



RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

3 Fort Wetherill Road, Jamestown, RI 02835

August 7, 2020

Julie Defilippi Simpson
Atlantic Coastal Cooperative Statistics Program
1050 N. Highland, Suite 200A-N
Arlington, VA 22201

Dear Mrs. Simpson,

The Commercial Fisheries Research Foundation (CFRF), the Rhode Island Department of Environmental Management (RI DEM), and the Martha's Vineyard Fishermen's Preservation Trust (MVFPT) have reviewed all questions and recommendations provided by the ACCSP Operations and Advisory Committees for our proposal titled "Implementing the Research Fleet approach to Improve Fishery-Dependent Data Collection for Channeled Whelk (*Busycotypus canaliculatus*) and Knobbed Whelk (*Busycon carica*) in Southern New England." The proposal has been revised accordingly and we have also briefly responded to each question and recommendation below:

1. Whelk C&E already collected in RI via logbook so emphasize the difference between proposal and what is already being collected.

We added an explanation of data collected through logbooks to pages 5 and 6 of the proposal. Currently both Rhode Island and Massachusetts only receive broad, trip level data from logbooks such as total pounds of whelk landed, number of traps hauled, number of traps in the water, and soak time. There is no biological data provided in those trip reports, such as size composition of catch, amount or size composition of discards, and no data collected on a per pot level.

2. Are fishermen on the steering committee? *Both fishermen and scientists. Concept of research fleet is to involved fishermen in the development. The Nature Conservancy is also committed to steering committee.*

Further explanation and description of steering committee members was added to pages 9 and 10 of the proposal. The CFRF board of directors is comprised of fishing industry members and at least one involved in or familiar with the whelk fishery will be offered a spot on the steering committee. Further, once the Research Fleet is established, Fleet Members will be given the opportunity to participate on the Steering Committee if desired.

3. Pg. 5 - I thought MADMF had 100% reporting for all harvester fisheries? Why would there be difficulties obtaining fishery dependent data?

Further explanation about the various fishery dependent data sources in Rhode Island and Massachusetts was added to pages 5 and 6 of the proposal. Both states collect fishery dependent data through trip reports, however this data alone does not allow for well-informed reference points for the stocks. Information on discards and size composition of the catch provide more informed data of which can be

used in more sophisticated assessments, as well as understanding the effectiveness of management actions through the appearance or disappearance of size classes in the data. Massachusetts does collect additional, pot-level size composition and discard, fishery dependent data through observed trips. The difficulties mentioned in the proposal were in reference to the logistical difficulty of sending out MA DMF staff to the outer cape and islands of Martha's Vineyard and Nantucket to observe trips. It is often cost prohibitive to send staff as it requires ferry rides and overnight lodging to visit these areas. The effort of the research fleet also addresses a geographical area where commercial effort is substantial with little data coverage by MADMF for the aforementioned reasons. Further, as mentioned in the proposal, no Rhode Island program currently addresses this data gap. The proposed project would greatly expand on the fine resolution, pot-level, data provided by the MA DMF fishery dependent observed trips by utilizing the time on the water of whelk fishermen to collect a similar suite of data in both Rhode Island and Massachusetts.

4. Pg. 7 - I thought these already exist from 100% harvester reporting in RI and MA? Are you trying to create a new data path to ACCSP? If so it seems like a stretch to do this for one or two species? I would prefer you find a way to transmit the data through already built channels. Cost effective? Do these states not require whelk reporting on either harvester or dealer level?

Please see responses to comments 1 and 3 for differences between trip reporting and finer scale fishery dependent data.

The proposed project would mirror existing data collection by the state of Massachusetts and expand it to Rhode Island to provide data directly into each state's assessment efforts. The data would be submitted directly through existing data collection channels to the states as well as to ACCSP. Further explanation added to page 6 and page 8 of the proposal to emphasize this.

5. Pg. 7 - Is ACCSP being asked to pay for a species-specific application?

No, ACCSP is not being asked to pay for a species-specific application. The data collection application, On Deck Data, has already been made and is currently being used to collect fishery dependent data from the black sea bass, Jonah crab, and American lobster fisheries and to collect oceanographic data. The application is also capable of collecting data from the quahog fishery. The work for the proposed project would involve minor edits to this existing application to allow for collection of specific fishery dependent whelk data. Further explanation of the On Deck Data application was added to pages 7, 8, and 11.

We appreciate your consideration of this proposal. Please do not hesitate to contact us if the Operations and Advisory Committee have any further questions.

Sincerely,



M. Conor McManus, PhD
Deputy Chief, RI DEM



N. David Bethoney, PhD
Executive Director, CFRF



Shelley Edmundson, PhD
Executive Director, MVFPT

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

**Implementing the Research Fleet approach to Improve Fishery-Dependent Data Collection for
Channeled Whelk (*Busycotypus canaliculatus*) and Knobbed Whelk (*Busycon carica*) in
Southern New England**

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Proposal components that address the ranking criteria are underlined
Changes from the original proposal are highlighted in yellow

Applicant Name: Rhode Island Department of Environmental Management Division of Marine Fisheries, the Commercial Fisheries Research Foundation, and the Martha's Vineyard Fishermen's Preservation Trust

Project Title: Implementing the Research Fleet approach to Improve Fishery-Dependent Data Collection for Channeled Whelk (*Busycotypus canaliculatus*) and Knobbed Whelk (*Busycon carica*) in Southern New England

Project Type: New

Requested Award Amount: \$115,149

Requested Award Period: August 1, 2021 – July 31, 2022

Principal Investigators: M. Conor McManus, PhD, Deputy Chief, Division of Marine Fisheries, Rhode Island Department of Environmental Management

N. David Bethoney, PhD, Executive Director, Commercial Fisheries Research Foundation

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Date Originally Submitted: June 15, 2020

Date Resubmitted: August 17, 2020

Objective:

The southern New England whelk fishery includes landings of two species, the channeled whelk (*Busycotypus canaliculatus*) and knobbed whelk (*Busycon carica*), from nearshore state waters (Angell 2019, Nelson 2018). The increase in fishery value and decline in landings has increased need for state management to ensure the sustainability of the fishery; however, fishery-dependent data to characterize the whelk fishery is lacking in both states. The Rhode Island Department of Environmental Management (RI DEM), Commercial Fisheries Research Foundation (CFRF), and Martha's Vineyard Fishermen's Preservation Trust (MVFPT) with support from the Massachusetts Division of Marine Fisheries (MA DMF) are proposing to collect fishery-dependent data on both channeled and knobbed whelk in Rhode Island and Massachusetts through a fishing vessel research fleet approach.

The objective of the project is to develop and implement a cost-effective method to collect critically needed fishery-dependent, biological and catch and effort, data from the whelk fishery in southern New England. The proposed project will last one year with at-sea sampling conducted for a total of eight months. Fishery-dependent data will be collected from the nearshore state fisheries for whelk in Narragansett Bay, Rhode Island and the south coast of Massachusetts, specifically in and around Martha's Vineyard and Nantucket Sound (Figure 1). Proposal components that address the ranking criteria are underlined
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The proposed project will focus on providing fishery-dependent data directly for inclusion in each respective state's assessment and management process for the whelk fishery.

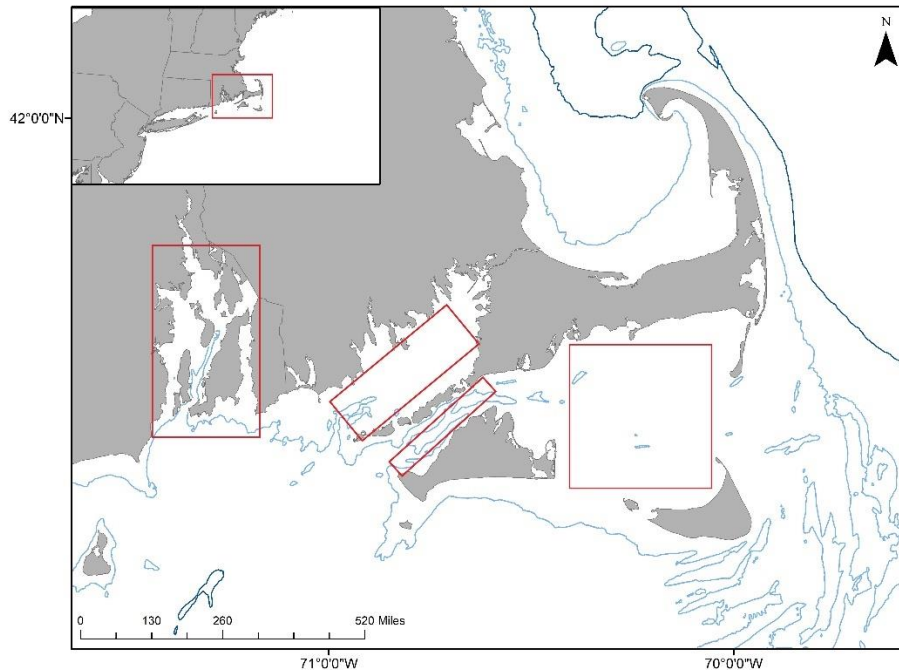


Figure 1. Map of the areas accounting for the majority of landings in the whelk fishery across Rhode Island (RI) and Massachusetts (MA). From East to West, the areas highlighted in red are Nantucket Sound (MA), Vineyard Sound (MA), Buzzards Bay (MA), and Narragansett Bay (RI). 20- and 50-meter bathymetry lines are displayed for reference.

Specifically, the proposed project will establish a fishing vessel-based Research Fleet in the southern New England whelk fishery. The Research Fleet will focus on fishermen collecting fishery-dependent biological, catch, and effort data from their commercial whelk trips. The goal of the Research Fleet will be to expand the fishery-dependent data coverage in respective state management areas in Rhode Island and Massachusetts, focused primarily in data poor areas, to inform the management of the fishery. The CFRF, and project collaborators, have proven the Research Fleet approach a success in collecting fishery-dependent data from a variety of other fisheries in southern New England such as; the American lobster, Jonah crab, black sea bass, and quahog fisheries (Gawarkiewicz and Mercer 2019). The principles of collaborative research and data collection, learned from previous Research Fleet projects, will be applied an expanded upon in the proposed project.

In summary the general goals of the proposed project are:

1. Collect and communicate critically needed whelk data (catch, effort, and biological) in a cost-effective way using modern electronic technology and fishermen's time on the water;

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2. Contribute to the improvement of whelk science and fisheries management in southern New England;
3. Develop a model approach for fishery-dependent data collection that involves the commercial whelk industry through collaborative research.

Specific objectives of the project include:

- Organize, train, and support a commercial fishing vessel research fleet for whelk and develop a tablet application (app) for at-sea data collection;
- Collect fishery-dependent data from commercial whelk vessels throughout Rhode Island and Massachusetts region to characterize the catch, effort, and spatial and temporal trends of the fishery;
- Distribute and apply fishermen collected data to the management and assessment of whelk in Rhode Island and Massachusetts;
- Demonstrate a model for fishery-dependent data collection, management, analysis, and utilization that can be duplicated in a cost-effective way in other regions and in other fisheries;
- Communicate to a broad audience the benefits and value inherent in this type of collaborative data collection program.

Need:

Substantial uncertainties in the assessment and management of whelk fisheries coastwide, in particular in the southern New England fisheries of Massachusetts and Rhode Island, have arisen as a result of large spatial gaps in fishery-dependent data. Lack of fishery-dependent data have hindered efforts to establish reference points and assess the status of stocks through stock assessments (Angell 2019, Nelson et al 2018, ACCSP 2019). As a result, there is growing concern from managers and industry members alike about the sustainability of the whelk fishery into the future.

The whelk fishery represents an opportunity to diversify landings for fishing businesses. Despite the fishery being open throughout the entirety of the year in Rhode Island and most of the year in Massachusetts (closed December 15 – April 14), there are very few vessels which only target whelk (TNC 2018). Most vessels targeting whelk only do so for a portion of the year when catch is high and will switch between a variety of other fisheries. However, due to the growth in the international market and substantial increase in ex-vessel price over the last decade, the income for vessels derived from whelk landings is significant (TNC 2018). It is suspected the increased reliance on, and importance of, the whelk fishery is directly correlated to declines in other fisheries such as the southern New England inshore lobster fishery and represent shifted fishing effort. Following peaks in landings between 2009 and 2012, declines in landings in Rhode Island and Massachusetts have occurred since 2013. Despite this, the value of the fishery peaked at over \$2 million in Rhode Island in 2018 and been maintained annually around \$5

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million in Massachusetts due to increasing ex-vessel prices (Angell 2019, Nelson et al 2018). After the most recent assessment, there were 106 fishing vessels reporting landings of whelk in the state of Rhode Island in 2018, although up from 2017, this represents over a 60% decrease in total vessels in the fishery compared to the peak in 2012 (Angell 2019). Active vessels in the Massachusetts fishery have remained relatively stable over this time period with about 140 permitted vessels, and about 80 vessels reporting landings annually during the same time frame (Nelson et al 2018). Even though the whelk fishery is dispersed on a broad scale between Rhode Island and Massachusetts, and whelk populations are likely segregated on a fine scale, the interstate markets for whelk are highly interconnected. Massachusetts dealers often purchase whelk from the Rhode Island fishery.

Despite the decline in landings, the whelk fishery still represents a large and viable opportunity for fishermen seeking to diversify their catch due to the high price. However, the combination of landings declines and anecdotal reports of localized depletion with increased or stable fishery value raises questions over the fishery's long-term sustainability.

Globally, whelk and conch fisheries are notoriously difficult to manage and are prone to overfishing and quick depletion due to their slow maturation, slow growth rate, and localized larval distribution. Coupled with the largely sedentary lifestyles, these life history parameters can often result in quick depletion of localized populations after years of high fishing pressure (Nelson et al 2018). Anecdotally, there have already been areas identified by fishermen in Massachusetts, specifically Buzzards Bay and Nantucket Sound, depleted of whelk (Nelson et al 2018). Although it has become evident from trends that the whelk fishery is overfished and overfishing is occurring in Massachusetts, and more recently in Rhode Island, there is still a question as to how widespread this may be occurring (Angell 2019, Nelson et al 2018). This is because of the difficulty of obtaining fishery-dependent data from the whelk fishery.

In both Rhode Island and Massachusetts, the primary index of abundance used in the stock assessment are the state trawl surveys. Further, both states also receive fishery-dependent data through mandatory trip reports submitted on a monthly basis from harvesters. Similar data is collected in each state through the trip reports which include total whelk landed per trip, traps hauled per trip, total traps in the water, and soak time of traps in the water. Although useful for tracking trends in the fishery, this broad level of fishery-dependent data has been inadequate to construct comprehensive stock assessments, particularly in Rhode Island. In addition, the mandatory trip reports do not provide any biological data from the whelk catch nor does it provide any data on the species composition of the catch or the sublegal discards within the fishery. Rhode Island conducted cooperative fishery-dependent sampling with observed trips opportunistically in the early 2010s, but currently does not have a dedicated fishery-dependent data collection program. In a similar fashion, Massachusetts opportunistically collects cooperative fishery-dependent data from commercial whelk vessels through observed trips. Observed MA DMF trips are the only source of fine scale, pot-level, data on the whelk fishery between the two states and provide specific data on species composition of the catch as well as the sizes of all landed and discarded sublegal whelk. Proposal components that address the ranking criteria are underlined
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Location of the string of traps is recorded as well as the shell-width of all whelks within specific traps. Not all traps within a string are sampled due to the high number of whelks within individual traps. However, this sampling occurs on a small fraction of commercial whelk trips; between 2003 and 2017, a total of 38 whelk trips were observed by the MA DMF survey with only 2 trips in 2013, 1 in 2015, and 3 in 2016 (Nelson et al 2018). Further, appropriate spatial representation of the fishery-dependent data collection program by MA DMF can prove to be challenging due to the distribution of the whelk fishery across the south coast of Massachusetts, Cape Cod, Martha's Vineyard, and Nantucket. As a result, there are areas of the whelk fishery in Massachusetts that are logistically too difficult to observe trips consistently from the outer Cape Cod, Martha's Vineyard, and Nantucket. In contrast, landings from Nantucket Sound make up the vast majority of statewide landings and are key fishing grounds to whelk vessels from the outer Cape Cod, Martha's Vineyard, and Nantucket, leaving a large portion of the fishing fleet and landings uncharacterized by the state survey. This problem is further exacerbated by the highly localized, and likely segregated, populations of whelk on scales potentially as fine as within Narragansett Bay. The proposed project would seek to greatly expand upon the fishery-dependent data available in Massachusetts and provide a new source of fishery-dependent data in Rhode Island. The project would utilize the time on the water of whelk fishermen, including those from Martha's Vineyard, to collect a similar suite of fishery dependent biological, catch, and discard data as the MA DMF survey but on a continuous, annual, time frame.

For these reasons, the channeled and knobbed whelk are listed by the ACCSP biological priority matrix as a top priority for expanded biological sampling (ACCSP 2019). In particular, the listing is a result of the large uncertainty if the whelk fisheries are overfished and if overfishing is occurring. Further, there have recently been significant changes in landings and management schemes in the whelk fishery coastwide, in particular in Rhode Island and Massachusetts, which when coupled with the low resilience of the fishery due to the life history parameters of the species, is a cause for concern (ACCSP 2019). Compared to other commercially important species supporting fisheries of a similar magnitude, little research has been conducted on even the basic biology and ecology for the two species (Edmundson 2016). Within the current literature available for both whelk species, there is discrepancy between basic biological parameters such as age at maturity, growth rates, and maximum age (Peemoeller 2013). It is currently unclear if these discrepancies are a result of fine scale population differences between various subpopulations or other factors.

The proposed project aims to address these uncertainties in the assessment and management. Through the implementation of a robust fishery-dependent data collection program, the proposed project will aim to reduce the fishery-dependent data gaps resulting in the data-poor listing in the channeled and knobbed whelk fishery. Ultimately, the proposed project will help to 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 across multiple state lines.

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Results and Benefits:

The ACCSP Biological Review Panel identified channeled and knobbed whelk as a top priority due to inadequate biological sampling (ACCSP 2019). Further, both managing agencies in Massachusetts and Rhode Island acknowledge the need for expanded fishery-dependent data collection in support of management and assessment efforts. The proposed project addresses the identified needs of both the ACCSP as well as multiple state management agencies. The results of the proposed project are expected to have broader regional impacts across the Atlantic coast, particularly other southern New England states with developing whelk fisheries such as Connecticut and New York. This project builds upon previous efforts between Rhode Island and Massachusetts of increased coordination and collaboration towards improving fisheries science and management (TNC 2018). The project will specifically have impacts in other states with whelk fisheries as the Research Fleet will serve as a model to further expand and adapt fishery-dependent surveys for whelk to improve data sources used in assessment and management efforts. Due to the unique life history traits of whelk, which result in challenging fishery management scenarios, cost-effective collaborative research efforts may prove to be the best suited for providing timely data used in assessments and management for the species.

The intended accomplishments of the proposed project include:

- Develop databases of whelk biological, catch, and effort data, that can be made accessible, within confidentiality guidelines, to many end users, including industry members, stock assessment scientists, and fishery managers;
- Develop a coordinated method of data transmission to the ACCSP and managing state agencies (Rhode Island and Massachusetts) building off existing data communication practices employed by the CFRF Black Sea Bass and Lobster and Jonah Crab Research Fleets;
- Demonstrate a cost-effective way to collect fishery-dependent data for a commercially important species which is currently listed as data poor;
- Provide a constructive way for members of commercial fisheries to contribute to the assessment and management of whelk;
- Improve the accuracy of the stock assessment and management plan for whelk by providing fishery-dependent data to inform and construct assessment reference points;
- Support diversification and increase economic opportunities for fishing communities by assisting in increasing the long-term sustainability of the whelk fishery;

Specific performance measurements will include:

- Development of a fishery-dependent whelk data collection fleet, consisting of commercial fishermen based out of Rhode Island and Massachusetts;
- **Updating of pre-existing data collection application, On Deck Data, to allow for entry of fishery dependent whelk data;**

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- Completion of eight months of field data collection (biological/catch/discard data) and assimilation of the data into a project database that will be shared regularly with ACCSP, MA DMF, and RI DEM throughout the first year;
- Completion of data analyses and sharing of results via final report dissemination, conference presentations, and local workshops;
- Utilization of the data by RI DEM, MA DMF, and other federal and/or state stock assessment scientists, and others in the fishing industry and fisheries science community; and
- Completion of all the planned project tasks in accordance with the approved project budget amount.

The underlying benefit of the proposed project will be more robust fishery-dependent biological, catch and effort, data available via the ACCSP and provided to MA DMF and RI DEM, on which to base the whelk stock assessment and management. The fishery-dependent data collected by the proposed project would be collected through the existing state channels of Rhode Island and Massachusetts to feed back into the ACCSP biosamples database for use in state and federal management. The collaborative design of the project, utilizing inter-state relationships, will design the at-sea sampling protocols from the inception of the project to provide high resolution, pot-level catch, effort, and biosample data. The data will be collected at-sea by fishermen in a format directly applicable to Rhode Island, Massachusetts and ACCSP data formatting standards and will pass directly to all three parties. Whether this will result in different harvest levels than are currently being realized is difficult to predict, but better informing future stock assessments will surely be a positive outcome, providing a more scientifically-sound basis on which to manage fishing effort. Furthermore, the data collected by the proposed project will also be essential in improving predictive capabilities, and finding the right balance between fishing pressure and resource availability. Finally, the long-term impact of the project is to improve the sustainability of the whelk fishery by filling data gaps resulting in the current data poor listing of the fishery.

Data Delivery Plan

A critical component of the proposed project is the compilation and communication of fishery-dependent biological, catch, and effort data to the ACCSP, participant fishermen, state management agencies of the whelk fishery in Massachusetts and Rhode Island. The CFRF will maintain the whelk database for internal project analyses (described below) and quality control, but will also regularly share the project data with other end users.

In an effort to provide regular feedback to fleet participants, project PIs will compile and distribute individual data reports for the eight participating vessels throughout the project. Based on the seasonality of the whelk fishery in both states proposed to be sampled, data reports will be sent to the participant vessels biannually. The first data report will be compiled and distributed at the conclusion of the fall fishery (in January), and the second data

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report at the conclusion of the spring fishery in July. Vessel-specific data reports will ultimately depend on the specific fishery-dependent data collected but will likely include: number sampling sessions, amount of effort sampled (number of strings of pots and individual pots), average depth of sampling, percentage of whelk retained for sale, percentage of whelk discarded, proportion of each species of whelk in catch and discards, number of whelk biologically sampled, size distribution of whelk sampled, and various catch per unit effort metrics. Additional summary fleet statistics will be available upon request by each individual Fleet participant. All data reports will be confidential within the Fleet, unless participants consent to share amongst other Fleet Members, and will only include the data collected by each report recipient.

Data delivery to managing end users is a primary objective of the proposed project. The CFRF will work with RI DEM and MA DMF project partners during the initial planning of the project to agree on specific data formats to be collected. This planning will be done with the intent to make the fishery-dependent data collected directly comparable and ready for incorporation to existing state fishery-dependent databases. The CFRF will also work with data coordinators at the ACCSP to agree upon desired formatting of all data submissions to the ACCSP of collected whelk biosamples and fishery data. The CFRF will follow data delivery plans currently employed by the CFRF Black Sea Bass and Lobster and Crab Research Fleets to deliver data collected by the proposed Whelk Research Fleet. Data will be delivered to both managing state agencies involved in the project, RI DEM and MA DMF, and ACCSP on the same biannual time frame. Similar to the data reports sent to fishermen, based on the seasonality of the fishery, the data submissions to the ACCSP, RI DEM, and MA DMF will occur in January and July of the project period.

Approach:

The proposed project seeks to collect, communicate, and analyze critically needed biological, catch, and effort fishery-dependent data for incorporation into ACCSP, RI DEM, and MA DMF databases and application in the various state whelk stock assessments. Project components include: 1) Development of a whelk fishing vessel research fleet and tablet application (On Deck Data) for at-sea data collection; 2) Collection of fishery-dependent biological (catch and effort) whelk data and fishery characteristics for eight months in the Massachusetts and Rhode Island fisheries; 3) Internal data analysis to investigate trends in whelk catch and discards in previously identified areas with little to no fishery-dependent data collection; 4) Compilation and communication of project data and results to ACCSP, RI DEM, and MA DMF for application by stock assessment scientists and fisheries managers; and 5) Outreach and education activities to share findings. Methodological details are outlined below.

*Development of Whelk Research Fleet and **Update of Data Collection App***

The first step towards developing the Whelk Research Fleet will be the establishment of a project steering committee and the solicitation of applications from active whelk fishermen in Proposal components that address the ranking criteria are underlined
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Massachusetts and Rhode Island. The steering committee will be established immediately upon the project start and will consist of project Co-PIs, lead research biologist, state fishery managers from MA DMF, and industry members. The CFRF Board of Directors is comprised exclusively of fishing industry and fishing industry support business members. Members from the CFRF Board of Directors with experience or familiarity with the whelk fishery will be included on the steering committee to offer input on the feasibility of project design and implementing the at-sea data collection protocols. Once the Research Fleet participants have been selected, interested participants may also join the project steering committee. Tom Angell from RI DEM will be offered a spot on the steering committee as a whelk biology specialist. Angell has led current RI DEM fisheries independent and dependent whelk analyses used to inform fisheries management, and will offer input on project design and data formatting. Project Co-PIs have already been in communication with Tracy Pugh, Steve Wilcox, and Bob Glenn at MA DMF and will offer them positions on the Steering Committee to represent MA DMF in the proposed project. The inclusion of MA DMF staff on the Steering Committee is critical for the success of the project as it will ensure the utility of the data collected by the Research Fleet across state lines. Despite differences in management scheme, the goal of the Research Fleet will be to collect standardized data applicable to the management of the fishery in both Rhode Island and Massachusetts. MA DMF staff have expressed an interest and commitment to be involved in the proposed project to ensure the data is useful for their assessment and management efforts. Other than offering assistance in sampling protocol design, MA DMF staff will also assist in the identification of areas to target expanding fishery-dependent data collection by the Research Fleet. The Nature Conservancy has expressed support of this project and Dr. Richard Bell has offered to sit on the project steering committee. Dr. Bell has an extensive experience in population dynamics and data limited assessment methods as well as a background with the local Massachusetts and Rhode Island whelk fishery (TNC 2018) and will be a valuable steering committee member.

The CFRF will announce a public application period, encouraging interested whelk fishermen to apply. To ensure a large pool of applicants, the CFRF will consult with the Steering Committee, to identify vessels well suited to undertake the fishery-dependent sampling, fish in areas identified as spatial gaps in existing fishery-dependent data and request applications if interested. MA DMF staff have already identified the fishing vessels from the Martha's Vineyard and Nantucket (Figure 1.) that fish within Nantucket and Vineyard Sound to be a top priority for inclusion on the Massachusetts side of the Research Fleet. This is due to the relative difficulty logistically to collect data from the existing MA DMF fishery-dependent survey on the respective islands. After the application period the CFRF, with consultation from the steering committee and the CFRF board of directors, eight fishing vessels will be selected to participate in the Whelk Research Fleet based on areas fished, months fished, and experience with biological data collection and collaborative research. Four vessels from Rhode Island and Four vessels from Massachusetts will be selected. The CFRF staff will notify the selected Whelk Research Fleet participants and will work with them to establish work agreements outlining the project timeline, sampling requirements, and invoicing procedures prior to collection of fishery-dependent data.

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While the Whelk Research Fleet is being assembled, the CFRF will work with an independently contracted programmer to update the existing data collection application, On Deck Data, to allow for fishery dependent whelk data collection through an existing channel which feeds into the ACCSP biosamples database. On Deck Data was developed by the CFRF for use in the Lobster and Crab Research Fleet and has since been expanded to new versions for data collection in the Black Sea Bass Research Fleet (funded through ACCSP) and Quahog Research Fleet (funded through Rhode Island Sea Grant). The whelk version will be designed such that participant fishermen are prompted to enter the required data fields (outlined below) in a clear and logical sequence. Ultimately, the final data fields to be recorded will be determined during the planning stages of the project if funded. The fishery-dependent data to be recorded will be prioritized and streamlined based on ease of collection while at-sea and impact on management decisions. On Deck data is programmed to automatically record the date, time, and location of sampling events via internal clock and GPS. An important component of On Deck Data is the wireless transfer of data to the project database as all data will be collected by Research Fleet members during their routine fishing practices and uploaded to the CFRF database upon return to port. The Co-PIs will work with ACCSP, RI DEM, and MA DMF staff to ensure the data formats used in the project database are compatible with the ACCSP biosamples database and relevant state databases. This will ensure efficient data transfer, both among state partner agencies and the ACCSP, throughout the course of the project. Participant fishermen will test the whelk data collection app and wireless transfer routine for functionality at-sea and on land prior to the beginning of Fleet sampling.

Fishery-dependent Data Collection

In Rhode Island, the bulk of landings originate from within Narragansett Bay, specifically in the northern portion around Mt. Hope Bay (Figure 1. RI DEM & TNC 2017) however there are landings dispersed throughout state waters. In Massachusetts, the fishery is concentrated along the south coast and islands with the bulk of landings coming from Nantucket Sound with Vineyard Sound, Buzzards Bay, and other areas accounting for a similarly smaller portion of total landings (MA DMF 2018). The Whelk Research Fleet will consist of eight fishing vessels, chosen strategically to cover existing spatial data gaps in whelk fishery-dependent data across the Massachusetts and Rhode Island fishery. While reviewing applicants from the application period described above, the CFRF will consult heavily with RI DEM, MA DMF, and MVFPT to identify overlap of area fished by each applicant and fishery-dependent data gaps. Priority will be given to vessels which cover areas identified as lacking current sources of data.

The goal of each participating Research Fleet member will be to perform at-sea catch sampling on a monthly basis during their commercial whelk fishing season and record all data through On Deck Data. Research Fleet members will sample a set number of strings of whelk pots each month. Within each string of sampled whelk pots, fishermen will sample the catch from specific, randomized pots. Date, time, and latitude/longitude will be recorded by the tablet automatically at the start of a haul of a string of pots. Research Fleet members will also record Proposal components that address the ranking criteria are underlined
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basic session information such as, number of pots in the string, pot type, soak time, and bait type. Catch will be sampled from randomized pots within the string with the exact number of pots sampled within each string to be determined based in discussions with fishermen, feasibility of sampling/time required to sample, and statistical power analyses. Biological catch data collected from each randomized pot will include shell height, width, length, and species for every whelk. Disposition of each whelk (retained or discarded) and any damage observed (e.g. broken tip or siphon), will also be recorded. This process will be repeated for each randomly assigned pot in the sampled string. As previously mentioned, the required number of strings sampled and pots sampled per string monthly will be determined through consultation with the steering committee and whelk fishermen to assess the time commitment required to sample. Due to the seasonality of the whelk fishery, the initial sampling protocols developed in the first months of the project will be tested through the fall season of the fishery. If, through feedback from Research Fleet or Steering Committee Members, the data is either too time consuming to collect or does not provide adequate statistical power changes will be made to the sampling protocols over the winter and implemented in the spring sampling season.

Ultimately, Research Fleet data collection will be oriented towards providing a biological characterization of catch and discards within the whelk fishery to construct stock assessment reference points as well as providing a CPUE estimate within the fishery. Exact data to be collected will be decided during the initial phases of the project through consultation with the project Steering Committee and fishermen. Collected data types and formats will be particularly emphasized to ensure applicability and relevance to both the MA DMF and RI DEM assessment and management process as well as ease of incorporation with existing ACCSP databases.

In addition to the above described fishery-dependent data collection, Research Fleet members will also be given tidbit temperature loggers to record bottom water temperature. Temperature loggers will remain fixed on a specific string of whelk pots during the fishing season. At the conclusion of each fishing season, project staff will pick up and offload all temperature data and return them to Research Fleet Members prior to the start of the next season. Bottom water temperature will allow the trends in catch to be associated with fine scale changes in water temperature.

Internal Data Analysis

The main goal of data collection is to bolster fishery-dependent data sources available for use by state management and assessment efforts. As a result, the effort will primarily be expended to ensure applicability of collected data across state lines. However, data collected by the Research Fleet will also be investigated internally by project staff. Specifically, internal data analyses will seek to answer questions about trends within the fishery. Specific research questions will be further developed during the project and after the initial season of sampling but will include; Are there spatial patterns in the size frequency or species composition in the whelk fishery? Are there catch implications (mean size, ratio of target species to each other) as a result of type of bait, soak time, or pot fished? How does bottom temperature impact whelk

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catch characteristics throughout the year? Research questions will evolve throughout the sampling period of the project and data will constantly be explored through the open-source statistical software R. Generalized Linear Models will be used to explore patterns of variation in catch rates and derive standardized CPUE following (Maunder and Punt 2004).

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 finalization 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 utilizing modern technology and the participation of fishing industry members in a research fleet approach to collect and relay much needed data to inform stock assessments and ultimately management measures for the sustainability of economically important species; and 2) the findings from analysis of the fishery-dependent whelk data collected by the Research Fleet by the project staff and inclusion in state management processes.

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 state/regional/federal agencies; 3) outside researchers who will utilize this information to inform their own research efforts in the 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 Whelk Research Fleet through personal meetings, group meetings, e-mail briefings, and phone conversations.
2. Periodic project briefings to key individuals outside the project including whelk fisheries managers in other states through correspondence, including periodic CFRF newsletters describing the project progress.
3. Continual postings of project information on the CFRF website, including descriptions of the research fleet involved, the equipment being used, the type of data being collected, and findings, as this information becomes available over the course of the project.
4. Organization of a research session at the end of the project involving managers, scientists, and members of the commercial 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.

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Changes from the original proposal are highlighted in yellow

Geographic Location:

At-sea sampling by the Research Fleet will be conducted within Massachusetts and Rhode Island state water. Exact location of sampling will be up to the selected Research Fleet members as all sampling will occur during normal commercial fishing operations. As mentioned previously, Research Fleet members will be selected to cover spatial gaps in existing fishery-dependent data sources. Project administration, and data management and analyses will be conducted at the RI DEM marine laboratory in Jamestown, Rhode Island and the Commercial Fisheries Research Foundation office in Kingston, Rhode Island.

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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
Convene Steering Committee & Develop Sampling Protocols	Announce Application and select Research Fleet vessels	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
	Apply for RI and MA permits for sampling	Distribute Permits to Fleet									
Acquire all sampling gear	Acquire all sampling gear	Distribute all sampling gear to Fleet									
Develop ODD, server, and database	Develop 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
		Quarterly reports to Fleet Members			Quarterly reports to Fleet Members			Quarterly reports to Fleet Members			Quarterly reports to Fleet Members
					Submit data to ACCSP, RI DEM, MA DMF	Write progress report and submit to ACCSP					Submit data to ACCSP, RI DEM, MA DMF
Develop project website and project outreach	Develop 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

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Project Accomplishments Measurement:

Project Goal	Metric 1	Metric 2	Metric 3	Metric 4	Metric 5	Metric 6	Metric 7
Collect and distribute whelk data in a cost-effective way	Creation of Whelk ODD, CFRF server, and MySQL database	Creation of 8-vessel Research Fleet for whelk	8 months of data collection by Fleet	Transfer of collected data into MySQL database	Transfer of collected data into MySQL database	Submission of all data reports to Fleet Members	Submission of biological and fishery data to ACCSP and other managers
Contribute to the improvement of whelk fishery management;	Expanded sources of fishery-dependent data in RI and MA	Provide whelk data from areas and times of year currently under sampled	Distribution of project data to managing stakeholders	Utilization of Research Fleet data in state whelk stock assessments			
Demonstrate model approach for cost efficient fishery-dependent data collection	Usage of collaborative approach established in other CFRF Research Fleets	Presentations of Fleet design at scientific conferences	Develop manuscript to validate Fleet design through peer review				

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Cost Summary:

Budget Table:

TOTAL	New Proposal		
	Proposal	In-Kind	Total
	\$ 115,149	\$ 3,656	\$ 118,805
% Contribution by Funding Source	97%	3%	100%
Object Class Category	Proposal	In-Kind	Total
A Personnel			
- RI DEM - Conor McManus	\$ 3,652	\$ 1,826	\$ 5,478
Total RI DEM Personnel Costs	\$ 3,652	\$ 1,826	\$ 5,478
B Fringe Benefits	\$ 2,480	\$ 1,240	\$ 3,720
C Travel	\$ 500	\$ -	\$ 500
D Equipment	\$ -	\$ -	\$ -
E Supplies	\$ 100	\$ -	\$ 100
F Contractual - CFRF			
a. Personnel			
- Executive Director - David Bethoney	\$ 11,440		\$ 11,440
- Research Biologist - Thomas Heimann	\$ 28,125		\$ 28,125
- Business Manager	\$ 4,576		\$ 4,576
Total CFRF Personnel Costs	\$ 44,141	\$ -	\$ 44,141
b. Fringe Benefits	\$ 3,973	\$ -	\$ 3,973
c. Travel	\$ 1,500	\$ -	\$ 1,500
d. Equipment	\$ -	\$ -	\$ -
e. Supplies			
- Research Supplies	\$ 4,950		\$ 4,950
- Office Supplies	\$ 1,000		\$ 1,000
Total Supplies	\$ 5,950	\$ -	\$ 5,950
f. Contractual			
- Programmer for On-Deck Data database	\$ 10,000		\$ 10,000
- Martha's Vineyard Fishermen's Preservation Trust	\$ 3,000	\$ -	\$ 3,000
Total Contractual	\$ 13,000	\$ -	\$ 13,000
g. Construction	\$ -	\$ -	\$ -
h. Other Costs			
- Fishing Vessel Stipends	\$ 20,800	\$ -	\$ 20,800
Total Other Costs	\$ 20,800	\$ -	\$ 20,800
i. Total Direct Charges	\$ 89,364	\$ -	\$ 89,364
j. Indirect Charges			
- Proposed at 20% of CFRF Direct Charges	\$ 17,873	\$ -	\$ 17,873
Total Indirect Charges	\$ 17,873	\$ -	\$ 17,873
k. Total CFRF Costs	\$ 107,237	\$ -	\$ 107,237
G Construction	\$ -	\$ -	\$ -
H Other Costs	\$ -	\$ -	\$ -
I Total Direct Costs	\$ 113,969	\$ 3,066	\$ 117,035
J Indirect Charges	\$ 1,180	\$ 590	\$ 1,770
K Total Proposal Costs	\$ 115,149	\$ 3,656	\$ 118,805

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Budget Justification:

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 \$115,149 for 12 months. The voluntary non-federal match funds provided by the RI DEM is \$3,656. The total proposal value is \$118,805. 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: Deputy Chief – approximately 4% of annual salary = \$5,478
 - C. McManus, Deputy Chief, RIDEM Division of Marine fisheries will serve as a co-advisor and manager to the proposed project, providing guidance on research protocols, assisting with statistical analyses, participating in Research Fleet meetings, developing a data management plan for the Fleet data, assisting in all technical writing and presentations, coordinating with neighboring states with whelk fisheries to inform them of this approach, and conveying project results to fishery governance to inform future stock assessments and fishery management decisions.

- B. Fringe Benefits: 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: \$500 is requested for travel to project meetings with the team, scientific and management outreach events, and visiting Research Fleet participants in the project.

- D. Equipment: There are no direct equipment charges.

- E. Supplies: \$100 is requested in supplies to build standardized gauges that the Research Fleet participants will be using. These gauges will be instrumental and ensuring the same tools are being used by industry and scientists in whelk data collection. They will also be used to inform enforcement on alternative measuring tools when inspecting whelk sizes.

- 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 federal funding will be used:
 - a) Personnel: \$44,141. 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

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- D. Bethoney, CFRF Executive Director, will oversee the administration, team communication/coordination, field research, 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 Biologist – Proposed at 50% of time for 12 months = \$28,125
A CFRF Research Biologist will be 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 = \$4,576
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. 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: \$1,500. 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 one personnel to share and disseminate project methods, findings, and conclusions.
- d) Equipment: \$0. There will be no equipment costs on this project.
- e) Supplies: \$5,950. This category includes research supplies and project office supplies.
1. Research Supplies: \$4,950 - Costs of tablets, waterproof cases, Tidbit temperature logger with base & fish measuring board. Proposed at \$618.75 per set x 8 vessels for the duration of the project.
 2. Office Supplies: \$1,000 – Costs to cover database storage and website fees (\$25/month), project office and meeting supplies, outreach materials, etc.
- f) Contractual: \$13,000. This includes costs associated with:
1. Programmer (\$10,000) - CFRF hiring an outside computer programmer to develop the On Deck Data application for whelk data collection, setup wireless data transfer to and storage in a SQL database, and assist with beta testing to address any issues that arise, and to update the app to maintain functionality. This cost estimate is based on the CFRF’s past experience programming a tablet application for black sea bass data collection (On Deck Data) and developing reliable wireless data transfer and storage. The whelk data collection app developed for this project will be an

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autonomous sampling platform, separate from the other On Deck Data sampling apps.

2. Martha's Vineyard Fishermen's Preservation Trust (\$3,000) to assist with fleet support and data gathering. This includes S. Edmundson's time for organizing and informing the Martha's Vineyard whelk fleet and aid related to data collection and training. -
 - g) Construction: There are no construction costs.
 - h) Other Costs: \$20,800. This includes:
 1. Fishing vessel stipends (\$20,800) for 8 vessels for 8 months at \$500 per month. A fleet of 8 vessels will be utilized each month to obtain the proposed biological samples. The total stipend is computed at 65% due to fluctuations in vessel sampling associated with weather, vessel maintenance, and seasonal whelk distribution.
 - i) Total Direct Charges: \$89,364. This is the total direct charges for cost items a-h.
 - j) Indirect Charges: \$17,873. Indirect general and administrative costs are calculated as 20.0% of federally requested 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 FY2019 Indirect Cost Rate Proposal dated 12/30/19 is for 20.01% based on FY2019 actual costs.
 - k) Total Proposal Costs: \$107,237.

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: \$113,969 Federal + \$3,066 In-Kind = \$117,035 total. This is the total direct charges for cost items A-H.

J. Indirect Charges: \$1,180 Federal + \$590 In-Kind = \$1,770. Proposed at 19.25% of RIDEM Direct Charges

K. Total Proposal Costs: \$115,149 Federal + \$3,656 In-Kind = \$118,805 Total.

Principle Investigators:

The co-Principal Investigators of this proposed project are: M. Conor McManus (Deputy Chief, RI DEM Division of Marine Fisheries), N. David Bethoney (Executive Director, CFRF), and Shelley Edmundson (Executive Director, MVFPT).

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M. Conor McManus will serve in an advisory and support role for the proposed project. McManus will provide advice during throughout the project on development of sampling protocols and specific data fields and formats to collect through the Research Fleet. Further, McManus will advise on the necessary minimum sampling targets to achieve appropriate statistical power to describe catch and begin constructing stock assessment reference points with Fleet data. McManus will meet with fishers to both aid in tablet utilization as well as learn how the data collection process worked for them. He will assist with analyzing data from the Research Fleet for progress and scientific reports and presentations. Finally, McManus will be crucial in the application of Research Fleet collected data to whelk assessment and management efforts and will coordinate with MA DMF to establish best practices for inclusion.

N. David Bethoney, Executive Director of the CFRF, will serve as the lead Co-PI for the proposed project. Bethoney will be responsible for overall projection direction and progress towards completing proposed objectives. Bethoney will be primarily responsible for overseeing proposed data analysis as well as dissemination of project results to the ACCSP and state agencies. At the time of funding, Bethoney will assign a lead CFRF Research Biologist to serve as the primary individual responsible for Research Fleet support, as well as data management, communication, and analysis.

Shelley Edmundson, Executive Director of the MVFPT, will serve in an advisory role for the proposed project. Edmundson has worked with the whelk fishery for years and is an expert on whelk ecology in the project area (Edmundson 2016). Edmundson will provide advice during the planning stages of the project from sampling design to vessel selection. Further, Edmundson will be available throughout the data collection period of the project to troubleshoot and serve as a liaison for vessels on Martha's Vineyard with the CFRF.

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M. CONOR MCMANUS

Rhode Island Department of Environmental Management
Division of Marine Fisheries, Fort Wetherill Marine Laboratory
3 Ft. Wetherill Road
Jamestown, Rhode Island, 02835

Tel: (401) 423-1941
Fax: (401) 423-1925
email: conor.mcmanus@dem.ri.gov

PROFESSIONAL PREPARATION

University of Rhode Island, Narragansett, RI
University of Rhode Island, Narragansett, RI
Boston University, Boston, MA

Ph.D., Oceanography, 2014-2017
M.S., Oceanography, 2010-2012
B.A., Marine Science, *cum laude*, 2006-2010

APPOINTMENTS

2018 – present Deputy Chief, RI DEM Division of Marine Fisheries
2018 – present Adjunct Professor, Graduate School of Oceanography, University of Rhode Island
2016 – 2018 Principal Marine Fisheries Biologist, RI DEM Division of Marine Fisheries
2012 – 2016 Fisheries Scientist, Applied Science Associates (dba RPS)
2013 – 2014 Marine Biologist, Integrated Statistics/NOAA-NMFS-NEFSC
2010 – 2012 Graduate Research Assistant, University of Rhode Island

SELECTED PEER-REVIEWED PUBLICATIONS (TOTAL = 17)

- McManus, M.C.**, Ullman, D.S., Rutherford, S.D., and Kincaid, C. 2020. Northern quahog (*Mercenaria mercenaria*) larval transport and settlement modeled for a southern New England estuary. *Limnology and Oceanography* 65(2): 289-303.
- Friedland, K.D., **McManus, M.C.**, Morse, R.E., and Link, J.S. 2019. Event scale and persistent drivers of fish and invertebrate distributions on the Northeast US Shelf. *ICES Journal of Marine Science* 76(5): 1316-1334.
- Langan, J., **McManus M.C.**, Schonfeld, A., Truesdale, C., and Collie, J. 2019. Nearshore sex-specific dynamics of the summer flounder (*Paralichthys dentatus*) in Rhode Island waters. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* 11(1): 76-85.
- Truesdale, C.L., **McManus, M.C.**, and Collie, J.S. 2019. Growth and molting characteristics of Jonah crab (*Cancer borealis*) in Rhode Island Sound. *Fisheries Research* 211: 13-20.
- McManus, M.C.**, Hare, J.A., Richardson, D.E., and Collie, J.S. 2018. Tracking shifts in Atlantic mackerel (*Scomber scombrus*) larval habitat suitability on the Northeast U.S. Continental Shelf. *Fisheries Oceanography* 27(1): 49-62.
- Oviatt, C., Smith, L., Krumholz, J., Coupland, K., Stoffel, H., Keller, A., **McManus, M.C.**, and Reed, L. 2017. Managed nutrient reduction impacts on nutrient concentrations, water clarity, primary production, and hypoxia in a north temperate estuary. *Estuarine, Coastal, and Shelf Science* 199:25-34.
- Hare, J., Morrison, W., Nelson, M., Stachura, M., Teeters, E., Griffis, R., Alexander, M., Scott, J.,... **McManus, M.C.**, Marancik, K., and Griswold, C. 2016. A vulnerability assessment of fish and invertebrates to climate change on the Northeast U.S. Continental Shelf. *PLoS ONE* 11(2): e0146756.
- McManus, M.C.**, Licandro, P., and Coombs, S.H. 2016. Is the Russell Cycle a true cycle? Multidecadal zooplankton and climate trends in the western English Channel. *ICES Journal of Marine Science* 73(2): 227-238. **McManus, M.C.**, Oviatt, C.A., Gibling, A.E., Tucker, J., and Turner, J.T. 2014. Western Maine Coastal Current reduces primary production rates, zooplankton abundance and benthic nutrient fluxes in Massachusetts Bay. *ICES Journal of Marine Science* 71(5): 1158-1169.

SCIENTIFIC PRESENTATIONS

Given 13 scientific presentations (12 oral, 1 poster) as lead author, and 28 (19 oral, 9 poster) as coauthor.

SELECTED SYNERGISTIC ACTIVITIES

Northeast Regional Sea Grant Lobster Extension Program Steering Committee; Member (2020-present).
Stellwagen Bank National Marine Sanctuary Advisory Council, Research Alternate Member (2019-present).

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ASMFC Spiny Dogfish Technical Committee, Member (2019-present).
ASMFC Coastal Sharks Technical Committee, Member (2019-present).
ASMFC Management and Science Committee, Member (2019-present).
American Fisheries Society's Southern New England Chapter, Board Member (2018-present).
ASMFC American Lobster Stock Assessment Subcommittee, Member (2017-present).
Northeast Coastal Acidification Network Policy Working Group (2017-present).
ASMFC Jonah Crab Technical Committee, Member (2017-2018).
ASMFC American Lobster Technical Committee, Member (2016-present).
University of Rhode Island Dive Control Board, Member (2015-2017).
NOAA NRDA *Deepwater Horizon* Water Column Technical Working Group Member (2012-2015).
Scientific journal reviewer: *Bulletin of Marine Science*; *Canadian Journal of Fisheries and Aquatic Sciences*;
Fisheries Research; *Fisheries Oceanography*; *Hydrobiologia*; *ICES Journal of Marine Science*; *Journal of Marine Systems*; *PeerJ*.
Proposal reviewer: *NOAA Saltonstall-Kennedy Program*; *New Hampshire Sea Grant Program*; *Massachusetts Clean Energy Center*

SELECTED HONORS AND AWARDS

2017 Certificate of Appreciation, Rhode Island Department of Environmental Management
2017 Bronze Medal Award*, National Oceanic and Atmospheric Administration
*Formally awarded to 14 federal employees, 9 contract employees received contribution acknowledgement.
2016 William E. Simmons Memorial Scholarship in Oceanography, URI-GSO
2016 Best Student Paper Award, American Academy of Underwater Sciences
2015 Davis Family Scholarship for Fisheries in Oceanography, URI-GSO
2015 Global Marine Initiative Student Research Award, The Nature Conservancy
2012 Henry S. Farmer Award in Biological Oceanography, URI-GSO
2011 Fillmore Memorial Scholarship Award, URI-GSO
2010 College Prize for Excellence in Marine Science, College of Arts and Sciences, Boston University
2008 Capstone Award, College of General Studies, Boston University

SELECTED AWARDED GRANTS (TOTAL = 10)

2020 Rhode Island Sea Grant, Co-PI, \$217,928
2020 Rhode Island Sea Grant, Co-PI, \$249,155
2019 U.S. Fish and Wildlife State Wildlife Grant, Co-PI, \$111,848
2018 RI Consortium for Coastal Ecology Assessment Innovation and Modeling, Co-PI, \$25,000
2017 U.S. Fish and Wildlife State Wildlife Grant, PI, \$27,300
2017 Rhode Island Sea Grant, Co-PI, \$137,765
2015 The Nature Conservancy, PI, \$20,220

STAFF ADVISING

Oversee the work of RIDEM Marine Fisheries' Research and Assessment team consisting of 1 Supervising Biologist, 5 Principal Biologists, 1 Principal Planner, 3 Fisheries Technicians, and 5 Seasonal Researchers.

GRADUATE STUDENT ADVISING

Served/serving as a graduate school committee member for 3 Ph.D. students and 3 M.S. students from: University of Rhode Island, University of Massachusetts – Dartmouth

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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.
2. Bethoney ND and Stokesbury KDE. 2019. Implications of extremely high recruitment:

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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 (Centropomus 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

Proposal components that address the ranking criteria are underlined

Changes from the original proposal are highlighted in yellow

Shelley A. Edmundson
Executive Director, Martha's Vineyard Fishermen's Preservation Trust
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Ph: (407) 414-5387 Shelley.Edmundson@gmail.com

Academic Background:

Ph.D., Zoology, 2016, *Summa cum laude* University of NH, Durham,
NH M.S., Environmental Science, 2008, *Summa cum laude* University of MA, Boston,
MA B.A., Biology, 2003, *Magna cum laude* Wheaton College, Norton, MA

Employment:

- **Martha's Vineyard Fishermen's Preservation Trust, Menemsha, MA**
Executive Director, 2016 - Present
Administrator/Treasurer, 2011- 2016
Co-founder of non-profit group created to preserve, promote, and sustain the Vineyard's commercial fishing heritage through the acquisition and distribution of fishing permits.
- **Vineyard Wild Caught, Menemsha, MA**
Co-Founder, 2009 - Present
Founded an initiative supporting local fisheries by identifying locally caught seafood through a labeling system that links Vineyard-harvested fish, lobster, and shellfish to the individual Vineyard fishing vessels and captains. Developed, organized, and continuously promote and sustain the initiative.

Scientific and Professional Organizations:

- Vineyard Vision Advisory Council (2018 - Present)
- Vineyard Conservation Society Board Member (2018 - Present)
- American Institute of Fishery Research Biologists (2014 - Present)
- American Fisheries Society, Estuaries and Marine Fisheries Sections (2013 - 2016)
- World Aquaculture Society, US Aquaculture Society Chapter (2013 - 2016)

Research Experience:

- **University of New Hampshire, Durham, NH, 2011- 2016, Ph.D. Candidate**
Researched channeled whelk biology including early life history, fecundity, growth rates, movements, and feeding activity. Organized and led collaborative research with local whelk fishermen on Martha's Vineyard, MA.
- **University of New Hampshire, Durham, NH, 2011- 2012, Ph.D. Student**
Assisted with research project involving winter flounder stock enhancement in coastal ponds in Massachusetts and New York.
- **University of Massachusetts, Boston, MA, 2005 - 2008, Master's Student**
Researched site suitability analysis for offshore sea scallop aquaculture in waters near Martha's Vineyard, MA.
- **Wallace Laboratory, Boston, MA, 2005 - 2006, Research Assistant**
Analyzed, reduced data, and assisted with research in a trace-metal laboratory study investigating the transport and distribution of metals in coastal ecosystems.

Fellowships/Awards:

- UNH Dissertation Year Fellowship, 2015 - 2016, Fellow
- UNH School of Marine Science and Ocean Engineering Research Development and Travel Support Program, December 2014, Awardee
- American Fisheries Society, Estuaries Section Travel Award, September 2013, Awardee

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- UNH School of Marine Science and Ocean Engineering Research Development and Travel, Support Program, February 2013, Awardee
- Martha's Vineyard Vision Fellowship, 2011 - 2015, Fellow
- National Science Foundation, Watershed Integrated Science Partnership, 2006 - 2007, Fellow
- Balfour Scholar, Wheaton College, 1999 - 2003, Scholar

Publications:

Edmundson, S. 2016. Channeled whelk (*Busycotypus canaliculatus*) ecology in relation to the fishery in Vineyard and Nantucket Sounds, MA. Fall 2016. Doctorate dissertation. University of New Hampshire.

Edmundson, S. 2014. Effects of temperature on incubation period, survival, and growth of juvenile channeled whelk (*Busycotypus canaliculatus*). *Newsletter of the American Fisheries Society*, Estuaries Section. Spring 2014.

Selected Presentations:

National:

Edmundson, S. and E.A Fairchild. 2015. Channeled whelk research. Mote Marine Laboratory and Aquarium. Sarasota, FL, June 11, 2015. (Guest lecturer)

Edmundson, S. and E. A. Fairchild. 2015. Channeled whelk research. Key West Community College, Key West, FL, April 6, 2015. (Guest lecturer)

Edmundson, S. and E. A. Fairchild. 2014. Channeled whelk growth rates in Nantucket Sound, MA. 16th International Conference for Shellfish Restoration. Charleston, SC, December 12, 2014. (Poster)

Edmundson, S. and E. A. Fairchild. 2013. Using hatcheries to answer early life history questions: A case study of channeled whelk. 143rd American Fisheries Conference. Little Rock, AR, September 11, 2013.

Edmundson, S. and E.A. Fairchild. 2013. Effects of temperature on incubation period, survival, and growth of juvenile channeled whelk (*Busycotypus canaliculatus*). The annual meeting of the World Aquaculture Society. February 21-25, 2013, Nashville, TN. (Poster)

Regional:

Edmundson, S. and E. A. Fairchild. 2016. Channeled whelk movements and behavior in Vineyard Sound. Cape Cod Natural History Conference. West Barnstable, MA, March 5, 2016.

Edmundson, S. and E. A Fairchild. 2015. Conch growth rates project update. Cape Cod Commercial Fishermen's Alliance. Chatham, MA, May 4, 2015.

Edmundson, S. and E. A. Fairchild. 2013. Researching channeled whelk growth rates in Nantucket and Vineyard Sounds. Permanent Endowment for Martha's Vineyard Board Meeting. West Tisbury, MA, July 23, 2013.

Edmundson, S. and E. A. Fairchild. 2013. Channeled whelk research at UNH. MA Division of Marine Fisheries. Boston, MA, May 13, 2013.

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References:

- ACCSP Biological Review Panel. 2019. Biological Sampling Priority Matrix.
- Angell, T.E. 2019. 2006-2018 Catch, Effort, and Fishery Trends in the Rhode Island Whelk Fishery and Recent Stock Status. RI Division of Marine Fisheries Research Reference Document.
- Edmundson, S. E. 2016. Channeled Whelk (*Busycotypus Canaliculatus*) Ecology in Relation to the Fishery in Vineyard and Nantucket Sounds, Massachusetts. Doctoral Dissertation. University of New Hampshire. 178p.
- Gawarkiewicz, G. and A. Mercer. 2019 Partnering with Fishing Fleets to Monitor Ocean Conditions. Annual Review of Marine Science 11: 391-411.
- Maunder, M.N. and A.E. Punt. 2004. Standardizing catch and effort data: a review of recent approaches. Fisheries Research 70: 141-159.
- Nelson, G.A., S.H. Wilcox, R. Glenn, and T.L. Pugh. 2018. A Stock Assessment of Channeled Whelk (*Busycotypus canaliculatus*) in Nantucket Sound, Massachusetts. Massachusetts Division of Marine Fisheries Technical Report.
- The Nature Conservancy. 2018. FishPath Workshop Report: Rhode Island Channeled Whelk. The Nature Conservancy, Arlington, Virginia, USA.
- Peemoeller, B.J., and B.G. Stevens. 2013. Age, size, and sexual maturity of channeled whelk (*Busycotypus canaliculatus*) in Buzzards Bay, Massachusetts. Fishery Bulletin 111(3): 265-278

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