COASTSPAN Survey Mitigation Plan

I. Purpose of the survey

The purpose of the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) surveys is to characterize the distribution and relative abundance (including recruitment) for a variety of large and small coastal shark species that use the estuarine and nearshore waters of the U.S. Atlantic coast. Data collected by COASTSPAN are used to generate fishery-independent indices of abundance for stock assessments and essential fish habitat (EFH) updates for management. Additional objectives of the survey are to: 1) tag sharks for migration studies; 2) inject tagged sharks with oxytetracycline whenever feasible for age validation studies; 3) collect biological samples for life history studies; and 4) collect morphometric data for a variety of species.

What data is collected?

Individual species identification, length, weight (when possible), and sex of shark and bycatch species along with set specific date, location, gear, environmental, and species specific catch-per-unit-effort (CPUE) data are collected. Additionally, live sharks are tagged before release, and biological samples are collected from live (non-invasive [i.e., fin clip]) and incidentally killed sharks. This information is used toward abundance, distribution, stock identification, migration, diet, reproduction, age and growth, and genetic studies of small and large coastal shark species that use estuarine and nearshore waters of the U.S. Atlantic coast.

What specific products use this survey?

Products using this survey include all SEDAR Atlantic small and large coastal shark species assessments; the annual Highly Migratory Species (HMS) Stock Assessment and Fishery Evaluation (SAFE) Report; species- and stock-specific status reviews for the ESA, CITES, determinations, and the IUCN; and species-specific updates to the Consolidated Atlantic HMS Fishery Management Plan (FMP) and amendments thereof (e.g., Amendment 10 to the 2006 Consolidated Atlantic HMS FMP: Essential Fish Habitat).

Which assessments/science advice pathways currently use this survey?

This survey is currently used in the Southeast Data Assessment and Review (SEDAR) process (conducts assessments for 20+ federally managed small and large coastal shark stocks in the Atlantic; see Tables 2.4-2.6 of the 2022 Stock Assessment and FIshery Evaluation Report for Atlantic HIghly Migratory Species) and Endangered Species Act (ESA) determinations, and by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), International Union for Conservation of Nature (IUCN), and the NOAA Fisheries HMS Management Division

Who are users of the survey data generated?

Users of this survey include assessment analysts, fisheries managers, and academic researchers.

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

Standardized survey dates must be maintained (monthly summer sampling). Additionally, standardized gear and survey sampling protocols need to be maintained for both random

stratified and fixed station methods used in COASTSPAN surveys. This includes the ability to anchor the bottom longline and sink gillnet gear without snagging cables, or exclusion from fixed stations or survey strata used within the random stratified design.

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

Abundance indices derived from this survey are a central component of the HMS stock assessment process used for direct management of these species. Additionally, COASTSPAN surveys provide abundance indices, and the only Atlantic recruitment indices for federally managed small and large coastal sharks used in the SEDAR process. It also serves as a platform for tagging used in studies essential to the stock assessment process. The abundance, distribution, and migration data from these surveys monitor nursery habitat use and species composition changes over time, important updates for EFH designations, especially as climate conditions change. Additionally, the Delaware Bay COASTSPAN survey conducted by the NEFSC monitors the seasonal distribution and abundance of 2 NOAA Fisheries Prohibited Species, the sandbar shark (*Carcharhinus plumbeus*) and the sand tiger (*Carcharias taurus*). Delaware Bay is a Habitat Area of Particular Concern (HAPC) for both of these prohibited species as it is a principal pupping and nursery area for the sandbar shark and provides seasonal habitat for all life stages of the sand tiger.

How does offshore wind energy impact survey objectives going forward?

Electromagnetic field (EMF) emissions from high voltage cables (HVC) used for transport from the offshore wind areas back to shore have been shown to be attractive to some elasmobranch species, including some sharks. COASTSPAN survey areas provide nursery habitat for several small and large coastal shark species. Running cables through these areas could alter the use of these areas by neonate and juvenile sharks, potentially exposing them to increased predation or reduced fitness due to increased foraging behavior associated with HVC EMF emissions without reward. This altered behavior could affect survey catches, making it hard to determine changes due to abundance or simply due to the presence of the HVC. Offshore wind areas could also alter (delay or speed up) the timing of migrations for adult females that use these surveyed coastal areas to pup or juveniles that return to these areas seasonally, which can not only affect survey abundance estimates but also reproductive success and recruitment. Additionally, migrating juveniles and adults recruited to offshore wind areas for feeding opportunities may also be impacted (altered timing/habitat use/habitat expansion or contraction), therefore relative abundance estimates based on survey catches will be affected across the full range of migratory individuals.

II. Survey Details

Beginning Year: 1998

Frequency: Annual

Season: Summer

Geographic Scope: Estuarine and nearshore (within state boundaries) waters along the U.S. East Coast from Florida to Delaware Bay.

The NEFSC manages the COASTSPAN program and conducts the COASTSPAN survey in Delaware Bay. The NEFSC contracts cooperating partners to conduct surveys in South Carolina’s nearshore and estuarine waters (South Carolina Department of Natural

Resources) and the estuarine and nearshore waters off Georgia's southern and Florida's northeastern coast (University of Northern Florida). The NEFSC also collaborates with partners that survey Chesapeake Bay and the estuarine waters of Virginia's Eastern Shore (Virginia Institute of Marine Science [VIMS]) and the estuarine and nearshore waters along the central portion of Florida's east coast (Florida Atlantic University) using COASTSPAN sampling protocols. The NEFSC provides tagging supplies to both contracted and collaborating partners.

All COASTSPAN sampling areas may be impacted by future surveying, construction, and operation of offshore wind energy areas (WEAs) and associated HVC cabling. Currently, there are expected impacts from leased WEAs and HVC cabling for COASTSPAN surveys in Delaware Bay (NEFSC) and Virginia waters (VIMS). Additionally, there are proposed WEAs that may affect the South Carolina (SCDNR) COASTSPAN survey, but these are still in the call phase. *This wind mitigation plan focuses on the NEFSC survey impacts in Delaware Bay and can be used as a template for other COASTSPAN survey areas as offshore wind energy development expands down the coast.*

Platform(s): Small research vessel, either commercial or owned by the COASTSPAN cooperating partner (government agency or academic institution). The Delaware Bay Survey uses a NOAA Fisheries-owned vessel (22 ft Boston Whaler).

Statistical Design: Multiple gears using both random stratified longline (by depth and geographic location, targeting small coastal and juvenile large coastal sharks), fixed longline (targeting large juveniles and adult shark species associated with structure [i.e. wrecks and artificial reefs, where channels meet shoals]), and fixed gillnet (targeting juvenile sharks in shallow water <10 ft) station designs. For the NEFSC Delaware Bay survey, this includes 28 random stratified longline stations and 18 fixed-gear longline stations per month (June, July, and August).

Methods: Anchored bottom longline and anchored sink gillnet gears are used during the summer months in COASTSPAN survey locations. Date, location, time, CPUE, and environmental data (depth, temperature, and salinity) are collected for each set. Additionally, biological data (species, sex, fork length, presence/absence of umbilical scar) and samples (DNA, muscle, and/or blood depending on research needs) are collected, and a conventional tag is applied to each individual shark for life history, distribution, and migration studies by species, life stage, and size class. In Delaware Bay, 2 longline gears are used; both are baited with previously frozen Atlantic mackerel (*Scomber scombrus*) on hooks with barbs depressed and consist of 1000 ft of mainline anchored at both ends with additional length for buoy lines depending on set depth. The smaller gear targeting juveniles consists of 50 gangions with 12/0 Mustad circle hooks with barbs depressed, 50 cm of 1/16 stainless cable, and 100 cm of 1/4-inch braided nylon line with 4/0 longline snaps. Additionally a 25-hook (16/0 Mustad circle hooks) bottom longline is used at stations chosen based on National Marine Fisheries Service historical data and based on environmental niche predictors to target large juvenile/adult sharks. Gangions include 50 cm of 3/32 stainless cable and 200 cm of 3-mm clear monofilament with 4/0 longline snaps. Soak time for the juvenile gear is 30 minutes and for the large juvenile/adult gear is 2 hours.

III. Effect of Four Impacts

Currently, there are expected impacts from leased WEAs and HVC cabling for COASTSPAN surveys in Delaware Bay (NEFSC) and Virginia (VIMS). Additionally, there are proposed WEAs that may affect the South Carolina (SCDNR) COASTSPAN survey, but these are still in the call phase. *This wind mitigation plan focuses on the NEFSC survey impacts in Delaware Bay and can be used as a template for other COASTSPAN survey areas as offshore wind energy development expands down the coast.*

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

   Currently, based on known leased and planned offshore wind areas, only the export cable has the potential to directly impact COASTSPAN surveys. Both fixed and random stratified surveys will be impacted by preclusion, at least temporarily, requiring abandonment of some historical stations or parts of entire geographic regions if the timing and location of cable surveying and construction coincides with our survey timing (summer). During offshore wind operation, COASTSPAN surveys will also be impacted by preclusion if the export cables are not buried or have a shallow burial within our survey strata or near a fixed station. All COASTSPAN gear is fished on the bottom and requires anchoring. Setting across or near a cable could cause the hooks or anchors to become snagged, altering how the gear fishes and potentially resulting in gear loss.

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.

   Preclusion from survey stations or random stratified regions will affect survey design and thus affect the resulting recruitment and abundance indices used in assessments. The survey design will need to be altered to account for these changes. This may include a reduction or omission of geographic regions or removal/replacement of fixed stations. These changes will need to be evaluated via simulation modeling along with calibration studies to determine how they affect the historical recruitment and abundance indices. If modeling indicates trend differences that calibration cannot overcome, then the survey time series will need to be split into pre- and post-offshore wind energy development segments, which may hinder the overall effectiveness of management advice based on this index.

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.

   HMS, such as sharks, are at risk of being heavily impacted by the presence of offshore wind platforms and infrastructure, including cabling, due to the new structures themselves and resulting changes to the water column. These alterations to the benthic and pelagic habitat may have cumulative or disparate impacts on behavior and movement ecology for not only sharks but for their prey species, as well.

   New structures may have an aggregating effect on shark movement and alter natural migration patterns due to the well-documented tendency of structure to act as fish aggregating devices (FADs) as they concentrate prey species. This may be especially apparent in areas where no bottom structure was present before. Aggregating effects on sharks themselves may also occur due to things like changes in oceanographic conditions and current patterns. Additionally, EMF emissions from HVCs used for transport from the offshore wind energy development areas back to shore have been

shown to be attractive to some elasmobranch species, including some sharks. Alternatively, increased noise, vessel activity, and preclusion of large areas to typical migratory movements may have a dispersive effect on sharks or their prey.

Resulting changes in migration patterns before, during, and after the nursery season will affect the timing of nursery use as well as distribution and foraging behavior within the nursery habitat. This can occur even if there is no survey preclusion (i.e., pre-construction surveys or construction near the entrance to the estuary during COASTSPAN survey timing within the estuary). These activities could result in delayed immigration to, avoidance of, limited use of, or early emigration from the nursery areas by these species. The affected pups and young juveniles could be exposed to increased predation and reduced foraging opportunities if the habitat they are pupped in or relocate to is not as protective or productive as their intended nursery habitat. These scenarios can affect our ability to monitor species abundance, recruitment, changes in juvenile fitness, and changes in juvenile mortality.

Changes in nursery habitat use patterns will impact relative abundance and recruitment estimates and potentially confound survey standardization. Additional secondary impacts on prey species may also affect the relative abundance of target species.

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

   Transit times between stations will increase during the pre-construction survey and construction phase of offshore wind development (submarine cabling portion) if the timing and location of cable surveying and construction coincides with our survey timing (summer). Increased transit times will result in increased survey costs due to the need for additional survey days and higher fuel costs.

IV. Mitigation Planned, as per Six Elements

1. ***Evaluation of survey designs***

   Survey impact evaluation will require more information regarding where and when offshore export cables and related infrastructure are being placed. If construction can avoid the survey window and our ability to anchor remains unchanged, survey operations will be unaffected by wind development.

   However, if construction cannot avoid the survey window or we are unable to anchor the gear at fixed or random stations, evaluation will be needed to assess impacts of offshore wind energy development on survey design to account for the loss of historical stations or survey strata and changes in catchability due to offshore wind energy development. This will require data simulation modeling, as well as calibration surveys to assess real-time feasibility and quantify impacts on efficiency, operations, and catch under a new survey design. Any change in survey design and/or standardized methodology will require a data calibration to evaluate compatibility of the new design to the historical design and to make post-wind energy development abundance indices comparable to historical indices, if possible.

Additional lab and field studies will be needed to assess the impacts of offshore wind energy development on shark migratory behavior, including timing of movement, overall migratory patterns, and spatial use of habitat, as well as that of key prey resources. These impacts can affect survey catchability, which would alter relative abundance estimates and resulting trends and therefore impact the provision of scientific advice to management. Studies to determine these impacts may result in additional correction factors to ensure post-wind energy development abundance indices are comparable to historical indices.

2. *Identification and development of new survey approaches*

New survey designs and additional studies are needed to develop a key understanding of the impacts of wind on shark abundance and migration, and to mitigate lost ability to produce abundance indices comparable to those produced historically.

Assumptions

There is limited information available on specific HVC characteristics (emission magnitude and frequency), location, and configuration (layed on substrate, covered, buried, burial depth, maintenance). These may vary among the leases and companies. This could increase or decrease the need for mitigation measures and the ability to implement new approaches.

Modification of current survey

To maintain the usefulness of the current recruitment and abundance indices without breaking the time series, several impacts will need to be addressed through survey design and modeling. The survey timing will need to be extended on either end to account for changes in migration into and out of the nursery area due to the development and operation of offshore wind energy and to help address changes in catchability due to these factors. In addition to more survey days, this will also require increased labor, fuel, sampling supplies, and conventional tags. Once specific locations for HVCs are identified, any modifications to the fixed stations or survey strata will need to be addressed. Random stratified stations are based on depth and geographic region. Fixed stations provide historical reference to previous work or are based on the availability of structure attractive to target species (i.e., reef, artificial reef, wreck, shallow flat protected by sandbar, deep channel up against shoal, and salt wedge). For replacement of fixed stations or survey strata (or strata alteration), it will be important to ensure similar habitat characteristics (bottom and water) are present. Multiple options will need to be considered, and sufficient time to conduct the survey with these changes should be given to allow for calibration studies. Calibration studies would require the use of an additional vessel (NEFSC Apex Predators Program has another boat that could be used in Delaware Bay), vessel fuel and maintenance, duplicate survey gear, time, and labor. For the omission of a survey stratum or fixed station without replacement, simulation modeling will need to be conducted to determine if the changes will affect the survey indices, requiring additional time and labor.

Therefore, calibration studies may result in changes to the survey design in addition to the need to expand survey coverage temporally at the beginning and end of the current survey season to fully assess the impact of offshore wind energy development moving forward.

Acoustic telemetry studies

Active and passive acoustic telemetry studies before and during all stages of offshore wind development and operation will be needed to determine real time changes in habitat use and timing of habitat use in response to preclusions, HVC EMF emissions, and the presence of wind turbines within migratory routes as any resulting changes will affect survey catchability. This work conflicts with our survey schedules and will need to be outsourced to an external partner who would need to be consulted for field experiment needs (equipment, labor, budgeting). Field work from this study can build off the current survey platform but would require additional survey and vessel supplies, time, and labor. These studies will not only inform relative abundance standardization for assessments but also updates to EFH designations, including HAPCs. Delaware Bay is designated as an HAPC for both sand tigers and sandbar sharks.

HVC EMF emissions study

Prior to construction, we will need to conduct controlled experiments on shark sensitivity by relevant shark species and size classes to electromagnetic emissions from the type of HVC being used and at varying depths, sediment types, and with and without additional barriers covering the HVC, as well as changes in behavior during these emissions due to the presence of baited gear. These experiments will help address any changes in catchability due to the presence of HVC electromagnetic emissions. Neonates and other small size classes may be studied in a laboratory/tank environment, but larger sizes may need to be studied in the field. Once operation commences, a study determining HVC emission range and fluctuations due to transmission and changes in burial depth should be measured to help explain effects on species distribution and abundance. This work is outside of our expertise and would need to be outsourced to an external partner who would need to be consulted for laboratory and field experiment needs (equipment, labor, budgeting). Field work from this study can build off the current survey platform but would require additional survey and vessel supplies, time, and labor.

Close-kin mark-recapture study

Another potential solution to mitigate loss of biological samples and impacts to traditional abundance estimates is to investigate the use of close-kin mark-recapture (CKMR) methods for population genetics surveillance. CKMR is a new technique that uses genetic information to estimate absolute abundance of spawning stock, adult survival, and reproductive output by age. The genetic data collected in CKMR can also provide information on stock structure, sex, and possibly age. However, stock assessments also require estimates of juvenile abundance, juvenile survival, and the stock-recruitment relationship, which are not estimated from CKMR. Hence, this technique will not replace traditional surveys but could act as a supplement to the current survey and help mitigate data loss due to offshore wind impacts. Additional benefits of CKMR studies include gaining insights into natal philopatry among species using estuaries for nursery grounds and expanding the understanding of EFH for reproductive strategies.

3. *Calibration and integration of new survey approaches*

HVCs that overlap COASTSPAN stations or cross through survey strata may result in preclusion of that station or strata (entirely or in part). Additionally, the presence of offshore WEAs may alter the timing of migration to summer nursery areas and overwintering areas. To mitigate these issues, the current survey will need to be

modified temporally and spatially. Simulation modeling and calibration surveys will need to be conducted to ensure compatibility with time series previously used in assessments. Further, additional research will be needed to evaluate the impacts of HVCs on shark behavior and catchability to produce necessary corrections for abundance indices due to changes in catchability. The results of the simulation modeling, calibration study, and additional research will inform survey design changes to help mitigate impacts of offshore wind energy development on COASTSPAN surveys. These steps are vital to mitigation and will incur separate costs in addition to the existing survey budget.

Modification of current survey

Annual temporal coverage

Expanding the temporal coverage of the survey on an annual basis is needed to mitigate loss of efficiency in sampling. In Delaware Bay, both longline surveys are conducted throughout the bay during the same time frame for each of the sampling periods in late June, mid-July, and early August. Each survey needs an additional sampling period before and after the normal survey time frame. This will increase the number of survey days from ~30 to ~50 days. This will require additional APP personnel, travel, vessel costs (gas, oil, maintenance), and survey supplies, including conventional tags.

Simulation modeling and calibration studies

Simulation modeling of historical data to determine changes in the relative abundance estimates and trends by excluding precluded stations, excluding strata, reducing strata, or restratification. Replacement stations will also be considered. For fixed stations, determining what is “close enough” to the precluded station for the replacement station will depend on the bathymetry, hydrography, and available structure (comparable to original structure in size and composition) affecting fishing of the gear, but this cannot logistically be answered without an in situ calibration study, and effects of the offshore wind energy development on movement behavior and catchability of the sharks must also be considered. Ultimately, alternative fixed stations and survey strata will be identified, originally via consultation with nautical charts, but will need to be ground truthed and then tested for compatibility to original stations/strata via calibration surveys. The calibration and the original surveys will run concurrently within each sampling period and will also include the temporal expansion periods using paired sampling with alternative stations/strata determined once cabling details are made available. This work will require additional APP personnel, travel, a second vessel with associated costs (gas, oil, maintenance), and survey supplies, including conventional tags

Finally, the increased temporal sampling and calibration studies must be carried out by APP staff and/or scientific personnel directly trained by APP staff to ensure equivalency of survey methods, including fish measurements, sample collection, and survey methods.

Acoustic telemetry and HVC EMF emission studies to address catchability

Active and passive acoustic telemetry studies can help address changes in migratory behavior, habitat use, and responses to HVC EMFs and will need to be conducted within the nursery sampling areas prior to offshore wind development and during each phase of development from pre-construction surveys through operation. Additionally, controlled EMF studies on emissions and responses to these emissions in the presence of baited gear will also be needed. Field work from this study can build off the current survey platform but would require additional time, labor, and survey and vessel supplies. We

propose to outsource this work to an external partner. A full proposal, including laboratory and field experiment needs, could be developed by external partners.

Prior to construction, we will need to conduct controlled experiments on shark sensitivity by relevant shark species and size classes to electromagnetic emissions from the type of HVC being used and at varying burial depths, sediment types, and with and without additional barriers covering the HVC, as well as changes in behavior during these emissions due to the presence of baited gear. Neonates and other small size classes may be studied in a laboratory/tank environment, but larger sizes may need to be studied in the field. Once operation commences, a study determining HVC emission range and fluctuations due to transmission and changes in burial depth should be measured to help explain effects on species distribution and abundance. Field work from this study can build off the current survey platform but would require additional time, labor, and survey and vessel supplies. We propose to outsource this work to an external partner. A full proposal, including laboratory and field experiment needs, could be developed by external partners.

CKMR study

A full scale CKMR study is currently not viable for most shark population estimates due to the number of samples required annually and the inability to collect these amounts given existing surveys and the reduced commercial fishery. The only exception may be the sandbar shark, which is a prominent species within many surveys, including Apex surveys (all COASTSPAN cooperators, Coastal Shark Bottom Longline Survey, and the Cooperative Shark Tagging Program). We propose to fund an external research collaborator to use DNA collected from sandbar sharks using COASTSPAN survey catches to develop the molecular tools needed and the experimental design for a CKMR study to estimate census size. Once these molecular tools are developed, an annual monitoring program would be developed.

4. ***Development of interim provisional survey indices***

Unfortunately, there are no existing data streams suitable for developing interim indices. Other methods that may eventually augment catch/survey data for estimating relative abundance (i.e., CKMR) have not been vetted and will require years of research before suitability can be determined. While acoustic monitoring is carried out in a limited capacity for some shark species in COASTSPAN survey areas, this has not been done consistently over time and with enough receiver arrays in place throughout the survey areas to provide sufficient insights into habitat use changes over time.

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

Annual funding will be needed for increased temporal sampling and ongoing passive acoustic monitoring to document changes in nursery immigration and emigration by HMS. This includes the purchase of 2 receivers (if not purchased by the government for the active telemetry study) and 20 acoustic tags per year, as well as installation and maintenance of acoustic receivers, and data archiving/extraction costs.

Funding will also be needed to stand up CKMR proof of concept study (not currently included in the budget worksheet).

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

Communication with current end users of survey data and indices (SEDAR, federal managers) will be necessary, along with NOAA Fisheries HMS Management Division and science centers who fund the current survey, in order to align expectations and ensure the end product mitigates offshore wind energy development impacts effectively to enable continued management advice based on survey results. Further, all surveys impacted should communicate with the Bureau of Ocean Energy Management via their science centers to disseminate information on offshore wind energy development impacts for future planning purposes.

Modification of current survey

Additional or modified abundance and environmental data generated from this survey mitigation plan can be folded into current data streams, which currently require database modernization. New studies examining changes to catchability and impacts of HVC on various species would benefit from the creation of new relational databases. In terms of data collected from the survey platform, there is a need to create a modernized at-sea data capture (i.e., electronic tablet) platform to accommodate increased volume of data and any new data streams, and to enable real-time data capture at sea. Modernization of database infrastructure and overall APP data management will allow timely availability of data for assessments. These will require additional APP personnel and Information Technology Division (ITD) labor. The APP analyzes and incorporates our survey data into the stock assessment process and would be heavily involved with the simulation modeling and calibration studies but would also benefit from outside expertise to assist in these activities.

Acoustic telemetry, EMF, and CKMR studies

Each of these studies would constitute new data streams, requiring coordination with research partners (universities, other research institutions, and other government offices), management entities impacted by new data streams (e.g., SEDAR, HMS), and ITD labor support.

V. Proposed Schedule for Implementation

Element	Task	Activities	Milestone
V. 1. & 2.	-Evaluate COASTSPAN historical station/strata preclusion by HVCs from current/proposed offshore WEAs, identify alternative stations/strata, and design calibration studies	-Hire needed personnel, develop calibration study designs, work on logistics and IT needs and secure contracts for carrying out calibration work -Request proposals and determine budgetary needs to outsource EMF, acoustic telemetry, and CKMR studies	-Hire staff -Finalize calibration study plans -Engage ITD and OMI personnel to finalize contracts and data infrastructure

V. 3.	-Conduct calibration studies, and outsource EMF and acoustic telemetry studies	-Staff, schedule, and carry out concurrent vessel calibration surveys, in addition to traditional COASTSPAN survey -Outsource EMF, acoustic telemetry, and CKMR studies to be conducted during the same time frame as calibration studies -Implement new data collection streams and adjust as needed based on conditions and needs that arise	-Collect data inside and outside cabling areas and at alternative sites, in addition to traditional data -Evaluate EMF, acoustic, and CKMR results -Complete data analyses and identify mitigation needs, including funding implications and logistical concerns -Provide all data to assessments for complete vetting with historical data -Produce a document outlining calibration process and lessons learned
V. 4 & 5	-Produce survey indices with adjustments for new methods -Develop wind energy monitoring needs/plans	-Implement results of above analyses to ensure consistent data products -Develop logistics, budget, and overall mitigation requests for wind area monitoring to be conducted ongoing	-Provide data sets and indices to management and assessments -Analyze and publish data and samples from cabling area monitoring ongoing, data streams updated to incorporate these data
V. 6	-Collaborate with partners, industry representatives, and assessment staff to make necessary changes	-Conduct collaborative meetings and continue participation with partners	-Meet with partners and assessment staff to identify changes and needs -Communicate changes at existing assessment and relevant stakeholder meetings

VI. Links to Other Surveys

The COASTSPAN surveys have no overlap with other NEFSC surveys in terms of spatiotemporal extent. The Cooperative Research Gulf of Maine Bottom Longline Survey does use similar gear and can be consulted for improved data management during field activities (use of digital field tablets for real-time incorporation of data into an electronic database) and database modernization.

VII. Adaptive Management Considerations/ Opportunities

Final siting and design of wind structures, vessel traffic, HVC placement, and other logistics associated with individual wind leases will determine if changes need to be made to mitigation plans on a rolling basis. Our program staff will monitor changes and update the plans as needed.

VIII. Statement of Peer-Review Plans

This plan will be peer reviewed in the same processes as the other mitigation plans in the NEFSC portfolio. It will also be presented to external groups such as the NOAA Fisheries HMS Division, SEDAR assessment panels, and other applicable stakeholder groups.

IX. Performance Metrics

The performance metrics for this plan will be based on the continued ability to track species relative abundance following wind mitigation efforts. Coefficients of variation for annual relative abundance estimates can help monitor for increases in data uncertainty, and model diagnostics will be performed to determine appropriate model fit.