Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • www.asmfc.org

Joseph Cimino (NJ), Chair *Dan McKiernan (MA), Vice-Chair* *Robert E. Beal, Executive Director*

Sustainable and Cooperative Management of Atlantic Coastal Fisheries

Month, day, year

To be sent to: Senator Collins and Rep. Pingree.

The Atlantic States Marine Fisheries Commission (ASMFC) is pleased to support your goal of protecting working waterfronts from rezoning, redevelopment, and the effects of climate change.

The Commission is a Compact of the 15 Atlantic coastal states that manage nearshore marine fisheries that occupy multiple states' waters. ASMFC serves as a deliberative body for the states to collectively decide how to manage their shared marine resources. Our group of Commissioners is comprised of public servants, scientists, fishermen, and more, all working to ensure the sound conservation and management of their shared coastal fishery resources.

Access to working waterfronts for the commercial, for-hire industries, and the multitudes of industries that support them, is essential to the viability of coastal communities, their culture, and their economies. One of our member states, Maine, has had a working waterfront access protection program since the mid-2000s. Maine provides funding to entities on a competitive basis in exchange for a covenant that restricts future use of the property to commercial fishing activities.

Just as commercial fishing supports a network of downstream businesses, those that support commercial fishing should also be considered for protection. These include but are not limited to boatbuilders, boatyards, marinas, and gear storage locations. Federal legislation should also consider a requirement for permanent protection of properties via easements or covenants for those receiving funding. Without permanent protection, there is a risk that these improved waterfronts face increased redevelopment pressure. If the infrastructure is lost to redevelopment, we will lose future generations of fishermen.

One of the ways the Maine Working Waterfront Access Protection Program is evaluated is on a project's "capacity to create new shoreside jobs". Commercial fisheries provide access to affordable U.S.-caught seafood far inland and around the globe. These properties help support a vast network of restaurants and fish markets. The for-hire fishing industry also provides unique recreational access for people who may not otherwise go fishing. It can be a gateway and learning opportunity for the public. Investments in working waterfronts preserve these valuable services

For the immeasurable cultural and economic benefits they provide, we support the creation of a federal working waterfront protection program. We look forward to meeting with your staff to discuss these items further.

Sincerely,

Robert E. Beal

Draft Proposed Plan for a Novel Industry Based Multispecies Bottom Trawl Survey on the Northeast U.S. Continental Shelf

January 18, 2024

Contributors: Northeast Trawl Advisory Panel, Northeast Fisheries Science Center Population Dynamics Branch, external reviewers

Point of Contact: Kathryn Ford, kathryn.ford@noaa.gov

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1. Overview

Representative sampling of marine fisheries species in the Northeast region is crucial to conducting the stock assessments that inform fishery management advice and understanding changes in community composition. Many scientific surveys sample multiple fish species. These surveys strive to standardize vessels, gear, timing, and many other aspects of sampling to ensure comparable indices from year to year, which is statistically important for comparing population abundance estimates through time. The survey vessel is a major factor in catchability, so NOAA Fisheries' Northeast Fisheries Science Center (NEFSC) multispecies bottom trawl survey (BTS), a sixty-year-old fishery-independent survey, has relied on only two primary ships over its time series. The first ship, the Albatross IV, was used from 1963 to 2008. Due to ship retirement, a new vessel, the Henry B. Bigelow (hereafter Bigelow) started to be used in 2009 (both vessels are or were operated by the Office of Marine and Aviation Operations at NOAA). At the transition from the Albatross IV to the Bigelow, the survey gear was updated and an extensive calibration between the Albatross IV and the Bigelow was done (Miller et al. 2010). A sister ship to the Bigelow, the Pisces, can be used as a contingency vessel when the Bigelow is unavailable and was used in this capacity in the Fall of 2017. Similarly, the Delaware II was used to fill in for the Albatross IV several times and associated calibration studies were done. To improve resiliency in the BTS in the event the Bigelow and the Pisces are unavailable, as is foreseen as a possibility in the coming years, the NEFSC is exploring what a similar survey would look like using fishing-industry vessels. An industry-based multispecies bottom trawl survey (IBS) would create resiliency in survey activities in the Northeast region and could enhance fishermen's trust of the data informing stock assessments (Kaplan and McCay 2004, Johnson and van Densen 2007, Baker et al., 2023).

As a result of the loss of sea days experienced in the spring 2023 BTS and the accumulated loss of sea days since 2015, the New England Fishery Management Council (NEFMC) requested that the NEFSC provide an overview of survey status and steps being taken to maintain the quality and quantity of survey data used to support fishery management in the region. A presentation on those topics was given at the September 2023 NEFMC meeting (Ford and Chase 2023). After the presentation and constructive discussion, the NEFMC passed the following motion:

> *The Council request the Northeast Fisheries Science Center (NEFSC) to develop a white paper to be submitted to the New England Fishery Management Council by January 12, 2024, outlining an industry-based survey that is complementary to the spring and autumn Bottom Trawl Survey*

This motion was then subsequently passed at the October 2023 Mid-Atlantic Fishery Management Council and supported at the October 2023 Atlantic States Marine Fisheries Commission meeting.

This document constitutes the requested white paper and is a component of the effort to consider at least four options for contingencies in the event the Bigelow is not available for the BTS, including 1) the Pisces, 2) an NEFSC operated vessel, 3) industry-based vessels calibrated to the Bigelow, and 4) a parallel industry-based survey. This white paper addresses option #4. The full contingency plan including all options is anticipated to be completed in FY2024.

Herein is described an industry-based multispecies bottom trawl survey (IBS) that would operate in parallel to the BTS. This plan for an IBS was developed in coordination with the Northeast Trawl Advisory Panel (NTAP), which includes commercial fishing, fisheries science, and fishery management professionals in the Northeast. An NTAP working group, through virtual meetings, individual phone calls, and comments and edits to two drafts of this white paper, provided feedback to ensure the feasibility and maximize the value of the IBS as a contingency to the BTS. The second draft of this white paper was provided for review to all NTAP members, NEFSC assessment and survey staff, and five external reviewers. While there was not complete agreement on all details of the IBS scope and design, this document represents a starting point tofurther develop an IBS.

If implemented, the IBS would develop its own unique time series that could be used to generate indices of abundance and other data useful to stock assessments, fishery management, ecosystem status, and scientific studies. When the BTS is conducting regular survey operations on the Bigelow, the IBS would be a parallel survey and would increase the number of stations sampled in a given stratum. When the BTS is not conducting regular survey operations on the Bigelow and cannot operate under other contingency options, the IBS would be the only shelf-wide fishery independent bottom trawl survey in the Northeast region of the U.S.

2. Survey Design Elements

This section describes the key design elements for a potential industry-based, multispecies groundfish trawl survey generating abundance indices for stock assessments and fisheries research in the Northeast region of the U.S. It is referred to as “The IBS” throughout this document. The IBS would use the same key design elements as the NEFSC multispecies groundfish trawl survey conducted on the Bigelow, referred to throughout this document as "The BTS." The IBS survey operations would be the same or similar to the BTS survey operations to the extent possible to maximize comparability between the surveys. The BTS survey operations, including design, survey operations, data collection, and pre- and post- cruise activities, are described in detail in Politis et al. (2014). The design as proposed here is intended to serve as a framework that can be modified based on further discussion with potential vessels and pilot testing. The key differences between the two surveys are described in the section "Key differences between the IBS and the BTS." This section assumes funding would be found for all elements since existing programs would continue and could not be responsible for staffing or equipment. The overall cost of the program to support the IBS would be determined with further scoping.

2.1 Program management

The IBS would be a federally funded survey conducted by a third party akin to the NEAMAP Southern New England/Mid-Atlantic Nearshore Trawl Survey and the NEAMAP Maine-New Hampshire Inshore Trawl Survey. Field sampling survey crews would include the vessel crew for vessel and fishing operations and the science crew for fish sample processing. Other support elements such as data management and gear storage and inspection would be conducted in addition to field sampling. The NEFSC would provide a program liaison and support for survey staging and data transfer. There are other program management options described in the Elements of Decision-making section.

2.2 Sampling design

The IBS would be designed to follow as many of the BTS protocols as possible, i.e. a trawl survey with a stratified random design conducted in the spring and fall, ideally sampling over a 24-hour period, completing approximately 370 stations from North Carolina to Canada in each season, using the same strata and depths defined for the BTS (i.e. extending from Cape Lookout to Nova Scotia and covering depths from 10-200 fm (18-365 m); Figure 1). The IBS would allocate stations in each season following the same allocation procedures as the BTS, resulting in approximately 370 stations with the same station density and following other station allocation protocols as BTS (e.g., a minimum of three stations planned in each stratum, Politis et al., 2014). It is expected that the IBS would be able to sample in strata located in Canadian waters under existing intergovernmental agreements.

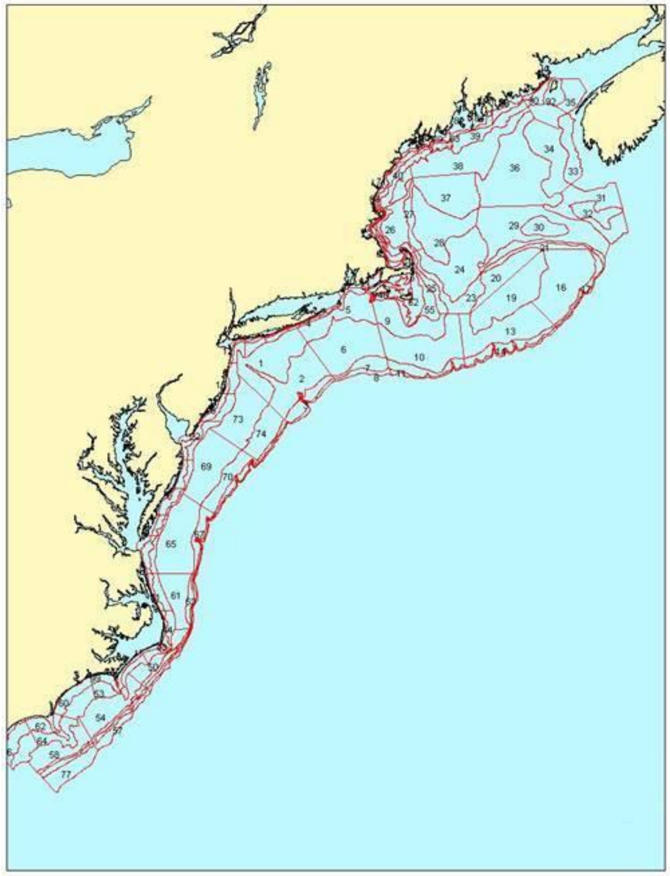

Figure 1.. The BTS survey strata.

The IBS would operate a fall survey between September and November and a spring survey from March to May. It would sample south to north timed to coincide with a typical BTS sampling season. A sampling day would be ideally 24 hours. Consideration was given to dividing the day into two periods that sample equal times with dusk and dawn at the middle of the time period. For example, if dusk is at 6 pm and dawn is at 6 am, one boat can sample from noon to midnight and the second boat can sample from midnight to noon.

Depending on how a 12-hour survey day is implemented, it may lengthen the time needed for the survey or may impact catchability of certain species that exhibit diurnal, nocturnal, or crepuscular behavior. Differentiating vessel effects from time of day effects would need to be considered in more detailed design development (e.g., vessels periodically switching between half-days).

If multiple vessels would be required to conduct the IBS, the vessels would be as similar as possible in length, beam, draft, and fishing power. Field studies and analytical calibration methods (e.g., VAST) would be used to standardize vessel catches to generate a single time series as is done with the Northwest Fisheries Science Center's multi-vessel bottom trawl survey (Keller et al., 2017). Vessels would operate with a predefined amount of spatial and temporal overlap to improve accuracy of the standardization.

2.3 Sampling gear

The IBS would use the same net and sweep as the BTS in order to sample the same stocks and cover the same geographic range. The IBS would use a fully standardized gear package either on single or on multiple vessels and would also sample for oceanographic parameters. The primary gear components are as follows:

- 3-bridle, 4-seam survey bottom trawl rigged with a rockhopper sweep meeting the same specifications as the BTS net and sweep (Politis et al., 2014)
    - Using a chain sweep for the southern New England and Mid-Atlantic component of this survey was a major point of discussion. Using different gear types across the sampling domain represents a relatively substantial change to survey design that was deemed outside of the scope of this document.
    - The use of standard doors or vessel-specific doors would be assessed in a pilot survey. Using a restrictor rope has also been suggested.
- Full complement of hull-mounted net mensuration gear including headrope and wingspread sensors (would use the same system on all vessels)
    - Sensors not being hull-mounted would be considered.
- Conductivity, temperature, and depth (CTD) instrument with temperature, depth, salinity (conductivity), dissolved oxygen, pH, and chlorophyll *a* sensors
    - Other parameters (nutrients, turbidity or water sampling via Niskin bottles) could be added, as technology and resources allow.
- Sounding capability to scope for trawl obstructions and untrawable bottom prior to each tow (does not need to be the same system on all vessels)
- Sampling tables, calibrated scales, and measuring boards, along with other associated sampling equipment
- Electronic data collection system (such as a portable Fisheries Scientific Computer System (FSCS)) that enables efficient and accurate catch, effort, and biological data collection and integration with GPS, net mensuration, and depth sensors

2.4 Vessels

The IBS would require vessels that can tow the sampling gear at the correct speed, host a scientific crew, and have enough space for catch processing. The size of the scientific crew is relevant for determining overall survey logistics since the crew size affects the speed of catch processing. Therefore, the crew size influences how many vessels are needed to complete the survey in the given timeframe. The BTS sails with 15 scientific crew to sample 24-hours a day. Other similar fisheries surveys sail with scientific crews of approximately 5 scientists for 12-16 hour survey days which would equate to approximately 10 scientists for 24-hour survey days. The primary criteria for vessels used in the survey would include:

- Appropriate length and horsepower to sample in open ocean conditions and tow gear at 3 knots for 20 minutes.
    - Minimum endurance would be defined (for example, being able to work a minimum of 12-hour operations over a 10-day period).

- Sufficient winch capabilities for towing the standardized gear package across the survey area
    - All winches would have the same wire diameter and adequately maintained wire. It would be determined if wire would be provided by the vessels or by the program. (Note: BTS uses a 1” winch wire, but 7/8” is more common in the northeast fleet.)
    - Winch wire length would be sufficient for towing in 200 fm (365 m) of water (at least 700 fm (1280 m) of wire).
- Necessary deck space for processing stations and catch processing
- Capacity for CTD casts to 200 fm (365 m). Placement of the CTD on the trawl net would be considered.
- Appropriate vessel crew for the length of the sampling day for captaining the vessel, operating the gear, and assisting with catch processing (vessel crew would assist with catch processing if time allows); this would vary based on the length of the survey day and survey legs. 12-hour survey days will likely have a vessel crew size of about 5 and 24-hour survey days will likely have a vessel crew size about 10.
- Meal provisioning for all personnel
- Space for 1 spare net (2 or 3 may be needed if multi-week surveys legs are being done)
- Capable of using appropriate doors
- If 24-hour operations are being done, appropriate number of bunks for vessel and science crews

Other vessel criteria would be developed after further discussion with potential vessels including dry lab space needs, required bridge electronics, on-board communications, and core safety equipment.

2.5 Towing protocols

Towing protocols would be developed to define tow path and direction, shelf-edge strata sampling, and standardized trawling procedures (setting, haul back, and trawl on-deck post tow procedures). Survey tow evaluation and validation would take place immediately following a tow so that invalid tows can be repeated. These procedures for the BTS are described in Politis et al. (2014). The development of these protocols would benefit from a pilot survey period in which survey vessels conduct experimental tows to verify standardized, workable protocols.

2.6 Sampling

Sampling would include data related to station, oceanography, gear performance, catch data, and biological data. The minimum data collection enterprise is as follows:

- Station data would include location, date, time, depth, vessel speed over ground, heading, sea state and weather conditions
- A CTD with temperature, depth, salinity, dissolved oxygen, pH, and chlorophyll *a* sensors would be deployed before conducting the tow at each station
- Gear performance data would include winch data (e.g., wire out, tension) and net geometry (e.g., door spread, wing spread, headrope height)

- Catch data would include total number and biomass (kg) for each species caught at each station, and individual lengths and weights.
- Biological data would include age structures (e.g., otoliths), sex, maturity, and stomach contents (preserved for analysis in the lab). Biological sampling may need to be limited due to staffing or storage space; limitations would be assessed during a pilot survey.
- Sampling would rely on subsampling protocols as defined in the BTS protocols to ensure efficiency.

2.7 Data management

The IBS would use an electronic data collection and management system to ensure high data quality and rapid availability to stock assessments and other research. Data will be available for use in stock assessments no later than 4 weeks after the survey concludes. Data would be publicly available within six months of collection.

The IBS data elements and structures would be comparable to the data elements collected by the BTS. All data would be electronically stored in the NEFSC databases for use by stock assessment scientists at the NEFSC. The appropriate timeline for incorporation of IBS abundance data into assessment models would likely be 3-10 years and would be dependent on the research track process. Data would also be available for use in the fishery management process and scientific research.

3. Differences between the IBS and the BTS

The key differences between the IBS as described above and the BTS are as follows:

- Program management relies on a third party (not NEFSC)
- Potential use of multiple vessels
- Potential use of different doors
- Smaller wire diameter
- No autotrawls
- Some towing protocols may need to differ to reflect different operational realities
- Potentially less biological sampling of fishes (potentially less age, sex, or maturity; no or less stomach contents; no or fewer special sampling requests)
- Plankton sampling to be determined
- No acoustic sampling (no ADCP, no EK80)

4. Elements of Decision-making

This section addresses the key considerations that influenced the design of the IBS. This section describes how various design decisions were made in developing this plan when multiple design options were available.

4.1 Scientific value

It is important to weigh the scientific value of new survey and research efforts. Since this survey was designed as a contingency option for an existing survey, the scientific value of the IBS was qualitatively compared to the existing survey, the BTS. The relative scientific value is influenced by whether or not the BTS would continue on the Bigelow as it is done now.

If the BTS continues on the Bigelow: Having a second multispecies groundfish survey could have substantial positive scientific value. There could be added value to doubling the sampling density in the survey strata (at least for some stocks). Further, both surveys could serve as a contingency for the other; in a season where BTS is not completed, IBS would be completed and vice versa, thereby creating resiliency in data collection.

If the BTS does not continue on the Bigelow: The primary impact on scientific value to the multispecies time series if the BTS does not continue on the Bigelow is undoubtedly the potential loss or gaps in the time series. Minimizing the impact of the break in the time series would benefit from multiple years of overlap between the BTS on the Bigelow and the IBS survey. If the Bigelow is no longer available as a survey platform and other contingency options are unavailable, the IBS would be the primary source of essential population-level data for multiple stocks and would be of substantial scientific value. The main drawbacks to the scientific value of the IBS compared to the BTS would be 1) potentially less standardization if multiple vessels are used, which decreases data quality and 2) potentially less biological sampling.

1. The use of multiple vessels presents a challenge for standardization in sampling. Ideally, IBS sampling would be standardized across multiple participating vessels, retaining as many BTS methods as possible and finding ways forward for aspects of sampling that cannot easily be standardized across participating IBS vessels. This would constitute a loss of standardization, but not a complete lack of standardization. It is feasible to address vessel effects either through calibrations or through the use of analytical tools, but efficacy of these approaches would vary across species and stock assessments. The necessity for standardizing data from multiple survey vessels may likely result in greater uncertainty in some indices of abundance. If multiple vessels are used, they should be as similar as possible in size, operation, and gear handling, should operate in similar spatial and temporal sampling frames to maximize standardization, and should be calibrated within and potentially across survey years. If a single vessel is used, the lack of standardization is much less of a concern and the main priority would be establishing linkages (e.g., calibration through fieldwork or analytical methods) with the BTS to bridge the separate time series.
2. For the IBS, some oceanographic (plankton sampling) and biological (stomach contents) sampling may need to be constrained due to staffing and sample storage limitations. The minimum biological sampling protocols were defined to address fishing industry stakeholders' feedback that a simpler sampling protocol would mean a greater number of industry vessels would be capable of conducting the survey. However, it is feasible to sample stomach contents and plankton on industry vessels. Since a loss of these data streams would be detrimental to our ecosystem science assessments of food webs, energetics, trends and distributions of plankton (some of which are used in stock

assessments), the pilot survey period should determine how these sampling protocols would impact survey timing and the number of vessels needed to complete the sampling in a given timeframe.

Timing on usefulness of the data: Data streams from the IBS could be used immediately for scientific products that rely on oceanographic data (conductivity, temperature, depth) and certain biological data (lengths, ages, and length/age at maturity). For science products that rely on time series of abundance estimates, the IBS could be informative after approximately 3-10 years of consistent sampling and would be dependent on the specific stock assessment method used.

4.2 Building trust & relationships

It is possible, but not guaranteed, that the IBS could build trust between the fishing industry and the fisheries science and management process. Existing industry-based surveys in the northeast region have built the fishing industry's confidence in survey data supporting stock assessments (Latour et al., 2023; Kaplan and McCay 2004; Johnson and van Densen 2007; Baker 2023; McElroy et al., 2019). Increased trust has also been claimed in other regions that have used industry-based surveys, including in Alaska (Lyle Britt, pers. comm.), the U.S. West Coast (NMFS 2023), and the Dutch North Sea beam trawl survey (de Boois et al., 2021). Efforts to improve trust in the BTS specifically, however, have not yet been successful. Co-developing the BTS gear was viewed as positive with respect to the net design but negative with respect to the doors (Ford et al., 2023). Participation by fishermen on the BTS and recent industry-based catch efficiency studies and flume tank demonstrations conducted collaboratively with industry (Politis et al., 2019; Jones et al., 2021; Miller et al., 2023) were viewed positively by participants, but have not broadly improved public perceptions that the survey gear poorly functions. The popular Marine Resource Education Program, a fishermen-led weeklong course on fisheries management, includes units on fishery-independent surveys and how the BTS operates, but the conventional narrative remains that the BTS is flawed. Also, a third party industry-based survey using gear designed by fishermen to focus on cod did not improve trust in survey results when the third party industry-based surveys found the same trends as the BTS in research conducted in 2004-2006 and 2016-2018 (Dean et al., 2023). However, there is great value in expanding and deepening collaborative relationships to improve information on fisheries resources in the region. There have been significant successes building these relationships and trust in survey data through the NEAMAP Southern New England/Mid-Atlantic Nearshore Trawl Survey and the Maine-New Hampshire Inshore Trawl Survey (Latour et al., 2023) and the NEFSC Gulf of Maine Bottom Longline Survey (McElroy et al., 2019).

4.3 Funding & program management

Whether the IBS is federally funded or not and whether program management goes through a federal agency or not introduces different risks to the viability of the IBS. Globally, all long-term fisheries time series on the scale being discussed here have been government-funded programs with reasonable stability. In the U.S., the BTS has had funding for seasonal sampling every year for 60 years, but there are existing shortfalls in funding for other federally-funded fisheries survey programs. Other fisheries surveys funded by state governments or non-governmental organizations using industry-based or research platforms have typically been shorter term, although several state-funded fisheries time series are notably long (e.g., Massachusetts' state trawl survey, Rhode Island's Narragansett Bay survey, New Jersey's Ocean Trawl Survey, and Virginia's Juvenile Fish and Blue Crab trawl survey).

Program management for the IBS would be complex and NEFSC would need to add staff dedicated to this effort. Due to the extent of the sampling season (six months a year) and the extent of the geographic range (North Carolina to Nova Scotia) there are many logistical and operational challenges. These challenges increase as the number of vessels being used increases.

There are five potential program management and funding models for the IBS:

1. NEFSC operated and NOAA Fisheries funded. This model is used for the NEFSC Clam Survey, the Gulf of Maine Bottom Longline Survey, and the industry-based trawl surveys on the west coast and in Alaska. In this model, a full survey team would be hired by the NEFSC. While feasible, this model has the potential to introduce competition with the BTS.
2. Third party operated and NOAA Fisheries funded. This model is used for the NEAMAP Southern New England/Mid-Atlantic Nearshore Trawl Survey and the NEAMAP Maine-New Hampshire Inshore Trawl Survey. Since this model has proven to be effective by NEAMAP, is conceptually straightforward, and is viewed positively by the Northeast Trawl Advisory Panel, it was used in the hypothetical IBS survey design. In this model, a liaison and staging and data management support personnel would be hired by the NEFSC but the bulk of the funding would be directed to the third party for vessel contracting, equipment purchasing, and all other operational aspects.
3. The research set aside model (RSA) is used for scallops and monkfish. The RSA model was originally used when the NEAMAP Southern New England/Mid-Atlantic Nearshore Trawl Survey was initiated. Because of the cost of a shelf-wide industry-based trawl survey and the linkage of the RSA model to market prices, it is unlikely that an RSA model is viable.
4. Third party operated and third party funded. This model is used for state trawl surveys in New Jersey, New York, and Rhode Island. This model is likely to include the least involvement of the NEFSC, though a NEFSC-hired program liaison and data management support personnel would be beneficial.
5. NEFSC operated and third party funded (or jointly funded). This model includes arrangements in which NEFSC is handling survey operations and one or more third parties are contributing either funds or in-kind support such as fuel.

If the program is managed by a federal agency, there is increased risk of survey platforms changing if they are contracted (as opposed to volunteering their services, as in some surveys) since the federal government requires competitive bidding for one-year contracts with a maximum of four option years. There is also increased risk of survey impacts due to government inflexibility around addressing emergency repairs and delayed appropriations (i.e. government shutdowns).

If the program is managed by a third party, it is possible that there would be fewer vessel changes over the life of the survey (as has been the case with the NEAMAP Southern New England/Mid-Atlantic Nearshore Trawl Survey on the F/V Darana R). A third party would also likely have increased flexibility to continue work during government shutdowns and could have more flexibility to address repair needs if there is less dependence on government contracting. Any dependence on governmental data collection and management systems and support might impede work during government shutdowns, but resilience planning could lessen this impact.

Depending on the specific funding mechanism, a third party management model may require competitive bidding for one-year contracts with a maximum of four option years, which could introduce uncertainty and potential staffing and platform changes.

Cost estimates for the IBS have not yet been developed.

4.4 Personnel

A third party receiving funding to implement the survey would need to build a multi-person management team for year-round business, logistical, technical, equipment, and data management support and a field survey team.

The IBS would benefit from personnel support from the NEFSC. The scale of the NEFSC engagement would depend on the funding and management models that are in place. In a third party model, NEFSC personnel could support project management, on-site survey mobilization (especially if FSCS is being used) and technical support, long-term data management, and analysis to ensure high data quality and use in assessments.

4.5 Data management considerations

The preferred data management model is to have the IBS feeding data into NEFSC servers directly through the FSCS system (similar to the model NEFSC uses with the Massachusetts' state trawl survey). This option maximizes the speed that data are available to stock assessment scientists and increases the likelihood of data being used by NEFSC, and so was used in the hypothetical IBS design.

There are two other potential data management options:

1. A third party could use another data collection system and deliver the data to NEFSC through the data delivery mechanism being piloted by scallop RSA partners in 2023. This option introduces risks of limited data use due to lags in data availability, inaccessibility or uneven access to all data elements in the data model.
2. A third party could entirely manage the data itself and provide indices. This option introduces uncertainty with respect to accessibility, vulnerability, and long-term archiving that would need to be addressed in program development and any potential government contracting. A third party managing the data also increases the potential for

lack of transparency in the calculation of indices. This data management option is undesirable.

Data access has been a challenge for NEFSC with several third party surveys. In order to maximize the value of the data collection effort to inform stock and ecosystem assessments, any third party data management component should be defined in a data agreement with NEFSC that specifies the expectations around the provision of data.

4.6 Flexibility (short-term reactiveness)

There are situations in which the Bigelow is available for most, but not all, of a given survey. In such a case, a contingency option of a vessel that can "fill in" for those sea days could be explored. In this white paper, the IBS was not designed to be a solution to filling in the BTS by sampling stations that the Bigelow has not sampled in a given season since the IBS is not calibrated to the BTS. Presumably, this could be more thoroughly explored after the feasibility of intercalibration is better understood. The IBS could be managed in a way that if short-term reactiveness were necessary, communication channels with the BTS would be robust and enable both programs to respond to the stressor. "Filling in" options will be explored in the Contingency Plan under option #3. However, although the IBS is not "filling in" for the BTS, the IBS would be able to collect data to support assessments.

4.7 Long-term viability

The IBS would be a long-term survey attempting to maintain consistency in vessel platforms and gears. The greatest uncertainty in predicting long-term viability is funding. Long-term viability of funding largely depends on the willingness of the funding source to continue to fund the survey and the demonstrated value of the survey. The IBS would also need to attract and retain skilled staff, since highly trained captains and scientists increase the consistency and quality of the data collection.

4.8 Need for calibration

The intent of the IBS is to develop an independent time-series. The development of calibration factors is species-specific and gets increasingly complex with an increase in the number and type of vessels, habitats, gear types, and species being sampled. The IBS would produce a separate time series that could be utilized in stock assessment. The need and value in integrating the IBS and BTS using calibration or analytical modeling methods (such as spatio-temporal models (e.g., VAST) could be considered on a stock-specific basis (Thorson 2019).

4.9 Protected species concerns

The IBS would double the amount of scientific trawl sampling done in the region. There are limited interactions of the BTS with protected species, but the IBS would need to specifically assess the potential for protected species interactions, apply for the necessary permits, and appropriately manage protected species interactions.

5. Conclusions

The IBS would provide a new time series of species abundance, distribution, and biology. In the early years of the IBS, it would likely have less precise indices of abundance than the BTS does, and if 24-hour sampling proves infeasible or cost prohibitive there may be bias in the sampling of species with diel cycles. It is possible that the IBS will need to decrease the extent of biological sampling that is currently accomplished on the BTS, if the scientific crew size is limited. Other regions that rely on industry-based surveys for their primary time series of fisheries abundance have addressed the challenges noted above and have been successful in executing their surveys reliably for decades. Thus, it is expected that the IBS could provide data useful to assessing stock status in the northeast region.

The existing BTS is broadly supported throughout the region as a robust, capable, and well-managed program and is a crucial data input to the majority of stock assessments in the Northeast. Therefore, ensuring the availability and preparedness of the Bigelow (and when needed, the Pisces), is a priority. However, there are known weaknesses of the BTS, particularly on a stock-specific basis, that warrant consideration of short- and long-term surveys to address those weaknesses. The recommendations received during the development of this white paper were:

- Develop new or expanded data collections specific to assessment needs. Develop standalone industry-based surveys that are based on scientific needs identified for stock assessments. These types of surveys have shown great utility over time.
- Develop a survey that is broken into two regions in which different gear types are used: south of Cape Cod to North Carolina (Southern New England & Mid-Atlantic) and north of Cape Cod (Georges Bank and Gulf of Maine). Ecological production units (EPUs) (Gamble et. al. 2016) should also be used in the survey design. Identify which species' stock assessments would be adversely affected by this approach (e.g., migratory species).
- Redesign survey strata to address known stratification issues, align with the ecological production units (EPUs), and/or provide overlap with inshore strata.
- Quantify the value of nighttime sampling in the Southern New England/Mid-Atlantic region.
- Conduct additional catchability studies. In particular, compare 20- and 30-minute tow lengths in terms of the impact on catch and on survey logistics.
- Develop a standardized and reproducible method to integrate multispecies bottom trawl surveys into a single time series.
- Develop an industry-based survey that can operate in wind farm areas across the northeast region and start sampling prior to wind farm development.
- Examine what would be lost if the maximum depth for the IBS is 160 fm instead of 200 fm since 160 fm is a more typical maximum depth for the fishing industry in this region.
- Consideration should be given to developing a survey that combines survey sampling with commercial fishing activities.

- Biological sampling should not be restricted. Include plankton and acoustic sampling in a pilot study and if they are deemed infeasible, then reconsider their need. It is easier to cut back on sampling than to add sampling after the survey has started.
- Describe how the index of abundance informs assessments and the research track timeline to better elucidate the costs and benefits of adding survey effort.
- Define expectations for building trust up front (e.g., consistently maintaining the standardized protocol over 10 years, data being used in stock assessment).
- Platform inconsistencies would be the obvious explanation of trends that differ from the BTS, which could further decrease trust.

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