**Mid-Atlantic Fishery Management Council**
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# MEMORANDUM

**Date:** April 1, 2016

**To:** Council

**From:** Mary Clark

**Subject:** Collaborative Research Projects

The Council's Collaborative Research Committee met on March 23, 2016 in Baltimore, Maryland to review sixteen proposals that were submitted in response to the Council's Request for Proposals (RFP) for the 2016-2017 Collaborative Fisheries Research Program. After thorough consideration of the proposals, the Committee selected four projects to receive approximately $610,000 in funding. Details are provided below, and the executive summaries for the selected projects are enclosed behind this memo.

1. **Changes in Availability of Mid-Atlantic Fish Stocks To Fisheries-Independent Surveys**
   *Principal Investigators: Janet Nye, Michael Frisk, and Skyler Sagarese.*
   This project will investigate how habitat modifies the availability of summer flounder, black sea bass, and spiny dogfish to the NEFSC trawl survey. The focus of this research is on the relationship between the NEFSC trawl survey index and actual abundance of these species.

2. **Collaborative Development Of A Winter Habitat Model For Atlantic Mackerel, "Version 2.0", For The Identification Of "Cryptic" Habitats And Estimation Of Population Availability To Assessment Surveys And The Fishery**
   *Principal Investigator: Gregory DiDomenico; Co-Principal Investigators: William Bright, Peter Moore, Josh Kohut, Mitchell Roffer, and John Manderson.*
   This project will synthesize existing information to develop and evaluate a quantitative model describing dynamic winter habitat distributions for Atlantic Mackerel. The goal of this study is to develop a model that can be used to accurately estimate the availability of the population to fishery independent surveys.

3. **Estimating and Mitigating the Discard Mortality Rate of Black Sea Bass in Offshore Recreational Rod-And-Reel Fisheries**
   *Principal Investigator: Olaf Jensen; Co-Principal Investigators: Eleanor Bochenek and Jeffrey Kneebone.*
   The primary objective of the proposed research is to generate a robust estimate of the discard mortality rate of black sea bass captured by recreational anglers using rod-and-reel fishing gear in the deepwater offshore fishery that occurs during the fall/winter in the Mid-Atlantic. In addition, this research will generate "best practice" capture and handling recommendations to reduce the mortality of discards.

4. **Determining Selectivity and Optimum Mesh Size to Harvest Three Commercially Important Mid-Atlantic Species**
   *Principal Investigator: Emerson Hasbrouck; Co-Principal Investigator: Jonathan Knight.*
   The project goal is to analyze the selectivity of multiple codend mesh sizes relative to summer flounder, black sea bass and scup retention. This study will compare the catch composition, commercial yield, retention efficiency, discards, and size selectivity parameters of a range of different codends in the commercial bottom trawl fishery in the Mid-Atlantic region.

**Title: Changes in availability of Mid-Atlantic fish stocks to fisheries-independent surveys**

**Applicant name:**

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**Applicant type:** nonprofit educational institution

**Principal investigators:**

Janet Nye, Stony Brook University
Michael Frisk, Stony Brook University
Skyler Sagarese, NOAA NMFS Southeast Fisheries Science Center (receiving no funds)

**MAFMC research area being addressed**

1. Investigate NEFSC trawl survey efficiency, catchability, and availability relative to summer flounder, black sea bass, and spiny dogfish.

**Proposed Start Date:** 5/15/16
**Proposed End Date:** 12/15/17

## Executive summary

## Title: Changes in availability of Mid-Atlantic fish stocks to fisheries-independent surveys

This proposal addresses Research Need #1 to "Investigate NEFSC trawl survey efficiency, catchability, and availability" for three of the species identified in this priority; summer flounder, black sea bass and spiny dogfish. It is often assumed that abundance indices from fisheries-independent trawl surveys are not prone to the pitfalls of fisheries-dependent catch rates. That is, we assume that catchability does not change with fish density or interannual environmental variability. This assumption is dangerous in light of the fact that many stocks in the Northeast US have shifted their distributions and/or have experienced range contractions and expansions that are related to both population size and rapid warming (Nye et al. 2009). The implications for these shifts in distribution have not been fully addressed despite there being important ramifications for stock assessments (Link et al. 2011). In particular, shifts in distribution can alter availability and subsequently catchability of a stock to fisheries-independent surveys upon which many stock assessments are dependent, especially for seasonally migrating stocks whose distributions may fall outside of the survey area (Walters 2003, Wilberg et al. 2009).

Like many Mid-Atlantic species, our three focal species (summer flounder, black sea bass and spiny dogfish) all undertake seasonal migrations where in winter they move generally south and offshore to the edge of the continental shelf where water temperature is warmer than in the coastal ocean. This offshore movement can potentially shift a proportion of their population out of the NEFSC trawl survey area. The NEFSC bottom trawl survey extends from Cape Hatteras to the Gulf of Maine and occurs over a two-month interval in both the spring and the fall when the temperature on the shelf is rapidly changing. Thus, the timing of the survey combined with variability in the timing and rate of spring warming and fall cooling in each season may impact availability of species to the survey, particularly those with temperature-induced migration patterns. Because temperature strongly modifies their movement offshore and south in the winter, there is high interannual variability in their distribution on the shelf, consequently changing the availability of each of these species to the survey. Here we propose to quantify the degree to which multiple habitat variables affect availability and catchability in the NEFSC trawl survey for summer flounder, black sea bass and spiny dogfish. Evaluation of time-varying catchability in these three species is critical to the stock assessments for each species, but also enables a comparison of the degree to which time-varying catchability among fishes with different life histories and habitat requirements might impact stock assessments.

Temperature is likely the most important variable influencing distribution and availability to the NEFSC survey of fishes in this region. Indeed, developing a habitat model based on temperature improved the biomass estimates and reduced uncertainty for the pelagic butterfish. However, our three focal species are more demersal in nature and furthermore, other variables have been identified as important habitat requirements. For summer flounder and black sea bass, access to estuaries and bottom habitat type are also important determinants of distribution and availability. Both species use estuaries as nursery habitat and forage there as adults. Summer flounder are known to prefer sandy habitat whereas black sea bass are known to aggregate on high-complexity habitat. Salinity is also an important factor in predicting black sea bass abundance (Miller et al. 2016). For spiny dogfish, habitat associations revealed a selection for warmer, more saline, and more southerly locations during spring (Sagarese et al. 2014b). In contrast, during autumn, larger dogfish occupied relatively warmer, shallower, and less saline waters. Seasonal occurrence was tightly linked to environmental factors such as bottom temperature

during both spring and autumn, with ecological factors (e.g., squid abundance) also influential during autumn (Sagarese et al. 2014a). To summarize, it is vital to assess the importance of both dynamic variables (temperature, salinity, oceanographic fronts) and static variables (distance to estuary and bottom type) in determining the availability of these species to the NEFSC survey. As dynamic variables change and static variables do not, the spatial mismatch between multiple variables may dramatically change the availability of each species to the survey.

**Brief overview of methods**

For each species, we will take a similar approach to understand how habitat modifies their availability to the NEFSC trawl survey in three steps or objectives. Briefly, we will:

1. Identify habitat variable(s) for which each species and if necessary each sex, age or size class selects for habitat using cumulative distribution functions (cdfs).
2. Develop a habitat model for each species using Generalized Additive Models (GAMs) that will allow incorporation of multiple habitat parameters if necessary.
3. Create hindcasts of availability to the survey by combining habitat models with hindcasts of dynamic oceanographic variables (temperature, salinity and fronts) to create a time series of catchability during the spring and fall NEFSC surveys.

The use of cdfs will allow us to determine if fishes are actively *selecting* for habitat variables while GAMs are a flexible modeling technique that allows for the incorporation of multiple habitat variables, the functional form of which may vary from strictly linear to complex nonlinear relationships.

**Measurable outcomes**

1. Critical habitat needs for three economically and ecologically important species: black sea bass, summer flounder and spiny dogfish
2. Time series of catchability for three Mid-Atlantic species that can be directly incorporated into each stock assessment
3. Habitat models for three species that can be used in applications other than changing availability to the stock assessment
4. A model of availability of summer flounder to shore-based recreational fishers
5. Training of at least one student in quantitative fisheries science
6. At least three peer-reviewed publications in fisheries and ecology journals

**Qualifications**

Nye, Frisk and Sagarese have been studying fish distribution, developing habitat models and modeling fish population dynamics for a combined total of over 35 years. Nye is a Fisheries Oceanographer who will lead the project and has developed GAMs for other Northeast US fish stocks such as Atlantic croaker, cusk and river herring. Nye and Frisk are currently developing similar models for estuarine-dependent species. Frisk's experience on the Science and Technical Committee for the MAFMC brings a wealth of knowledge about the issues with the stock assessments for each species. Frisk and Sagarese are both NOAA Sea Grant fellows in Population Dynamics with Sagarese's dissertation work focused on developing stage and sex specific habitat models for spiny dogfish. She is currently an assessment scientist for the Southeast Fisheries Science Center and as such has the skills and knowledge to develop habitat models and catchability indices that can be incorporated into stock assessments.

**Title**: Collaborative development of a winter habitat model for Atlantic Mackerel, "version 2.0", for the identification of "cryptic" habitats and estimation of population availability to assessment surveys and the fishery

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**MAFMC Research Area Being Addressed**:
The proposed research to develop an Atlantic Mackerel habitat model addresses MAFMC research priorities # 1 and # 2 published in the Mid-Atlantic Collaborative Fisheries Research Request for proposals. If funded, we will develop a 2nd generation habitat model that will be used to: 1) develop environmentally informed and time varying estimates of the availability of Atlantic Mackerel to fishery independent surveys used to inform models in upcoming stock assessments, and 2) serve as a quantitative hypothesis we will use to design an efficient, cost effective and state of the art industry based field survey of cryptic habitat and potential mackerel aggregations outside the domain of fishery independent surveys and the current fishery.

**Proposed Start Date:** May 1, 2016
**Proposed End Date:** December 15, 2017

**Executive Summary**

***Research priority area being addressed*:** This proposal for industry, academic and government collaborative research addresses the following MAFMC collaborative research priorities listed in the 2016 Request For Proposals:

1) Investigate net efficiency, availability and catchability of Atlantic mackerel to the NEFSC trawl survey
2) Investigate abundance and/or distribution of Atlantic mackerel beyond the depth range of current NEFSC trawl surveys.

These were also among the same important research priorities identified by the Atlantic Mackerel Working group (AMWG) of industry, academic and government experts assembled for the 1st *Atlantic Mackerel Population Ecology and Fishery Workshop*: *Industry & Science perspectives, December 2-3, 2015* Point Judith, RI which was supported by the MAFMC and NOAA/NEFSC Cooperative research program. *We will leverage the expertise and advice of the AMWG that includes the lead US stock assessment scientist throughout this project to ensure the product we develop is of the highest quality and has the highest possible impact in an ecosystem based assessment of the North West Atlantic Mackerel population scheduled in late 2017.*

***Brief overview of methods*:** Our overall objective in the proposed industry-science collaboration is to synthesize existing information to develop and evaluate a quantitative model describing dynamic winter habitat distributions for Atlantic Mackerel that can be used to accurately estimate the availability of the population to fishery independent (FI) surveys and the fishery. To address RFP priority #1 we will apply the model in hindcast mode to estimate availability of the population to fishery independent surveys used in the 2017 Atlantic Mackerel stock assessment. We will do this by applying methods similar to those used in the recent stock assessments of Atlantic Butterfish, Scup and Bluefish (NEFSC 2014, 2015). To address RFP priority area #2 we will use simulations of the model as a quantitative hypothesis of cryptic habitat distributions to design an efficient, cost effective strategy for an industry based exploratory survey of locations and times of potential Mackerel aggregations outside the domain of FI surveys and the fishery.

We will achieve our objectives as follows. We will **1)** ***formally evaluate two existing models of dynamic winter/spring habitat distributions for adult and juvenile Atlantic Mackerel in the Northwest Atlantic.*** The first model was developed collaboratively by Roffer's Ocean Forecasting Service, Inc. (ROFFS™) and the fishing industry in 2007-2009 (CO-PI: *Roffer*). This model was based on satellite derived sea surface temperature, ocean color, water mass boundary stability and historical catch data. The second model has been co-developed from 2015 through the present by NEFSC Cooperative Research Program (CO-PI: *Manderson*) and the Study Fleet (CO-PI: *Bright* and others) using validated data assimilative ocean models, FI survey data, study fleet and observer catch data and the mental models of individual fisher collaborators. Secondly, we will ***2) assemble and review scientific and industry based information describing characteristics of deep water mackerel habitats (>200M) in the North East Atlantic*** that contribute significantly to an annual European harvest of 500,000-1 *million tons* (CO-PI: *Moore & Bright have close relations with the EU Mackerel fishery industry*). With input from the AMWG we will ***3) synthesize results of the evaluation of the two US models and deep water mackerel habitat information from the Northeast Atlantic to develop a 2nd generation winter habitat model for Atlantic Mackerel (v2.0)***. We will ***evaluate the accuracy and precision of model v2.0 during the winter of a 2016-2017 by leveraging field activities of NOAA/NMFS Northeast Fisheries Science Center (NEFSC) cooperative research study fleet, as well as available study fleet, observer,***

***and fishery independent data***. We will review results of the model evaluation and pathways for applying it to develop an index of population availability to fishery independent surveys used the assessment with the AMWG. With guidance from the AMWG we will ***4) apply the model to develop population availability estimates with uncertainties, and draft technical working papers in time for Atlantic Mackerel assessment data, modeling, SARC review meetings scheduled for the summer and fall of 2017.*** Finally, we will ***5) design a cost effective and efficient industry based survey of habitats outside the domain of fishery independent surveys and the fishery using the 2nd generation model as a quantitative hypothesis*** of locations and times of "cryptic" mackerel habitat and potential aggregation.

**Measurable outcomes**: We will use a collaborative industry-science approach to produce and evaluate a 2nd generation winter habitat model for Atlantic mackerel. This model will be used in hindcast mode to develop a quantitative estimate of the availability of the mackerel population to fishery independent surveys in the North West Atlantic. We will produce availability estimates and working papers describing technical details for presentation at benchmark stock assessment meetings scheduled for the second half of 2017. The 2nd generation habitat model be used as a quantitative hypothesis to design industry based surveys of potential mackerel aggregations in "cryptic" habitats including those in deep water off the edge of the US continental shelf. During well-defined and critical periods in the research we will review preliminary results and approaches with the Atlantic Mackerel Working group (AMWG). We will incorporate advice of the working group to maximize the likelihood that products produced will have impact in the assessment and management of the North West Atlantic Mackerel population.

**Project Title**: Estimating and mitigating the discard mortality rate of black sea bass in offshore recreational rod-and-reel fisheries

**Applicant:** Partnership for Mid-Atlantic Fisheries Science (PMAFS)

**Applicant Federal Employment Identification Number:** 261663944

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**Applicant Type:** Non-profit

**Co- and Principal Investigators:**

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**Industry Collaborators**: Captain Bob Rush (Starfish Boats, Sea Isle City, NJ), Recreational Fishing Alliance, Jersey Coast Anglers Association, and Rhode Island Charter and Party Boat Association

**MAFMC Research Area Being Addressed**: **4. Determine the discard mortality rate by gear type for the recreational summer flounder and/or black sea bass fisheries. Special consideration will be given to projects that address discard reduction.**

**Project Period:** April 1, 2016 through December 15, 2017

## Executive Summary

The proposed research addresses priority #4 of the Mid-Atlantic Fishery Management Council's (MAMFC) 2016-2017 Collaborative Fisheries Research program: **Determine the discard mortality rate by gear type for the recreational** summer flounder and/or **black sea bass fisheries. Special consideration will be given to projects that address discard reduction.**

Black sea bass (*Centropristis striata*) are a common species caught by numerous seasonal recreational fisheries along the east coast of the United States. Given the geographic extent of the fishery (Florida to Maine), the species is captured using a wide array of gear and tackle types, and across a wide range of depths, water temperatures, and air temperatures. Published black sea bass discard mortality rates vary considerably (i.e., 4.7% to 39%), with a general increase in mortality evident in deeper capture depths. Currently, black sea bass stock assessments and fishery management plans assume a 25% discard mortality rate for the coast-wide recreational fishery, but the wide range of estimates indicate that this rate may not be representative of all regional fisheries. In late fall and winter, black sea bass are captured by recreational anglers during directed and non-directed (e.g., scup, cod, tilefish) offshore trips in deepwater (50-80 m) off the Mid-Atlantic. Due to size restrictions, daily possession limits, "high-grading", or closed seasons, many of the captured fish are released in this offshore fishery. The black sea bass discard mortality rate following rod-and-reel capture in a similar depth range (43-54 m) off South Carolina was estimated to be relatively high (e.g., 39%), but the extent to which this estimate is applicable to the deeper depths and both colder water and air temperatures characteristic of the fall/winter offshore fishery is unclear. In addition, this estimate was derived from low sample size and by monitoring fish in cages, which can bias mortality estimates. Consequently, the discard mortality rate of black sea bass in the Mid-Atlantic offshore fishery remains uncertain and warrants further research.

The primary objective of the proposed research is to generate a robust estimate of the discard mortality rate of black sea bass captured by recreational anglers using rod-and-reel fishing gear in the deepwater offshore fishery that occurs during the fall/winter in the Mid-Atlantic. In addition, this research will generate "best practice" capture and handling recommendations to reduce the mortality of discards (e.g., through the use of circle hooks, by swim bladder venting, and/or the establishment of capture and handling practices to promote fish survival). To accomplish these objectives, we will utilize a combined approach of passive acoustic telemetry and conditional reasoning, which has proven effective for generating gear-specific discard mortality rates for other recreationally-caught species (e.g., Atlantic cod, haddock). Briefly, black sea bass will be captured by volunteer recreational anglers of varying experience levels during research tagging charters conducted from November 2016 through January 2017 aboard a recreational headboat sailing out of Sea Isle City, NJ. All fishing/sampling will occur at a shipwreck located in ~50 m depth that is representative of the locations commonly fished by recreational anglers during the winter. Prior to any sampling, we will establish standardized rod-and-reel and terminal tackle setups to be used during all research tagging charters to ensure that all capture conditions are consistent with normal fishery conditions. Based upon preliminary input from our industry and scientific collaborators, it is anticipated that J-hooks will be the most common tackle type. If true, then the proposed research will also include anglers fishing with circle hooks to evaluate their conservation benefits for reducing discards.

During each trip, anglers will be provided with a standardized fishing setup and allowed to determine how best to fish, handle, and unhook their catch to promote authentic scenarios. For each captured black sea bass, a series of technical (capture time, depth, angler experience level, tackle type, fight and handling time, and hook location and removal method) and biological (total length, physical injury, air and water temperature, and release behavior) variables will be recorded. Each fish will be assigned a physical injury score, which accounts for external signs of barotrauma. A random subsample of black sea bass (n=80) will be tagged with acoustic transmitters containing pressure/depth sensors, released at the surface, and monitored for days to weeks following release using an array of 20 acoustic receivers. Previous research on black sea bass indicated that swim bladder venting may decrease discard mortality, therefore, an equal number of transmitters will be deployed on vented and unvented fish (n=40/treatment). Post-release mortality will be quantitatively assessed by comparing the acoustic depth observations from each tagged sea bass to that of the depth observations of known dead fish that will be tagged and released into the array of acoustic receivers. Estimation of discard mortality rate will be accomplished using a longitudinal survival model as described in Benoit et al. (2015). In addition to generating an empirically-derived discard mortality estimate that accounts for natural mortality, this approach will allow us to identify specific capture-related variables that are predictors of mortality and therefore develop "best practice" recommendations to reduce the black sea bass recreational discard mortality rate within the offshore fishery and beyond.

Ultimately, by collecting detailed information about black sea bass capture events in the deeper range of typical fishing depths, the proposed study will both generate a conservative worst-case scenario estimate of the discard mortality rate (i.e., given the species' susceptibility to barotrauma) and derive "best practice" recommendations that will be applicable to both inshore and offshore fisheries (given the similarities between fishing gear utilized to target black sea bass along the east coast of the United States). In addition, acoustic detection data generated by this study will improve our understanding of black sea bass spatial ecology and behavior on an offshore shipwreck. Given the expertise of the individuals from the recreational fishing and scientific communities that will be involved in the proposed study, we are confident that our results will both be accurate and highly applicable for future black sea bass management efforts. In addition, the strong partnership with the recreational industry and collaborating institutions will ensure that our results are widely disseminated to fishery scientists, fishery managers, and the recreational angling community. This comprehensive approach will both work to reduce black sea bass discards in the recreational fishery and enhance overall management of the species throughout its U.S. Atlantic range.

**Determining Selectivity and Optimum Mesh Size to Harvest Three Commercially Important Mid-Atlantic Species**

Applicants

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MAFMC Research Area Being Addressed
Priority # 5 Determine mesh selectivity for summer flounder and/or black sea bass to quantify selectivity at a range of mesh sizes, shapes, and configurations.

Proposed Start Date
April 30, 2016

Proposed End Date
April 30, 2017

**Determining Selectivity and Optimum Mesh Size to Harvest Three Commercially Important Mid-Atlantic Species**

## Executive Summary


Research Area Being Addressed

The Cornell University Cooperative Extension Marine Program (CCE) in collaboration with Jonathan Knight from Superior Trawl and members of the commercial fishing industry of the Mid-Atlantic region propose an at-sea research project aboard a commercial fishing vessel involved in the directed summer flounder, black sea bass (BSB) and scup fisheries of the Mid-Atlantic to address the MAFMC research priority # 5: Determine mesh selectivity for summer flounder and/or black sea bass to quantify selectivity at a range of mesh sizes, shapes, and configurations.

This priority has been selected by CCE based on review of the history of the scientific studies (or lack there-of) that form the basis of the minimum mesh size requirement for these species and input from the commercial fishing industry. We have decided to evaluate an additional species, scup, which is also a commercially important species to the MAFMC. All three of these species are managed with different mesh requirements. The regulations that have been implemented and data used to develop the management plans for all these species is approximately 20 years old. Additional and current research is needed to determine the selectivity for summer flounder, black sea bass and scup to evaluate the possibility of a common optimal mesh size for harvest of all 3 species as per discussions at recent MAFMC meetings. This would increase efficiency and streamline regulations as well as of improve and simplify fishing operations.

Brief Overview of Methods

The project goal is to analyze the selectivity of multiple codend mesh sizes relative to summer flounder, black sea bass and scup retention. Upon doing this we will recommend a possible management and implementation solution to sustain the state of the resources and to reduce the impact of the fishery on the ecosystem. Reducing the capture of undersized marketable species, which only influences fishing mortality without yielding economic benefit, could help the fishery by minimizing the handling and sorting time of catches and improving the quality of landings.

This study will compare the catch composition, commercial yield, retention efficiency, discards, and size selectivity parameters of 4 different codends in the commercial bottom trawl fishery in the Mid-Atlantic region. The methods proposed are to evaluate the selectivity of summer flounder, black sea bass and scup with the following codends of 4.5” diamond, 5” diamond, 5.5” diamond and 6” square mesh.

A single vessel will be used during this research to tow a specially constructed trouser trawl. The trouser trawl design, a single trawl net with two separate sections and individual codends, allows a control codend to be compared with an experimental codend on the exact same course during each tow. Therefore, each individual tow made by the vessel will be in of itself a replicate tow due to the inherent nature of the trouser trawl net design. CCE has used this trouser trawl net in previous studies and has found it to be an effective and proficient study method.

We propose conducting 20 tows per treatment for a total of 80 tows for the project. The trouser trawl allows us to perform a direct comparison to the control every tow therefore maximizing the efficiency of the study. Fourteen research days will be needed to complete all 80 tows. Fishermen and CCE staff will aim to perform 6 one-hour tows per day.

Experimental sampling will occur from August –November 2016, in order to take

advantage of optimum conditions in the summer flounder, black sea bass and scup fisheries. The study vessel, F/V Caitlin & Mairead, owned and captained by David Aripotch, from Montauk, is an active participant in directed fisheries of summer flounder, scup and black sea bass. We will plan research trip depending on reported concentrations of summer flounder, black sea bass and scup collected from industry. Steaming time to the grounds will typically be a couple of hours or less. Research fishing will occur from south and east of Block Island to south of Long Island according to fish movements and intensity. These areas are located in NMFS statistical areas 539,613, 612 and 611. We have selected the project time period because these species currently mix at these locations before and during their fall migration offshore. Fourteen days of experimental fishing will occur between August and November.

To assist in project development and implementation CCE will establish a Program Advisory Committee (PAC). The PAC will be formed to define final specific overall at-sea research design of the project. The PAC will have input on tow locations, monitor project activities and results, and provide real-time adaptive recommendations.

Measurable Outcomes

This project will provide timely, accurate and comprehensive data to be used for science based management strategies that protect and rebuild fisheries resources while minimizing impacts to fishing communities. The objective of collaborative efforts with industry is to achieve both the sustainability of the fishery resources important to the Mid-Atlantic and the sustainability of the livelihoods and economic well-being of the harvesters and coastal communities that depend on these resources. Results of this study can be directly incorporated into the management of these three species throught a FMP Amendment/ Framework/ Addendum process.

CCE will quantify the selectivity of each experimental codend tested and make all catch data available to the funding agency. CCE will provide a description of project accomplishments and progress towards objectives and performance measures in progress reports and in the final report. CCE will conduct outreach and education on these 3 commercially important species. Industry collaboration and results will be posted to the CCE website and social media. This collaboration is a proactive effort focused on increasing the knowledge of mesh selectivity and protecting the resource for sustained future harvest.