

Hook and Line Survey Mitigation Plan

I. Purpose of the survey

What data is collected?

The Hook and Line Survey will collect species-specific aggregate weight and abundance, as well as individual lengths and biological characteristics (e.g., age, maturity, genetics, diet, energetics). Tagging will also be conducted opportunistically and by request. A suite of environmental data will be collected via conductivity, temperature, and depth (CTD) deployments at each survey station. Habitat data will be collected using seafloor imaging (still or video) techniques. Finally, operational and gear deployment data will be collected for every gear set.

What specific products use this survey?

The Hook and Line Survey is a new survey, but expected products include multiple stock assessments for species managed by the MAFMC, NEFMC, and ASMFC; the State of the Ecosystem report; age-length keys; and maturity ogives. In addition, this survey could contribute to studies focused on assessing project-specific and cumulative impacts of offshore wind development on marine species across the Northeast continental shelf. Scientific products related to species distributions, habitat use, movement, and biology may also use data or information from the Hook and Line Survey.

Which assessments/science advice pathways currently use this survey?

The Hook and Line Survey is a new survey, so all data uses are prospective. Once the survey is mature, the data will be used in stock assessments for a variety of commercially and recreationally important species and for analyses that support management actions. This will encompass species covered by the Mid-Atlantic Fishery Management Council (MAFMC), New England Fishery Management Council (NEFMC), and Atlantic States Marine Fisheries Commission (ASMFC), including but not limited to Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), pollock (*Pollachius pollachius*), white hake (*Urophycis tenuis*), red hake (*Urophycis chuss*), summer flounder (*Paralichthys dentatus*), scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), spiny dogfish (*Pomatomus saltatrix*), Atlantic croaker (*Micropogonias undulatus*), and skates. At least 5 years of Hook and Line Survey data will be required before abundance indices from the survey are integrated into stock assessments, but habitat and biological data could be used immediately to supplement existing data streams. Beyond stock assessments and management, the data from the Hook and Line Survey will also be used in research to understand the cumulative impacts of offshore wind on resource species and their habitats.

Who are users of the survey data generated?

Data users include but are not limited to stock assessment scientists and managers for species managed by the MAFMC, NEFMC, and ASMFC scientists within NOAA and at academic institutions studying marine ecosystem dynamics; and NOAA Fisheries, Council, and Commission staff.

Are there any formal quality standards (e.g., operational/gear requirements or standard operating procedures) for the survey that need to be considered?

Standardization in the Hook and Line Survey gear, vessel operations, and gear deployment will need to be maintained coastwide. Survey protocols will be designed to ensure consistent operations regardless of proximity to offshore wind turbines, while managing safety risks. The survey will be conducted using multiple vessels along the coast and would require a standardized operating procedure (SOP) that is consistent across platforms and potentially includes overlap among platforms to evaluate vessel differences. The final SOP will be developed in consultation with data end users (e.g., stock assessment scientists, ecosystem scientists) as well as industry partners conducting the survey. Criteria for acceptable stations will be included in the SOP. Foundation type will be an important factor for determining operational feasibility and consistency; some evaluation of the operational constraints associated with each foundation type will be considered during the design of the survey and during the execution of the survey as new foundation types are used.

Are there added values that cannot be met without this survey?

A Hook and Line Survey would help to ensure data continuity for many species as mobile gear surveys will be precluded from wind energy developments. It would also fill data gaps for species that are not well sampled by existing surveys. More specifically, a Hook and Line Survey would provide a continuous data stream on species that are currently sampled by mobile gear surveys that will be excluded from wind energy development areas. In addition, a Hook and Line Survey will provide data on structure-oriented and semi-pelagic species that are not well sampled by mobile gear surveys and have been demonstrated to aggregate around offshore wind turbines in other regions. Species that are highly structure-oriented (e.g., black sea bass and cod) or semi-pelagic (e.g., bluefish and pollock) may be better captured across their habitats and length range by hook and line gear than traditional trawl surveys. Finally, the changes in habitat created by wind energy development will increase the need for data on many species that would be sampled by the Hook and Line Survey. Importantly, the Hook and Line Survey would be able to be conducted in fixed and floating wind energy development areas, which ensures data continuity as offshore wind development expands.

How does offshore wind energy impact survey objectives going forward?

Offshore wind energy development will not impact the objectives of a new Hook and Line Survey, which are to track trends in relative abundance, monitor biological characteristics of fisheries species, and monitor oceanographic conditions and habitat. Offshore wind will, however, impact the design of the Hook and Line Survey, as protocols will need to be operable within and around wind turbines. Specifically, the ability to access wind energy areas and the operational constraints associated with fishing in close proximity to wind turbines will impact the sampling design and protocols of the Hook and Line Survey. The survey could be designed to also evaluate the impact of wind energy development on species abundance and distribution (relevant to the developers) and to test whether turbines increase abundance or affect aggregation. Finally, the Hook and Line Survey would provide a data source to assess the gradient effect (patterns in abundance associated with distance from turbines) of offshore wind on fisheries species.

II. Survey Details

Beginning Year: TBD

Frequency: Annual

Season: Spring (March-May). Note that this survey could also be conducted during the fall in addition to the spring, but the cost would double.

Geographic Scope: Continental shelf waters beyond 3 miles from Cape Hatteras, NC, through the Gulf of Maine

Platform(s): Charter head boats, commercial hook boats, and for-hire charter vessels

Statistical Design: This survey will be stratified by region and depth, with additional consideration given to bottom complexity and the presence of wind energy areas (WEAs). A spatially balanced sampling design will be explored in the pilot Hook and Line Survey in 2024. Smooth and structured bottom types would be defined using a variety of data sources, including but not limited to a Terrain Ruggedness Index (TRI) scaled relative to regional strata to account for variation in bottom complexity and known structures, both natural and artificial (reefs/wrecks), using NOAA chart data. Stations will be proportionally allocated relative to area and will provide comparative coverage both inside and outside of WEAs. Station locations may also target areas where there is strata overlap between offshore wind development and the current Bottom Longline Survey (BLLS) and the Bottom Trawl Survey (BTS). Smooth and structured strata designations will be adapted as WEAs are developed and habitat types change within and around WEAs.

Methods: This survey will use auto-jigging machines to standardize fishing behavior among users. The terminal gear, bait, rig length, and jig settings will be standardized. A series of stakeholder engagement sessions were conducted throughout the northeast region in fall 2023 to gain input on the proposed survey and gear design. Information gathered during these meetings was used to determine specific gear configurations and deployment strategy, bait choice, sampling station locations, and operational logistics. Three gear deployment approaches were selected in consultation with industry partners and will be tested in the pilot Hook and Line Survey in 2024. Two replicates (1 with large hooks and 1 with small hooks) of each gear deployment will be fished at each survey station, with a total of 6 jig machines. SOPs will be designed to target multiple species complexes to account for the coastwide variation in catch composition and habitat. Final gear configurations and deployment protocols will be defined in collaboration with hook and line fishing industry members after the completion of the pilot Hook and Line Survey in 2024. All fishing gear and sampling equipment used on the Hook and Line Survey will be provided by the Northeast Fisheries Science Center (NEFSC) to ensure consistency across vessels.

A set period of fishing operation will be conducted at each sampling site, and multiple sites will be sampled per day. Catch will be retrieved, and scientists will process the catch. Species-level aggregate weights and individual lengths will be collected for all captured organisms, and biological samples (e.g., age, maturity, genetics, diet, energetics) will be collected in response to requests from end data users. Environmental data will be collected at each site, including CTD deployments using standard equipment. Bottom habitat data will be collected from a camera system deployed at each station. Habitat imaging will be used to characterize the habitat type of each sampling site and to inform essential fish habitat designations and related studies. Data will be collected using an electronic data collection system to maximize accuracy and efficiency. The final methodology for this survey will be developed in consultation with data end users (e.g., stock assessment scientists, fishery managers) as well as industry partners conducting the pilot survey in 2024.

III. Effect of Four Impacts

1. **Preclusion** of NOAA Fisheries sampling platforms from the wind development area because of operational and safety limitations.

Hook and line gear is likely one of the easiest and safest gears to operate in close proximity to offshore wind turbines (floating and fixed). If access is allowed, the Hook and Line Survey operations should be possible among the turbines. However, some smaller areas of preclusion may exist close to turbines, junctions, anchors/moorings, and cables. These preclusions could be greater in floating wind areas or for jacket versus monopile foundations, and this will need to be considered in the spatial design of the survey. Proximity gradients relative to the distance from turbines will also be accounted for in the survey design, with sufficient station density to cover a range of distances.

2. **Impacts on the statistical design of surveys** (including random-stratified, fixed station, transect, opportunistic, and other designs), which are the basis for scientific assessments, advice, and analyses.

The Hook and Line Survey will likely employ a spatially balanced sampling design, with consideration given to the presence/absence of wind farms and structured bottom. Given the significant modifications to the seafloor associated with offshore wind energy development, bottom type designations will need to adapt as wind structures are built. The survey design will also consider any areas of preclusion or limited access. Analysis should be conducted to determine an appropriate sampling density to ensure reliable variance estimates on survey indices. Sampling density should also account for the differences in catch volume among survey approaches (e.g., sampling density may need to be higher for hook and line than trawl surveys).

3. **Alteration of benthic and pelagic habitats and airspace** in and around the wind energy development, requiring new designs and methods to sample new habitats.

The wind turbines and associated supporting structures will create structured habitats. In addition, they will alter benthic and pelagic habitats, but the magnitude and scale of these changes are presently unknown. The impact of this could be greater in areas with low densities of existing complex habitat. The addition of structured habitat will be accounted for in the sampling design to allow for testing and monitoring of the impact on species across the region. Further, the creation of gradients in pelagic and benthic habitats as a result of wind energy development will be accounted for in the survey design. A Hook and Line Survey provides a sampling method that can be widely applied across habitat types to assess trends in relative abundance, oceanography, and biology over time.

4. **Reduced sampling productivity** caused by navigation impacts of wind energy infrastructure on aerial and vessel surveys.

There is some potential of reduced sampling productivity due to navigational challenges within and around offshore wind energy developments as well as potentially from fixed-gear conflicts. The small size of Hook and Line Survey vessels, however, will likely reduce this issue to some extent, relative to larger vessel surveys. The use of a small boat fleet in itself will be a mitigation to the inefficiency of altered transit times to and

from sampling locations. However, this assumes there will not be any preclusion areas for transit. Some increases in transit time would still be expected, particularly at night or in rough weather conditions. Accommodations should be made in the planned station number, spatial coverage, and budgeting to allow for course alterations to ensure safe transit routes.

IV. Mitigation Planned, as per Six Elements

1. *Evaluation of survey designs*

This is a new survey that is intended to ensure continued data flow from areas where traditional mobile-gear surveys will be precluded as well as to address data gaps for species associated with complex habitats. This survey will help stock and ecosystem assessments continue to provide scientific advice despite reduced data inputs from long-term surveys that will be unable to operate in wind energy areas. This survey will also provide data to support stock assessments for structure-oriented and semi-pelagic species that are poorly sampled by traditional survey approaches. At least 5 years of data will be required before the time series is sufficient for producing indices of abundance for stock assessments and fisheries management. The biological data, oceanographic data, and habitat data, however, would be appropriate for immediate applications.

2. *Identification and development of new survey approaches*

As offshore wind impacts the operational feasibility of traditional surveys, new survey designs and methods will be necessary to maintain data streams from fishery-independent sources. The proposed Hook and Line Survey will employ a novel design and methodology that is more easily and safely executed among offshore wind infrastructure. This multispecies Hook and Line Survey will be designed to provide species-level data on the distribution, abundance, biomass, and biological characteristics of fisheries species and their habitats across the continental shelf. The survey will likely extend to at least 150 meters and will include areas within and surrounding WEAs that are inaccessible to mobile-gear surveys. We propose a spatially balanced statistical design, with consideration of habitat type and the presence of wind energy development. Partnership with a statistician to define the appropriate station density and spatial distribution will be essential to finalizing the design of this survey. Consultation with members of the fishing community, who will be key partners in this survey, will also be important before finalizing the sampling design and operational SOPs.

The survey domain will range from Cape Hatteras through the Gulf of Maine and will include areas within and outside of offshore wind energy developments in federal waters, likely extending to 150 meters in depth. Primary strata will be defined by depth and region, with additional consideration given to bottom complexity and the presence/absence of offshore wind. A TRI scaled relative to regional strata to account for variation in bottom complexity may be informative for the sampling design. Smooth and structured strata designations will be adapted as WEAs are developed and habitat types change within and around WEAs.

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Analyses will be conducted to determine the station density required to produce species abundance and biomass estimates with an acceptable amount of variance. These analyses can build upon the approaches used in other regional surveys but with careful consideration for the unique (low) catch rates of hook and line sampling. Station density should be sufficient to collect data on a variety of species despite the lower volume of catch expected for hook gear relative to larger mobile gears.

The survey will be conducted collaboratively with multiple vessels (either commercial or recreational fishing vessels) to cover the full geographic scope of the northeast region (Cape Hatteras to Maine). The use of relatively small vessels should largely mitigate safety limitations of operating near turbines (fixed and floating). Multiple vessels will also provide redundancy and help ensure the ability to consistently conduct operations. The survey will have as narrow a seasonal scope as logistically possible to limit the impact of changes in availability due to seasonal movement of fisheries resources. Initial scoping has identified March-May as the potential survey season; the final survey season will be defined in consultation with stakeholders and data end users.

Vessels will anchor at each randomly assigned station within a 0.25 nautical mile (nm) radius allowance to avoid issues with safety, weather, and gear conflicts. Fishing will be conducted for a standard amount of time before transit to the next station. Final survey protocols will be developed in consultation with industry partners.

A standard set of survey gear will be used by all vessels. Gear deployment protocols will be followed coastwide to ensure comparability among regions and habitats. Six sets of auto-jigging equipment will be used to deploy and retrieve hook gear in a consistent manner with limited angler effect. Gear will be deployed for a total of 20 minutes of bottom time. Six jigging machines will be deployed at each station, and the configuration, terminal gear, and techniques will vary to support sampling of the broadest range of species. Each gear configuration will be fished in replicates (e.g., a minimum of 2 jig machines with the same configuration at each station). Decisions regarding gear configurations will be made in consultation with partner fishermen, who are most knowledgeable about gear selectivity. Two hook sizes may be used within each terminal gear configuration, creating a “small gear” and “large gear” to target a wide range of fish sizes. Bait type and size will be standard across the sampling region. Consideration should be made for market impacts on the consistent availability of the bait type chosen.

Industry partners will retrieve and redeploy gear. Once the gear is retrieved, catch will be processed by scientific staff collecting aggregate weight, abundance, and individual length data. Biological sampling (age and maturity at a minimum) will be conducted based on a length-structured sampling design consistent with other surveys. A CTD cast will be conducted at each station after the fishing gear is retrieved. A habitat camera system will also be deployed after the fishing gear is retrieved for classifying bottom type. Each station will be evaluated based on gear and operational criteria for representativeness and consistency with rules for exclusion of stations not meeting these requirements.

Complementary tagging of animals of sufficient health will be conducted to support collaborating programs or organizations. Fish movement studies could be highly informative to the changes in fish distribution in response to habitat alterations caused

by wind energy development. Hook and line is one of the best methods for capturing and tagging animals with a resulting high survival rate.

3. Calibration and integration of new survey approaches

If there is a commitment to support the Hook and Line Survey for the long term, calibration with the Bottom Trawl Survey (BTS), Gulf of Maine BLLS, and Mid-Atlantic Council Tilefish Survey through paired deployments may be warranted. It is uncertain, however, if calibration is feasible due to the following operational limitations:

- Securing and coordinating days at-sea for paired gear deployments between surveys within each region would be logistically challenging due to limited availability of the Bigelow.
- The Hook and Line Survey will be focused on sampling structured-bottom habitat. Given the BTS's limitations in sampling structured habitat, calibration within that habitat will be difficult.
- Hook and line methods will likely have major differences in catch efficiency and volume across species compared to bottom trawl and longline methods.

Regardless of calibration, this survey would initiate a new time series throughout the lifespan of offshore wind development. As mobile gear surveys will be precluded from wind energy developments, this new survey will ensure continuity of data for many species, as well as fill data gaps for species that are not well sampled by existing surveys. Analysis of catch data from the pilot Hook and Line Survey will focus on the selectivity of the hook and line gear. This information will be critical to developing survey mitigation approaches that are complementary and that address long-term data needs both efficiently and effectively.

4. Development of interim provisional survey indices

As the Hook and Line Survey is new, the development of interim provisional survey indices largely does not apply. However, due to the fact that some of the offshore wind areas are already in the construction phase of development, there may be value in collating catch per unit effort data from commercial and charter hook and line vessel logbooks and/or observer data.

5. Wind energy monitoring to fill regional scientific survey data needs

The Hook and Line Survey design and methods are still in development and will be determined based on findings from the pilot Hook and Line Survey in spring 2024. Preliminary survey design and methodology are as follows:

Survey Design

Vessel Selection

The Hook and Line Survey will be conducted aboard either commercial or charter hook and line vessels. Exact vessel requirements are still in development and will be determined based on findings from the pilot survey. Preliminary vessel requirements are as follows:

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- The vessel must have been actively used for commercial or for-hire hook and line fishing or research in the past 12 months.
- The vessel must be capable of safely fishing on the continental shelf in water depths of 18-150 meters and conduct trip durations of at least 3 days and up to 5 days.
- The vessel must have a fuel capacity to sustain a trip of greater than 200 nm (100 nm one way) from port.
- The vessel must be able to maintain a minimum cruising speed of 8 knots in low sea states.
- The vessel must be able to mount and deploy hook and line gear, as well as any specialized sampling gear that will be provided by the NEFSC (CTD, camera systems, acoustics).
- The vessel will be required to supply a minimum of 2 anchors and line sufficient to deploy and efficiently haul anchors in depths of up to 150 meters.
- The vessel will be required to have the ability to efficiently discard fish overboard.
- The vessel will be required to have sufficient deck space for fishing and scientific operations. The specific amount of deck space will be defined in the pilot Hook and Line Survey in 2024.

Survey Period and Sampling Area

The Hook and Line Survey design and methods are still in development and will be determined based on findings from the pilot Hook and Line Survey in spring 2024. Preliminary survey design and methodology are as follows:

- The Hook and Line Survey will be conducted annually in the spring (March-May).
- The survey will begin in the Mid-Atlantic region, moving up the coast to Southern New England, ending in the Gulf of Maine.
- The length of each survey leg will range from 1-5 days (0-4 nights).
- The exact timing and length of each trip will be determined after vessel selection is made and will take into consideration the timing of offshore wind development construction events and weather.

Station Locations

This survey will employ a spatially balanced sampling approach, with target areas defined by region, depth, habitat type, and presence/absence offshore wind development. Stations will be proportionally allocated relative to area and will provide comparative coverage both inside and outside of WEAs, specifically targeting areas where offshore wind is currently built, leased, planned, proposed, and under construction. Station locations may also target areas where there is strata overlap between offshore wind development and the current BLLS and BTS. Pending input with industry stakeholders, known structures (wrecks/reefs) will also be considered in the sampling design. Smooth and structured strata designations will be adapted as WEAs are developed and habitat types change within and around WEAs. The maximum and minimum depth will range from a minimum of 18 meters to a maximum of 150 meters (or the maximum depth that offshore wind energy is developed).

After regional input from the stakeholder engagement workshop series is synthesized, the Hook and Line Survey team will also engage the NEFSC Population Dynamics Branch and Ecosystem Surveys Branch in the statistical design process including:

- statistical sampling design;
- station density;
- number of stations;

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- exact station locations;
- BTS comparative survey stations; and
- an operational radius around each station

Gear Set Up

Six DNG jigging reels will be mounted around the edge of each vessel. The approximate location of each mounted reel will be consistent between vessels. Exact locations of reels, however, may vary slightly between vessels due to available deck space. The DNG jigging reels have the ability to program standardized settings. Jigging configurations will be discussed during stakeholder meetings and tested during the pilot Hook and Line Survey in spring 2024.

Reel Configurations

Reel configurations including jigging patterns and exact leader designs will be developed based on input and expertise gathered from the stakeholder engagement workshops and industry partner meetings. One configuration (leader design and jigging pattern) per region will be developed and tested during the pilot within all 3 of the survey areas (Gulf of Maine, Southern New England, and Mid-Atlantic). Leaders will be designed to target multiple species complexes to account for the coastwide variation in catch composition and habitat.

Two different hook sizes will be used creating a “small gear” and “large gear” option for each leader design, with the goal of targeting a wide size range of fish. Exact hook sizes will be determined after stakeholder engagement workshops and industry partner meetings as well as by using literature and experience from existing Hook and Line Surveys (Harms et al. 2010; Vidal et al. 2018). Lure and bait size will be consistent across hook sizes. This is to ensure the survey is able to sample a wide range of species and sizes.

Survey Operations/At-Sea Protocols

Station Arrival

- Every effort shall be made to anchor within a 0.10 nm radius of the preselected random location to ensure that sampling occurs on the target habitat . An additional 0.15 nm radius will be allowed to address safety concerns around wind turbines.
- Bottom habitat is determined by the captain using the vessel's sounder and plotting software. If no structured habitat is found after approximately 15 minutes of searching with 0.15 nm, the radius will then be expanded to 0.25 nm.
- If no viable station is found after approximately 1 hour, an alternative station with comparable depth, habitat, and proximity to offshore wind development will be surveyed

Station Level Data to be Recorded

- Vessel, crew, and scientific staff
- Date
- Time of arrival/time fishing begins/time fishing ends
- Location
- Sea state (wind speed and direction, swell, wave height)
- Moon phases – post hoc
- Water column profiles – CTD
- Current

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- Images of bottom for habitat characterization
- Station notes
 - Adaptations to protocols
 - Sea conditions
 - General observations, including wind construction near station at time of sampling
 - Surface observations (birds working in the area, bait on surface, depredation)
 - Other fishing gear in area of sampling

Sampling Equipment

- A current sensor will be deployed on a buoyed line before the anchor is set. The current sensor will be retrieved after sampling is completed.
- A CTD and camera system will be deployed after sampling is completed. A CTD cast will be conducted from the surface to the bottom.
- A drop camera system will be deployed for 5 minutes after sampling is completed.

Gear Deployment

Each leader will be set with a 5-pound sinker minimum. Upon arrival at each station, the chief scientist and captain will refer to the vessel's depth sounder and surface observations to determine if additional sinker weight is needed. If the sinker weight is found to be insufficient, the sinker weight may be adjusted per machine at the discretion of the captain. Jig machine settings will be adjusted to account for sinker weight, and all adjustments will be documented.

Once the machine configurations are set and leaders are attached using a snap swivel, each machine will deploy their leader. Paired with each machine is a timer set to 20 minutes; when the sinker reaches the determined depth, the timer begins. The reel will sit or jig at the assigned depth until fish are detected and haulback begins. At the detection of haulback, staff will pause the timer and record the bottom time and depth at which the catch was detected (depth when haulback is triggered is displayed on the machine). The leader will then be hauled into the vessel, detached from the mainline, and passed on to the scientific staff for sampling. Sequentially, a new leader is connected to the mainline, deployed, and the timer is resumed. If there is no catch to record (i.e., lost fish), the haulback will be documented, and the same leader will be checked for damage and redeployed. If there is any damage or loss of gear, the leader is replaced and the incident recorded. These steps are repeated until each reel has completed a total of 20 minutes of bottom time at each station.

Stakeholder input will determine a maximum bottom time without any indication of interactions (fish caught). If no interactions are detected after the designated amount of time, the timer will be paused, and the leader will be checked to see if bait is present. Similarly, stakeholder input will determine the maximum amount of bottom time before bait needs to be refreshed/replaced.

Gear Operations Data to be Recorded

Reels

- Reel configuration/settings

Leader Configuration

- Leader design used

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- Hook gear used (“small” or “large” gear)
- Sinker weight used

Individual Machine Data/Gear Deployment

- Time and location the machine is first set and sinker reaches the designated depth
- Bottom time and location (when machine detects a fish)
- Time and location of end haul (when each machine has completed the set bottom time of 20 minutes)

Hook/Bait Condition

- Fish on
- No bait on hook
- Bait on hook
- Some bait on hook
- No hook back (lost)
- Other notes (e.g., fish foul hooked or snagged on more than one hook)

Gear Performance

- Number of deployments
- Acceptable deployments
- Excluded deployments – gear will continue to be deployed, but the timer will not be reset or restarted if one of the following occurs:
 - Lost sinkers, tangles, hang ups, broken or lost gangion, tangles between multiple jig machines, bite offs
- Amount of gear lost, damaged/replaced/repared at each station

Biological Sampling Protocols

Species-level aggregate weights and individual lengths will be collected for all captured organisms, and biological samples (e.g., age, maturity, genetics, diet, energetics) will be collected in response to priorities and requests from collaborators and data users.

Bottom time and reel configuration for individual catch will be recorded, including invertebrates, substrate, seaweed/plants, and miscellaneous (trash/plastic).

6. *Development and communication of new regional data streams*

A broad array of constituents will be consulted prior to finalizing the statistical design and operational approaches of the Hook and Line Survey. A description of the Hook and Line Survey will be provided to the MAFMC, NEFMC, and ASMFC for comment. We expect this review and refining process to take nearly a full year. Outreach meetings to the for-hire and commercial fishing sectors will be conducted during that same year. Targeted smaller meetings with industry members, academics, state agencies, other survey programs, and non-governmental organizations with specific expertise will also be beneficial to the survey design. Staff from the NEFSC Population Dynamics Branch, Population Biology Branch, and Ecosystems Survey Branch will assist in the statistical design process. All potential data end users will be informed about the program, including population dynamics and population biology staff, members of the Ecosystem Dynamics and Assessment Branch, the Habitat Ecology Branch, the Greater Atlantic Regional Fisheries Office (GARFO), and others.

Data collection tools and databases will need to be developed for the Hook and Line Survey. Some existing tools and systems can potentially be adapted (e.g., BLLS application, Southwest Fisheries Science Center Hook and Line Survey), but significant scoping in consultation with Information Technology (IT) staff will be necessary to evaluate applicability. Electronic data collection tools (e.g., scales, fishboards) will be acquired and linked using wireless means. The vessel size and layout may determine what equipment is feasible. New data systems will be built with consistency with existing data systems in mind (i.e., consistent with other NEFSC survey data) as much as possible. New audit routines specific to these data will be developed. The data will be served up on the same servers and systems as other NEFSC survey data to ensure easy access to end users.

IT Resources Needed:

- Developer and database architecture, and data management support to stand up a functional data collection system and database
- Assistance in developing a data storage plan
 - Numeric/text and images (possibly video)
 - Live storage for now; as the survey progresses, cold storage will need to be discussed
 - Data retention
- Developer support to develop and maintain data collection system and database needs
 - Pilot phase (spring 2024) may use modified Gulf of Maine BLLS data collection system to collect Hook and Line Survey data.
 - Long term, we would like to design a data collection system and database geared towards hook and line operational needs.
- Ongoing data management support
- Given the synergies between the Hook and Line Survey and BLLS, the IT support described above would be provided by the Data and Information Systems Branch in the Fishery Monitoring and Research Division (FMRD).
- It is expected that long-term data infrastructure support would be provided by ITD and funded through indirect/overhead

V. Proposed Schedule for Implementation

Table 1. Proposed schedule for implementation of the Hook and Line Survey.

Mitigation Element #	Task	Activities	Milestone
2	Develop Survey Design Plan	-List procedures and protocols for executing pilot survey -Conduct meetings with Population Dynamics Branch and other data users	-Determine gear configurations and vessel requirements, station allocation, jig machine operational procedures
2	Obtain Permits	-Request Scientific Research Permit with GARFO - Request sampling permits from individual states, as needed	-Obtain permits

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2	Recruit 3 Vessels as Pilot Survey Platforms	-Recruit 1 vessel per region to perform pilot survey	-Set up contracts with three vessels -Perform vessel Inspections - Determine on-vessel operational setup
2	Hire Additional Staff	-Recruit and onboard 1 full-time employee (FTE) to develop and lead pilot Hook and Line Survey, 1 FTE to act as survey coordinator, and 1 IT Specialist in the Data and Information System Branch (shared with BLLS)	-Hire survey lead, coordination, and IT staff
2	Survey Purchases	-List all supplies, materials, and equipment needed for pilot Hook and Line Survey	-Make purchases of all equipment needed for pilot
2	Develop Data Collection System and Database	-Scope possible data collection platforms -Develop or modify existing systems for data collection and database for pilot in consultation with DIS	Obtain data collection equipment (scales, fishboards, etc.); work with DIS to refine BLLS data collection system to be used for the Hook and Line Survey; create database
2	Finalize Survey Design Plan	-Use recommendations from stakeholder input and Population Dynamics Branch in final protocols and design for the pilot survey -Define survey operations period	-Finalize survey station design, vessel specifications, terminal tackle selection, leader/gangion design, jigging machine configurations, fish sampling procedures, operational protocols, and station evaluation criteria
2	Conduct Pilot Survey	-March-May 2024 - use 3 vessels to deploy sampling gear; test the use of automatic jigging machines as a survey tool -Conduct survey operations near existing wind infrastructure to evaluate logistical constraints	-Collect environmental and operational data, and species-level weight and length data -Collect biological samples -Analyze data to assess selectivity by species and size
2/6	Host Series of Stakeholder Engagement Workshops	-Host a series of workshops throughout target regions to gain industry input to finalize survey design -Communicate new survey approaches and facilitate collaboration with industry stakeholders and scientific community	-Host 3 workshops per region (in-person and online) for a total of 9 workshops -Finalize survey design plan

2/6	End of Year Meeting with Participating Vessels	-Host a meeting with all participant vessels to review and discuss the methodology, operations, and survey results.	-Collect feedback and input from participant captains and crew, and incorporate into final survey plan for 2025 operations
5	Operationalize Survey by 2025	- Finalize survey operational plans based on 2024 pilot results. - Hire additional field staff to support operational Hook and Line Survey	-Currently not funded
6	Data Management and Exploration	-Audit data collected, load into database, and conduct exploratory analyses	-Data available in NEFSC Oracle database - Peer reviewed publication detailing analyses of Hook and Line Survey data to assess gear selectivity and species indicators
6	Dissemination of Survey Results	-Develop means to distribute and present pilot survey results	-Distribute and present at relevant meetings -Develop technical report of findings

VI. Links to Other Surveys

- New data collection tools and databases will need to be developed for the Hook and Line Survey. Initially, the Hook and Line Survey could adapt existing data collection tools and data management systems from the Gulf of Maine BLLS. Detailed gathering requirements and sufficient resourcing are needed to develop the data collection tools and data management support for the long-term survey. The Hook and Line Survey may be able to share IT support with the BLLS through the DIS.
- Staffing for the Hook and Line Survey would be independent of other surveys due to timing and intensity of at-sea sampling.
- This survey platform could be applicable for collaborative efforts with other proposed non-extractive surveys (i.e., drop cameras, unmanned survey vehicles/autonomous underwater vehicles, acoustic systems, eDNA sample collection and monitoring, and the monitoring and deploying of moored survey instruments). There are potential opportunities to validate/provide species-level information for acoustic surveys, as well. These additional sampling efforts are dependent on final vessel capabilities, logistics, and onboard equipment.
- This Hook and Line Survey has the potential to contribute to biological sampling efforts for commercially important species, and it could help address data gaps in biological sampling from other NEFSC surveys. Hook and line fishing is a minimally invasive technique that results in high-quality biological samples and fish condition. Thus, the Hook and Line Survey could provide opportunities to collect live specimens or tag fish. There are many opportunities to coordinate with the NEFSC Population Biology Branch and other groups to collect requested samples.
- The wide range of target species and condition of the catch provides many opportunities to leverage this new survey to contribute to collaborative tagging studies, including but not limited to tagging for highly migratory species, groundfish, and other commercially valued species.

VII. Adaptive Management Considerations/ Opportunities

This survey is adaptable in terms of seasonality, spatial scope, and data elements (i.e., biological and environmental sampling). A series of stakeholder engagement workshops conducted in the Gulf of Maine, Southern New England, and Mid-Atlantic regions provided opportunities to discuss and refine the proposed Hook and Line Survey design with industry members. This workshop series also produced a suite of alternative survey approaches that could be used if circumstances change.

VIII. Statement of Peer-Review Plans

- The input and expertise of the fishing industry is critical to the development of this Hook and Line Survey plan. Nine stakeholder engagement workshops were conducted across the northeast region in fall 2023 to discuss and refine the proposed Hook and Line Survey plan. Six workshops were held in person in-person and three workshops were hosted virtually. The workshops began with an overview of the proposed Hook and Line Survey design and operational plan, followed by a facilitated discussion to gather the input of commercial and charter (for-hire) fishermen operating in the Gulf of Maine, Southern New England, and the Mid-Atlantic. The workshop series gathered feedback on survey areas of operation, leader design, jigging operations, and vessel and operational logistics to help finalize the survey's design and protocols.
- The Hook and Line Survey will leverage the larger Federal Survey Mitigation Strategy's peer review process to seek input and feedback from other partners and stakeholders.
- The Hook and Line Survey team has collaborated with the NEFSC Population Dynamics Branch, Ecosystem Surveys Branch, and Offshore Wind Ecology Branch throughout the statistical design process. This collaboration will continue as the survey progresses.
- The Hook and Line Survey team has also engaged with a variety of potential data users, including the Population Biology Branch, Ecosystem Dynamics and Assessment Branch, Habitat Ecology Branch, GARFO, and other programs and agencies.
- A technical memo will be developed on the survey's operational design and evaluated through internal peer review.

IX. Performance Metrics

- Ability to execute the survey with sufficient sampling density and catch volumes to develop indices of abundance that are informative to stock assessments and resource management and provide biological data to fill gaps in existing data streams.
- Ability to safely operate this survey within offshore wind development areas.
- Completion of the pilot Hook and Line Survey in spring 2024:
 - Evaluate the species and size selectivity of the hook and line gear across the northeast region.
 - Finalize survey protocols and operational characteristics (i.e., leader design, jig machine operational settings, vessel specifications, and station selection procedures).
- Develop survey documentation, including publicly available reports of the pilot Hook and Line Survey as well as the final survey design.

- Develop or adapt an existing application for electronic data collection systems and a database and data management plan.
- Quality-assured survey data for a range of species addressing concerns about data continuity for species potentially impacted by the decrease in spatial coverage of the BTS as well as species not well represented in existing BTS data.

X. References

- Harms JH, Wallace JR, Stewart IJ. 2010. Analysis of fishery-independent hook and line-based data for use in the stock assessment of bocaccio rockfish (*Sebastes paucispinis*). *Fish Res.* 106(3):298-309.
- Vidal T, Glenn R, Reilly B, Bednarski M, DeCelles GR. 2018. Between a rock and soft bottom: evaluating the use of rod and reel to monitor tautog in southern Massachusetts. *Mar Coast Fish.* 10(6):550-562.