone D (Figure 4). MILCA is a unique area within the Maine lobster fishery as one of the only legally protected lobster fishing territories (ME DMR Regulations Ch. 25.95). This territory is granted to protect the Monhegan Island fishery and year-round community from territorial pressures of larger inshore harbors. In exchange for MILCA's protected conservation status, all licenses must be held by Monhegan Island residents, active licenses are limited to a maximum of 17, the fishing season is restricted from October 1–June 7 annually, and trap limits are capped at 375 rather than Zone D's typical 800. MILCA is also home to the UMaine Deepwater Offshore Wind Test Site designated by LD 1465 for a floating demonstration project (Maine State Legislature n.d.).

F1 indicated that he uses all the traps associated with his license and generally fishes the southern portion of MILCA, where the UMaine test site has been designated. As a MILCA fishery participant, F1 fishes fewer traps than F2 and F3. He noted that like many Gulf of Maine lobster fishermen he occasionally lands Jonah crab (*Cancer borealis)* as bycatch but does not specifically target the species. He extends set time from 3–7 to 15 days in the winter to deal with smaller weather windows and less active lobsters.

F2 and F3 represent information from the offshore Maine lobster fishery operating in LMA 1. Both fishermen hold state and federal licenses and typically will fish all their gear offshore in federal waters from mid-fall through early summer in longer trawl configurations, specifically trawls of 20 and 25 traps for F2 and 10 and 12 traps for F3. As lobsters move inshore to state waters for the summer, both fishermen follow them with a portion of their gear, which they break down into smaller trawls. Specifically, F2 uses trawls of four and five traps and F3 uses trawls of five and six traps. F3 noted that the period he spends fishing inshore state waters has decreased significantly in recent years and that a greater portion of lobsters remain offshore in state waters outside of the peninsulas, headlands, and islands or in federal waters. Both fishermen use the maximum number of traps allowed on their license; however, F3 is restricted to 600 traps because his license is split between Zones E and F.

Before the 2021 NOAA ALWTRT trawling up regulations, F2 and F3 fished similar offshore grounds. F2 was fishing Toothakre Ridge and the LMA 1/3 line south of the ridge while F3 was fishing Three-Dory Ridge out to Jeffrey's Ledge. Both areas are between the 12-nm and 12+-nm lines in Figure 4. However, following the trawling up regulations, F2 has not fished in the LMA 1 seasonal closure area, and F3 has not fished outside of the 6-nm line due to new minimum trap-per-trawl requirements that require more traps per trawl than his boat can safely carry on the back deck. Both fishermen indicated that their behavior and fishing patterns have largely changed due to whale rules in the past 5 years. Like F1, both offshore lobstermen fish gear on 3–4-day sets during periods of high catch and lobster activity but extend set times to deal with lower catch and shorter weather windows during the winter.

Finally, F4 represents a historic LMA 3 fisherman who took part in initial offshore lobster resource targeted trips in a region known as "the Hat" in LMA 3 near the Hague Line in the 1980s. He fished bottom-set gillnets within about 30 nm from Massachusetts Bay up to the Kettle Grounds south of Boothbay Harbor, Maine. He provides the caveat that the lobster information he provided may be dated and, unlike the other Gulf of Maine participants, he comes from the perspective of a crewman on an offshore lobster boat rather than a captain. While F4 captained gillnet vessels primarily fishing day trips targeting groundfish, his experience with offshore lobster consisted of trip fishing (7–10 days). As a crewmember, F4 provides a unique non-daytrip, non-captain viewpoint to the data we collected. His set times largely differed as a gillnetter as opposed to lobster fishing because the quality of catch falls significantly in a gillnet the longer it fishes.

Table 3. Gulf of Maine Key Informant Fishing Demographics

Key Informant	Fishery	Lobster License	No. Traps	Depth Range	Vessel Length	Vessel Width	Set Time (days)
F1	State of Maine lobster	Zone D, MILCA (state)	375	5–50 fa	38 ft	13 ft	3; 7–15 winter
F2	State of Maine/LMA 1 lobster	Zone D (state), LMA 1 (federal)	800	30–100 fa	40 ft	15 ft, 8 in.	3 (good catch); 4–5 (low catch); 5–6 (winter)
F3	State/LMA 1 lobster; tuna hook-and-line (federal)	Zone E/F (state); LMA 1 (federal)	600	5–85 fa	41 ft (38 ft + 3 ft ext.)	15 ft, 6 in.	3–4 (summer/ fall); 4–5 (late fall); weather dependent (winter)
F4	Federal Gillnet/Gulf of Maine lobster	LMA 3 (crew) Prior to current regulations	NA	40–70 fa (gillnet) 40–80 fa (lobster)	42 ft (gillnet) 54 ft (lobster)	10–12 ft (gillnet) 20 ft (lobster)	1–3 (gilllnet) N/A (lobster)

3.3 Spatial Requirements

Fishermen reported their fishing gear spatial requirements in a variety of ways, but spatial requirements are reported numerically where possible. Across the handful of fishermen interviewed, we found groundline length between traps typically increased for longer trawls. This trend should be investigated over a larger sample size of fishermen and can be examined in future interviews.

Trap trawls, like most commercial fishing gear, do not fall directly to the seafloor. Rather, the trap trawls drift some unknown distance and direction as a function of current velocity and gear weight. Characterizing the spatial requirements of fishing gear requires an understanding of the physical space the gear uses at any given time, the amount the gear drifts while it is being set, and the amount the gear could drift if bad weather occurs during the set. The space the gear physically requires will be determined by the amount of groundline between traps, whether anchors are used, and the amount of additional line on endlines. Participant reporting on traps per trawl, endlines per trawl, groundline between traps, and endline (warp) length are shown in Table 4. The degree to which gear may move as it is set is summarized in Table 5. The gear drift is reported separately for typical drift in fair weather conditions and bad weather drift.

As a state of Maine fisherman, F1 has not been substantially impacted by trawling up regulations and fishes pairs (two traps) and triples (three traps). He uses a single endline and less groundline between traps than the other participants. He uses three unique endline lengths of 48, 54, and 63 fa to fish three overlapping depth ranges of 35–42 fa, 40–48 fa, and 42–50 fa. This method allows him to set gear confidently in areas where the bottom topography changes rapidly over a short distance without fear of sinking his endline buoy and tide toggle. F1 predicted his gear to drift the least of all participants.

F2 and F3 reported similar spatial requirements for fishing gear offshore near the MeRA site; however, their overall trawl lengths on the bottom significantly differ due to a difference in maximum traps per trawl deployed by each fisherman. Both fishermen report fishing longer strings due to federal requirements, using two endlines (typical for long trawls), and using longer lengths of groundline than F1. Both fishermen report similar gear drift numbers, expecting gear to move about 0.21–0.43 nm while setting out. They differ slightly in how they use their endlines in different depth ranges. F2 uses 15%–25% additional endline relative to the water depth in shallow (<65 fa) to midrange (65–90 fa) depths. He extends this additional endline to approximately 30% in deeper water (>90 fa). This method balances lengthening lines to deal with large current or waves offshore without adding additional drag from too much line. On the other hand, F3 always fishes with slightly more scope on his endlines, using 25%–30% additional length of lines across all water column depths.

Using endline anchors is a common practice in Downeast, Maine[2] where tidal currents require heavier floatation to retrieve lines and anchors to keep gear in place. However, neither F2 nor F3 fishes with anchors on their endlines because they fish the midcoast region. Gear adaptation is possible. For example, F2 has modified his end traps to move less by using eight standard bricks

---

[2] Hancock and Washington County, Maine, or State of Maine Lobster Zones A and B

per trap as additional weight. On the other hand, F3 has a personal preference for lightweight gear to prevent injury when he lifts traps over the rail and does not plan to fish with anchors.

F4 reported on both historic bottom gillnet and offshore lobster spatial requirements, with a greater level of detail given for gillnet responses. The estimated gillnet length is generally longer than the reported lengths of lobster trap trawls. While F4 reported his own spatial requirements, he indicated that other people may fish significantly longer gillnet strings consisting of 10–30 panels. Each net panel is 50 fa wide and 2 fa tall (0.5 fa for flounder gear). They consist of a float line that holds the net upright in the current and a lead line holding it to the bottom. The string is kept in place using 25–30-pound (lb) anchors attached via 20–30 fa of groundline. F4 did not provide a value for the expected gear drift distance but emphasized that it is a site-specific issue that must be learned with experience in each new location. For lobster fishing, F4 estimated that for 30 trap trawls, the length on bottom would be between 450 and 900 fa. The spatial requirements provided for LMA 3 offshore lobster are historic estimates and can be used to begin refining array designs but will need to be updated in the second round of conversations, as certain values like minimum traps per trawl will have changed due to new regulations.

All fishermen report that gear is expected to move more in bad weather. A full trap trawl may move up to a mile (0.86 nm) as reported by F2 and F3, or a gillnet could be pulled up to a half mile (0.43 nm) and twisted around. F2 also reported that it was common (multiple times per winter) for an end trap to part-off with the endline, leaving the majority of the string in the general area but carrying the parted end trap and line in the current to drift endlessly. However, F3 typically sees his deep-water (depths of 70+ fa) gear move less during storms than his shallow to middle-range gear; he may lengthen out endlines “a little” before storms to make hauling back easier. F4 indicated that, as the vessel operator, when possible, it was ideal to retrieve gillnet gear before storms but that there is rarely sufficient time to move offshore lobster gear in response to day-to-day weather forecasts. Instead, his captain would manage gear exposure to long sets and storm conditions by more generally managing the total amount of gear in the water seasonally by bringing a portion of traps in for the winter.

Table 4. Gulf of Maine Key Informant Spatial Requirements

Key Informant	Traps per Trawl/Nets per String	No. Endlines	Groundline Length (fa) per Trap	Endline Length	Maximum String Length on Bottom (fa)
F1	2s and 3s	1	14	Variable lengths for depth ranges (48, 54, 63 fa for 35–42, 40–48, 42–50 fa, respectively)	28
F2	2s, 3s, 4s, 20s, 25s	2	17	+10 fa at < 65 fa; + 15 fa at 65–90 fa; 120s > 90 fa	408
F3	5s, 6s, 10s, 12s	2	20	Variable lengths, ~+25%–30% of depth	240
F4	12 50-fa net panels (gillnet) 30s (lobster)	2	20–30 anchor groundline (gillnet) ***Estimate*** 15–30 (lobster)	+30% of depth (gillnet) N/A (lobster)	660 (gillnet) 450–900 (lobster)

Table 5. Gulf of Maine Key Informant Anticipated Gear Movement While Setting

Key Informant	Typical Gear Drift	Bad Weather Drift
F1	<0.086 nm	No answer
F2	0.22–0.43 nm	0.86 nm
F3	0.22–0.29 nm	0.86 nm
F4	Site specific	0.43 nm (gillnet) N/A (lobster)

3.4 Comfort-Level Ratings

The self-reported comfort levels for fishermen were specific to the individual; however, there is generally a decrease in comfort for more novel activities. This means that as fishermen gain more experience with new scenarios, such as fishing near offshore wind farms, they expected to become more comfortable over time. Fishermen also described additional factors impacting comfort. For example, F1 emphasized that the level of catch per trap would determine his comfort more than perceived risk to his fishing gear, while F4 thought that as a vessel operator he would not want to actively fish near turbines as conditions worsened. F1 and F4 indicated that with increasing experience they would likely become more comfortable in time.

All the fishermen interviewed considered themselves risk-averse, and everyone stated that they would avoid an offshore wind array as weather conditions worsened due to safety concerns. While F1 may still traverse near a turbine, he would not actively fish in a wind array during bad weather. F2, F3 and F4 felt they would not traverse the array as conditions deteriorated, which could result in longer steams home during bad weather, increasing the indirect risk from the wind array by forcing them to operate for longer in bad weather. F4 further emphasized that in fishing, a trip often does not begin or end until weather changes. This means that to maximize time on offshore fishing grounds, the boat will typically transit during the tail-end of foul weather on the trip out and return back to port as bad weather approaches. All fishermen but F2 indicated an ability to traverse a wind array in calm conditions. F2 perceives the risk from a potential breakdown or loss of steering in a wind array to be high enough that he would always avoid. F4 stressed that UK commercial fishermen, fishery liaisons, and other vessel operators typically use "Force 5" as a reference number for when wind arrays become unsafe to operate in, where Force 5 refers to wind speeds greater than 17 knots. All fishermen reported in some way that there would be a window of intermediary conditions where one could typically actively fish or operate their vessel outside of the farm, but they perceive it would be unnecessarily risky to operate within the array. This means that the offshore wind farms would decrease their fishing windows, relative to unobstructed space. Multiple participants brought up the need for real-time marking of infrastructure locations, which would allow for more confident navigation and operation, particularly around mooring systems.

Comfort levels between fishermen may be loosely related to the number of traps per trawl. Smaller trawls generally have reduced spatial requirements, and they cost less. For F1, the cost of a triple-trap trawl is roughly $500, whereas F2 estimates the cost of replacing a 25-trap trawl to be around $4,000 to $4,500. Additionally, F3 indicated that smaller trawls allow fishermen to get gear very close together. This pattern can be further investigated in future interviews.

F1 is typically comfortable fishing near other buoys and reported being comfortable setting gear at a minimum two to three boat lengths (12.5–19 fa) from other fishermen. When deciding whether or not to set traps, he makes adjustments for current drift by considering the bottom type and weather forecast for conditions that could move the gear while set, weighing risk to his property against his expected catch based on experience.

F1 thinks that he would make similar considerations fishing in rows between turbines as he does when fishing near other buoys or gear. When it comes to fishing in between mooring lines and close to the structures, he felt he would fish as close as possible if catch was sufficiently high, like 5 lbs per trap. As the rate of catch dropped off, he would move away quickly to lower risk to his property. Because this would be a learning experience, he would use "junk traps" initially during the learning curve and hopes there would be a gear loss replacement program sponsored by the state or developer. He makes a distinction in comfort between mooring lines and power cables, noting that he would want to stay significantly farther away from a dynamic power cable and not interact with it. He would not feel comfortable fishing on an unburied static cable and would wait about a year for sediment to accumulate on top of static cables to prevent catching a trap on any exposed infrastructure.

F2 has the lowest baseline comfort level fishing around other fishing gear and was also the most concerned by the idea of fishing in a wind array. As previously noted, F2 generally fishes longer, more expensive trawls than the other informants. F2's lower comfort levels are informed by his experience that entanglements with other fishermen present a time-risk to profit and are potentially costly due to gear loss. Likewise, he has lost gear to fixed structures in the past and avoids them.

When considering fishing in between turbine rows, F2 says he would not want to be closer than the 0.43-nm drift that can be expected while setting. He also says that there would need to be additional room to account for the gear moving under stronger currents. He does not believe it would be possible to successfully place a 25-trap trawl in between mooring lines without seeing some level of interaction. Ultimately, F2 does not see experimenting and potentially losing gear as worthwhile. Instead, he would move elsewhere, causing potential conflict due to territoriality between fishermen.

Of the key informants, F3 is the most comfortable fishing around other fishing gear and reported that he fished 5 fa or less from other fishermen. When hauling his gear, he frequently has another fisherman's endline laying across his groundline, but they do not typically tangle, and the endline will slough off as he passes it. His comfort decreases near fixed structures such as weather or navigational moorings, and he will typically set a minimum distance of 2–3 times the additional scope on his buoy line relative to water column depth.

F3 reports extremely low comfort fishing near a floating offshore wind mooring system or dynamic cable because his hydraulic trap hauling system would not be able to move the moorings or cables if he were to get stuck. He is additionally concerned that mooring lines and dynamic power cables will move some unknown amount, whereas navigational moorings are well-fixed. This will make it unclear how close he could set gear. He is extremely averse to fishing between turbine rows but would experiment with it if mooring anchors were spaced at least 0.86 nm from each other. Similar to F2, F3 does not feel it would be possible to place a trawl in the space between mooring lines, as his gear takes up about 0.22 nm on the bottom before accounting for drift. If he were to fish in a wind array, he would likely set over one set of anchors to allow gear to drift toward the center of the area between turbine rows, but he acknowledges that he would not be able to do this unless he fishes longer trawls from a larger vessel.

Similar to F1, both F2 and F3 were concerned about added safety issues when interacting with any project power cable. There is a concern in the fishing community that the dynamic cable could interact with gear in a way that would result in electrocution on deck. Providing education around this issue when presenting future projects should be a high priority to address this concern. Beyond novel safety issues, F2 and F3 felt there was no clear answer to who would be liable if fishing gear damaged a power cable. Between these concerns both fishermen indicated they would not be comfortable at all fishing near a power cable.

F4 has a unique perspective on fishing around wind turbines as a former fishery liaison for fixed-bottom offshore wind projects. He believes that some gear types will be able to fish in offshore wind arrays if they choose, as the fishing community builds a body of experience with FOSW arrays over time and develops a risk profile. His historic comfort fishing near other people's gear was extremely high because there were agreements between gillnetters as to how to deal with entanglements, and it was atypical for nets to become badly entangled unless the supporting lead and float lines became tangled. Generally, an entanglement resulted in snapping twine that makes up the net itself and repairing the small holes. This allowed him to fish gear within 50 fa of other fishermen. He did not ever fish nets around fixed anthropogenic structures and would have been uncomfortable until he had more site-specific experience. To deal with this discomfort, he would give himself distance from the fixed structure.

The answers F4 provided on comfort level in wind arrays were more open-ended, and he discussed the potential for severe entanglement as opposed to acceptable entanglement. From the perspective of gillnet fishing, he would generally expect the net to interact with mooring lines by draping over them if it drifted during setting. He does not see this as a cause for major concern, similar to when interacting with other fishing gear. However, if the anchors or net lines were moving while set due to inclement weather or large tidal currents, it could result in a more severe entanglement of the net—for example, the net dragging beneath a mooring line touchdown point. On the other hand, when considering lobster, he is concerned that more severe entanglements involving traps could potentially impact wind infrastructure, potentially damaging mooring lines or dynamic cables. F4 feels that, similar to a mooring line, power cables would not be at risk of entangling a gillnet but may tangle lobster traps. F4 also provides 0.43-nm anchor spacing as a reference number for experimenting with fishing in between turbine rows. He also referenced fishing industry members dividing areas within arrays for fishing as done in southern New England. From his experience as a fishery liaison for areas south of Cape Cod, F4 reports that in this region, adjacent arrays are planned to form contiguous rows of turbines with 1-nm spacing, allowing for continuous fishing between leases. In the available lanes, fixed-gear fishermen agree to use the 0.25 nm closest to turbines and leave the central 0.5 nm open for mobile gear. While there will be risks and growing pains, he believes that fixed-gear fishermen will ultimately find a way to access floating offshore wind arrays successfully given the adaptability of commercial fishermen and success fishing fixed-bottom wind arrays reported by fishermen in the UK. F4 made an interesting point: when doing a hypothetical risk analysis, he is always going to play it safe and be conservative. Likewise, while fishing and transit may be possible, there will be a heightened risk of collision[3] due to fatigue, particularly for multiday fishing trips due to the additional obstacles offshore. To truly know how fisheries will respond, it would take people physically being inside a wind array to understand the scale of infrastructure relative to fishing gear and judge whether they would learn how to fish the area.

F4 answered questions on comfort level for offshore lobster fishing from the perspective of a crewman. He notes that as crew, you will typically trust decisions your captain makes, and the main concern would be risk to profit if it took more time to haul gear within the wind array. He does make the exception that if a captain brought him into a wind array in inclement weather, he would be very uncomfortable but did not seem to think that would be likely with a trusted captain.

The self-reported comfort ratings for transiting an array and fishing near various components are reported in Table 6. Additionally, responses regarding fishing on unburied cables, the preferred minimum anchor spacing, and self-reported risk aversity are tabulated in Table 7.

---

[3] Collision is used colloquially in this report, the nautical term would be "allision" for a vessel striking stationary object

Table 6. Self-Reported Comfort Level Ratings for Various Fishing Scenarios in the Gulf of Maine

Ratings are given on a scale of 1 to 5, where 1 is "very uncomfortable" and 5 is "very comfortable."

Key Informant	Comfort Transiting Array (Calm)	Comfort Near Fishing Gear	Comfort Near Moored Structures	Comfort In-Between Turbine Rows	Comfort In-Between Mooring Lines
F1	Very Comfortable [5]	Comfortable [4]	Comfortable [4]	Comfortable (If catch is worth it) [4]	Comfortable (with experience if catch is worth it) [4]
F2	Very Uncomfortable [1]	Uncomfortable / Somewhat Uncomfortable [2–3]	Very Uncomfortable [1]	Very Uncomfortable (depends on bottom, who else is there) [1]	Very Uncomfortable (would not do it) [1]
F3	Somewhat Comfortable (would not transit if not calm) [3]	Very Comfortable [5]	Somewhat comfortable [3]	Very Uncomfortable [1]	Very Uncomfortable (would not do it) [1]
F4	Comfortable (fatigue would be an issue) [4]	Very Comfortable [5]	Uncomfortable [2] (until more experience)	N/A (will require experience to build comfort)	N/A (will require experience to build comfort)

Table 7. Responses to Fishing on Unburied Cables, Preferred Minimum Anchor Spacing, and Risk Aversity

Key Informant	Can You Fish on Unburied Cables?	Minimum Anchor Spacing	Self-Reported Risk Aversity
F1	"Not in the first year."	Not provided	"More cautious now more than ever. Gear is expensive and I've got nothing to prove."
F2	"Doubtful."	0.87 nm	"Very conservative, I don't like setting it where I think I could lose it."
F3	"No... that's not where a lobster's gonna be."	0.87 nm	"I'm more conservative the older I get; when I was younger I was more hungry, desperate for money."
F4	"I think I'd be comfortable."	0.43 nm	"No, I'm pretty risk averse. That's why you go further away."

3.5 Additional Concerns

In discussing risk operating in and around floating offshore wind arrays, there were consistent concerns that arose in conversations. All key informants were concerned about turbine substructure movement in inclement weather and infrastructure marking, whether physically or on a chart. F1 suggested that marker buoys could be used to mark anchor points, or the outside of the turbine watch circle (the bounds of floating motion) so that fishermen could visualize where mooring lines were falling at any given time. F3 preferred a solution that may add sensors to mooring lines or use automatic identification system pingers on anchors to make them very clear on bottom machines. F4 noted that the turbine substructure and the mooring lines will have an area of water that they could occupy at any given time, and these areas should be marked on chart plotters.

F1 indicated that the main risk he saw from weather was risk to profit if fishing activities slow, and the other participants sited potential for major collision and a heightened risk of disorientation as main concerns. F4 felt that for a crewman, economic risk was far more likely to occur than physical risk or risk to property, which a captain is exposed to. F2 stressed issues of property loss such as gear loss and vessel loss but also risk of mortality. He later reached out to cite further concern about ecological impacts surrounding effluent outflow at array substations. F3 and F4 noted that as wind increases, the amount you drift while hauling the gear increases, and you would have to pay additional attention to where you were relative to the turbine substructure and mooring lines. F4 imagined a scenario where wind blew a lobster vessel over a mooring line such that the trap trawl they were hauling could seriously entangle with the mooring line mid-water.

Due to risk of collision from boat engine failure or disorientation, F3 highlighted concern around the safety features of individual platforms. He feels that each platform should be equipped with a ladder to the water for swimmers to climb aboard and rip-cord blowup housing that could shelter individuals waiting for rescue. He is concerned that radar interference from turbines, fog, and rain could combine to create a dangerous level of disorientation in what is typically an unobstructed environment. F3 is ultimately concerned about radar in the case of disaster within an array. F4 pointed out that any environmental conditions could become dangerous, depending on crew rotation while piloting a vessel. For example, he is concerned about individuals who must navigate wind arrays to transit to fishing grounds because this significantly extends the time a captain must spend at the helm before being relieved by a less experienced crewman. In an example he provided, for a southern New England captain fishing out of New Bedford and traversing Buzzards Bay and the wind arrays off Martha's Vineyard, the captain's time at the helm would be extended from 6 hours to 14 hours. This creates a serious risk of a fatigue-based incident or collision.

Beyond concerns with boat engine failure and disorientation, individuals expressed concern around infrastructure failure. F1 and F3 referenced the potential for blade loss as a serious hazard to vessels operating in an array and the environment, though F1 stated it was a better option than an oil spill. F2 is skeptical of the infrastructure's resilience during particularly bad weather. He would not traverse a farm during a storm because he is unsure if a mooring line may fail and what the implications of that on the floating substructure movement would be.

When gear does inevitably interact with floating offshore wind infrastructure, F1, F3, and F4 all questioned to varying degrees how this would be handled by individual developers or the government. It is unclear whether there would be a gear replacement system, how long gear replacement or payouts would take, and how these would be checked to prevent fraudulent claims. While F1 operated with the assumption that another party would be responsible for the lost gear, F3 more generally asked who would be liable. F4 recognized differences in liability depending on whether gear was lost in an exclusion zone or as a fisherman was using discretionary access.

Generally, fishermen were most interested in infrastructure solutions that reduced the overall spatial impact of floating offshore wind arrays. F2, F3, and F4 all referenced tension-leg platforms in some way, and F2 emphasized that the largest barrier to coexistence is the reduction of spatial impact to fisheries. F3 suggested that a spatial solution may want to put them as far apart as possible so that fishing activities are effectively unchanged, or so close that a vessel could not pull between substructures.

4 Mid-Atlantic Bight (Mobile Gear)

For the Mid-Atlantic Bight case study, key fishery informants were chosen based on fishing experience with pelagic longlining and recreational fishing, involvement in offshore wind fishery coexistence conversations, and their potential to experience impact from floating offshore wind development.

Pelagic longlining uses a long main line with baited hooks attached via shorter branch lines, as shown in Figure 6. The pelagic longline fishery primarily targets tunas (*Thunnus* sp.*)* and swordfish (*Xiphias gladius)* and accounts for approximately 56% of the overall highly migratory fish species catch in the U.S. Atlantic (NOAA Fisheries 2022). Annual landings from 2017–2021 in this fishery for these species have varied between 2,500 and 3,600 metric tons. In 2021, 56% of the revenues from the Atlantic highly migratory species fisheries were caught using pelagic longlines. According to our key informant, the fleet of pelagic longliners has decreased from a mid-1990s peak of more than 300 vessels to approximately 80 vessels between Maine and Texas currently permitted, with 50% actively fishing. Under the draft lease areas proposed by BOEM in the Central Atlantic (BOEM 2024), it appeared this fishery was at risk of complete dislocation and therefore was deemed of interest for this study. As of this writing, the deeper water lease areas have not been leased, and no auction is currently planned.

Bottom longlines are constructed similar to pelagic longlines, as shown in Figure 7. As used by our informant, the mainline is constructed of monofilament, and weight is provided by sash weights or other heavy materials attached by gangions. Bottom longlines are used to capture about 75% of the golden tilefish (*Lopholatilus chamaeleonticeps)* allowable landings, or about 324,000 lbs in 2024, and about 67% of the blueline tilefish (*Caulolatilus microps)* landings, or about 5,000 lbs per year (NOAA 2024; Mid-Atlantic Fishery Management Council 2019).

Gillnets are constructed of panels of monofilament mesh, with floatation along the top and some form of weight along the bottom, as shown in Figure 5. As fished by our key informant, three of these panels were strung together and no anchors were used. Weight is provided by a lead line with internal weights. The gillnet fishery for croakers (*Micropogonias undulates)* and bluefish *(Pomatomus saltatrix)* is not as carefully monitored as many other fisheries, so statistics are difficult to come by. As stated by our key informant below, he no longer fishes gillnets due to restrictions on catches of sharks.

The type of fish pots described in the interview used to target black sea bass (*Centropristis striata)* are constructed differently than the Gulf of Maine lobster pots seen in Figure 3 but are deployed in a similar manner. They tend to be cubical, approximately 2 ft on a side, and constructed of a 1.5 in x 1.5 in square coated wire mesh (State of Rhode Island Department of Environmental Management 2024). They are baited to attract fish and are weighted with rebar along the bottom edges. This gear type is one of the primary gear types for black sea bass in the Mid-Atlantic Bight and accounts for approximately 24% of commercial black sea bass landings (Atlantic States Marine Fisheries Commission n.d.).

Millions of people fish the Mid-Atlantic Bight with rod and reel every year. An estimate from 2016 indicated spending of over $10 million by anglers in that region supporting 75 jobs (NOAA

Fisheries 2022). For the Atlantic coast as a whole, recreational anglers landed over 3,000 metric tons of Atlantic tunas and swordfish (NOAA Fisheries 2022).

Notably, both Mid-Atlantic Bight interviewees expressed consent to be named in the project reporting; thus, we are able to provide a higher level of detail on these participants compared to the anonymous Gulf of Maine interviewees.

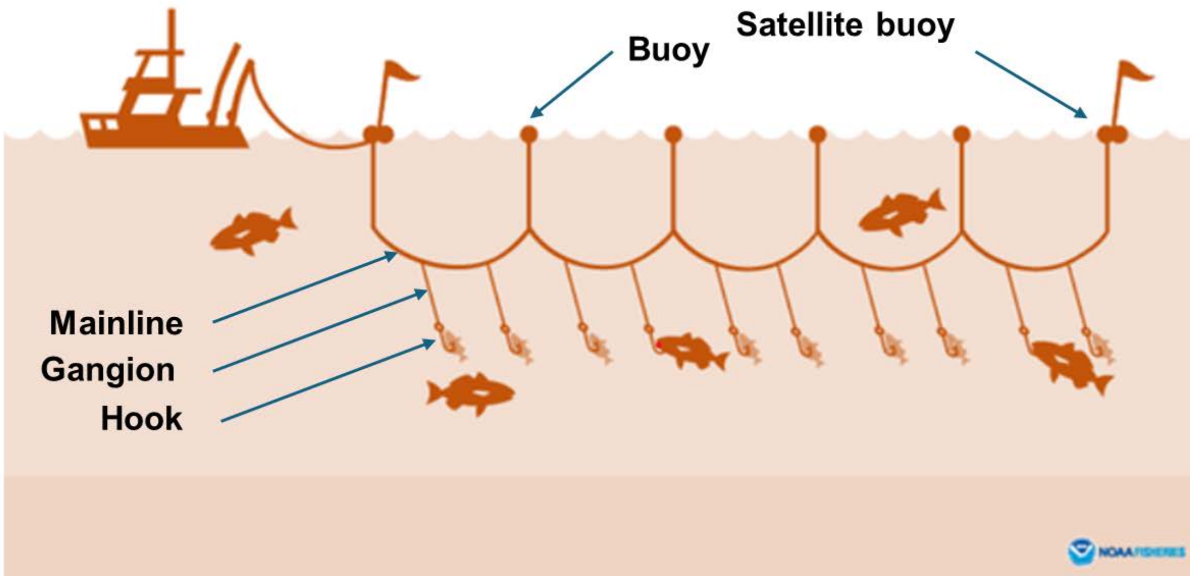

Figure 6. Schematic representation of pelagic longline gear with added labels.

Modified from NOAA Fisheries (https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-pelagic-longlines)

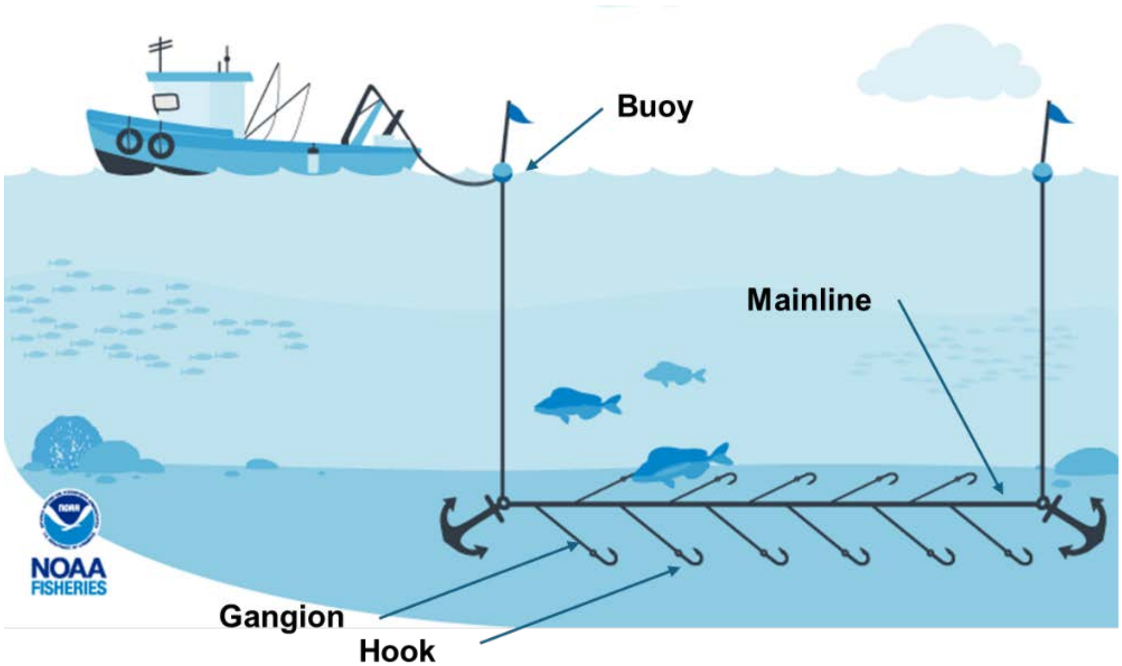

Figure 7. Schematic representation of bottom longline gear with added labels. The gear described in the study also has weights clipped to the mainline using gangions.

Modified from NOAA Fisheries https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-bottom-longlines.

4.1 Pelagic and Demersal Longline, Gillnet, Fish Pots

Dewey Hemilright was interviewed as the pelagic longline key informant. He provided additional information on demersal longlining, gillnetting, and fish pots. Dewey expressed his consent to be named in the project reporting.

4.1.1 Participant Background

Dewey Hemilright, 57, is an active commercial fishing vessel owner who has transitioned into operating strictly shoreside and has hired a captain to run the vessel at sea. Dewey engages in pelagic and bottom longline fishing and has experience as a sink gillnet and fish pot fisherman. He has fished for 35 years in total, 30 years using pelagic longlines for tunas and swordfish and 30 years using bottom longlines for golden and blueline tilefish. He has gillnetted for sharks (*Chondrichthyes*), bluefish, croakers, and other groundfish in the past until he stopped due to increased regulations. For the past 2 years, he has also targeted black sea bass using baited fish pots. He considers himself very involved in offshore wind and fisheries coexistence and noted that he is employed by a developer as a fishing representative. He is very active in fisheries management. His demographic information is summarized in Table 8.

His fishing grounds are primarily in the Mid-Atlantic Bight, mostly along the coast of Virginia and North Carolina, and the catch is landed in Wanchese. Neither his fishing location nor his landing port vary seasonally. His vessel is 42 ft in length, and his trip length varies by gear type: pelagic longlining trips are typically 2–5 days, bottom longlining trips are 1–2 days, and pot trips are 2–3 days. His farthest steam is 6–7 hours, with the route varying based on sea conditions, target species, and other factors. His vessel size is typical for both pelagic and bottom longlining fisheries.

4.1.2 Spatial Requirements

Pelagic longline gear is one of the most spatially demanding types of fishing gear. A typical set can be 20 nm or longer and include 600 hooks at depths of 55 fa or greater. Dewey judged that he needed about 1 nm of width to set the gear. How curved or straight the set is varies depending on water temperature or other factors. The gear is left to drift for 4 to 12 hours, typically overnight, and the distance it drifts, and its shape, are widely varying. Drift can be tens of nautical miles or sometimes not far if catches bring the gear into bottom contact. The overall shape of the gear can be in any pattern.

Bottom longlines are weighted to fish along the bottom. They are typically up to 2 nm in length, with 200 hooks. Dewey estimated he needed a 1-nm-wide lane to set the gear. The gear drifts little during setting or while deployed during a 30-minute soak time. The gear is set with buoys and buoy lines at either end.

Sink gillnets are in panels of 50 fa each, and Dewey fishes three panels in a string, with an overall length of about 55 fa. Figure 5 shows a single gillnet panel. He estimated the gear could be fished in a width of 25 fa. Unlike Figure 5, his gillnet gear is not anchored, but it does have an internally weighted lead line along the bottom edge of the net. He sets his gear with buoys at both ends. Dewey estimated that the gillnet string could drift 0.5–0.75 nm while it is in the water. The gear is set with buoys and buoy lines at either end. The gear is fished as a “strike net”—he identifies a school of fish on his fish sounder and attempts to rapidly set the gillnets around the fish, hauling the net back immediately. The soak time in these cases is a matter of minutes.

Fish pots are set in strings of 4 to 5 pots spaced 7.5 fa apart. They could be set in a lane 25 fa wide, according to Dewey. They are composed of wire mesh and vary in size but are typically relatively cubical and 5 ft on a side. They are weighted with rebar along the bottom. This weight means they do not drift much while being set or while they are soaking. They are marked with buoys and buoy lines at either end of the string. The spatial requirements defined by Dewey are summarized in Table 9.

4.1.3 Comfort-Level Ratings

Dewey described his comfort level generally fishing around other fishing gear or fixed structures as “typical.” He stated that pelagic longlines cannot be set near any fixed structure or any other fishing gear unless confidence is very high in how the gear will drift. He did express the remote possibility of setting on the down-current side of an array if that side faced the open ocean and confidence in the direction of drift was high.

Dewey’s comfort level with different components of floating offshore wind infrastructure varied by gear type and is summarized in Table 10. Many of his concerns were related to knowing how the gear drifted as it was being deployed and after it was deployed. For example, he expressed less discomfort setting pots within arrays and near structures because the pots are heavy, they sink rapidly and without much lateral drift as they are set, and they do not move much when they are on the bottom. In contrast, pelagic longlines are not tethered in any way (unless some of the catch pulls it to the bottom), and they can drift for tens of nautical miles overnight and assume a variety of shapes. Pelagic longline gear components are also expensive, particularly the satellite buoys that are used to mark different sections of the very lengthy sets (>20 nm). The unpredictability of the drift of the gear and the expense of potential gear loss due to interaction with any obstruction contributed strongly to Dewey's discomfort with setting close to any floating offshore wind infrastructure.

Dewey was concerned about knowing the precise location of any structures before setting pots, gillnets, or bottom longlines between moorings or power cables. If he knew their positions exactly, he expressed that his comfort level would be higher.

Buried power cables were not a concern for any gear type. For unburied cables, Dewey was less sure and was interested in knowing more about the mattresses or cobble used to protect cable. He was interested in seeing details of their construction so he could assess how they could potentially interact with bottom gear, in particular, the hooks on bottom longlines. A greater rugosity on the scour would likely increase the risk of the gear getting tangled (or "hung") on the protective structures like mattresses or cobble, potentially damaging the gear and increasing risk of damage to the vessel or risk to fishermen.

Dewey envisioned being more comfortable setting gillnets in between rows of the turbines compared to setting a pelagic longline between rows of turbines. He felt somewhat comfortable setting bottom longlines and pots between the rows. He expressed concern that the bottom type might not be attractive to his target species, and in that case, he would not set the gear there in the first place.

Bottom longlines by nature of their length and need to be on the seafloor, are incompatible with setting over or above moorings or cables. They are meant to be deployed on the bottom, so setting above a cable or mooring would likely lead to entanglement of the gear, which can be 2 nm or more in length. Similarly, gillnets and pots are also deployed along the seafloor. Dewey would not set any of this gear above moorings or cables.

Regarding weather or changes in weather, Dewey indicated that some gear was less risky to set than others. Pots go over the side and can thus be set in rougher weather, whereas the gillnets are set and hauled over the stern, which potentially means exposure to following seas and shipping water over the stern.

4.1.4 Additional Concerns

Dewey provided a great deal of information about four different gear types. It should be noted that he has much less experience fishing with fish pots than other gear, but he seemed confident in his responses to questions about that gear.

Dewey emphasized that decisions about whether to set gear in a particular location are based on conditions at that moment. For example, he might do a quick test set to see if there are fish present before deciding to fully set his gear near a hazard. He would also consider the tide, the sea state and weather, and the presence of other gear or other structures. A fisherman might also weigh the risk and cost of gear damage against the potential revenue from taking a higher risk.

Dewey also brought up concerns about knowing the locations of the floating offshore wind farm components. As an example, Dewey mentioned fishing near some towers off the coast of Georgia. If he sees marks of fish there, he feels comfortable setting downwind but close to the towers because he knows where the underwater hazards are and how the gear is going to drift. In a floating offshore wind array, the location of hazards such as anchors or power cables might be uncertain, and therefore he would not be able to weigh the risks of losing or damaging his gear. He suggested a chip or updated plotter charts that might help a fisherman know precisely where the underwater structure is.

He also addressed the challenges of working hypothetically, remarking that, as with weather and tide, fishermen are used to reacting quickly and efficiently to tangible, visible issues. The many possible configurations of platform, anchoring, power cables, and cable protection would influence his in-the-moment decision-making about when and how to fish.

He suggested that smoother mattresses, anchors, and other structures could enhance compatibility of fishing and floating offshore wind. Another suggestion to improve compatibility is for developers to inform fishermen of the condition of the seafloor and habitat after construction to help them assess if fish are likely to be within the array footprint. Another complexity Dewey mentioned was that floating offshore wind would lead to more vessel traffic from service vessels, and this increased traffic might be an additional hazard.

Dewey frequently mentioned the restrictions that different fishery regulations placed on size of fishing gear, seasons of fishing, and amount of fishing that could be conducted. In his opinion, these restrictions reducing fishing effort have already reduced the pelagic longline fleet from historic sizes, even though substantial quota is left unfished. He feared that floating offshore wind would reduce this fleet even further.

4.2 Recreational Fishing

John Nappo was interviewed as the recreational fishing key informant. John expressed his consent to be named in the project reporting.

4.2.1 Participant Background

John Nappo, 60, is an active recreational fisherman and a fishing tackle shop owner on Long Island, New York. He is also a professor of maritime technology at Kingsborough Community College. He has been fishing for 52 years. For 16 years, he lobstered commercially before selling his license. He occasionally fished for tunas commercially at that time, landing them in Brooklyn, New York. He considers himself very involved in offshore wind and fisheries coexistence conversations, springing from his teaching duties as a college professor involved with offshore wind workforce development. After learning about turbine siting, he became concerned that turbines were being placed in “extremely sensitive spots.” He appeared very informed on offshore wind and fisheries in general, and in floating offshore wind in particular. For example, he was aware of information available from the University of Maine and was aware of floating offshore wind arrays in Norway and Scotland.

He fishes what he called the Bight, an area he defined as offshore Long Island from inshore depths of 17 to 150 fa, and out to 100 nm offshore, from Montauk, New York, to Cape May, New Jersey. He primarily targets yellowfin (*T. albacares)*, bluefin (*T. Thynnus)*, and albacore (*T. alalunga)* tunas using rod-and-reel as an angler from a boat.

John primarily fishes out of Captree, Long Island, with Montauk as a secondary port. Trips for him are typically not more than three days in length, while some other fishermen fish shorter, single day trips. His farthest steam in distance is 110 nm, usually southeast from Captree toward Hudson Canyon, Middle Grounds, or McMaster Canyon.

His primary gear is rod and reel. He fishes from mid-May until October, when the weather deteriorates, from 80 to 100 nm offshore at about 17–25 fa. He noted the fishing season used to be shorter but has lengthened due to the warming climate.

His boat is 27 ft, but he previously had a 38-ft boat. Boat lengths among recreational fishermen vary from 26 ft up to 72–80 ft, with the larger vessels possibly being party/charter vessels. John's demographic information is summarized in Table 8.

Table 8. Mid-Atlantic Bight Key Informant Overview

Interviewee	Home Port	Fishery	Vessel Length (ft)	Experience Fishing (years)	Involvement in Coexistence Conversations
Dewey Hemilright	Wanchese, North Carolina	Pelagic and demersal longline, sink gillnet, fish pots	42	35 total, pelagic and demersal longline (35 each), sink gillnet (30 each), fish pots (2)	Very involved (fisheries representative for a developer)
John Nappo	Captree, Long Island, New York	Recreational angling, recreational demersal longlining	27	52	Very involved (college professor supporting offshore wind workforce development)

4.2.2 Spatial Requirements

When fishing, John's boat might be trolling, drifting or anchored—the spatial needs and depths are different for each type of recreational fishing. If anchored, he uses a minimum 3:1 depth-to-line ratio (more in rougher weather), with a lot of chain on the bottom end. Using the ratio, a potential swing radius for a vessel can be determined. For example, if a vessel is on anchor at a depth of 50 fa and uses 3 × 50 (150) fa of anchor line, the swing radius of the vessel is approximated by the Pythagorean theorem, where the anchor line is the hypotenuse and the depth is one triangle side. When drift fishing for squid, he may be at a depth of 98 fa, or if drifting based on current and temperature while targeting tilefish, 33–50 fa is typical.

He sets his hooks from just below the surface to 1.5 fa above whatever depth he is fishing, which could range from 17 to 150 fa. The depth changes based on water temperature and interactions with the Gulf Stream. The spatial requirements are summarized in Table 9.

Table 9 Mid-Atlantic Bight Fishing Gear Dimensions

Key Informant	Fishery	Depth Range (fa)	Gear Length and Width	Drift	Trip Length (days)	Soak Time (hours)
DH	Pelagic longline	80 and deeper	20 nm/600 hooks × 1 nm	Up to 20+ nm at 0.5–2 knots	2–5	4–12
DH	Demersal longline	10–100 (sharks); 40 and deeper (tilefish and other fish)	≤3 nm/200 hooks × 1 nm	None	1–2	0.5
DH	Sink gillnet	5–100	165 × 25 fa	0.5–0.75 nm	1–2 days	0.2
DH	Fish pots	40–60	4–5 pots 7.5 fa apart × 25 fa	Little or none	2–3	4–8
JN	Rod-and-reel	1.2–900	Any depth up to about 250–300 fa	N/A	<3 for him; 28 hours for fleet	N/A

4.2.3 Comfort-Level Ratings

John expressed a high level of comfort fishing next to floating offshore wind infrastructure, and said if fish were present within an array, he would fish there. His opinion was that a certain skill level was necessary to control the vessel to avoid collisions with the substructure, which he felt he possessed. He also noted that some recreational fishermen have dynamic positioning for their vessels, where electronic controls can be used to stay in one location without human steering, or where it can be interfaced with advanced sonar that can detect individual fish or schools of fish and keep the vessel in a constant position relative to those schools.

Tuna fishing sometimes requires long retrieval times to tire the fish to bring them to the vessel. While this potentially presents a challenge to fishing within an array, John indicated he would adapt his fishing behavior to reel the fish as quickly as possible to the vessel. He also stated that if a fish was lost due to a fishing line break, the financial loss is minimal. He would perhaps only lose some monofilament fishing line and a lure. Also, as a recreational activity, losing a fish is part of the experience.

John's opinion was that offshore wind farm infrastructure was likely to create recreational fishing opportunities: The colonization of the infrastructure by marine growth would consequently attract fish because of food availability or attract fish to the structure itself, which is known as the artificial reef effect. He expressed interest in knowing where exactly the anchors were located on the bottom and the style of mooring system, so that he could estimate where in the water column the mooring lines were. He noted that most standard echosounders found on commercial and recreational vessels, if used correctly, would be able to visualize the mooring and electrical cables and allow fishermen to react accordingly.

He expressed a willingness to fish over both buried and unburied cables. He expressed concern about knowing where a dynamic power cable would be in the water column. Once mooring line or cable line locations are known, he would be very comfortable fishing above them.

John emphasized the possibility of using phone apps that access cloud-based navigational data and suggested that the locations of cables, platforms, anchors, and other structures could be maintained in the cloud. In that situation, fishermen could access those details from the cloud using satellite internet when they arrive at a location. John's self-reported comfort level ratings are summarized in Table 10.

Table 10. Self-Reported Comfort Level Ratings for Various Fishing Scenarios Across Gear Types in the Mid-Atlantic Bight

Ratings are given on a scale of 1 to 5, where 1 is "very uncomfortable" and 5 is "very comfortable."

Comfort Scenario	Key Informant and Type of Fishing*				
	DH: PLL	**DH: BLL**	**DH: Gillnet**	**DH: Pot**	**JN: Rod and Reel**
Near Other Fishing Gear Or Fixed Structures	Very Uncomfortable [1]	Uncomfortable [2]	Somewhat Comfortable [3]	Comfortable [4]	Very Comfortable [5]
On Top of Buried Cables	Very Comfortable [5]	Very Comfortable [5]	Very Comfortable [5]	Very Comfortable [5]	Very Comfortable [5]
On Top of Unburied Cables	Very Comfortable [5]	Somewhat Comfortable [3] (depends on armoring type)	Somewhat Comfortable [3] (depends on armoring type)	Somewhat Comfortable [3] (depends on armoring type)	Comfortable [4] (if coordinates are known)
Between Turbine Rows	Very Uncomfortable [1]	Somewhat Comfortable [3]	Uncomfortable [2]	Somewhat Comfortable [3]	Very Comfortable [5]
Between Moorings or Cables	Uncomfortable [2]	Uncomfortable [2]	Uncomfortable [2]	Uncomfortable [2]	Very Comfortable [5]
Above Moorings or Cables	Very Uncomfortable [1]	Very Uncomfortable [1]	N/A	N/A	Very Comfortable [5]
Risk Tolerance	Typical				High

*DH = Dewey Hemilright; JN = John Nappo; PLL = pelagic longline; BLL = bottom longline

4.2.4 Additional Concerns

John frequently mentioned expensive technological capabilities that the recreational fleet can or does use. In particular, Starlink and some advanced sonar were mentioned as ways to enhance knowledge of fish and vessel location. Sonar that identifies that fish are present takes a lot of guesswork out of hook-and-line fishing, where typically the lack of a catch could be due to poor technique in the presence of fish or to no fish being present. Also, using phone apps and navigational equipment that could accommodate information about exclusion zones could help the vessel automatically avoid entering those areas when on autopilot.

John also mentioned the different motivations involved in recreational fishing and suggested that safety was not a high enough priority. With higher-horsepower engines, recreational fishermen have the opportunity to go faster and farther in search of fish but may lack adequate navigational experience and focus on safety.

5 Conclusions

Incorporating fishing considerations into the design of a floating wind farm requires an in-depth understanding of the spatial requirements of fishing gear and activities. The Gulf of Maine and Mid-Atlantic Bight fisheries considered in this study have a wide range of spatial requirements.

Some fisheries appear to be incompatible with any reasonable form of accommodation in a floating wind farm design. In particular, pelagic longlining for tunas and swordfish in the Mid-Atlantic Bight and elsewhere employs gear that stretches for many miles and requires large ocean areas free from obstructions of any kind. At the other extreme, recreational fishing needs are minimal, and at least some practitioners will be able to fish inside an array and near floating offshore wind structures if there are no prohibited zones and if fish are present. The recreational fleet also appears to be capable of accessing technology that would protect their safety and allow them to find fish inside arrays better than the commercial fleet.

The spatial requirements for the Gulf of Maine offshore lobster fishery fall somewhere between those extremes. Multiple key informants indicated they expected some ability to fish within floating offshore wind arrays after gaining experience operating near them. However, as a participant's traps per trawl scaled up in accordance with the minimum traps required by NOAA ALWTRT trawling up regulations at BOEM lease sites, they became less comfortable with the prospect of actively fishing in arrays. An increased number of traps per trawl increases the space required by the lobster fishing gear and the associated cost of possible entanglements.

Understanding the location of floating offshore wind anchors, moorings, and cables was a recurring concern among fishermen. However, technology advancements such as Starlink and advanced sonar systems could help fishermen easily navigate and fish within an array. Thus, a potentially large discrepancy that may exist among different fisheries is access to these technologies that facilitate fishing in and near floating offshore wind arrays.

It should be noted that in the development of lease areas in the Central Atlantic and Mid-Atlantic Bight, BOEM had access to substantial and robust information on historical use of the shelf area in the region by pelagic longliners and appeared to exclude these areas from leasing. Similarly, BOEM Gulf of Maine Phase 1 leasing has excluded LMA 1 where the majority of Gulf of Maine lobster fishing effort is focused.

Our key informants provided information for more fisheries than we originally intended. This additional information is welcome, potentially increasing the utility of our design investigation and strengthening our analysis and conclusions. They also voiced concerns about other areas of floating offshore wind development that could provide inspiration for future work beyond this project.

In future stages of the project, we are planning a second round of interviews with our key informants and peer groups, who will be shown the adapted floating offshore wind array designs and asked for their input. At that time they will also be able to question the information provided in this report from the first round of interviews. This refinement of spatial requirement information by additional key informants will strengthen the quality of information used to design potential solutions.

Glossary

Bottom type	Substrate classification in a specific area. This may be described using a Coastal and Marine Ecological Classification Standard substrate components for empirical work but is often roughly classified as bedrock, cobble, gravel, shell hash, sand, silt, and mud by fishermen. Some fishermen may simply distinguish between hard and soft bottom.
Gang size	The number of traps a fisherman is actively fishing.
Trawl	A string of traps set by fishermen.
Part-off	To break off a portion of fishing gear, i.e., a trap or endline.
Setting	To place or position gear.
Set time	The duration of time that fishing gear is left to actively fish before hauling back.
Scope	Additional line used.
Tide toggle	A secondary buoy attached near the top of an endline and used to indicate the direction of the current while hauling or navigating near endlines.
Drift	Drift may describe how far the gear moves from its original deployed location, or how far it drifts while it is being set.

References

Allen, Christopher, Anthony Viselli, Habib Dagher, Andrew Goupee, Evan Gaertner, Nikhar Abbas, Matthew Hall, and Garrett Barter. 2020. *Definition of the UMaine VolturnUS-S Reference Platform Developed for the IEA Wind 15-Megawatt Offshore Reference Wind Turbine*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-76773. https://www.nrel.gov/docs/fy20osti/76773.pdf.

American States Marine Fisheries Commission. 2020. *American Lobster Benchmark Stock Assessment and Peer Review Report*. National Oceanic and Atmospheric Administration. https://www.asmfc.org/uploads/file/5fb2c4a82020AmLobsterBenchmarkStockAssmt_PeerReviewReport.pdf.

Ashley, M. C., S. C. Mangi, and L. D. Rodwell. 2014. "The Potential of Offshore Windfarms to Act as Marine Protected Areas – A Systematic Review of Current Evidence." *Marine Policy* 45 (March):301–9. https://doi.org/10.1016/j.marpol.2013.09.002.

Atlantic States Marine Fisheries Commission. No date. "Black Sea Bass." Accessed: Oct. 31, 2024. https://www.asmfc.org/species/black-sea-bass.

Bicknell, Anthony W. J., Samuel Gierhart, and Matthew J. Witt. 2025. "Site and Species Dependent Effects of Offshore Wind Farms on Fish Populations." *Marine Environmental Research* 205 (March):106977. https://doi.org/10.1016/j.marenvres.2025.106977 .

Bureau of Ocean Energy Management. 2024. "Commercial Leasing for Wind Power Development on the Central Atlantic Outer Continental Shelf-Central Atlantic 2-Call for Information and Nominations." *Federal Register* 89 FR 67960 (Aug. 22, 2024). https://www.federalregister.gov/documents/2024/08/22/2024-18841/commercial-leasing-for-wind-power-development-on-the-central-atlantic-outer-continental.

Carlton, Jessica L., Jonathan A. Jossart, Frank Pendleton, Necitas Sumait, Jennifer Miller, Jean Thurston-Keller, Desray Reeb, et al. 2023. *A Wind Energy Area Siting Analysis for the Oregon Call Areas (Draft)*. Bureau of Ocean Energy Management. https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Oregon_WEA_Draft_Report_NCCOS.pdf.

Gaertner, Evan, Jennifer Rinker, Latha Sethuraman, Frederik Zahle, Benjamin Anderson, Garrett Barter, Nikhar Abbas, et al. 2020. *Definition of the IEA 15-Megawatt Offshore Reference Wind*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-75698. https://www.nrel.gov/docs/fy20osti/75698.pdf.

Goode, Andrew, and Lydia White. 2023. "American Lobster Settlement Index: Update 2023." University of Maine. Available at: https://umaine.edu/marine/american-lobster-settlement-index-alsi/.

Gray, M., P. L. Stromberg, and D. Rodmell. 2016. "Changes to Fishing Practices around the UK as a Result of the Development of Offshore Windfarms–Phase 1 (Revised)." *The Crown Estate*.

Green, Rebecca, Suzanne MacDonald, Rebecca Fuchs, and Matthew Hall. 2023. *Social Acceptance of a Reduced Footprint Synthetic Mooring System for Floating Offshore Wind Turbines in the Gulf of Maine*. Golden, CO: National Renewable Energy Laboratory. NREL/PR-5000-85503. https://www.nrel.gov/docs/fy23osti/85503.pdf.

Jarrett, Robert N. II, Damian C. Brady, Richard R. Wahle, and Robert S. Steneck. 2024. "Shifts in Habitat Use and Demography of American Lobsters in Coastal Maine (USA) Over the Past Quarter Century." *Marine Ecology Press Series* 746: 87–98. https://doi.org/10.3354/meps14691.

Jylkka, Zach, and Luke Feinberg. 2024. "Gulf of Maine Offshore Wind." Bureau of Ocean Energy Management. https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/BOEM_EasthamMeeting.pdf.

Lopez, Anthony, Rebecca Green, Travis Williams, Eric Lantz, Grant Buster, and Billy Roberts. 2022. "Offshore Wind Energy Technical Potential for the Contiguous United States." Golden, CO: National Renewable Energy Laboratory. NREL/PR-6A20-83650. https://www.nrel.gov/docs/fy22osti/83650.pdf.

Mackinson, Steven, Hazel Curtis, R. Brown, K. McTaggart, N. Taylor, S. Neville, and S. Rogers. 2006. "A Report on the Perceptions of the Fishing Industry into the Potential Socio-Economic Impacts of Offshore Wind Energy Developments on Their Work Patterns and Income." *Science Series Technical Report-Centre for Environment Fisheries and Aquaculture Science* 133. https://www.vliz.be/imisdocs/publications/ocrd/123163.pdf.

Maine State Legislature. No date. "An Act to Facilitate Testing and Demonstration of Renewable Ocean Energy Technology." Public Law, Chapter 270, LD 1465, Item 1.

McCarron, Patrice, and Heather Tetreault. 2012. *Lobster Pot Gear Configurations in the Gulf of Maine*. Consortium for Wildlife Bycatch Reduction. https://www.bycatch.org/sites/default/files/Lobster_Gear_Report_0.pdf.

McCoy, Angel, Walter Musical, Rob Hammond, Daniel Mulas Hernando, Patrick Duffy, Philipp Beiter, Paula Pérez, Ruth Baranowski, Gage Reber, and Paul Spitsen. 2024. *Offshore Wind Market Report:2024 Edition*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-90525. https://www.nrel.gov/docs/fy24osti/90525.pdf.

McManus, M. Conor, Damian C. Brady, Curtis Brown, Joshua T. Carloni, Melani Griffin, Andrew G. Goode, Kristyn Kleman, et al. 2023. "The American Lobster Settlement Index: History, Lessons, and Future of a Long-Term, Transboundary Monitoring Collaborative." *Frontiers in Marine Science* 9: 1055557. https://doi.org/10.3389/fmars.2022.1055557.

Methratta, Elizabeth T., Anne Hawkins, Brian R. Hooker, Andrew Lipsky, and Jonathan A. Hare. n.d. "Offshore Wind Development in the Northeast US Shelf Large Marine Ecosystem: Ecological, Human, and Fishery Management Dimensions | Oceanography." (March 25, 2025). https://tos.org/oceanography/article/offshore-wind-development-in-the-northeast-us-shelf-large-marine-ecosystem-ecological-human-and-fishery-management-dimensions.

Mid-Atlantic Fishery Management Council. 2019. "Blueline Tilefish Fishery Information Document." https://static1.squarespace.com/static/511cdc7fe4b00307a2628ac6/t/5c7d92689b747a7942c23d57/1551733353194/4_2019+BLT+AP+Info+Doc_Final.pdf.

National Marine Fisheries Service. 2022. *Fisheries of the United States*. U.S. Department of Commerce. https://media.fisheries.noaa.gov/2022-05/Fisheries-of-the-United-States-2020-Report-FINAL.pdf.

National Oceanic and Atmospheric Administration. 2021. "Taking of Marine Mammals Incidental to Commercial Fishing Operations; Atlantic Large Whale Take Reduction Plan Regulations; Atlantic Coastal Fisheries Cooperative Management Act Provisions; American Lobster Fishery." *Federal Register* 86 FR 51970 (Sept. 17, 2021). https://www.federalregister.gov/documents/2021/09/17/2021-19040/taking-of-marine-mammals-incidental-to-commercial-fishing-operations-atlantic-large-whale-take.

National Oceanic and Atmospheric Administration. 2024. "Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic; Re-Opening of Golden Tilefish for Commercial Harvest With Bottom Longline Gear in the South Atlantic." *Federal Register* 89 FR 59002 (July 22, 2024). https://www.federalregister.gov/documents/2024/07/22/2024-16052/fisheries-of-the-caribbean-gulf-of-mexico-and-south-atlantic-re-opening-of-golden-tilefish-for.

NOAA Fisheries. 2022. "Atlantic Highly Migratory Species Stock Assessment and Fisheries Evaluation Reports." National Oceanic and Atmospheric Administration. https://www.fisheries.noaa.gov/atlantic-highly-migratory-species/atlantic-highly-migratory-species-stock-assessment-and-fisheries-evaluation-reports.

Randall, Alyssa L., Jonathan A. Jossart, Lucas B. Feinberg, Brandon M. Jensen, Zachary E. Jylkka, Seth J. Theuerkauf, and James A. Morris Jr. No date. *A Wind Energy Area Siting Analysis for the Gulf of Maine Call Area*. Bureau of Ocean Energy Management. https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/Gulf_of_Maine_Draft%20WEA_Report_NCCOS_0.pdf.

Roach, Michael, Mike Cohen, Rodney Forster, Andrew S Revill, and Magnus Johnson. 2018. "The Effects of Temporary Exclusion of Activity Due to Wind Farm Construction on a Lobster (Homarus Gammarus) Fishery Suggests a Potential Management Approach." *ICES Journal of Marine Science* 75 (4): 1416–26. https://doi.org/10.1093/icesjms/fsy006.

Roach, Michael, Andy Revill, and Magnus J Johnson. 2022. "Co-Existence in Practice: A Collaborative Study of the Effects of the Westermost Rough Offshore Wind Development on the Size Distribution and Catch Rates of a Commercially Important Lobster (Homarus Gammarus) Population." *ICES Journal of Marine Science* 79 (4): 1175–86. https://doi.org/10.1093/icesjms/fsac040.

Schupp, Maximilian Felix, Andronikos Kafas, Bela H. Buck, Gesche Krause, Vincent Onyango, Vanessa Stelzenmüller, Ian Davies, and Beth E. Scott. 2021. "Fishing within Offshore Wind Farms in the North Sea: Stakeholder Perspectives for Multi-Use from Scotland and Germany."

Journal of Environmental Management 279 (February):111762. https://doi.org/10.1016/j.jenvman.2020.111762.

State of Maine Department of Marine Resources. No date. "Historical Maine Fisheries Landings Data." Maine.gov. Accessed: Oct. 25, 2024. https://www.maine.gov/dmr/fisheries/commercial/landings-program/historical-data.

State of Rhode Island Department of Environmental Management. "Fish Pot Survey." Accessed: Oct. 31, 2024. https://dem.ri.gov/programs/marine-fisheries/surveys-pubs/fishpot.php.

Steneck, R.S., T.P. Hughes, J.E. Cinner, W.N. Adger, S.N. Arnold, F. Berkes, S.A. Boudreau, et al. 2011. "Creation of a Gilded Trap by the High Economic Value of the Maine Lobster Fishery." *Conservation Biology* 25(5): 904–912. https://doi.org/10.1111/j.1523-1739.2011.01717.x.

Szostek, C. L., S. C. L. Watson, N. Trifonova, N. J. Beaumont, and B. E. Scott. 2025. "Spatial Conflict in Offshore Wind Farms: Challenges and Solutions for the Commercial Fishing Industry." *Energy Policy* 200 (May):114555. https://doi.org/10.1016/j.enpol.2025.114555.

Tanaka, Kisei R., Jie Cao, Burton V. Shank, Samuel B. Truesdell, Mackenzie D. Mazur, Luoliang Xu, and Yong Chen. 2019. "A Model-Based Approach to Incorporate Environmental Variability Into Assessment of a Commercial Fishery: A Case Study With the American Lobster Fishery in the Gulf of Maine and Georges Bank." *ICES Journal of Marine Science* 76(4): 884–896. https://doi.org/10.1093/icesjms/fsz024.

Tsai, Hsin-Hua, Huan-Sheng Tseng, Chun-Kai Huang, and Su-Chun Yu. 2022. "Review on the Conflicts between Offshore Wind Power and Fishery Rights: Marine Spatial Planning in Taiwan." *Energies* 15 (22): 8768. https://doi.org/10.3390/en15228768.

Vanover, Charles, Paul Mihas, and Johnny Saldana (Eds.). 2021. *Analyzing and Interpreting Qualitative Research: After the Interview*. Sage Publications, Inc.

Waller, J., J. Bartlett, E. Bates, H. Bray, M. Brown, M. Cieri, C. Clark, et al. 2023. "Reflecting on the Recent History of Coastal Maine Fisheries and Marine Resource Monitoring: The Value of Collaborative Research, Changing Ecosystems, and Thoughts on Preparing for the Future." *ICES Journal of Marine Science* 80(8): 2074–2086. https://doi.org/10.1093/icesjms/fsad134.

Appendix A. Interview Question List

A.1 Interview Introduction

Thank you for joining me today and participating in this study. Before we begin, I will give you an overview of the study and the interview itself. This interview should take somewhere between 15 minutes and an hour.

We are hoping that with your help we can build a framework for how future floating offshore wind projects can be designed to accommodate fisheries. This project aims to combine the highly specialized knowledge of engineers and fishermen to find solutions that can accommodate fishery access.

These interviews are being conducted as the first stage in a larger project led by NREL that is exploring coexistence between fisheries and floating offshore wind. While I perform interviews with fixed gear fishermen such as yourself, my colleague in southern New England with Responsible Offshore Science Alliance (ROSA) is having similar conversations with recreational and commercial fishermen in the Central Atlantic, including pelagic longlining. We are hoping to ultimately develop two suites of array design solutions: one focused on the Gulf of Maine and one focused on the Central Atlantic. These array design solutions are for hypothetical wind farms, where the findings and framework will be published to help future offshore wind development better coexist with fishing.

To do this we'll perform multiple rounds of interviews with fishery participants. The first interviews have been branded "scoping" interviews and we will use these to get to know your fishing habits and the spatial requirements of your fishing behavior and your physical fishing gear. We will then show you a figure of a floating wind farm with design variables labeled, such as turbine spacing, mooring profiles, and cable routing. You can describe which aspects of the array would interact with fishing gear the most and how we might solve these issues. This information will inform the development of a co-design framework that alters the wind farm design parameters to optimize coexistence with fishing. Finally, we will include a section to add interview questions for future conversations in case we are missing an important portion of the potential interactions.

As a reminder, these interviews are being audio-recorded, but your name will not be associated with the recording. Any demographic information will be removed from your interview transcript to prevent re-identification. These measures should allow us to retain confidentiality for you and any other participants. We will keep the interview recording until January 2026. If there are any questions you do not wish to answer, you may say so and we will skip them. Have you read the informed consent form and do you grant us consent to include you in the project?

Do you have any other questions before we begin?

A.2 Interview Questions

Gulf of Maine

Demographics

The purpose of these questions is to get information on transit patterns and timing, which will be used to make the array design more friendly to transit. This will also help us determine what metocean conditions the array will be subject to during fishing season.

Who, age, port, length of time fishing:

0.1 What is your name, age, and home port?

- 0.1.1 How long have you been fishing overall?
- 0.1.2 What gear type(s) do you fish?
- 0.1.3 What depth range do you fish (shallowest to deepest)?
- 0.1.4 Are you an owner/captain/crew?
- 0.1.5 How many crew are on a trip?
- 0.1.6 How involved are you in offshore wind and fisheries coexistence conversations?

1.1. When do you fish in the Gulf of Maine?

- 1.1.1. How long have you fished in the Gulf of Maine?
- 1.1.2. What fisheries/target species do you participate in?
- 1.1.3. Does your target fishery change during the year?
- 1.1.4. How many days is a typical trip?

1.2. Where do you fish in the Gulf of Maine, i.e., distance from shore, zone licensed, fishing grounds?

- 1.2.1. How does this vary seasonally?
  - 1.2.1.1. In the past?
  - 1.2.1.2. *If changed,* why has this changed?
- 1.2.2. Where do you fish out of? Does this shift seasonally?
- 1.2.3. Where do you land your catch? Does this shift seasonally?

1.2.4 How long is your furthest steam? Do you follow any particular route?

1.3. How is your gear configured? Seasonal changes?

1.3.1 How many traps per buoy?

1.3.1.1. How does this change seasonally?

1.3.2 How many traps do you deploy throughout the season currently?

1.3.2.1. In the past?

1.3.3. How does soak time [set time] vary throughout the season?

1.3.4. Do you fish with crew?

1.3.4.1. *If yes,* does this seasonally vary?

1.3.5. How large is your boat?

Array Design Parameters

The purpose of these questions is to get ideas of what proximity to floating wind infrastructure fishing can occur. The answers here will be combined with the answers to the questions above as inputs into the design tool, where they will be used as design constraints to make a floating wind array compatible with fishing.

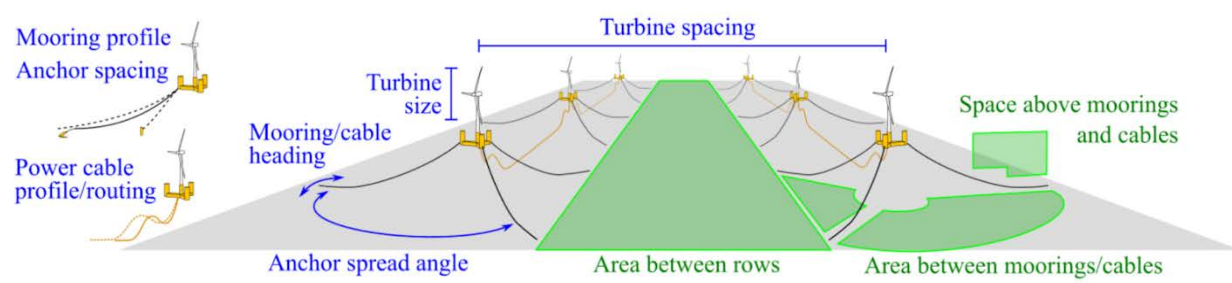

Figure A-1. NREL Floating offshore wind array design parameters

Script: *Potential array design parameters to edit are in the figure here. We can change factors such as wind turbine spacing, which may vary within the rows and columns of an array; mooring system, which may include hybrid mooring lines or catenary chain structures; mooring line profile in the water column; anchor spacing and subsequent mooring line headings and orientation; and dynamic power cable, i.e., cable profile and routing/orientation or static cable routing, i.e., pathways for buried cables, which will be important if you do not want to or cannot fish on top of buried cables.*

2.1. What are the spatial requirements of fishing activities both horizontal and vertically?

2.1.1 What are necessary scope ratios for lines relative to depth of the water column and tide?

2.1.2 How do these currently inform where you set gear?

2.1.3 Would this inform how you fish in a floating wind array?

2.1.4 How far does your gear drift while set?

2.2. Where in the water column do your fishing activities occur?

2.2.1. How and where do you anticipate gear would interact with wind infrastructure, i.e., trap vs. buoy snarl?

2.2.2. What are your concerns about how your gear would interact with a mooring system/power cable?

2.3 What is your comfort level fishing close to other gear, buoys, or fixed structures such as a mooring system or dynamic cable?

2.3.1 How close would you be willing to fish?

2.3.2 Would this vary between cable types?

2.3.3 Would this vary between fishermen?

2.3.3.1 How do you categorize your own risk-taking with fishing gear?

2.3.4 How close would you be willing to transit?

2.5 Can you fish on top of buried power cables?

2.5.1 *If yes,* would you fish on top of buried power cables?

2.5.2 Could you fish on an unburied cable, i.e., concrete mattress or scour cobble?

2.6 What issues do you see potentially rising when fishing in a floating wind array?

2.6.1 What would your comfort level be fishing in area between rows of turbines? Why?

1	**2**	**3**	**4**	**5**
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.6.1.1 How close could you set to the moorings?

2.6.2 What would your comfort level be fishing in area between moorings/cables of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.6.2.1 How close could you set to the moorings?

2.6.3 What would your comfort level be fishing above moorings / cables of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.6.3.1 How much space above the bottom do you need to fish?

2.7 How would your fishing activities change in different environmental conditions?

2.7.1 What concerns do you have about the behavior of the floating wind infrastructure under different environmental conditions?

2.7.2 If environmental conditions can change rapidly, how would you consider this in access or fishing activity?

Future Interviews

These questions are meant for researchers to learn what the fisheries want from future work. This is also intended to help improve questionnaires like this for future fishery contributions/engagement/input on co-design projects.

3.1. Do you feel like we were able to characterize your thoughts regarding the co-design of floating wind farms to improve fishing access? Do you have anything to add?

3.2. Are there specific questions that you feel should be asked in future interviews that weren't included today?

3.2.1. What would fisheries want future researchers to look into with regards to co-design?

3.3. How do you prefer that researchers contact you or conduct interviews?

3.3.1 What did we do well, and how can we improve?

3.4. Are there any comments that you feel weren't covered today and you would like to put on this record?

Central Atlantic: Pelagic Longline

Demographics

The purpose of these questions is to get information on transit patterns and timing, which will be used to make the array design more friendly to transit. This will also help us determine what metocean conditions the array will be subject to during fishing season.

Who, age, port, length of time fishing

0.1 What is your name, age, and home port?

0.1.1 How long have you been fishing overall?

0.1.2 What gear type(s) do you fish?

0.1.3 What depth range do you fish (shallowest to deepest)?

0.1.4 Are you an owner/captain/crew?

0.1.5 How many crew are on a trip?

0.1.6 How involved are you in offshore wind and fisheries coexistence conversations?

1	2	3	4	5
Very Involved	Involved	Somewhat Involved	A little bit involved	Not Involved

1.1. When do you fish in the Central Atlantic?

1.1.1. How long have you fished in the Central Atlantic?

1.1.2. What fisheries/target species do you participate in?

1.1.3. Does your target fishery change during the year?

1.1.4. How many days is a typical trip?

1.2. Where do you fish in the Central Atlantic (i.e., distance from shore, fishing grounds)?

1.2.1. How does this vary seasonally?

1.2.1.1. In the past?

1.2.1.2. *If changed,* why has this changed?

1.2.2. Where do you fish out of? Does this shift seasonally?

1.2.3. Where do you land your catch? Does this shift seasonally?

1.2.4 How long is your furthest steam? Do you follow any particular route?

1.3. How is your gear configured? Seasonal changes?

1.3.1 How long is a typical longline set?

1.3.1.1. How does this change seasonally?

1.3.1.2 How many hooks in a set?

1.3.2 How are the ends marked? What is the distance between surface buoys?

1.3.3. How long is a typical gangion?

1.3.3.1. Does this seasonally vary?

1.3.4. How deep are the hooks? How deep is the gear overall?

1.3.4.1 Do you ever anchor your gear?

1.3.5 How long do you soak your gear?

1.3.6 How large is your boat? Is it a typical size in the fleet?

Array Design Tool

The purpose of these questions is to get ideas of what proximity to floating wind infrastructure fishing can occur. The answers here will be combined with the answers to the questions above as inputs into the design tool, where they will be used as design constraints to make a floating wind array compatible with fishing.

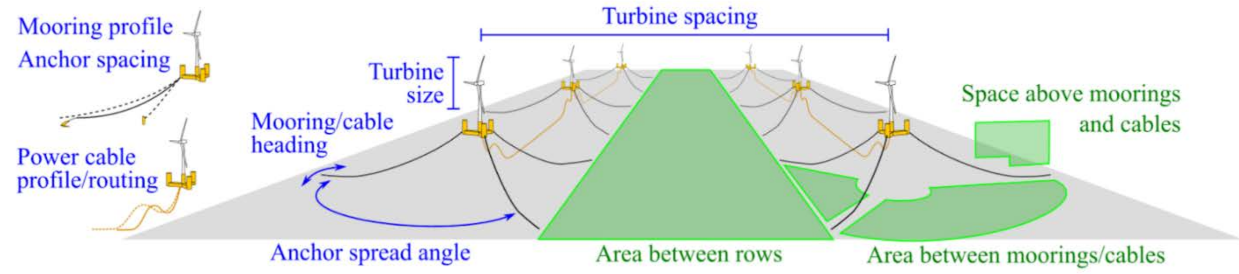

Figure A-2. NREL floating offshore wind array design tool sample figure

Script: *Potential array design parameters to edit are in the figure here. We can change factors such as wind turbine spacing, which may vary within the rows and columns of an array; mooring system, which may include hybrid mooring lines, catenary chain structures, and tension-leg tendons; mooring line profile in the water column; anchor spacing and subsequent mooring line headings and orientation; and dynamic power cable, i.e., cable profile and routing/orientation or static cable routing, i.e., pathways for buried cables, which will be important if you do not want to or cannot fish on top of buried cables.*

2.1. What are the spatial requirements of fishing activities both horizontal and vertically?

2.1.1 How do these currently inform where you set gear?

2.1.2 Would this inform how you fish in a floating wind array?

2.1.3 How far does your gear drift while set?

2.2. Where in the water column do your fishing activities occur?

2.2.1. How and where do you anticipate gear would interact with wind infrastructure, i.e., trap vs. buoy snarl?

2.2.2. What are your concerns about how your gear would interact with a mooring system/power cable?

2.3 What is your comfort level fishing close to other gear, buoys, or fixed structures such as a mooring system or dynamic cable?

2.3.1 How close would you be willing to fish?

2.3.2 Would this vary between cable types?

2.3.3 Would this vary between fishermen?

2.3.3.1 How do you categorize your own risk-taking with fishing gear?

2.4 Can you fish on top of buried power cables?

2.4.1 *If yes,* would you fish on top of buried power cables?

2.4.2 Could you fish on an unburied cable, i.e., concrete mattress or scour cobble?

2.5 What issues do you see potentially rising when fishing in a floating wind array?

2.5.1 What would your comfort level be fishing in area between rows of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.5.1.1 How close could you set to the moorings?

2.5.2 What would your comfort level be fishing in area between moorings/cables of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.5.2.1 How close could you set to the moorings?

2.5.3 What would your comfort level be fishing above moorings/cables of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.6 How would your fishing activities change in different environmental conditions (e.g., weather)?

2.6.1 What concerns do you have about the behavior of the floating wind infrastructure under different environmental conditions?

2.6.2 If environmental conditions can change rapidly, how would you consider this in access or fishing activity?

Future Interviews

These questions are meant for researchers to learn what the fisheries want from future work. This is also intended to help improve questionnaires like this for future fishery contributions/engagement/input on co-design projects.

3.1. Do you feel like we were able to characterize your thoughts regarding the co-design of floating wind farms to improve fishing access? Do you have anything to add?

3.2. Are there specific questions that you feel should be asked in future interviews that weren't included today?

3.3. How do you prefer that researchers contact you or conduct interviews?

3.3.1 What did we do well, and how can we improve?

3.4. Are there any comments that you feel weren't covered today and you would like to put on this record?

Central Atlantic: Recreational Fishing

Demographics

The purpose of these questions is to get information on transit patterns and timing, which will be used to make the array design more friendly to transit. This will also help us determine what metocean conditions the array will be subject to during fishing season.

Who, age, port, length of time fishing:

0.1 What is your name, age, and home port?

0.1.1 How long have you been fishing overall?

0.1.2 What gear type(s) do you fish?

0.1.3 What depth range do you fish (shallowest to deepest)?

0.1.4 Are you an owner/captain/crew?

0.1.5 How many crew are on a trip?

0.1.6 How involved are you in offshore wind and fisheries coexistence conversations?

1.1. When do you fish in the Central Atlantic?

1.1.1. How long have you fished in the Central Atlantic?

1.1.2. What fisheries/target species do you participate in?

1.1.3. Does your target fishery change during the year?

1.1.4. How many days is a typical trip?

1.2. Where do you fish in the Central Atlantic (i.e., distance from shore, fishing grounds)?

1.2.1. How does this vary seasonally?

1.2.1.1. In the past?

1.2.1.2. *If changed,* why has this changed?

1.2.2. Where do you fish out of? Does this shift seasonally?

1.2.3. Where do you land your catch? Does this shift seasonally?

1.2.4 How long is your furthest steam? Do you follow any particular route?

1.3. What is your primary method of fishing?

1.3.1 What water depths do you primarily fish in?

1.3.1.1. How does this change seasonally?

1.3.1.2 When fishing, are you trolling, drifting or anchored?

1.3.2 When anchored how long is your typical anchor rode? When drifting how deep will you usually set your lines?

1.3.3. How frequently do you deep drop fish?

1.3.3.1. Does this seasonally vary?

1.3.4. How deep are the hooks? How deep is the gear overall?

1.3.5 How large is your boat? Is it a typical size in the fleet?

Array Design Tool

The purpose of these questions is to get ideas of what proximity to floating wind infrastructure fishing can occur. The answers here will be combined with the answers to the questions above as inputs into the design tool, where they will be used as design constraints to make a floating wind array compatible with fishing.

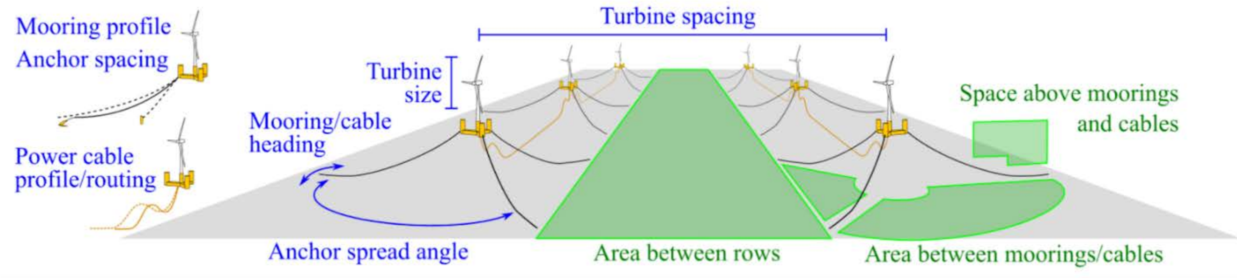

Figure A-3. NREL floating offshore wind array design tool sample figure

Script: *Potential array design parameters to edit are in the figure here. We can change factors such as wind turbine spacing, which may vary within the rows and columns of an array; mooring system, which may include hybrid mooring lines, catenary chain structures, and tension-leg tendons; mooring line profile in the water column; anchor spacing and subsequent mooring line headings and orientation; and dynamic power cable, i.e., cable profile and routing/orientation or static cable routing, i.e., pathways for buried cables, which will be important if you do not want to or cannot fish on top of buried cables.*

2.1. When deep drop fishing are the spatial requirements of fishing activities primarily horizontal or vertical?

2.1.1 How does the bathymetry of a particular area affect how you set your lines?

2.1.3 Would this inform how you fish in a floating wind array?

2.1.4 How far do you usually drift while swordfishing or tilefishing on the bottom?

2.2. Where in the water column do your fishing activities occur?

2.2.1. How and where do you anticipate gear would interact with wind infrastructure, i.e., weighted swordfish gear vs. buoy gear?

2.2.2. What are your concerns about how your gear would interact with a mooring system/power cable?

2.3 What is your comfort level fishing close to other gear, buoys, or fixed structures such as a mooring system or dynamic cable?

2.3.1 How close would you be willing to fish?

2.3.2 Would this vary between cable types?

2.3.3 Would this vary between fishermen?

2.3.3.1 How do you categorize your own risk-taking with fishing gear?

2.4 Can you fish on top of buried power cables?

2.4.1 If yes, would you fish on top of buried power cables?

2.4.2 Could you fish on an unburied cable, i.e., concrete mattress or scour cobble?

2.5 What issues do you see potentially rising when fishing in a floating wind array?

2.5.1 What would your comfort level be fishing in area between rows of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.5.1.1 How close could you set to the moorings?

2.5.2 What would your comfort level be fishing in area between moorings/cables of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.5.2.1 How close could you set to the moorings?

2.5.3 What would your comfort level be fishing above moorings/cables of turbines? Why?

1	2	3	4	5
Very uncomfortable (Would not use)	Uncomfortable	Somewhat comfortable	Comfortable	Very Comfortable (Would use like normal fishing)

2.6 How would your fishing activities change in different environmental conditions (e.g., weather)?

2.6.1 What concerns do you have about the behavior of the floating wind infrastructure under different environmental conditions?

2.6.2 If environmental conditions can change rapidly, how would you consider this in access or fishing activity?

Future Interviews

These questions are meant for researchers to learn what the fisheries want from future work. This is also intended to help improve questionnaires like this for future fishery contributions/engagement/input on co-design projects.

3.1. Do you feel like we were able to characterize your thoughts regarding the co-design of floating wind farms to improve fishing access? Do you have anything to add?

3.2. Are there specific questions that you feel should be asked in future interviews that weren't included today?

3.3. How do you prefer that researchers contact you or conduct interviews?

3.3.1 What did we do well, and how can we improve?

3.4. Are there any comments that you feel weren't covered today and you would like to put on this record?