

TITLE: Incorporating Fishermen's Knowledge into a Standardized Catch Per Unit Effort Index for the Commercial Monkfish Gillnet Fishery

Identification of Problems: *Describe the specific problem(s) or area(s) of interest to be addressed. Specify the Program Priority(ies) in section I.B. that most closely relates to the proposal.*

This proposal directly addresses a top Program Priority: *research to develop a standardized catch per unit effort (CPUE) index for the commercial directed monkfish gillnet fishery to be used for stock assessment purposes.*

Monkfish supports one of the most lucrative fisheries in the United States (Richards et al., 2008). However, historically they were considered “trash fish,” often discarded at sea or used in the production of fish meal (Armstrong et al., 1992; NMFS, 2021). Recently, monkfish have become more popular with American consumers due to a decrease in other popular groundfish species and a change in eating habits (Weber, 2001). The monkfish market first developed in the 1980s and by the mid-1990s, monkfish had surpassed groundfish species such as Atlantic Cod, Haddock, and flounders and became the highest valued finfish in the Northeast United States (Richards et al., 2008). In 1997, landings peaked at 62 million pounds (28,123 metric tons) with revenues of \$35 million and decreased to 6,800 metric tons valued at \$10 million in 2021 (NOAA Fisheries).

In response to the expansion of the directed monkfish fishery in the 1990s, the fishing industry requested a fishery management plan (FMP) be developed (Haring and Maguire 2008). The plan was implemented in 1999, which included a limited access permit program, a Days-At-Sea (DAS) management system, trip limits and minimum size limits. Monkfish are managed into two management areas: Northern Management Area (NMA) which covers the Gulf of Maine and northern part of Georges Bank, and Southern Management Area (SMA) which extends from the southern flank of Georges Bank through the Mid-Atlantic Bight. Prior studies indicated monkfish had faster growth rates in the SMA (Armstrong et al., 1992) than in the NMA (Hartley, 1995), but the two separate management areas are primarily based on different fishing patterns (e.g., mainly gillnet in SMA and mainly trawl in NMA; NEFSC, 2016).

The monkfish fishery has been jointly managed since 1999 under the Monkfish Fishery Management Plan (FMP) by the New England and Mid-Atlantic Fishery Management Councils, with the NEFMC having the administrative lead (NEFMC, 1998). The directed monkfish fishery is primarily managed with a yearly allocation of monkfish days-at-sea and possession limits, though incidental landings are allowed in some fisheries. Traditionally, monkfish have been caught in bottom otter trawl, gillnet, and scallop dredge gear. In the Northern Management Area (NMA), gillnets account for about 30% of the total monkfish catch while the remainder is the result of bottom otter trawl trips targeting groundfish species (Haring and Maguire, 2008). In contrast, the Southern Management Area (SMA) monkfish landings are primarily due to targeted monkfish trips. Gillnets in this area account for approximately 65% of total monkfish landings compared to 25% for bottom otter trawl (Haring and Maguire, 2008).

In the mid-1960s, annual landings of monkfish were 100 metric tons and peaked to 28,000 metric tons by 1997 (Richards et al., 2008). Landings subsequently declined to 14,000 tons as a

result of fishery restrictions and control management measures such as days at sea (DAS), and trip limits. In 2019, the combined catch from both management areas totaled 11,500 metric tons valued at \$14.5 million USD (NOAA Fisheries). Despite the rapid development of the monkfish fishery, the biology, distribution, and size/sex composition of monkfish between management areas is poorly understood, because very few monkfish are caught in the Northeast Fisheries Science Center (NEFSC) bottom trawl survey conducted in the spring and fall (Richards et al., 2008), making the survey indices for the species highly variable. Few monkfish are caught because of the survey gear (e.g., ground cable with rock hoppers) and the deeper distribution of monkfish relative to the survey strata (Haring and Maguire 2008). The following excerpts from the original Monkfish FMP provide the Council's perspective on overfishing (NEFMC, 1998; Monkfish FMP, p.18): "*The only data available to support a definition based on a minimum stock level are from fishery independent surveys. A few state-supported surveys exist, but the most comprehensive are the bottom surveys conducted by NMFS. There are problems because the surveys do not encompass the entire range of the monkfish resource. No samples are taken offshore of the Continental Shelf edge where monkfish are known to occur.*" As of 2021, commercial landings of monkfish were 6800 metric tons and valued at \$10 million (NOAA Fisheries). The council's monkfish advisors consider low monkfish prices to be the main limiter of the fishery (2022 Monkfish Fishery Performance Report).

Fishery specifications are set every three years. Effort controls such as possession limits and Days-at-Sea (DAS) are used to ensure that the fishing landings remain within the Total Allowable Landings (TAL). An overfishing limit (OFL) for each the northern and southern monkfish stocks has been defined as the product of the fishing mortality threshold (F_{max}) and the current estimate of exploitable biomass ($B_{current}$). The stock assessments in 2010 and 2013 concluded that the northern and southern monkfish stocks were not overfished and overfishing was not occurring. In 2016, the analytical stock assessment method was rejected because of uncertainty in growth estimates, and an empirical approach was developed that is entirely based on trends in the NEFSC bottom trawl survey indices (Richards, 2016). In the spring and summer, a 2022 Management Track Stock Assessment was conducted for monkfish to develop the 2023-2023 specifications.

Framework 13 was initiated in April 2022 to include the 2023-2025 fishing year specifications. In May, the Committee developed alternatives for adjusting effort controls and gillnet mesh size. The Council was scheduled to take final action on Framework 13 during its December meeting. However, the council voiced concerns about the method used during the last three stock assessments to determine monkfish stock status. The empirical stock assessment method, known as Ismooth, applies the Northeast Fisheries Science Center bottom-trawl survey multiplier to the latest three-year average catch from the fishery to develop new catch advice. This peer reviewed method was used to develop acceptable biological catch (ABC) recommendations for the 2023-2025 fishing years. The Scientific and Statistical Committee (SSC)'s ABC recommendations are used as a starting point for setting the total allowable landings for the fishery. Industry voiced concerns over the Ismooth approach because the trawl survey may not be catching monkfish consistently, and monkfish landings have been low due to COVID-19 pandemic, lack of markets, high trip costs, low fish prices and other factors. . The decrease in catch was likely a result of a decrease in fishing effort, but it may artificially decrease the ABC derived from Ismooth if surveys do not accurately reflecting stock trends. The SSC met in January 2023 and decided to

update its recommendation for setting acceptable biological catches (ABCs) for monkfish in both the northern and southern management areas for fishing years (FY) 2023-2025. This resulted in 2023-2025 ABCs of 6,224 metric tons for the Northern Area, and 5,861 metric tons for the Southern Area. The Council approved the ABCs, and voted to submit the framework to NOAA Fisheries. If approved by NOAA Fisheries, the proposed fishing year 2023-2025 total allowable landings would be a potential 76% increase over the 2021 landings for the Southern Monkfish Fishery Management Area.

We propose to develop standardized fishery catch rates to provide fishermen's perceptions on factors that influence monkfish catch rates and potentially a stock index to help increase the accuracy of monkfish stock assessments and improve fishery management of New England monkfish. For example, a standardized CPUE index from the SMA gillnet fishery or the NMA trawl fishery may be valuable supplements to NEFSC bottom trawl survey indices. In 2020, recommendations from the New England Fishery Management Council's Fishery Data for Stock Assessment Working Group Report (Cadrin et al. 2020) prioritize the development of a CPUE index for monkfish.

Stock assessment models assume that abundance indices (usually expressed as catch-per-unit-effort, *CPUE*; or landings-per unit-effort, LPUE) are proportional to stock size (\bar{N}) at time t :

$$CPUE_t = q\bar{N}_t$$

Therefore, catchability (q) of the index is assumed to be constant over time (Cadrin et al. 2016). Catchability (q) can also be expressed as the effect of a unit of fishing effort (E) directed on the entire population, with the effect measured as the exponential rate of fishing mortality (F) imposed on the population over a time interval t :

$$F_t = qE_t$$

Factors that interfere with the index-stock relationship must be accounted for, such as changes in fishing vessels, fishing gear, fishing behavior or environmental conditions. Fishery-independent surveys are designed to standardize for vessel, fishing gear, fishing protocol, as well as time and area. By contrast, fishery catch rates need to be standardized, because fishing effort results from individual fishing decisions that are incentivized by markets and constrained by regulations. Shifts in species distributions and vulnerability to fishing gear may also account for some apparent differences between monkfish catch limits and availability of monkfish that fishermen experience.

Statistical methods have been developed to account for common factors of catch rates (e.g., fishing area, fishing season, vessel characteristics) to derive standardized CPUE indices (Maunder and Punt 2004). The goal of CPUE standardization is to remove confounding effects of variables other than relative abundance, therefore creating a relative index that is representative of the stock's exploitable biomass (Maunder et al. 2006). For example, a generalized linear model (GLM) can be applied to account for the variability in CPUE caused by these factors, producing indices that are much more informative for stock assessments (SEDAR 2009). Recent advancements in spatiotemporal modeling also offer new methods for CPUE standardization (e.g., Grüss et al. 2019). Understanding the effect of individual variables can

improve the understanding of CPUE trends for scientists, fishery managers and fishermen (Bentley et al. 2011).

Several aspects of fisheries and associated fishery monitoring data are needed to develop a standardized CPUE series that is a reliable index of abundance. Differences in fishing power need to be standardized so that a unit of effort and CPUE are comparable over time. Information on target species is helpful for developing a standardized CPUE series to select fishing effort that is targeted at the species of interest and to exclude avoidance behavior for non-target stocks. Catch estimates need to be accurate for an informative CPUE index, either for an entire fleet CPUE, or for a smaller standard fleet. An understanding of fishing effort is needed to develop a CPUE, including information on fishing gear, fishing power, and an appropriate unit of fishing effort for each type of fishery. Fine-scale temporal and spatial information is helpful for measuring and standardizing fishing effort, even if catch, effort and CPUE are derived in more aggregated units (e.g., statistical reporting area, quarter-year).

Fishermen's ecological knowledge can also help in CPUE standardization (O'Donnell et al. 2010) and to determine covariates influencing catch rates (e.g., Johannes et al. 2000, Lapp et al. 2015, Wright et al. 2017, 2018; Hansell et al. 2018a, 2018b). Collaborating with fishermen also increases the quantity and quality of data and can reduce the cost of science (Johnson and van Densen 2007), and incorporating fishermen's ecological knowledge into a scientific process can increase fishermen's confidence in the scientific results and promotes trust between fishermen and scientists (NRC 1998). Therefore, combining fishermen's ecological knowledge with conventional stock assessment may improve assessments and reduce gaps of knowledge.

Stock assessments of many northeast U.S. fisheries currently do not use CPUE as an index of abundance within the stock assessment models (NEFSC 2019). However, CPUE is currently used in other northeast U.S. stock assessments (O'Keefe et al. 2015, Cadrin et al. 2020). Several more recent groundfish assessments considered CPUE or LPUE as indices of abundance during the assessment review process (e.g., Gulf of Maine and Georges Bank cod, Gulf of Maine haddock, white hake, pollock, witch flounder; <https://www.nefsc.noaa.gov/saw/reports.html>) but did not include them as indices of abundance in the final assessment models. A workshop on the use of fishery catch rates for Gulf of Maine and Georges Bank cod concluded that LPUE indices should be formally considered in stock assessments (NEFSC 2012), and fishery catch rates are being considered by the ongoing cod research track stock assessment working group.

Including CPUE as an index of abundance has the potential to improve performance of monkfish assessments if the index is sufficiently standardized, particularly during periods with changes to survey operations. In a review of Northeast fishery stock assessments, the National Research Council concluded that "fishers have a greater trust in the data that they themselves provide, and therefore an effort should be made to validate and use CPUE data" (NRC 1998). Even if it is not used as an index of abundance in the stock assessment model, considering CPUE in the stock assessment process and documentation can be valuable for providing fishery data with greater spatial and temporal resolution than fishery-independent surveys and understanding fishery dynamics (NEFSC 2012, Cadrin et al. 2020).

Project Objectives: *Objectives should be simple and understandable; as specific and*

quantitative as possible; clear as to the "what and when," but should avoid the "how and why" (which is fully addressed in the project description), and; attainable within the time, money and human resources available. Projects should be accomplishment oriented and identify specific performance measures.

Our goal is to develop standardized catch per unit effort (CPUE) indices for the commercial directed monkfish gillnet fishery and possibly the multispecies trawl fishery to be used for stock assessment purposes. To do this, we will work cooperatively with the commercial fishing industry to accomplish the following objectives (specific performance measures are detailed in the project description, below) :

- **Objective 1: Obtain fishery data and develop CPUE Standardization**
- **Objective 2: Collaborate with Monkfish Fishermen throughout the region to elicit expertise on monkfish CPUE**
- **Objective 3: Contribute CPUE series for Monkfish Stock Assessments**
- **Objective 4: Manage Monkfish RSA Days at Sea (DAS)**

Project Description: *The project description is the scientific or technical action plan of activities that are to be accomplished during each budget period of the project. This description must include the specific methodologies, by project job activity, proposed for accomplishing the proposal's objective(s).*

The main body of the proposal should be a clear statement of the work to be undertaken and should include: Specific objectives and performance measures for the period of the proposed work and the expected significance; relation to longer-term goals of the PI's work; and relation to other work planned, anticipated, or underway through Federal assistance.

We propose to implement the recommendations in the New England Fishery Management Council's Fishery Data for Stock Assessment Working Group Report (Cadrin et al. 2020) in close collaboration with the NEFSC (e.g., Jon Deroba, Anna Mercer, Andy Jones and others), other regional scientists (e.g., monkfish plan development team) and the monkfish industry.

We propose to implement the methodology and best practice recommendations of the SEDAR Abundance Indices Workshop (SEDAR 2009) and the Fishery Data for Stock Assessment Working Group (Cadrin et al. 2020). Workshops will be organized with fishermen to discuss factors affecting their catch rates beyond stock abundance. Fishery monitoring data from fishermen's logbooks, seafood dealers, at-sea observers, study fleets and electronic monitoring will be analyzed under a data access agreement. Time series of standardized CPUE will be developed for monkfish stocks.

- **Objective 1: Obtain fishery data and develop CPUE Standardization**
 - Task 1.1 Complete a Data Access Agreement with NEFSC to obtain fishery monitoring data from fishermen's logbooks, seafood dealers, at-sea observers, study fleets and electronic monitoring from monkfish trips for the time period 2009-2022.
 - Task 1.2 Consider other species catch rates in the monkfish CPUE that co-occur with monkfish (e.g., skates) and species that may indicate non-targeted monkfish effort (e.g., dogfish).

- Task 1.3 Apply best practices for CPUE standardization as recommended by the New England Council’s Fishery Data for Stock Assessment Working Group.
- Task 1.4 Graduate students will be recruited and trained in quantitative fisheries science, including stock assessment, biological statistics, and advanced statistical or population modeling.

- **Objective 2: Collaborate with Monkfish Fishermen to elicit expertise on monkfish CPUE knowledge**

- Task 2.1 Organize a working group of monkfish fishermen and project scientists, focused on CPUE project goals, sharing perspectives and knowledge, and sharing project results (June-July 2023)
- Task 2.2 Organize at least two workshops (planning and preliminary results) with monkfish fishermen to discuss factors related to catch rates, including fishing strategies (or fishing behavior) and fishing gear modifications that target or avoid certain species or stocks, interpretation of gear codes in logbooks, port, horsepower and captain impacts, quality/size range of discards, effect of regulations over time, changes in markets, seasonality, quota lease prices, environmental conditions and others (July-August 2023 and Jan- March 2024)
- Task 2.3 Incorporate planning workshop results into a survey for monkfish fishermen to elicit their expertise on factors of catch rates using questionnaires so that results can be used in building statistical standardizations models through data selection, explanatory factors. Exact timing depends on process for obtaining data and planning workshop. Postcards will be mailed to monkfish permit holders to solicit survey participation and collect phone/email for future outreach. We will target those actively landing monkfish but have budgeted assuming we will mail to all 582 limited access vessels from 2021 (NEFMC 2022).
- Task 2.3 Organize a final workshop with monkfish fishermen to discuss project results (April 2023) and/or present results at the Council’s Monkfish Advisory Panel or RSA share day.

- **Objective 3: Contribute CPUE series for Monkfish Stock Assessments**

- Task 3.1 Provide technical working papers to NEFSC lead assessment scientists for their presentation to the Assessment Oversight Panel in preparation for the 2025 management track stock assessment of monkfish and submit working papers with standardized CPUE indices.
- Task 3.2 Generate a management recommendation based on our findings for the monkfish fishery designed with fishermen’s and scientists’ input
- Task 3.3 Participate in the next research track stock assessment for monkfish.

- **Objective 4: Manage Monkfish RSA Days at Sea (DAS)**

- Task 4.1 Organize a steering committee to guide RSA allocation decisions, to include fishing organizations, project scientists, and fishermen (not those applying for RSA). Incentivize project participation with priority access to RSA DAS. (June 2023)
- Task 4.2 Apply for the RSA exempted fishing permit and distribute to participating fishermen with clear instructions on rules and reporting. Provide fleet support on questions that may arise associated with RSA DAS. (June 2023)

- Task 4.3 Develop RSA application form and solicit industry to apply to purchase monkfish RSA DAS (include advertisement in Commercial Fisheries News) (June 2023)
- Task 4.4 Collect RSA payments and manage DAS/pounds usage, updating totals on a weekly basis. Provide monthly reports to participating fishermen. (ongoing)
- Task 4.5 Provide RSA reports to NOAA as required. (every 6 months)

Timeline and Milestones

Project award period: June 1, 2023, through April 30, 2025 (pg. 5 of RSA Call)

Final indices shared by April 2025

Objectives	Timeline for completion: June 2023-April 2025
Objective 1	Obtain fishery data and develop CPUE Standardization
Task 1.1	Summer-Fall 2023
Task 1.2	Summer-Fall 2024
Task 1.3	2023-2024 and 2024-2025
Objective 2	Collaborate with Monkfish Fishermen to elicit expertise on monkfish CPUE knowledge
Task 2.1	Summer 2023, Jan-March 2024 (prelim), April 2025 (final results). (1 beginning, 1 w prelim, more as needed, final share (at least three, more as needed)
Task 2.2	Fall-Winter 2023
Task 2.3	Fall-Winter 2023
Objective 3	Contribute CPUE series for Monkfish Stock Assessments
Task 3.1	Spring 2025
Task 3.2	Spring 2025
Objective 4	Manage Monkfish RSA days at sea (DAS)
Task 4.1	June 2023
Task 4.2	June 2023
Task 4.3	June 2023
Task 4.4	July 2023-April 2025
Task 4.5	July 2023-April 2025
Tasks 4.6	July 2023-April 2025

Milestones Include:

- Steering Committee/RSA DAS Application (June-July 2023)
- Graduate Student(s) in place (summer 2023)
- Monkfish Vessel Survey Distributed (TBD)
- Vessel Workshop 1 (July-Aug 2023)
- Vessel Workshop 2 (Jan-Mar 2024)

- Vessel Workshop 3 (April 2025)
- Presentation of results to Council Monkfish PDT (April 2025)
- Final Technical Report, shared with NOAA, Council, GARFO, NEFSC, AOP (April 2025)
- Presentation of results to RSA Research Day and/or Monkfish Advisory Panel (April 2025)
- Project RSA DAS leased/funds raised (incremental)
- Progress reports every 6 months and a final report within 90 days of the conclusion of grant period.
- Final RSA DAS report to NOAA (April 2025)

Project Impacts: *Describe how these products or services will be made available to the fisheries and management communities, and how they would support an identified NMFS management priority (please refer to Council research priorities, etc.) and will be transitioned from research to fisheries management.*

Providing standardized CPUE indices for the monkfish stock assessment has the potential to make the stock assessment more robust, resulting in more accurate information to drive management decisions. Having the fishing industry participate in the development of the CPUE indices creates buy-in for the underlying science and empowers them to participate in the science and management processes.

Working papers that document standardized indices of abundance will be provided to NEFSC lead assessment scientists and the Assessment Oversight Panel in preparation for future stock assessments. The upcoming stock assessments include the 2025 management track stock assessment. Project partners will collaborate with NEFSC scientists and the Assessment Oversight Panel to propose that standardized CPUE time series be considered as indices of abundance for stock assessments. In situations where CPUE is not included in the assessment model, it can help to reconcile fishermen's perspectives with research track stock assessment results for public outreach.

The resulting datasets (aggregated, and disaggregated for scientists with data sharing agreement), statistical analysis, and code will also be made publicly available for the stock assessment community and broader scientific communities. We will foster open science standards and collaborative connections analysis of fishery data to support reproducible research. Our ultimate goal is to include standardized CPUE series as a routine component of monkfish stock assessments. Therefore, sharing code for analysis of various data streams will be needed for new people to update series developed by others. We expect a graduate thesis and publications on methodology and case study results. Results from this project are expected to benefit all stakeholders in the New England monkfish fishery. The resulting standardized CPUE indices will provide valuable information for stock assessment scientists and fishery managers. We hope that these products will contribute to improved stock assessment and fishery management to help sustain productive fisheries.

Education & Outreach: *How will this project provide a focused and effective education*

and outreach strategy regarding NOAA's mission to protect the Nation's natural resources? This includes the degree to which the potential users of the results, i.e., industry or state resource managers, have been involved in the planning of the activity, will be involved in the execution of the activity and/or are providing funds, and whether there is a plan to disseminate the results to user groups (including Regional Fishery Management Councils and, if applicable, marine mammal take reduction teams) and the public.

On all outreach material, as well as in media coverage and presentations to the fishing industry we will acknowledge NOAA's RSA Program as a program sponsor, as well as noting NOAA's mission to protect the Nation's natural resources. This project has public-facing outreach component to engage the monkfish fishing community in research workshops and to solicit monkfish RSA DAS. Industry outreach materials include email, text, and mailed postcards.

The results of the project will be shared broadly with NOAA Fisheries (Regional Office and Science Center), as well as the New England Fisheries Management Council. Reports will be sent electronically to managers and scientists. Co-PI Cadrin will present the project results to the Council Monkfish PDT and the Monkfish Stock Assessment Working Group.

The Fishermen's Alliance and SMAST have robust media and communications expertise that will be leveraged to also create public exposure for the overall project and its impacts. Our team will use the following vehicles to share our work with both the general public and fishing communities that may benefit from the project impacts:

- Social Media (facebook, twitter, instagram)
- Organizational Websites
- Organizational monthly e-newsletters to 5,000+ subscribers
- Press releases seeking earned media in newspapers, industry publications, magazines, broadcast media
- Partner networks

Outreach goals include:

- 270 monkfish limited access permit holders that caught at least 1 pound of monkfish in 2021 will be invited to participate in the survey and at least one workshop.
- 10,000+ people engaged (through media hits, social media, website, etc.)
- 5000+ people receive direct email with project information
- 2 unique earned media hits in local, state, and regional media outlets (with dozens of re-prints)

Permitting: As this is a desktop study analyzing existing fishery dependent data, no permitting is required to complete the research. The use of monkfish RSA days will require an Exempted Fishing Permit from GARFO; we will work with Spencer Tamlage to secure the EFPs for the participating vessels to be exempt from possession limits on monkfish RSA DAS. All vessels utilizing monkfish RSA DAS already hold monkfish fishing permits.

Project Management: *Describe how the project will be organized and managed. Include resumes of principal investigators, which may be appendices or attachments. List all persons directly employed by the applicant who will be involved with the project. If a consultant*

and/or subcontractor is selected prior to application submission, include the name and qualifications of the consultant and/or subcontractor and the process used for selection. Describe who will monitor project performance. Also include participation by persons or groups other than the applicant. Describe how Federal, state, and non-governmental entities, particularly members of fishing communities, will participate in the project, and the nature of their participation.

The project will be managed by principal investigator Melissa Sanderson, Chief Operating Officer at the Fishermen's Alliance. Melissa has over 18 years of experience working with commercial fishermen, NOAA Fisheries, and NGO's on collaborative projects, including the collection of biological samples and scientific research using commercial fishing platforms under EFPs and LOAs. She has significant experience managing federal, state, and private grant awards, including leading the recent regional Electronic Monitoring Audit Model Pilot Program for the groundfish fleet and a Scallop Research Set Aside project. Melissa will monitor project performance to ensure that objectives and milestones occur as planned, manage Monkfish RSA DAS, and ensure timely reporting to NOAA.

Aubrey Church, Policy Manager at the Fishermen's Alliance has over 11 years of experience working with the fishing industry, NOAA Fisheries, state agencies, and nonprofit organizations on collaborative research projects, including empowering commercial fishermen to collect biological and environmental data at sea under EFPs. Aubrey has experience managing federal, and private grant awards, including leading the CFRF Lobster and Jonah Crab Research Fleet, and the South Fork Wind Farm gillnet fisheries monitoring survey. Aubrey will conduct outreach activities with commercial fishermen in the Southern New England region to solicit monkfish RSA DAS leases and participation in the research workshops. She will organize and lead the fishermen research workshops with Co-PI Cadrin.

Co-PI Steven X. Cadrin is a professor and chair of the SMAST Department of Fisheries Oceanography. Steve has been a stock assessment scientist for over 30 years, previously with the National Marine Fisheries Service's Northeast Fisheries Science Center in Woods Hole, Massachusetts Marine Fisheries, and New York Department of Environmental Conservation. His accomplishments include the advancement of stock assessment methods for a wide range of invertebrate and finfish species, fishery management advice for regional, national and international fisheries, and global leadership in evaluating geographic stock structure and modeling spatially complex populations. He has chaired several regional, national and international working groups and committees and has convened workshops, symposia, and conferences for the International Council for the Exploration of the Seas, National Marine Fisheries Service, New England Fishery Management Council, American Fisheries Society and the Northeast Fish and Wildlife Conference. Steve was the inaugural recipient of the Excellence in Mentoring Award from the Joint Ocean Commission Initiative and is Past President of the American Institute of Fisheries Research Biologists. His teaching and research agendas focus on population modeling, stock identification, fisheries management, collaborative research with fishermen, and application of advanced technologies for fishery science. Steve will coordinate research collaborations, data access protocols and reporting requirements and will advise and train graduate students to analyze fishing gear characteristics and develop the CPUE indices.

Graduate Students

SMAST is recruiting a new graduate student with training in fisheries and quantitative analysis. Their graduate research will include method development and applications of CPUE standardization to the Southern New England monkfish stock.

Other Collaborators

We will work in close collaboration with the NEFSC scientists (Anna Mercer, Jon Deroba, Andy Jones and others), other regional scientists (ADD IN , Monkfish Plan Development Team), and the monkfish industry in Southern New England (MA and RI ports). In addition, we will leverage partnerships with other regional organizations to recruit vessel participants including Commercial Fisheries Research Corporation, Maine Coast Fishermen's Association, Cornell Cooperative Extension, groundfish sector managers, and other groups interested in RSA DAS.

Captain Greg Connors, F/V Constance Sea, has fished for more than 36 years, targeting skate and monkfish. He will serve in an advisory role to the project team and help recruit other fishermen to participate. We will solicit at least 50 southern New England monkfish fishermen to participate in the research workshops and surveys and to apply to lease RSA DAS. Their specific responsibilities are outlined below in the Vessel Participation section.

RSA compensation fishing and fund generation: *The proposal should describe how funds would be derived under an RSA award, and demonstrate an understanding of the concept of RSA compensation fishing and how the RSA funding mechanism works. This includes describing prior RSA experience successfully coordinating with the fishing industry to generate funds.*

CCFA will lease the RSA DAS for a fixed price per DAS to monkfish fishermen (assuming \$400/DAS but can revise based on NMFS feedback) and the proceeds will be used to fund the cost of the research. There will be no split in the landings revenue.

There should be a description of potential risk factors that could result in a budget shortfall, and what steps the project would take to mitigate such risk. Proposals must provide a description of the safeguards that will be used to ensure that the set-aside award will not be exceeded.

The CCCFA is well versed in quota management, having operated a permit bank since 2007. The permit bank includes both groundfish and scallop quota, which is leased out to participants on a yearly basis. CCCFA also managed 200,000 lbs of scallop RSA quota for two projects in FY22 and have refined best practices for near real-time tracking of RSA quota usage and value of RSA landings. We have confirmed that there is already demand for 250 monkfish RSA DAS per year from the 11 fishermen we have already engaged in project planning. Financial transactions are tracked in a QuickBooks database, and permit bank quota is tracked in a custom-built database. Scallop RSA quota was tracked in a series of spreadsheets but future awards will be tracked in a custom database or a more functional spreadsheet. The CCCFA has also successfully managed a

number of Exempted Fishing Permits in the groundfish and skate fleets. The collaborative Atlantic halibut research with NEFSC and other partners required bi-weekly submissions of reports to GARFO as to how many halibut had been caught under the permit. The fast turnaround reporting enabled us to keep close tabs on the total catch and communicate that number to participating fishermen, thus avoiding any issues with overages.

Evaluation of project: *The applicant is required to provide a description of project accomplishments and progress towards the project objectives and performance measures at the end of each funding period and in the final report. The application must describe the methodology or procedures to be followed to quantify the results of the project.*

We will evaluate the project based on the success of achieving our primary objectives. The technical benchmarks will be as follows:

- **ADD ANYTHING FROM STEVE HERE**
- Collect surveys from a large portion of the SNE monkfish fleet and have broad participation in a research workshop
- Share results with NEFSC, stock assessment scientists, and stakeholders.
- Share results with broader scientific community through publication in a peer-reviewed journal and presentation at a regional scientific conference.
- Share results with the NEFMC's monkfish advisory panel and / or planning and development team in a manner deemed most appropriate by those groups, to introduce data into the management process.
- Credit the RSA program and appropriate award number in any mention of the project in CCCFA online and print materials.

Vessel participation: *Each proposal must identify the activities for the vessel(s) participating in the project, including research and compensation fishing activities. The applicant should differentiate between fishing industry partners that would participate in the project, if funded, and those where no such agreement exists (e.g., previous partners);*

All vessels participating in research will be expected to complete the following activities:

- Attend at least one project workshop to share their knowledge about monkfish fishing, with a specific focus on quantifying effort in a standardized way (task 2.1).
- Complete the vessel survey (task 2.2)

Committed fishing industry partners participating in research (signed letter of support) will complete the research activities above but will also be invited to advise project partners on developing the vessel survey (task 2.2) and advise the steering committee (task 4.1).

All vessels participating in compensation fishing activities (using monkfish RSA DAS) will be expected to complete the following activities:

- Pay for monkfish RSA DAS in a timely manner.
- Follow NOAA requirements for using a monkfish RSA DAS, including correct VMS declaration, RSA start hail, and RSA end hail.

- For every RSA trip, provide CCCFA with trip level details on monkfish RSA DAS usage, trip landings and ex-vessel prices, and RSA end hails within a week of the trip.

Need for Government financial assistance: *Demonstrate the need for assistance. Explain why other funding sources cannot fund all the proposed work. List all other sources of funding that are or have been sought for the project.*

This project was conceptualized in response to the Monkfish RSA research priorities. No other sources of funding have been identified or sought for the project. Fishermen's Alliance is 501c3 charitable organization and SMAST is a 501c3 educational organization. Neither have the discretionary funds to self-fund this project; both rely upon outside grant support to conduct research projects. An investment from the Monkfish RSA Program is necessary to develop the monkfish CPUE indices. This research requires a significant investment of time and resources. The PIs and Co-PI will be conducting the work, and thus require compensation. Many fishermen are struggling to keep their businesses solvent and cannot afford to finance this work themselves. The Fishermen's Alliance will also be leveraging support by facilitating the in-kind involvement of several fishermen and industry participants to participate in the project work. In this way we will leverage pre-existing relationships to maximize the impact of the government financial assistance requested for this project.

Federal, state and local government activities: *List any programs (Federal, state, or local government or activities, including Sea Grant, state Coastal Zone Management Programs, etc.) this project would affect and describe the relationship between the project and those plans or activities. Describe any coordination with other agency programs or on-going research efforts. Describe any other proposals or outside activities that are essential to the success of this proposal.*

Federal- research track assessment

Results will be contributed to the 2025 management track stock assessment and also presented to the next scheduled Monkfish Research Track Stock Assessment in 2025-2026. Upon completing the CPUE indices research, Co-PI Cadrian would be willing to chair the RTSA.

Baseline for data collection needs from a future monkfish fishery dependent survey/study fleet.

Literature Cited: see separate document [HERE](#)