

Proposal for Funding made to:
Atlantic Coastal Cooperative Statistics Program
Operations and Advisory Committees
1050 N. Highland Street, Suite 200 A-N
Arlington, VA 22201

Advancing Fishery Dependent Data Collection for Black Sea Bass (*Centropristis striata*) in the Southern New England and Mid-Atlantic Region Utilizing Modern Technology and a Fishing Vessel Research Fleet Approach

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Applicant Name: Rhode Island Department of Environmental Management (RI DEM) and the Commercial Fisheries Research Foundation (CFRF)

Project Title: Advancing Fishery Dependent Data Collection for Black Sea Bass (*Centropristis striata*) in the Southern New England and Mid-Atlantic Region Utilizing Modern Technology and a Fishing Vessel Research Fleet Approach

Project Type: Maintenance

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Objective:

This proposal is a request for financial support for an additional 12 months of biological catch, effort, and bycatch sampling by the Black Sea Bass Research Fleet, which was successfully piloted in 2016 with support from ACCSP and has been in continuous operation since. Through the first three years of funding provided by the ACCSP, the Research Fleet sampled 22,631 black sea bass from 1,615 locations throughout the inshore and offshore fishing grounds of southern New England and the Mid-Atlantic. The Research Fleet will continue data collection through July 31, 2021 (Year 4 of funding from ACCSP). All biosamples data collected by this project have been communicated to and accepted by ACCSP. The proposed project will continue delivering black sea bass biosamples data to ACCSP at six-month intervals through July 31, 2022.

The goal of the proposed project is to continue the Research Fleet's sampling efforts in developing a year-round time series of black sea bass (*Centropristis striata*) catch, bycatch, and biological data for five different gear types (trawl, lobster/crab pot, fish pot, gillnet, rod and reel) throughout the Southern New England (SNE) and reaching into Mid-Atlantic (MAB) region. The continuation of this project is critical to the evolution of black sea bass assessment and management efforts by the Atlantic States Marine Fisheries Commission, Mid-Atlantic Fisheries Management Council, Northeast Fisheries Science Center, and Atlantic Coastal Cooperative Statistics Program as the Black Sea Bass Research Fleet produces spatially and seasonally distinct data for numerous commercial and recreational gear, which is currently lacking for this species.

Project components include: 1) Continue the existing fishery dependent data collection program that utilizes fishing vessels and specially designed sampling applications to collect and relay catch and bycatch data (number, length, sex, disposition) and fishery characteristics (location, gear type, effort, habitat) for black sea bass from across the SNE/MAB region throughout the year; 2) Internal data analysis to address research questions about spatiotemporal patterns in black sea bass biological and fishery characteristics and gear-specific selectivity; and 3) Communication of project data and results to the Atlantic Coastal Cooperative Statistics Program (ACCSP), black sea bass stock assessment scientists, managers, and members of fishing industry.

In summary, the general goals of the proposed project are:

- 1) Collect and communicate critically needed fishery dependent black sea bass data (catch and effort, bycatch, and biological) in a cost-effective way using modern electronic technology and fishermen's time on the water;
- 2) Contribute to the evolution of the northern Atlantic black sea bass stock assessment and associated management measures;
- 3) Demonstrate a model for fishery dependent data collection, management, analysis, and utilization that can be duplicated in a cost-effective way in other regions of the black sea bass range and in other fisheries.

Specific objectives include the following:

- Continue the Black Sea Bass Research Fleet for an additional 12 months to further refine seasonal characterizations of northern Atlantic black sea bass biology and distribution;
- Collect fishery dependent black sea bass data from five gear types (trawl, lobster/crab pot, fish pot, gillnet, rod and reel) across the SNE/MAB region to characterize the size and sex distributions of black sea bass catch and bycatch and investigate the spatial and temporal trends of the fishery;
- Maintain and evolve the On Deck Data app to meet the data needs of scientists and the logistical needs of participant fishermen;
- Communicate black sea bass biosamples data to ACCSP every six months;
- Conduct internal analyses of the project database to: 1) Assess the selectivity and CPUE of five gear types in the SNE/MAB region and explore temporal variability, and 2) Further monitor and assess spatial and temporal trends in species' catch and bycatch composition and fishery characteristics;
- Further refine gear-specific fishery dependent indices that utilize different data error structures, standardization techniques, and Bayesian applications;
- Communicate to a broad audience the benefits and inherent value in this type of collaborative data collection program.

Need:

As asserted in the ACCSP Biological Review Panel's biological sampling priority matrix, black sea bass is identified as a top priority for data collection, receiving the highest total priority ranking for inadequate biological sampling as well as being a high priority for managing stakeholders (ASMFC, NMFS, and state agencies) (ACCSP 2019). The lack of adequate data for northern Atlantic black sea bass is an issue of regional importance, as this highly valuable stock ranges from Cape Hatteras to the Gulf of Maine (Musick & Mercer 1977, Moser & Shepherd 2009). In part due to the dearth of data throughout the black sea bass range, assessment and management efforts have been slow to react to the shifting distribution and growing abundance of the species (Bell et al. 2014, NEFSC 2017). As stated by ASMFC (2019), high priority data needs for black sea bass include: increased sampling of commercial landings and sample size of observed charter trips. The Black Sea Bass Research Fleet has, and will continue to with continued funding, provide exactly this type of information. Ultimately, cost-effective sampling programs, such as the Black Sea Bass Research Fleet, are needed to collect these data on regional scales and inform and evolve the stock assessment to consider the complex life history and ever evolving spatial structure of black sea bass.

Fishery dependent data has become an important source of information that is used as a term of reference for many stock assessments, but in the case of the northern Atlantic black sea bass stock, the data generated by the Black Sea Bass Research Fleet serves as the only systematically collected fishery dependent data source with a focus on the data being used in the assessment process. Thus, this project seeks to strengthen the fishery dependent data for this population in an effort to provide better information from across the temporal and spatial distribution of this species.

As such, the ACCSP Biological Review Panel identified expanded collection of biological data as a top priority for improving the black sea bass stock assessment (ACCSP 2019).

Other regions have adapted sampling and analytical techniques to better fit the life history and habitat associations of the black sea bass (Southern Atlantic and Gulf of Mexico stocks). These stock assessments rely heavily on fishery-dependent indices of abundance (SEFSC 2013). Such fishery-dependent indices of abundance, however, have not yet been developed for the northern black sea bass stock due to insufficient data, but will become possible if the Black Sea Bass Research Fleet is able to amass a robust time series of data. This project aims to address this need by maintaining the existing Black Sea Bass Research Fleet to conduct year-round biological sampling of black sea bass catch and bycatch within the trawl, lobster/crab, fish pot, gillnet, and rod and reel fisheries in the SNE/MAB region.

Ultimately, the proposed project will help meet ACCSP's mission of improving data quality for fisheries science. In addition, this project, and its integration with the ACCSP data housing program, will lend to the other mission of the ACCSP, namely by contributing to a single data

management system that will meet the needs of fishery managers, scientists, and fishermen. Collecting timely scientific data across a species range is imperative for successful fisheries management, as more robust data enables fisheries science to be as comprehensive as possible, which in turn supports informed and efficient decision making by managers. Furthermore, stock assessment scientists rely on robust biological, catch and effort, and bycatch data to help improve the quality of stock assessments. In these ways, the proposed project meets all of the main elements of the mission of ACCSP.

Results and Benefits:

The results of the proposed project include:

- Improved quality, quantity, and timeliness of biological, catch and effort, and bycatch data for the northern Atlantic black sea bass, made available via the ACCSP;
- A vetted source of year-round black sea bass data that can be used to inform the stock assessment and management of this data poor species;
- Coordinated data transmission procedures with the ACCSP that follow the CFRF's existing data communication practices with ACCSP;
- A demonstrated, cost effective, method to collect data for a commercially and recreationally important species from areas and times of year not accessed by existing survey programs;
- Improved collaboration and trust between fishermen, scientists, and managers;
- Improved accuracy and credibility of the stock assessment and management plan for the northern Atlantic black sea bass stock;

The benefits of the proposed project are:

- Address priorities of ACCSP by providing critically needed black sea bass data from the SNE/MAB region to support assessment and management efforts that reflect the current state of the resource;
- Provide an efficient and constructive way for fishermen to be involved in the scientific process by using modern technology to collect quantitative black sea bass data during routine fishing practices;
- Fill black sea bass data gaps in areas, habitats, and times of year not covered by standard survey techniques;
- Evolve and improve the black sea bass stock assessment by providing expanded biological data from retained and discarded black sea bass from a variety of gear types;
- Support regional science and management agencies, including ACCSP, ASMFC, MAFMC, and state agencies in their efforts to sustainably manage the black sea bass resource;
- Support diversification and resilience of fishing communities in the many states across the Atlantic coast with a black sea bass fishery;
- Provide a model for cost-effective fishery dependent data collection efforts in other regions and fisheries.

- Build strong working partnerships between fishermen, scientists, and managers that will contribute to the sustainable management of the nation’s living marine resources;
- Build confidence in the efficacy of the northern Atlantic black sea bass stock assessment and management process.

Data Delivery Plan:

An important component of the proposed project is the compilation and communication of fishery and biological data to the ACCSP, participant fishermen, stock assessment scientists, and management teams. The CFRF will maintain the black sea bass database for internal project analyses (described below) but will also regularly share the project data with other users, regardless of any internal publication endeavors.

Copies of the black sea bass database will continue to be sent semi-annually (every six months) to the ACCSP. These data will be made available in a format that is compatible with the ACCSP database to encourage data be readily used in the black sea bass stock assessment and other analyses. Data submissions to the ACCSP will build upon the established procedures from the first four years of the project. All data provided to the ACCSP will match ACCSP data collection standards and any requested and available metadata will be provided. At the end of the project, data will also be made available to fishery scientists at the NMFS Northeast Fisheries Science Center. A vessel ID system will be used to maintain the confidentiality of participant fishing vessels. The CFRF will maintain open communication with the ACCSP data coordinator and will remain available to provide any necessary metadata along with data submissions.

In an effort to provide regular feedback to fleet participants, the project team will compile and distribute individual data reports every three months (quarterly). Vessel-specific data reports will include the following summary statistics: number of catch sampling sessions, amount of effort sampled (number of trawls, hooks, traps), average depth of sampling, percentage of black sea bass catch retained for sale, percentage of black sea bass catch discarded, number of black sea bass biologically sampled, sex distribution of black sea bass sampled, minimum/maximum length of black sea bass sampled, and average length of black sea bass sampled. Additional summary statistics will be available upon request. Data reports were compiled and distributed to Research Fleet participants following the above-mentioned quarterly time frame and content guidelines throughout the entirety of past project sampling.

Completed Data Delivery to ACCSP:

During the first funding year of the project, the CFRF and RI DEM worked with the ACCSP Data Coordinator, Julie Defilippi Simpson, to coordinate data formats, metadata, and delivery procedures for the Research Fleet’s black sea bass biosamples data. As a result of these efforts, all black sea bass biosamples data collected to date through the funded project have been incorporated into the ACCSP black sea bass biosamples database. The CFRF has maintained the semi-annual data submission to the ACCSP and submits data in June and December of each

sampling year. The project team will maintain a semi-annual data delivery schedule to ACCSP throughout the proposed project following the same data formats and standards previously established.

Currently, the Research Fleet collects a suite of effort data alongside all biosamples data. To present, the effort data has not been included with past data submissions as the biosamples database at ACCSP was not set up for its inclusion. Efforts will be made by the CFRF and RI DEM to incorporate and share all effort data, including retroactively, with the ACCSP.

Approach:

The proposed project seeks to collect, communicate, and analyze critically needed catch, bycatch, and biological data for incorporation into the ACCSP biosamples database and ultimate application in the northern Atlantic black sea bass stock assessment. Project components include: 1) Maintenance of the current Black Sea Bass Research Fleet; 2) Collection of fishery-dependent biological (catch and bycatch) black sea bass data and fishery characteristics for 12 months in the SNE/MAB region; 3) Internal data analysis to address research questions about spatiotemporal patterns in the black sea bass population and fishery; 4) Compilation and communication of project data and results to ACCSP, stock assessment scientists, and fisheries managers; and 5) Outreach and education activities to share findings. Methodological details are outlined below.

Maintenance of Black Sea Bass Research Fleet and Data Collection App:

During the first funding year of this project, the CFRF and RI DEM were successful in developing the Black Sea Bass Research Fleet for fishery dependent data collection, including the development of a Project Steering Committee, solicitation and selection of participant fishing vessels, development of the On Deck Data app and SQL database, refinement of sampling protocols, construction of sampling equipment, training of Research Fleet participants, on-time initiation of data collection, data delivery to ACCSP and professional and industry outreach. The project was implemented by the PIs, CFRF staff, and a Project Steering Committee, which consists of members of the fishing industry as well as state and federal fisheries scientists and managers. Currently the project is run by the PIs and CFRF staff and the project steering committee serves in an advisory role and provides feedback on project progress and major milestones as needed. More information about the accomplishments of the project are available on the project website: www.cfrfoundation.org/black-sea-bass-research-fleet.

If funded, during the fifth year of the project, the CFRF and RI DEM will maintain all fishing vessels supported through year-4 funding from ACCSP. It is important to maintain the current members of the Research Fleet for as long as possible. Ultimately, when data will be applied to the stock assessment or validated in regards to other sources of black sea bass data, having participation from the same vessels throughout the time series will allow project staff to investigate potential vessel effects evident in the data. When possible, and if funds permit, the Research Fleet may be expanded in the same manner, through open application calls, for new

vessels. The sampling rate of the Research Fleet is dictated by the highly seasonal variation of black sea bass catch and bycatch in various fisheries across southern New England. As a result, the sampling rate by the Research Fleet fluctuates from year to year. If funds become available due to normal fluctuations in the Research Fleet, project Co-PIs will evaluate the possibility of expanding the Fleet to include more vessels.

The black sea bass data collection app, On Deck Data, was developed during the first year of the project to enable Research Fleet participants to collect standardized black sea bass data as well as day-to-day observations. On Deck Data prompts participant fishermen to record a suite of session data (location, depth, habitat type, etc.), effort data (mesh size, length of trawl, hooks fished, etc.), and biological data (length, sex, disposition) while at sea. To account for the multi-gear nature of the black sea bass fishery, On Deck Data prompts gear-specific data entry for Research Fleet participants (Table 1). On Deck Data was originally launched during the first year of the project and has received various improvements and quality of life updates in each funded year since to streamline data collection.

Table 1. Summary of fishing effort data collected by the Black Sea Bass Research Fleet.

Trawl	Gillnet	Commercial Rod & Reel	Charter	Lobster/Crab Traps	Fish Pot
Mesh Size (inches)	Number of Net Panels Per String	Time Spent Fishing (hours)	Time Spent Fishing (hours)	Soak Time (days)	Soak Time (days)
Tow Time (hours.decimal)	Length of Net Panels (feet)	Number of Rods Fished	Number of Rods Fished	Number of Traps	Number of Traps
Sweep Length (feet)	Mesh Size (inches)	Humber of Hooks Used	Number of Hooks Used	Escape Vent Size (inches)	Escape Vent Size (inches)
	Soak Time (days)			Escape Vent Shape	Entrance Size (inches)
	Net Height (feet)				
	Tie Downs (inches)				

On Deck Data will be maintained throughout the proposed project to allow for efficient data collection and wireless data submission by Research Fleet participants. The CFRF and RI DEM will continue to work with an application developer to address any issues that arise and to update On Deck Data to maintain functionality. Application maintenance is a constant task, as tablets regularly receive operating system updates that may impact On Deck Data functionality. On Deck Data has to receive regular updates to specifically allow for compatibility with

accessing and uploading data via wireless internet on new version of the Android operating system. Further, as tablet models receive minor hardware changes between annual models reformatting some screens of On Deck Data to display properly across multiple tablet models is anticipated.

The Black Sea Bass Research Fleet will continue to follow the fishery-dependent sampling protocols implemented during the first year of the project to collect catch and effort, biological, and bycatch data from the SNE/MAB region. The percentage of project effort devoted to each of these modules is as follows: Catch and Effort 25%, Biological 50%, Bycatch 25%. The estimated project effort devoted to biological sampling reflects the collection of black sea bass length and sex data by participant vessels during three trips per month for 12 months. The intention of data collection is to provide a biological characterization of the catch and discards of black sea bass from a variety of gear types in the SNE/MAB regions. The estimated effort devoted to the catch and effort module is based upon sampling during the open black sea bass fishing season, sub periods open to commercial fishery exist nearly year-round. Further due to the multi-gear nature of the Research Fleet, every vessel interacts with black sea bass as targeted catch or bycatch differently even during open periods. Finally, the project effort allocated to the bycatch module reflects sampling efforts conducted while the commercial black sea bass fishing season is closed and while participant vessels are targeting other species. Due to the low daily allocation through the summer and fall seasons in Rhode Island, there is still a large portion of bycaught black sea bass sampled after vessels have hit their daily limits.

Fishery-Dependent Data Collection:

The Black Sea Bass Research Fleet started collecting data on November 30, 2016 and, if this proposal is funded, will continue to do so, utilizing the established sampling protocols and procedures, through at least July 31, 2022. The Black Sea Bass Research Fleet currently consists of fourteen fishermen based in Rhode Island, chosen strategically to provide data coverage from across the SNE/MAB region, throughout the year, from a variety of gear types: F/V Excalibur (Offshore Trawl), F/V Johnny B (Fish Pot, Rod & Reel, Lobster Pot), F/V Laura Lynn (Fish Pot, Rod & Reel, Lobster Pot), F/V Matrix (Lobster/Crab Pot), F/V Nancy Beth (Gillnet), F/V Priority Too (Rod & Reel, Charter), F/V Second Wind (Offshore Trawl), F/V Sweet Misery (Gillnet, Lobster Pot), F/V Lady Clare (Lobster Pot), F/V Debbie Sue (Trawl), F/V Harvest Moon (Fish Pot, Lobster Pot), F/V X-Terminator (Fish pot, Gillnet), F/V Blue Label (Fish Pot, Gillnet), and F/V Brooke C (Lobster/Crab pot, Fish Pot, Scallop Dredge) . The majority of samples have originated from statistical areas 537 and 539 as these two statistical areas exclusively cover the fishing grounds of the F/V Johnny B, F/V Laura Lynn, F/V Matrix, and F/V Priority Too, all of which are either seasonal fishing vessels or do not interact with black sea bass in the winter. The majority of inshore lobster, fish pot, rod and reel and gillnet samples come from the end of spring through the end of the fall when black sea bass are in highest abundances inshore in statistical areas 537 and 539. The F/V Second Wind and the F/V Excalibur fish further south than the above-mentioned vessels and interact with black sea bass year-round but primarily during the winter, however various vessel repairs and unrelated injuries have reduced the amount of data collected by these two vessels. The F/V Lady Clare and F/V Brooke C fish

offshore and interact with black sea bass heavily in the winter and spring months, however encounters them less frequently through the summer and fall. The F/V X-Terminator and F/V Blue Label both fish seasonally and mostly inshore in stat area 537 and were brought into the Fleet to expand the number of gear replicates in the gillnet and fish pot fisheries. F/V Debbie Sue, fishes the further south of all Research Fleet Members and consistently completes trips into the MAB region south of Hudson Canyon. In total, the Black Sea Bass Research Fleet has sampled black sea bass from 9 distinct statistical areas, 537, 539, 616, 613, 611, 615, 533, 525, and 622.

Participant fishermen will use Samsung Tab A tablets pre-programmed with On Deck, described above, to efficiently and accurately record and transmit fishery dependent data. As such, the proposed project will advance the use of electronic technology in at-sea biological data collection, management, and analysis efforts.

The goal for each participant is to conduct at-sea catch sampling sessions during three fishing trips each month (Nelson 2014). Thus, the black sea bass research fleet will aim to sample 42 trips per month, for a total of 504 trips over twelve months. Given the population inferences implied in the project objectives and the aggregating nature of black sea bass, a biological sampling (length/sex) minimum of 50 black sea bass per location will be the required (Zhang & Cadrin 2012). With a goal of sampling three locations per month, the Research Fleet may sample up to 21,600 black sea bass over the course of the year.

The realized sampling frequency, however, will be dependent on a variety of factors, including weather, seasonal black sea bass distribution, and fishery closures. Further, due to the high seasonality of a large portion of the Black Sea Bass Research Fleet, fishery sampling frequency exhibits high seasonal fluctuations. Due to the multi-gear nature of the Research Fleet, the proposed sampling targets do not adequately represent the fishing schedules for each gear type. For example, due to the low daily catch limit (50 pounds per day per vessel for most of the year) in Rhode Island for black sea bass if a fishing vessel is only targeting black sea bass on a day trip and the limit is caught, all fishing ceases. This leads to instances where sampling 50 black sea bass per location becomes unfeasible as fishing may have already stopped prior to landing 50 black sea bass. Further, many of the larger trip vessels are mainly retaining their daily or trip limits of black sea bass from bycatch while targeting other species, which again leads to instances of fishing ceasing prior to 50 black sea bass caught. However, the goal of sampling 150 black sea bass per month remains to ensure statistical power. Vessels may sample fewer fish from more than three locations to reach the 150 fish per month target. Further, the same scenario occurs in highly mobile fishing gears, such as charter and commercial rod and reel, which will often change locations prior to catching 50 black sea bass. Both instances may lead to the potential for more numerous sampling locations with fewer fish from each location. Finally, the maximum target of 21,600 black sea bass would only be achievable if all Research Fleet participants operated year-round. Since many of the gear types represented within the Research Fleet stop fishing for the winter months, the realized sampling numbers are lower.

At each sampling location, participant fishermen will use On Deck Data to record the date, time, location, statistical area, depth, habitat type, target species, gear type, effort deployed (see Table 1), total number/pounds of black sea bass retained and discarded, and length, sex, and disposition of at least 50 black sea bass. Sampling date, time, and location will be automatically recorded by the internal tablet GPS. Standardized fish measuring boards will be used across the Research Fleet to ensure a consistent measure of fish length to the nearest centimeter. Data will be wirelessly uploaded to a MySQL database once a vessel returns to port and continually monitored by the project team. This data communication, review, management, and storage process was established and vetted during the first year of the project and has been implemented in each year since.

As outlined above, all participant fishermen will aim to sample black sea bass during three fishing trips per month regardless of black sea bass fishery closures. Thus, each fishing vessel will need an exempted fishing permit to retain black sea bass on deck for biological sampling when the commercial fishing season is closed and operating in Federal water. Scientific collector's permit, issued by RI DEM, will also be required for vessels fishing within state waters. These permits were successfully acquired multiple times during the first funding years of the project and will be extended through subsequent years of data collection and expanded to cover new Research Fleet participants.

Internal Data Analysis:

As described above, the Black Sea Bass Research Fleet was able to operate effectively and deliver data in an efficient manner during the first three years of data collection, sampling over 22,637 black sea bass from 1621 locations between Narragansett Bay to the northern end of the MAB and east to George's Bank from November 30, 2016 to June 1, 2020. These data are summarized in the Table 2. The ultimate application of these data will be the black sea bass stock assessment. To achieve this goal, the project team has worked directly with steering committee members and black sea bass stock assessment scientists (Gary Shephard, NEFSC; Steve Cadrin, SMAST) since the beginning of the project to ensure that Research Fleet data is of the necessary quality and structure for utilization in the stock assessment. Communication with the above listed stock assessment scientists will continue with the proposed project. Work with the stock assessment scientists will be focused on directly incorporating the Research Fleet data into the stock assessment, creating in depth gear selectivity models for the gear types represented within the Research Fleet and exploring the creation and incorporation of CPUE indices of abundance(including gear specific indices), both of which could be directly utilized in the stock assessment. Further, the proposed work will include gear specific discard characterizations describing the length frequencies of discarded black sea bass from each gear type through both time and space, with the intention of providing a more accurate black sea bass discard rate for the stock assessment.

Table 2. Summary of data collected by the Black Sea Bass Research Fleet as of June 1, 2019.

Total Black Sea Bass Sampled	22,637
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Percent Male	30%
Percent Female	42%
Percent Unknown	28%
Minimum Size (cm)	2
Maximum Size (cm)	63
Average Size (cm)	31.6
Percent Discarded	69%
Percent Retained	31%

In addition to the application of biological black sea bass data to the stock assessment, the data derived from the Black Sea Bass Research Fleet could also be used to characterize the catch, bycatch, and other characteristics of black sea bass in the SNE/MAB region, including gear selectivity and spatiotemporal patterns in catch composition. An additional 12 months of sampling by the Research Fleet will provide a better understanding of these seasonal and spatial dynamics as the data will now become the first multi-gear, multi-year, time series for the species.

The data collected during the previous funding years of the project exhibit interesting biological and fishery trends that will continue to be monitored in subsequent years of sampling for the proposed project. The high frequency of legal-sized, discarded, black sea bass suggests black sea bass are primarily being discarded due to seasonal closures and/or low daily limits and not due to the minimum size limit (Figure 1). The range of the discarded length further supports this, showing that even the largest of sampled black sea bass (receiving the highest market value) are often discarded.

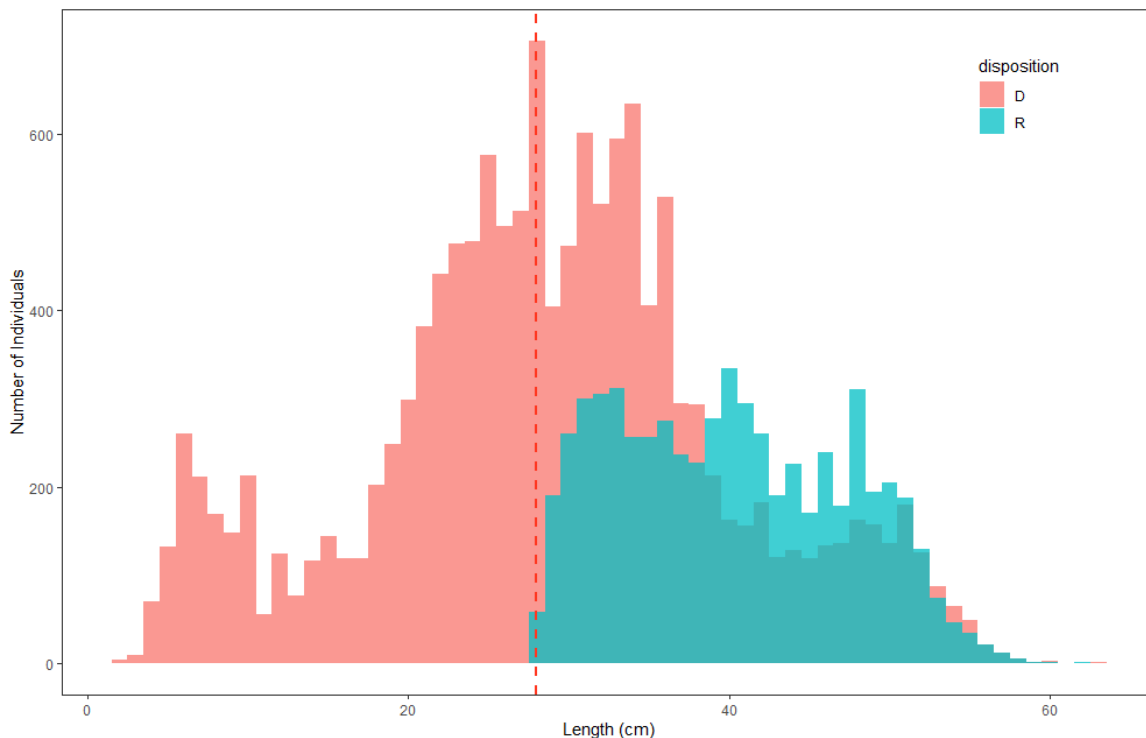


Figure 1. Size spectra of black sea bass sampled by the Research Fleet from November 30, 2016 to June 1, 2020. Red bars indicate discarded (D) fish. Blue bars indicate retained (R) fish. Red-dashed line represents the Rhode Island minimum legal size of 11 inches (27.94 cm).

When comparing gear selectivity between the different gear types represented within the Research Fleet, trends between discarded and retained black sea bass are apparent (Figure 2 and 3). Trawl gear interacts with the largest range in sizes of black sea bass of all the gear types represented. Rod and reel (commercial and charter), fish pot, and lobster pot all exhibited nearly as wide a range of size interaction with black sea bass as trawl gear types, however did not interact with the smallest of size classes of black sea bass as frequently and therefore had higher mean total length. Of the three gear types previously mentioned, rod and reel exhibited less variance in size interaction due to relative lower presence (and ultimately absence) of smaller size class of black sea bass. Gillnet appears to be in a distinct grouping of its own and exhibits the highest selectivity amongst all represented target gear types as well as interacting with the largest size classes of black sea bass exclusively. Conch pot and oyster aquaculture are similarly selective compared to gillnet gear however interact almost exclusively with the smallest size classes of black sea bass. Interestingly, in the previous year of data collection the Research Fleet sampled the first instances of black sea bass, of legal size, retained from conch pots.

These trends which have become apparent from just the first few funding years of sampling suggest there are gear specific size selectivity occurring in the black sea bass fisheries in the SNE/MAB regions. The proposed project will continue to track these trends as the time series builds with subsequent years of sampling. This type of information could have important

ramifications to the stock assessment as it could help inform the selection of fleets modeled within the assessment.

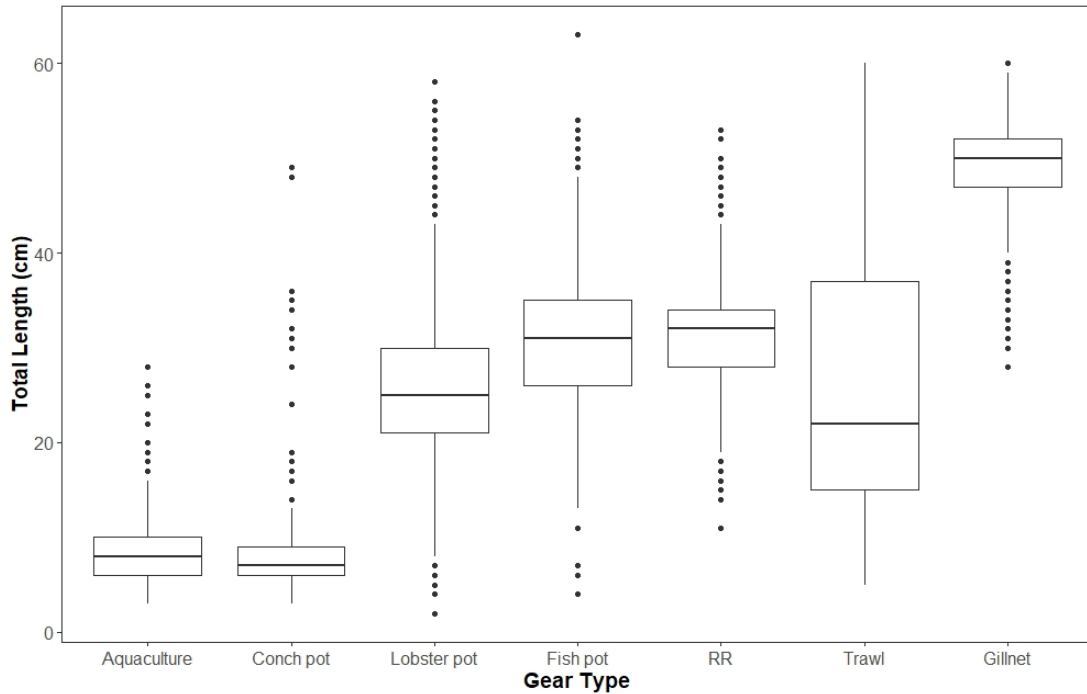


Figure 2. Size selectivity of discarded black sea bass sampled by each gear type represented within the research fleet. From left to right, gear types are as follow; oyster aquaculture, conch pot, lobster pot, fish pot, rod and reel (commercial and charter), trawl, and gillnet.

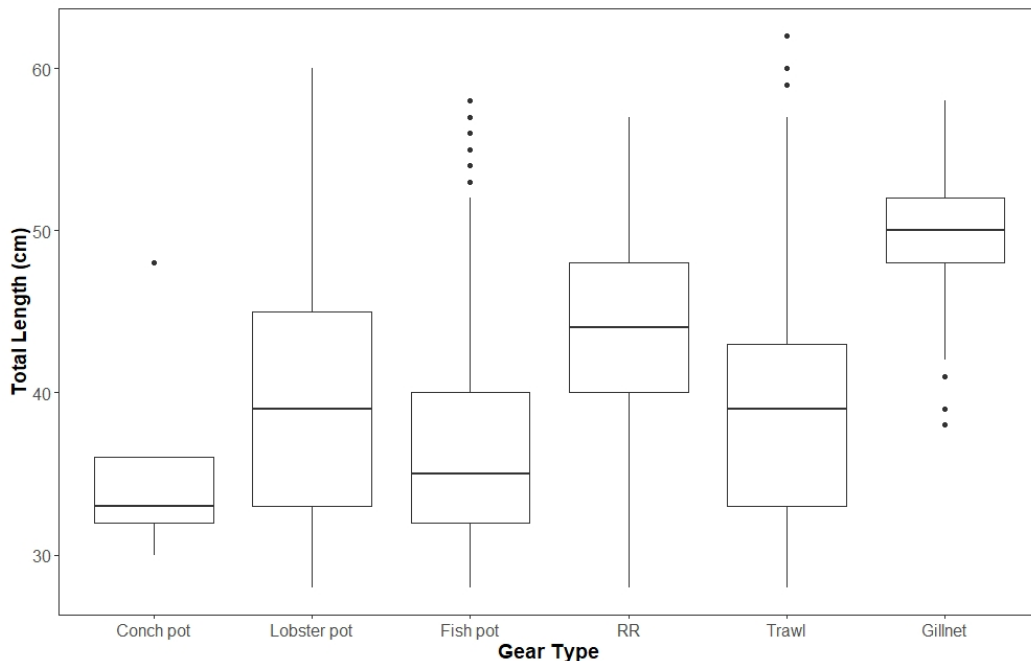


Figure 3. Size range of retained black sea bass sampled by each gear type represented within the research fleet. Note, aquaculture gear type is absent from this graph because no black sea bass have been retained from this gear type.

During the proposed year of the project, the project team will focus primarily on the refinement of analyses previously established for application to the stock assessment including: size spectra, sex ratios, catch per unit effort (CPUE), black sea bass retention and discard structure, seasonal activity of Research Fleet, and gear selectivity. Specifically, internal data analysis questions proposed during the past funded year of the project were: 1) Are there spatial (latitudinal) patterns in the length frequency or sex ratio of black sea bass?, 2) Are there seasonal differences in black sea bass catch composition (length frequency and sex ratio)?, 3) Are different life stages of black sea bass apparent in commercial fisheries catch in specific areas or at different times of year?, and 4) What is the selectivity (min, max, mean length) of different gear types (trawl, fish pots, gillnet, lobster/crab pot, rod and reel) that harvest black sea bass? Year-5 analyses will build upon the initial results from exploration of these questions. The establishment of gear type selectivity regressions comparing different gear types as well as multiple years of Research Fleet data will serve as the primary and direct input to the next black sea bass stock assessment.

The open-source statistical software package R will be used for data analysis. Length frequencies, black sea bass length gear selectivity, spatial and seasonal sex ratio regression models, and catch rate patterns will all be updated based on the protocols established in prior years of the project to further analyze seasonal trends as well as compare data from year to year.

In addition to further addressing the aforementioned research questions, the project team will also explore novel fishery dependent indices for the black sea bass stock assessment, as time permits. Building upon the analytical techniques established in prior years, data will continue to be standardized from the disparate gear types represented within the Research Fleet through generalized linear modeling approaches and/or hierarchical modeling techniques to allow for more direct communication into the black sea bass stock assessment.

Outreach and Education

Education, outreach, and ongoing communication are considered to be an integral part of the overall work plan for the proposed project. These components of the proposed project support the goal of fostering collaborative working partnerships among scientists, managers, and members of the fishing industry through all phases of research, from the fine-tuning of sampling strategies through the analysis and sharing of data and results.

The primary outreach/education goal of the proposed project is to share and disseminate information on two topics: 1) the lessons learned from the collaborative Research Fleet approach for fishery dependent data collection; and 2) the findings from analysis of the black sea bass catch, bycatch, and biological databases derived from this project.

A secondary goal is to share and disseminate project information to a variety of interest groups including: 1) commercial fishing industry members; 2) fisheries scientists and managers based in various state, regional, and federal agencies; 3) outside researchers who will utilize this information to inform their own research efforts in the region; and 4) other interested parties who are seeking information on new data collection/ocean monitoring techniques and approaches, and/or trends in black sea bass abundance and distribution in the SNE/MAB region.

There are a number of work elements embedded in the project work plan that are aimed at specifically addressing outreach and education goals, including:

1. Ongoing communication with project team members, including the members of the Black Sea Bass Research Fleet through personal meetings, group meetings, e-mail briefings, and phone conversations. Through prior funding years, annual Research Fleet meetings were held. The CFRF hosts all Research Fleet members, PIs, project staff, and steering committee members to receive feedback on the data collection process and present trends and analyses of the past years' worth of data. These Fleet meetings have been invaluable for receiving project feedback and as well as forming relationships between the fishing industry, managers, and scientists. The same annual Fleet meetings held through previous years of funding will be continued during the proposed project.
2. Periodic project briefings to key individuals outside the project team, including ASMFC, MAFMC, NMFS NEFSC, and NMFS GARFO staff, members of the black sea bass fishing fleet, and interested others through direct e-mail/mail correspondence, including periodic newsletters describing the project progress.
3. Regular postings of project information on the CFRF website, including descriptions of the fishermen involved, the equipment being used, the type of data being collected, and findings, as this information becomes available over the course of the project (www.cfrfoundation.org/black-sea-bass-research-fleet).
4. Organization of a research session at the end of the project involving managers, scientists, and members of the commercial and recreational fishing industries to share project findings and discuss experiences and results.
5. Issuance and distribution of a written summary report.
6. Participation in professional conference(s) to share project methods, findings, and conclusions.

Geographic Location:

At-sea sampling will be conducted within the northern Atlantic black sea bass stock area (SNE/MAB region), potentially including statistical areas 521 to 631. The final distribution of at-sea data collection will depend on the commercial fishing locations selected by participant fishermen. Project administration, and data management and analyses will be conducted at the Commercial Fisheries Research Foundation office in Kingston, Rhode Island and the RI DEM marine laboratory in Jamestown, Rhode Island.

Milestone Schedule:

Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13-15
Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Research Fleet data collection and Fleet support	Final report writing and submission of report and all project data to ACCSP
Apply for extended EFP	Distribute EFP to Fleet when obtained	Distribute EFP to Fleet when obtained		Apply for RI DEM Permits								
Maintain sampling gear and buy new sets	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear	Maintain sampling gear & collect after sampling	
Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	Maintain ODD, server, and database	
Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	Data QA/QC, review, and analysis	
		Quarterly reports to Fleet Members			Quarterly reports to Fleet Members			Quarterly reports to Fleet Members			Quarterly reports to Fleet Members	
				Submit data to ACCSP		Write progress report and submit to ACCSP				Submit data to ACCSP		
Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	Maintain project website and project outreach	

Project History Table:

<u>Funding Year</u>	<u>Title</u>	<u>Original Project Dates</u>	<u>Funded Amount</u>	<u>Total Project Cost</u>	<u>Description</u>
2016	Advancing Fishery Dependent Data Collection for Black Sea Bass (<i>Centropristis striata</i>) in the Southern New England and Mid-Atlantic Region Utilizing Modern Technology and a Fishing Vessel Research Fleet Approach	September 1, 2016 – August 31, 2018	\$137,827.00	\$203,072.00	Piloted the research fleet technique for collection of fishery dependent catch, effort, bycatch, and biological data in the multi-gear black sea bass fishery
2018	Advancing Fishery Dependent Data Collection for Black Sea Bass (<i>Centropristis striata</i>) in the Southern New England and Mid-Atlantic Region Utilizing Modern Technology and a Fishing Vessel Research Fleet Approach	May 1, 2018 – May 31, 2019	\$135,648.00	\$187,949.00	Maintained the research fleet fishery dependent data collection of catch, effort, bycatch, and biological data in black sea bass fishery and expanded Research Fleet by two fishing vessels
2019	Advancing Fishery Dependent Data Collection for Black Sea Bass (<i>Centropristis striata</i>) in the Southern New England and Mid-Atlantic Region Utilizing Modern Technology and a Fishing Vessel Research Fleet Approach	June 1, 2019 – May 31, 2020	\$132,749.00	\$169,033.00	Maintained the Research Fleet data collection of catch, effort, bycatch, and biological data in the black sea bass fishery in the SNE/MAB region and expanded the Research Fleet by two fishing vessels
2020	Advancing Fishery Dependent Data Collection for Black Sea Bass (<i>Centropristis striata</i>) in the Southern New England and Mid-Atlantic Region Utilizing Modern Technology and a Fishing Vessel Research Fleet Approach	June 1, 2019 – May 31, 2020	\$132,097.00	\$157,735.00	Maintained the Research Fleet data collection of catch, effort, bycatch, and biological data in the black sea bass fishery in the SNE/MAB region and expanded the Research Fleet by two fishing vessels

Project Accomplishment Measurement (Metrics and Achieved Goals):

Project Goal	Metric 1	Metric 2	Metric 3	Metric 4	Metric 5	Metric 6	Metric 7
Collection & communication of biological and fishery data for BSB	Upkeep of ODD, CFRF server, and MySQL database	Support of 14 Research Fleet Members	Twelve months of biological BSB and fishery data collection by Fleet	Collection of up to 25,200 BSB records, 504 record of catch/discards, and 504 session/effort data by Research Fleet	Transfer of collected data into MySQL database	Distribution of all quarterly reports to Fleet Members	Submission of biological and fishery data to ACCSP and other managers
Reduce uncertainties in BSB stock assessment	Increase number of gear replicates in non-trawl fishery	Provide BSB data from areas and times of year currently under sampled	Distribution of project data to managing stakeholders at federal, region, and local level	Utilization of data by BSB stock assessment working group	Explore fishery dependent index of abundance for BSB using Fleet data		
Asses spatial & temporal patterns in BSB fishery and catch	Analyze catch trends between years, gear types, and locations of Fleet sampling	Monitor discard structure between years within Fleet sampling	Monitor size and sex structure of retained BSB between sampling years	Monitor trends in length frequencies within gear types, locations and times of year	Add additional years of data to explore inter annual differences in length frequency	Update of BSB sex ratio logistic regression models from prior years	Develop manuscript for publication utilizing biological or fishery data from Fleet
Demonstrate model approach for cost efficient fishery dependent data collection	Usage of collaborative approach established in previous years	Presentations of Fleet design at scientific conferences	Develop manuscript to validate Fleet design through peer review				

Cost Summary and Funding Transition Plan:

This proposal represents a 0.1% (\$3) cost reduction from Year 4’s proposal of a similar scope. The drop is due primarily to a reduction in the research supplies cost, the ODD programmer cost, and an update to the CFRF personnel and Fringe Benefits to current staff rates. These changes are reflected in the CFRF sub-contract (section F of the Budget Table).

The CFRF and RI DEM have pursued funding from a variety of sources for the Black Sea Bass Research Fleet and will continue to do so to ensure the longevity and utility of the data collected to the management of this data poor species. Last year, the CFRF secured partial funding from the Sarah K. de Coizart Tenth Perpetual Charitable Trust to partially support

additional fishing vessels operating in the Research Fleet as well as to undertake laboratory sampling of black sea bass from the federal water, winter fishery. The awarded funds represent a willingness for the CFRF and RI DEM to search for external sources of funds to support the Research Fleet as well as an agreement by the management representatives on the steering committee and the industry collaborators that the project addresses important issues.

The CFRF no longer has internal funds to cover research projects or issue RFPs, as the multi-year NOAA awards that enabled the CFRF to operate such programs expired in December 2015. Since then, the CFRF has relied exclusively on competitive research awards to support all of its operations, collaborations, and research projects.

Budget Table:

		Year 5 (Maintenance)		
		Proposal	In-Kind	Total
TOTAL		\$ 132,064	\$ 22,473	\$ 154,537
% Contribution by Funding Source		85%	15%	100%
Object Class Category		Proposal	In-Kind	Total
A	Personnel			
	- RI DEM - Jason McNamee		\$ 5,347	\$ 5,347
	- RI DEM - Contractor		\$ 4,547	\$ 4,547
	- RI Dem - Intern		\$ 2,500	\$ 2,500
	Total RI DEM Personnel Costs	\$ -	\$ 12,394	\$ 12,394
B	Fringe Benefits	\$ -	\$ 4,214	\$ 4,214
C	Travel	\$ -	\$ -	\$ -
D	Equipment	\$ -	\$ -	\$ -
E	Supplies	\$ -	\$ -	\$ -

F	Contractual - CFRF			
	a. Personnel			
	- Executive Director - David Bethoney	\$ 11,440		\$ 11,440
	- Research Scientist - Thomas Heimann	\$ 28,125		\$ 28,125
	- Business Manager	\$ 4,575		\$ 4,575
	Total CFRF Personnel Costs	\$ 44,140	\$ -	\$ 44,140
	b. Fringe Benefits	\$ 3,973	\$ -	\$ 3,973
	c. Travel	\$ 3,000	\$ -	\$ 3,000
	d. Equipment	\$ -	\$ -	\$ -
	e. Supplies			
	- Research Supplies	\$ 1,000		\$ 1,000
	- Office Supplies	\$ 1,000		\$ 1,000
	Total Supplies	\$ 2,000	\$ -	\$ 2,000
	f. Contractual			
	- Programmer for On-Deck Data database	\$ 1,500	\$ -	\$ 1,500
	Total Contractual	\$ 1,500	\$ -	\$ 1,500
	g. Construction	\$ -	\$ -	\$ -
	h. Other Costs			
	- Fishing Vessel Stipends	\$ 55,440	\$ -	\$ 55,440
	- Executive Assistance	\$ -	\$ 2,500	\$ 2,500
	Total Other Costs	\$ 55,440	\$ 2,500	\$ 57,940
	i. Total Direct Charges	\$ 110,053	\$ 2,500	\$ 112,553
	j. Indirect Charges			
	- Proposed at 20% of CFRF Direct Charges	\$ 22,011	\$ 500	\$ 22,511
	Total Indirect Charges	\$ 22,011	\$ 500	\$ 22,511
	k. Total CFRF Costs	\$ 132,064	\$ 3,000	\$ 135,064
G	Construction	\$ -	\$ -	\$ -
H	Other Costs	\$ -	\$ -	\$ -
I	Total Direct Costs	\$ 132,064	\$ 19,608	\$ 151,672
J	Indirect Charges	\$ -	\$ 2,865	\$ 2,865
K	Total Proposal Costs	\$ 132,064	\$ 22,473	\$ 154,537

Budget Justification – Year 5 (Maintenance Project, Proposed):

The total proposed federal budget requested by the Rhode Island Department of Environmental Management (RI DEM) and the Commercial Fisheries Research Foundation (CFRF) for all components of the work is \$132,064 for 12 months. The voluntary non-federal match funds provided by the RI DEM and CFRF is \$22,473. The total proposal value is \$154,537. The proposed timeframe is August 1, 2021 to July 31, 2022.

The proposed budget justification for object class category items include the following:

- A. Personnel: \$12,394 In-Kind (RI DEM). RI DEM staff will play an advisory/support role in the proposed project, providing guidance on research protocols, assisting with statistical analyses as needed, exploring gear-specific indices of abundance and alternative modeling approaches as time permits, support in the procurement and storage of samples, and communicating project results to fishery governance system via existing participation in technical committees and working groups.
- B. Fringe Benefits: \$4,214 In-Kind (RI DEM). Fringe costs are charged on RI DEM FTEs only. RIDEM Annual Fringe benefit rates are:

Retirement 24%	Deferred Compensation 0.4%
FICA 6.2%	Medicare 1.45%
Health care \$21,937/year	Dental \$1,132/year
Vision Mercer \$165/year	Assessed Fringe 4.25%
Retiree Health 6.75%	
- C. Travel: There are no direct travel charges.
- D. Equipment: There are no direct equipment charges.
- E. Supplies: There are no direct supplies charges.
- F. Contractual: The CFRF will conduct most of the work involved in this project, with administrative and technical assistance provided by RI DEM as In-Kind. These services will be charged to the grant as contractual costs and are outlined below to provide more detail as to how the funding will be used:
 - a) Personnel: \$44,140 federal. This includes the wages for the following CFRF personnel for time spent working directly on the project:
 - 1. Executive Director – Proposed at 10% of time for 12 months = \$11,440.
D. Bethoney, CFRF Executive Director, will oversee the administration, team communication/coordination, and outreach aspects of the project. He will also assist with data analysis, report and outreach material development, and communication of project progress to the client, fishing industry and management communities.

2. Research Scientist – Proposed at 50% of time for 12 months = \$28,125.
T. Heimann, CFRF Research Scientist, is the primary individual responsible for fleet organization, maintenance, and support, as well as data management, communication, and analysis.
 3. Business Manager – Proposed at 10% of time for 12 months = \$4575.
T. Winneg, CFRF Business Manager, will carry out all the finance related aspects of the project including research budget tracking, invoice processing, and administrative support tasks, including purchasing supplies.
- b) Fringe Benefits: \$3,973 federal. This includes a percentage for payroll taxes and worker's compensation insurance prorated in accordance with % of salary paid from program. Benefits proposed at 9% of personnel costs based on 2019 benefits and historical analysis.
 - c) Travel: \$3,000 federal. Travel costs include travel support (mileage) for project staff to provide support at docks to Research Fleet participants, to participate in meetings with the Research Fleet, stock assessment scientists, and managers, and to participate in one industry/professional conference for two personnel to share and disseminate project methods, findings, and conclusions.
 - d) Equipment: \$0. There will be no equipment costs on this project.
 - e) Supplies: \$2,000 federal. This category includes research supplies and project office supplies.
 1. Research Supplies: \$1,000 - Costs of tablets, waterproof cases, stylus & fish measuring board. Proposed at \$500 per set x 2 vessels for the duration of the project. The two sets of sampling equipment for existing Research Fleet vessels are replacements for equipment that is damaged or lost.
 2. Office Supplies: \$1,000 – Costs to cover database storage and website fees (\$50/month), project office and meeting supplies, etc.
 - f) Contractual: \$2,000 federal. This includes costs associated with:
 1. Programmer (\$1,500 - federal) - CFRF hiring an outside computer programmer to maintain the OnDeckData application and database coding for data relay and storage, to address any issues that arise, and to update the app to maintain functionality.
 - g) Construction: There are no construction costs.
 - h) Other Costs: \$55,440 federal + \$2,500 match = \$57,940. This includes:
 1. Fishing vessel stipends (\$55,440 - federal) for 14 vessels for 12 months at \$600 per month. A fleet of 14 vessels will be utilized each month to obtain the proposed biological samples. The total stipend is computed at 55% due to fluctuations in

vessel sampling associated with weather, vessel maintenance, and seasonal black sea bass distribution.

2. Executive Assistance (\$2,500 - in-kind match) covers the administration assistance for the project (including, review of fleet applications and invoices, work agreements, progress/final reports) by the CFRF President and Vice President, who provide these services at no cost. Costs proposed at \$250 per day for 5 days for 2 people over the duration of the project.

i) Total Direct Charges: \$110,053 federal + \$2,500 in-kind = \$112,553 total. This is the total direct charges for cost items a-h.

j) Indirect Charges: \$22,011 federal + \$500 in-kind = \$22,511 total. Indirect general and administrative costs are calculated as 20.0% of Total Direct Charges. Indirect general and administrative costs are used to cover costs associated with the general operations of the CFRF including accounting services, legal services, maintenance of office space, liability insurance, payroll fees, phone/fax lines, internet service, board member participation, etc. The CFRF's FY2020 Indirect Cost Rate Proposal dated 12/30/19 is for 20.0% based on FY2019 actual costs.

k) Total Proposal Costs: \$132,064 Federal + \$3,000 In-Kind = \$135,064 Total.

G. Construction. There are no construction costs on this grant

H. Other Costs. There are no other costs associated with this grant.

I. Total Direct Charges: \$132,064 Federal + \$19,608 In-Kind = \$151,672 total. This is the total direct charges for cost items A-H.

J. Indirect Charges: \$3,099 In-Kind (RIDEM). Indirect charges are charged on RIDEM Salaries only. The Negotiated Indirect Cost Rate for FY2017 is 25%. (Total personnel is \$12,394 x 25% = \$3,099.)

K. Total Proposal Costs: \$132,064 Federal + \$22,473 In-Kind = \$154,537 Total.

Budget Justification – Year 4 (Maintenance Project, Proposed):

The total proposed federal budget requested by the Rhode Island Department of Environmental Management (RI DEM) and the Commercial Fisheries Research Foundation (CFRF) for all components of the work is \$132,097 for 12 months. The voluntary non-federal match funds provided by the RI DEM and CFRF is \$25,638. The total proposal value is \$157,735. The proposed timeframe is August 1, 2020 to July 31, 2021.

The proposed budget justification for object class category items include the following:

L. Personnel: \$12,394 In-Kind (RI DEM). RI DEM staff will play an advisory/support role in the proposed project, providing guidance on research protocols, assisting with statistical

analyses as needed, exploring gear-specific indices of abundance and alternative modeling approaches as time permits, support in the procurement and storage of samples, and communicating project results to fishery governance system via existing participation in technical committees and working groups.

M. Fringe Benefits: \$4,214 In-Kind (RI DEM). Fringe costs are charged on RI DEM FTEs only.

RIDEM Annual Fringe benefit rates are:

Retirement 24%	Deferred Compensation 0.4%
FICA 6.2%	Medicare 1.45%
Health care \$21,937/year	Dental \$1,132/year
Vision Mercer \$165/year	Assessed Fringe 4.25%
Retiree Health 6.75%	

N. Travel: There are no direct travel charges.

O. Equipment: There are no direct equipment charges.

P. Supplies: There are no direct supplies charges.

Q. Contractual: The CFRF will conduct most of the work involved in this project, with administrative and technical assistance provided by RI DEM as In-Kind. These services will be charged to the grant as contractual costs and are outlined below to provide more detail as to how the funding will be used:

l) Personnel: \$42,790 federal. This includes the wages for the following CFRF personnel for time spent working directly on the project :

1. Executive Director – Proposed at 10% of time for 12 months = \$9,350
2. Research Scientist – Proposed at 50% of time for 12 months = \$28,600.

The CFRF Research Scientist is the primary individual responsible for fleet organization, maintenance, and support, as well as data management, communication, and analysis.

3. Business Manager – Proposed at 10% of time for 12 months = \$4,840

m) Fringe Benefits: \$3,851 federal. This includes a percentage for payroll taxes and worker's compensation insurance prorated in accordance with % of salary paid from program. Benefits proposed at 9% of personnel costs based on 2019 benefits and historical analysis.

n) Travel: \$3,000 federal. Travel costs include travel support (mileage) for project staff to provide support at docks to Research Fleet participants, to participate in meetings with the Research Fleet, stock assessment scientists, and managers, and to participate in one

industry/professional conference for two personnel to share and disseminate project methods, findings, and conclusions.

- o) Equipment: \$0. There will be no equipment costs on this project.
- p) Supplies: \$3,000 federal. This category includes research supplies and project office supplies.
 - 1. Research Supplies: \$2,000 - Costs of tablets, waterproof cases, stylus & fish measuring board. Proposed at \$500 per set x 4 vessels (2 new vessels and 2 existing fleet vessels) for the duration of the project. The two sets of sampling equipment for existing Research Fleet vessels are replacements for equipment that is damaged.
 - 2. Office Supplies: \$1,000 – Costs to cover database storage and website fees (\$35/month), project office and meeting supplies, etc.
- q) Contractual: \$2,000 federal. This includes costs associated with:
 - 1. Programmer (\$2,000 - federal) - CFRF hiring an outside computer programmer to maintain the On Deck Data application and database coding for data relay and storage, to address any issues that arise, and to update the app to maintain functionality.
- r) Construction: There are no construction costs.
- s) Other Costs: \$55,440 federal + \$5,000 match = \$60,440. This includes:
 - 1. Fishing vessel stipends (\$55,440 - federal) for 14 vessels for 12 months at \$600 per month. A fleet of 14 vessels will be utilized each month to obtain the proposed biological samples. The total stipend is computed at 55% due to fluctuations in vessel sampling associated with weather, vessel maintenance, and seasonal black sea bass distribution.
 - 2. Executive Assistance (\$5,000 - in-kind match) covers the administration assistance for the project (including, review of fleet applications and invoices, work agreements, progress/final reports) by the CFRF President and Vice President, who provide these services at no cost. Costs proposed at \$250 per day for 10 days for 2 people over the duration of the project.
- t) Total Direct Charges: \$110,081 federal + \$5,000 in-kind = \$115,081 total. This is the total direct charges for cost items a-h.
- u) Indirect Charges: \$22,016 federal + \$1,165 in-kind = \$23,181 total. Indirect general and administrative costs are calculated as 20.0% of federally requested Total Direct Charges (\$110,081). Indirect general and administrative costs are used to cover costs associated with the general operations of the CFRF including accounting services, legal services, maintenance of office space, liability insurance, payroll fees, phone/fax lines, internet service, board member participation, etc. The CFRF's FY2019 Indirect Cost Rate Proposal dated 12/21/18 is for 20.15% based on FY2018 actual costs. The 0.15% indirect cost rate

differential is a voluntary nonfederal match by CFRF. CFRF has historically averaged around 20% of Indirect G&A which is proposed for this project.

- v) Total Proposal Costs: \$132,097 Federal + \$6,165 In-Kind = \$138,262 Total.
- R. Construction. There are no construction costs on this grant
- S. Other Costs. There are no other costs associated with this grant.
- T. Total Direct Charges: \$132,097 Federal + \$22,773 In-Kind = \$154,870 total. This is the total direct charges for cost items A-H.
- U. Indirect Charges: \$2,865 In-Kind (RIDEM). Indirect charges are charged on RIDEM Salaries only. The Negotiated Indirect Cost Rate for FY2018 is 17.25%. (Total personnel and Fringe is \$16,608 x 17.25% = \$2,865.)
- V. Total Proposal Costs: \$132,097 Federal + \$25,638 In-Kind = \$157,735 Total.

Summary of Proposal for Ranking Purposes

Type: Maintenance

Primary Program Priorities:

This project follows fishery-dependent sampling protocols to collect black sea bass catch and effort, biological, and bycatch data from the SNE/MAB region. The percentage of project effort devoted to each of these modules is as follows: 50% Biological, 25% Catch and Effort, 25% Bycatch. Thus, Biological sampling is the primary program priority. The estimated project effort devoted to biological sampling reflects the collection of black sea bass length and sex data by participant vessels during three trips per month for twelve months (approximately 504 trips and 25,200 black sea bass total).

Project Quality Factors:

Multi-Partner/Regional impact including broad applications:

The results of the proposed project have regional impacts and broad applications, as black sea bass are expanding to inhabit, and potentially be harvested from, the majority of the US east coast. Furthermore, the social and economic implications of this work could be extensive, as project data contributes to the improvement of the northern Atlantic black sea bass stock assessment and potentially the creation of new economic opportunities. From a collaboration perspective, this project provides a unique opportunity for the RI DEM and CFRF to maintain a fisherman-based research fleet to address ACCSP priorities, drawing upon networks of partners

in industry, fisheries research, and management. This project will help RI DEM and CFRF demonstrate that, with support from ACCSP, they have the ability to bring stakeholders together, outside of a contentious management environment, to collect, communicate, and analyze critically needed data to address the data needs of the data poor northern Atlantic black sea bass.

Greater than year 2 contains funding transition plan and justification for continuance:

This proposal is for a one-year study to continue an industry-based research fleet approach to biological, catch, and bycatch sampling for northern Atlantic black sea bass. The project has been successful through the first two years of funded work and has sampled over 14,000 black sea bass. Year 3 funding is expected to result in increased sampling rates and coverage as the Research Fleet will expand by two vessels while reducing overall costs. An additional year of funding would bolster the first year-round, multi-year database for this biologically data poor species. Ultimately, long term maintenance of this project will provide invaluable data to the ACCSP, ASMFC, and MAFMC, and improve the assessment and management of the northern Atlantic black sea bass resource. The CFRF and RI DEM have continued to apply for funding for this project through external sources and have already secured supplemental funding to partially support the Research Fleet as described above. Obtaining long-term funding for the Research Fleet is a top and ongoing priority for project PIs and staff.

In-kind contribution: The total project cost is \$157,735. In-kind contributions provided by RI DEM and CFRF total \$25,638. Thus, RI DEM and CFRF will provide 16% of total project costs.

Improvement in data quality/quantity/timeliness:

The proposed project addresses the critical need to improve the quality, quantity, and timeliness of biological, catch and effort, and bycatch data for the northern Atlantic black sea bass, which the ACCSP Biological Review Panel identified as having inadequate biological sampling and high stakeholder priority, resulting in the highest-ranking priority score. Ultimately, the proposed project will help to meet ACCSP's mission of improving data quality for fisheries science by contributing to a single data management system that will meet the needs of fishery managers, scientists, and fishermen.

Potential secondary modules as by-products:

The potential secondary modules are catch and effort (25%) and bycatch sampling (25%). The project effort allocated to the catch and effort module refer to the sampling that occurs while the fishery is open. Although the fishery is open for a large portion of the year, black sea bass is often caught and retained as a non-target species. The project effort allocated to the bycatch module reflects sampling efforts conducted while the commercial black sea bass fishing season is closed and while participant vessels are targeting other species but still interacting with black sea bass as bycatch.

Impact on stock assessment:

The northern Atlantic black sea bass stock assessment new model requires spatially and temporally comprehensive data that is currently lacking. Thus, the proposed project aims to provide critically needed biological data from retained and discarded black sea bass, and fishery data from a variety of gear types to continue to evolve and improve the black sea bass stock assessment. The project team will also explore novel fishery dependent indices for the black sea bass stock assessment, as time permits.

The Research Fleet collected data has the potential to directly improve the federal stock assessment in a number of ways including reducing the uncertainty in recruitment rates, gear type specific selectivity, and gear (and location) specific discard characterizations.

Currently, the indices of abundance relied upon in the black sea bass stock assessment come primarily from the NEFSC winter and spring trawl survey, Northeast Area Monitoring and Assessment Program (NEAMAP) survey trawls, recreational catch per effort, and is supplemented with various state trawl survey indices of abundance (NEFSC 2017). The utility of the Research Fleet data in this respect is to inform the management about catch and discard structure from a variety of gear types. Whereas the stock assessment currently only delineates between trawl and non-trawl gear types, after building a multiple-year time-series the Research Fleet data could potentially be utilized to create a variety of CPUE indices of abundance (trawl, gillnet, lobster pot, rod & reel, fish pot, and multigear). Further, the Research Fleet data has the potential to be directly used to create a discard characterization for the northern stock sub-unit and reduce uncertainties in the annual total fishery removals. Finally, due to the nature of the Research Fleet being comprised entirely of commercial fishing vessels, from a variety of gear types, the data collected is spatially and temporally expansive across the northern black sea bass sub unit in locations and times of year not covered by any of the federal or state survey programs utilized in the stock assessment. Therefore, there is the potential to reduce the uncertainties in recruitment rates within the northern sub unit as the Research Fleet is able to record presence and absences of juvenile and young of the year black sea bass in entirely unsampled locations and times of year.

Innovative:

The innovative and cost-effective nature of the proposed project, which relies upon collaboration between a Program partner and the fishing industry, can provide an opportunity for fishermen to constructively engage in the data collection process for black sea bass and provide a model for future data collection efforts in other regions and fisheries. In addition to demonstrating a novel sampling approach, the proposed project also leverages modern technology to improve the efficiency of data collection and communication.

Properly Prepared:

This proposal follows the guidelines provided in the ACCSP Funding Decision Document.

Principal Investigators:

The co-Principal Investigators of the proposed project are: Jason McNamee (Chief, RI DEM Marine Fisheries), David Bethoney (Executive Director, CFRF), and Thomas Heimann (Research Associate, CFRF). Curriculum vitae are provided in the following pages.

Jason McNamee will play an advisory/support role in this project, given his existing commitments at the RI DEM Division of Marine Fisheries. More specifically, Jason will provide advice for sampling protocols, act as a liaison to the existing black sea bass assessment/management infrastructure and assist with data analysis as his time permits (data review/analysis will primarily be the role of the CFRF Research Biologist). In his role as both a technical committee member, and having been a member of the contracted stock assessment team for the MAFMC, Jason McNamee will be able to help the project with capturing the correct information and making sure this information is formatted appropriately for inclusion in future northern Atlantic black sea bass stock assessment projects.

Dr. N. David Bethoney, Executive Director of the CFRF, will serve as the lead Co-PI for the proposed project. Dr. Bethoney will be responsible for overall projection direction and progress towards completing proposed objectives. Dr. Bethoney will be primarily responsible for overseeing proposed data analysis as well as dissemination of project results to the MAFMC and ASMFC. He will also assist in at-sea related research on an as-needed basis.

Thomas Heimann, CFRF, serves as the primary individual responsible for Research Fleet maintenance and support, as well as data management, communication, and analysis. Heimann has been the primary Research Administrator for the Black Sea Bass Research Fleet since its first year of funding starting in September 2016. Heimann has gained extensive experience with the work involved in initiating and supporting an industry-based research fleet and has formed a relationship with the current Fleet Members.

Jason Earl McNamee, PhD
519 Congdon Hill Rd
Saunderstown, RI 02874
Day Phone: 401-423-1943
Email: jason.mcnamee@dem.ri.gov

WORK EXPERIENCE

RI Department of Environmental Management 12/2002 - Present
Jamestown, RI US

Chief, Marine Resource Management

Duties:

- Management of the Marine Fisheries program for the RI Dept. of Environmental Management
- Management of a staff of 20 professionals in the field of marine fisheries
- Manage operating budgets for multiple federal grants and state accounts
- Creation of grant proposals for marine fisheries projects
- Management of the Ft Wetherill Marine Laboratory building and research vessels
- Membership on several technical panels: the New England Council Science and Statistics Committee (Chair), Atlantic States Marine Fisheries Commission Menhaden (chair), Tautog (chair), and Summer Flounder/Scup/Black Sea Bass technical and stock assessment committees, Biological and Ecological Reference Point committee
- Support to the RI Marine Fisheries Council
- Creation and administration of the RI Marine Fisheries Institute
- Principal investigator (PI) on the Narragansett Bay juvenile seine survey
- PI for the Narragansett Bay Menhaden monitoring program
- Small vessel operation
- Production and review of multiple annual technical and grant completion reports
- Perform stock assessment analyses

Skills developed: Personnel and budget management experience; Supervisory experience; Good statistical and computer skills (ADMB, R, Microsoft software, ADAPT, JMP, ASAP, Oracle Discoverer, web design); Species identification experience; Experience using water quality instrumentation (DO meter, pH meter, Gas Chromatograph, Conductivity meter, flow meter); GIS Experience (Arcview and R); Field work experience; Experience in the construction and maintenance of technical research equipment; Seine, fyke net, trawl net, gillnet, fish pot, and electroshock surveying; Small boat handling (State of Rhode Island and Coast Guard certified)
Supervisor's Name: Janet Coit
Supervisor's Phone: 401-222-4700 ext. 2409

RI Department of Environmental Management 4/2000 - 12/2002
Providence US

Senior Natural Resource Specialist

Duties: My duties were to perform all tasks necessary to conduct and complete a Total Maximum Daily Load reports including field work, data collection and processing, and writing of the report. I also participated with other staff to help in the completion of their reports.

Rhode Island Department of Environmental Management & Commercial Fisheries Research Foundation
ACCSP Funding Proposal (Maintenance Project – Year 5): Fishery Dependent Sampling for Black Sea Bass (*Centropristis striata*)
Proposal components that address the ranking criteria are underlined and a summary is provided on pages 22-25.

Skills developed: Good statistical and computer background (Microsoft software), Experience designing and implementing a personal research project, Experience preparing a federally approved Quality Assurance Protection Plan, Experience using water quality instrumentation (DO meter, pH meter, Conductivity meter), Experience in the collection of water samples for testing (biological and metals), GIS Experience (Arcview) Field work experience, Small boat handling (State of Rhode Island and Coast Guard certified), Experience in the preparation of a federally approved Total Maximum Daily Load report, Experience disseminating information to the public

Supervisor's Name: Christian Turner

Supervisor's Phone: unsure, no longer employed at RIDEM

EDUCATION

University of Rhode Island – Graduate School of Oceanography

Narragansett, RI US

PhD – 8/2018

Major: Biological Oceanography

Doctoral Dissertation Topic: Multispecies Statistical Catch-At-Age Model for a Mid Atlantic Species Complex

University of Connecticut

Groton, CT US

Masters of Science Degree - 6/2006

38 Semester Hours

Major: Biological Oceanography

University of Rhode Island

Kingston, RI US

Bachelor's Degree - 5/1996

136 Semester Hours

Major: Zoology

PROFESSIONAL PUBLICATIONS

- ASMFC Lobster stock assessment (2015), ASMFC Menhaden stock assessment (2004, 2012, 2015), ASMFC Tautog stock assessment (2006, 2011, 2015), NEFSC Summer flounder stock assessment (2011, 2013), NEFSC Scup stock assessment (2011, 2015), NEFSC Black sea bass stock assessment (2004, 2016), Interactions between the introduced Asian shore crab, *Hemigrapsus sanguineus*, and three common rocky intertidal littorine gastropods in Southern New England (MS Thesis).
- Taylor, DL, J McNamee, J Lake, CL Gervasi , and DG Palance. 2016. Juvenile winter flounder (*Pseudopleuronectes americanus*) and summer flounder (*Paralichthys dentatus*) utilization of Southern New England nurseries: Comparisons among estuarine, tidal river, and coastal lagoon shallow-water habitats. *Estuaries and Coasts*. 39:1505-1525.

Dr. NAIFF DAVID BETHONEY
Executive Director Commercial Fisheries Research Foundation
P.O. Box 278 Saunderstown, RI
401-515-4662, dbethoney@cfrfoundation.org

EDUCATION:

University of Massachusetts at Dartmouth School for Marine Science and Technology
PhD Dissertation: Understanding and avoiding River herring and American shad bycatch in the Atlantic herring and mackerel mid-water trawl fisheries.
Cum. GPA: 3.92 PhD Received 2013

MA Thesis: Association between diet and epizootic shell disease in the American lobster (*Homarus americanus*) around Martha's Vineyard
Cum. GPA: 3.93 M.S. Received 2010

Colby College - Waterville, ME
Major: Biology with Concentration in Environmental Science
Cum. GPA: 3.41, Cum Laude B.A. Received 2008

SEA Education Association of Woods Hole, MA Study Abroad: Fall 2006
Documenting Change in the Caribbean: Designed and implemented an original biological research project with practical application while at sea. Studied at Woods Hole, and sailed from St. Croix, USVI to Key West, Florida with research stops at Montserrat, Dominican Republic, and Jamaica.

WORK EXPERIENCE:

- Commercial Fisheries Research Foundation Spring 2020-Present

Executive Director: Responsible for overseeing foundation business manager, scientific staff, interns, and consultants to carry out all tasks associated with ongoing projects and general administration. In addition, responsible for pursuing new partnerships and projects, including proposal development and submission, under the advisement of the foundation Board of Directors.

- UMASS-Dartmouth School for Marine Science and Technology Fall 2008-Spring 2020

Research Assistant Professor, Fall 2014-Present: All responsibilities of research associate position related to drop camera and herring work with the ability to be lead principle investigator on research proposals and serve on student committees.

Research Associate, Summer 2013-Summer 2014: All responsibilities of research assistant position described below with management and development responsibilities for scallop drop camera and groundfish video surveys. Management responsibilities include equipment purchasing and maintenance and oversight of all technical operations and student involvement.

Research Assistant, Summer 2010- Spring 2013: Major responsibilities included coordinating River Herring bycatch avoidance program, assisting the Massachusetts Division of Marine Fisheries port side sampling program, and scallop drop camera survey at-sea data collection and analysis.

Graduate Research Assistant, Fall 2008-2010: Assisted with American lobster research including lobster husbandry, measuring and photographing lobsters, collecting larvae, and setting up housing apparatuses.

SCIENTIFIC JOURNAL PUBLICATIONS IN LAST 3 YEARS:

1. Stokesbury KDE and Bethoney ND. 2020. How many sea scallops are there and why does it matter? *Frontiers in Ecology and the Environment*. In Press.

Rhode Island Department of Environmental Management & Commercial Fisheries Research Foundation
ACCSP Funding Proposal (Maintenance Project – Year 5): Fishery Dependent Sampling for Black Sea Bass (*Centropristis striata*)
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2. Bethoney ND and Stokesbury KDE. 2019. Implications of extremely high recruitment: crowding and reduced growth within spatial closures. *Marine Ecology Progress Series* 611:157-165.
3. Bethoney ND, Cleaver C, Asci SC, Bayer SR, Wahle RA, Stokesbury KDE. 2019. A comparison of drop camera and diver survey methods to monitor Atlantic sea scallops (*Placopecten magellanicus*) in a small fishery closure. *Journal of Shellfish Research* 38(1):43-51.
4. Stokesbury KDE, Bethoney ND, Georgianna D, Inglis S, Keiley EF. 2019. Convergence of a disease and litigation leading to increased scallop discard mortality and economic loss in the Georges Bank, USA fishery. *North American Journal of Fisheries Management* 39(2):299-306.
5. Bethoney ND and Stokesbury KDE. 2018. Methods for image-based surveys of benthic macroinvertebrates and their habitat exemplified by the drop camera survey of the Atlantic sea scallop. *Journal of Visualized Experiments* 137: DOI: 10.3791/57493.
6. Bethoney ND, Schondelmeier BP, Kneebone J, Hoffman WS. 2017 Bridges to best management: Effects of a voluntary bycatch avoidance program in a mid-water trawl fishery. *Marine Policy* 83: 172- 178
7. Bethoney ND, Zhao L, Chen C, Stokesbury KDE. 2017. Identification of persistent benthic assemblages in areas with different temperature variability patterns through broad-scale mapping. *PLoS ONE* 12(5): e0177333. <https://doi.org/10.1371/journal.pone.0177333>.

GRANTS RECEIVED AS A PRINCIPLE INVESTIGATOR IN LAST 2 YEARS:

- | | |
|--|---------------|
| 1. “FY 2020: Advancing Fishery Dependent Data Collection for Black Sea Bass (Centropristis striata) in the Southern New England and Mid-Atlantic Region Utilizing Modern Technology and a Fishing Vessel Research Fleet Approach”
Awarded from: Rhode Island Department of Environmental Management
Value: \$132,097 | March 2020 |
| 2. “SMAST drop camera survey of Patagonian scallop Management Unit B, 2019”
Awarded from: Clearwater Seafoods
Value: \$194,811 | August 2019 |
| 3. “SMAST Drop Camera of Brown Bank and the Canadian Portion of Georges Bank, 2019”
Awarded from: Clearwater Seafoods
Value: \$ 162,329 | July 2019 |
| 4. “SMAST drop camera of Vineyard Wind lease areas before development”
Awarded from: Vineyard Wind LLC
Value: \$ 243,888 | June 2019 |
| 5. “Drop camera surveys examining the scallop population and habitat of the Mid-Atlantic and assessment of automated scallop count and measurement algorithm”
Awarded from: National Oceanic and Atmospheric Administration
Value: \$ 242,440 | May 2019 |
| 6. “High-resolution drop camera surveys to track scallop aggregations in Closed Area I access area, Nantucket Lightship, and Great South Channel”
Awarded from: National Oceanic and Atmospheric Administration
Value: \$ 106,281 | May 2019 |
| 7. “Maintaining and expanding bycatch avoidance strategies in the mid-water trawl Atlantic herring fishery”
Awarded from: National Oceanic and Atmospheric Administration
Value: \$ 134,979 | February 2019 |
| 8. “SMAST Drop Camera of Brown Bank and the Canadian Portion of Georges Bank, 2018”
Awarded from: Clearwater Seafoods Value: \$ 146,398 | Sept 2018 |

Rhode Island Department of Environmental Management & Commercial Fisheries Research Foundation
ACCSP Funding Proposal (Maintenance Project – Year 5): Fishery Dependent Sampling for Black Sea Bass (*Centropristis striata*)
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Thomas E. Heimann

114 Olney Street Unit 1
Providence, RI 02906
(508)728 3401
theimann@cfrfoundation.org

EDUCATION

NORTHEASTERN UNIVERSITY
Master's: Marine Biology, Jan 2016

Boston, MA

PRESCOTT COLLEGE
B.A. Marine Science, May 2013

Prescott, AZ

RELATED WORK EXPERIENCE

Commercial Fisheries Research Foundation
Research Associate

South Kingston, RI
Sep 2016 – Present

- Research project management position working collaboratively with the Rhode Island fishing industry as well as state and federal fisheries management bodies. Responsible for management of both Black sea bass Research Fleet and Quahog Research Fleet as well as lead at-sea sampler for the Southern New England Cooperative Ventless Trap Survey. Duties include Fleet support and training, sampling protocol development, database management, data manipulation and statistical analysis, report writing, at-sea sampling on lobster vessels, grant writing, and outreach.

Northeastern University
Diving Research Methods Teaching Assistant

Nahant, MA
Sep 2015 – Oct 2015

- Employed by Northeastern University to be a teacher's assistant for an intensive American Academy of Underwater Sciences diving research methods course. Duties included demonstrating underwater research and diving skills, minor SCUBA gear maintenance and repair, and supervision of student divers.

Mote Marine Laboratory
Research Experience for Undergrads, National Science Foundation Intern

Sarasota, FL
May 2012 – Jul 2012

- Highly competitive National Science Foundation funded internship at Mote Marine Laboratory in Florida. Worked closely with a postdoctoral fellow on an independent research project in sensory biology and behavior of the common snook, a local sportfish. Project dealt specifically with the impacts of the hatchery rearing environment on the survival of released fish in the wild. Worked extensively with Microsoft Excel for data analysis.

Sheriff's Meadow Foundation
Ecological Stewardship Intern

Vineyard Haven, MA
May 2010 – Aug 2010

- Summer Intern position on Martha's Vineyard. Responsibilities included property management, boundary mapping, invasive species control, vegetation identification, and tour guide.

SCIENTIFIC PUBLICATIONS

Malek Mercer, A.J., Ellertson, A., Spencer, D., and **Heimann, T.** 2018. Fishermen fill data gaps for American lobster (*Homarus americanus*) and Jonah crab (*Cancer borealis*) in the Northeast USA. Bulletin of Marine Science, 94:3, pp 1121-1135.

SELECTED PRESENTATIONS

Heimann, T., McManus, C., Leavitt, D., Malek Mercer, A.J. 2018. Methods for Establishing a Quahog (*Mercenaria mercenaria*) Industry-Based Research Fleet for expansion of Fishery Dependent Data Sources. National Shellfisheries Association Annual Meeting. Seattle, Washington.

Heimann, T., McManus, C., Leavitt, D., Malek Mercer, A.J. 2018. Engaging Fishermen to Address Data Gaps and Evolve Management of the Quahog in Narragansett Bay. Southern New England Chapter of the American Fisheries Society Winter Meeting. New Bedford, MA.

Heimann, T., Malek Mercer, A.J., and McNamee, J. 2018. Advancing Fishery Dependent Data Collection for Black Sea Bass (*Centropristis striata*) in Southern New England and Mid-Atlantic Region Using a Fishing Vessel Research Fleet Approach. American Fisheries Society 148th Annual Meeting. Atlantic City, New Jersey.*

Heimann, T., Malek Mercer, A.J., and McNamee, J. 2019. Using Fishermen-Collected Data to Explore the Black Sea Bass (*Centropristis striata*) Population and Construct Gear-Specific Discard Characterizations. Southern New England Chapter of the American Fisheries Society Winter Meeting. Storrs, Connecticut.

Heimann, T., McManus, C., Leavitt, D., Malek Mercer, A.J. 2019. Quantifying Quahogs (*Mercenaria mercenaria*) in Narragansett Bay: Insights from a Collaborative Sampling Program. Southern New England Chapter of the American Fishery Society Winter Meeting. Storrs, Connecticut.

Heimann, T., Malek Mercer, A.J., and McNamee, J. 2019. Using Industry Collaboration to Improve Black Sea Bass Management. Wakefield Fisheries Symposium. Anchorage, Alaska.

CERTIFICATIONS AND SKILLS

- Statistical Language R (Commonly used packages; ggplot, shiny, sp)
- MySQL
- ArcGIS
- American Academy of Underwater Sciences Scientific Diver Certificate
- PADI Rescue Diver Certificate
- At-Sea Safety Training Certificate
- Experienced in Small Boat Operations

References:

- Atlantic Coastal Cooperative Statistics Program (ACCSP). 2018. Biological Sampling Priority Matrix. 4 p.
- Atlantic States Marine Fisheries Commission (ASMFC). 2013. Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management. Special Report # 89. ASMFC, Arlington, VA. 58pp.
- Bell, R. J., Richardson, D.E., Hare, J.A., Lynch, P.D., and Fratantoni, P.S. 2014. Disentangling the effects of climate, abundance, and size on the distribution of marine fish: an example based on four stocks from the Northeast US shelf. ICES Journal of Marine Science: fsu217.
- Drohan, A. F., J. P. Manderson, and D. B. Packer. 2007. Essential fish habitat source document: Black sea bass, *Centropristis striata*, life history and habitat characteristics. 2nd Edition. NOAA Technical Memo. NMFS-NE-200, 78 p.
- Moser, J., and G. R. Shepherd. 2009. Seasonal distribution and movement of black sea bass (*Centropristis striata*) in the Northwest Atlantic as determined from a mark-recapture experiment. Journal of Northwest Atlantic Fishery Science 40: 17-28.
- Nelson, G.A. 2014. Cluster Sampling: A Pervasive, Yet Little Recognized Survey Design in Fisheries Research. Transactions of the American Fisheries Society 143 (4): 926-938.
- Northeast Fisheries Science Center (NEFSC). 2011. 53rd Northeast Regional Stock Assessment Workshop (53rd SAW) Assessment Report. US Department of Commerce, Northeast Fish Science Center Reference Document 12-05; 559 p.
- Northeast Fisheries Science Center (NEFSC). 2017. 62nd Northeast Regional Stock Assessment Workshop (62nd SAW). Assessment Summary Report. US Department of Commerce, Northeast Fish Science Center Reference Document 17-01; 37 p.
- Musick, J. A., and L. P. Mercer. 1977. Seasonal distribution of black sea bass, *Centropristis striata*, in the Mid-Atlantic Bight with comments on the ecology of fisheries of the species. Transactions of the American Fisheries Society. 106: 12-25.
- Southeast Fisheries Science Center (SEFSC). 2013. Stock Assessment of Black Sea Bass off the Southeastern United States: SEDAR Update Assessment. 102 p.
- Steimle, F. W., C. A. Zetlin, P. L. Berrien, and S. Chang. 1999. Essential fish habitat source document: Black sea bass, *Centropristis striata*, life history and habitat characters. NOAA Technical Memorandum NMFS-NE-143: 1-42.
- Waltz, W., Roumillat, W.A., and P. K. Ashe. 1979. Distribution, age structure, and sex composition of the black sea bass, *Centropristis striata*, sampled along the southeastern coast of the United States. Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Department. Technical Report Number 43, December 1979.
- Zhang, Y. and S.X. Cadrin .2013. Estimating Effective Sample Size for Monitoring Length Distributions: A Comparative Study of Georges Bank Groundfish, Transactions of the American Fisheries Society 142 (1): 59-67.