SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

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August 13, 2021

Atlantic Coastal Cooperative Statistics Program
1050 N. Highland St. Ste. 200 A-N
Arlington, VA 22201

We are pleased to submit the proposal titled, "FY22: SAFIS Expansion of the SciFish Customizable Fisheries Citizen Science Data Collection Application." This proposal is being submitted as a Year 2 maintenance proposal. It was initially funded as a new project in FY20: SAFIS Expansion of "SAFMC Release" and "NC DMF Catch U Later" Discard Reporting Applications". In FY21 it was then funded as a Year 1 maintenance project: SAFIS Expansion of Customizable Fisheries Citizen Science Data Collection Application.

The FY22 proposal builds on work that will be completed through the FY20 and FY21 projects but also incorporates new objectives. Additionally, a new objective was added to the proposal since the initial submission in June 2021 that incorporates the addition of two new projects in SciFish to help pilot the policy and procedure development and serve as prototypes for the expandability of the platform. A summary of the FY22 proposal objectives is below, highlighting the changes in scope of work and the new objective added since the proposal's initial submission:

- Continue data collection under the ACCSP citizen science application, SciFish, via the *SAFMC Release* and NCDMF *Catch U Later* projects and expand the species that can be reported.
- Continue the development and construction of SciFish, a customizable ACCSP fisheries data collection application. This application will standardize data collection, increase data availability, and reduce the need for future and existing projects to invest additional costs in individual applications. The FY22 project will move the SciFish platform prototype (application and project builder interface) developed in the FY21 project into production and explore the incorporation of features that could help with participant recruitment and retention.
- Include a new objective to develop policies and procedures needed for partners to build and support projects within the SciFish mobile application.
- Include a new objective to add two new projects, NCDMF *Tagging Program* and University of New England's (UNE) *Mail-A-Scale*, to the SciFish platform to pilot the policy and procedure development and serve as prototypes for the expandability of the platform. The project managers for these programs will be augmenting existing citizen science programs by moving from paper data collection to electronic data collection.
- The FY22 proposal's primary program priority remains biological sampling (90%). However, the secondary module has changed back to catch and effort (10%) like the initial FY20 proposal.
- The FY22 proposal is being submitted by SAFMC and NCDMF like the initial FY20 proposal.

This proposal has been revised based on the reviewers' questions and recommendations. In the original proposal, committee members asked that we address the following questions and recommendations. We have addressed them below (see red text) and within the proposal where applicable.

Questions
- *Are there any results since this project started, would like to see the value added.*
  The initial FY20 project is wrapping up now and the FY21 project will begin in late summer 2021. A summary of FY20 project results and the FY21 project objectives are below and can be found within the proposal in Table 3. Additional details on the FY20 project results will be included in the final grant report available in September 2021.

  The FY20 project combined two similar released fish reporting applications (SAFMC *Release* and NCDMF's *Catch U Later*) into a new ACCSP customizable citizen science application, SciFish, that will be available to other partners. It also expanded the application to increase the species that can be reported through the *SAFMC Release* project. Beta testing for both projects in SciFish is wrapping up now and SciFish production will launch in August 2021.

  Additionally, a series of scoping meetings were held in Spring 2021 to outline a framework for the continued development of the ACCSP customizable citizen science data collection application (SciFish) that can support multiple project types. The scoping meetings consisted of an online questionnaire, two virtual town hall meetings, and three half day microlab workshops. Just under 200 individuals completed the questionnaire and just under 60 people attended the town halls. There was a total of 46 microlab participants representing fishermen, scientists, and managers from 23 organizations across 15 states. The microlabs focused on identifying data gaps and deficiencies that could be addressed through a citizen science approach; the data needed to fill these gaps that could be reasonably collected; and app or platform usability.

  Using the information gained through the FY20 scoping meetings, the FY21 project will focus on building the customizable citizen science app prototype which will include the expansion of the app to support the project types and data fields prioritized through the FY20 scoping meetings, as well as the development of a project builder interface. Additionally, it will continue data collection in SAFMC *Release* on shallow water grouper releases and flounder releases in NCDMF *Catch U Later*. The FY21 project will begin in late summer 2021.

- *Applying for 3rd year, wasn't this originally a 1-year proposal?*
  New objectives have been added within each proposal submission that build on the work done the previous year. The FY21 project will use the information gained through the FY20 scoping meetings to build the customizable citizen science app prototype and project builder interface which will allow ACCSP partners to develop projects within the SciFish platform at little to no cost. The FY22 project will move the SciFish platform into production; develop policies and procedures for project creation; add two projects into SciFish to pilot the policy development and serve as prototypes for the expandability of the platform; and expand species included in *SAFMC Release* and NCDMF *Catch U Later*. The project PIs anticipate that SciFish will transition to ACCSP ownership and be available to all partners at the end of this FY22 project.

Please let us know if you have any questions or would like any additional information.

Best,

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Applicant Name: South Atlantic Fishery Management Council (SAFMC)
North Carolina Division of Marine Fisheries (NCDMF)

Project Title: **FY22: SAFIS Expansion of the SciFish Customizable Fisheries Citizen Science Data Collection Application**

Project Type: Maintenance
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Requested Award Amount: **$116,182**

Requested Award Period: One year upon receipt of funds

Submission Date: August 13, 2021

FY22 Atlantic Coastal Cooperative Statistics Program (ACCSP) Proposal
for the SAFMC and NCDMF

OBJECTIVES:
- Continue data collection under the ACCSP citizen science app, SciFish, via the *SAFMC Release* and NCDMF *Catch U Later* projects and expand the species that can be reported.
- Continue development and construction of SciFish, a customizable fisheries data application, to standardize data collection, increase data availability, and reduce the need for future and existing projects to invest additional costs in individual applications.
- Develop policies and procedures needed for partners to build and support projects within the SciFish mobile application.
- Pilot policy and procedure development with two additional projects: 1) the North Carolina Division of Marine Fisheries *Tagging Program* which seeks to better evaluate the migration, growth, habitat use, and population status of multiple species and 2) University of New England (UNE) *Mail-a-Scale* which seeks to expand current data collection of recreationally caught striped bass in Maine.

NEED:
Fishery managers often consider the biology and sustainability of a fish stock alongside socio-economic values of the resource and fishery when developing fishery management plans. Despite substantial efforts there are long-standing data gaps which, if addressed, could be useful in developing improved management strategies. Data that are self-reported by fishermen show great promise to alleviate these data limitations and citizen science approaches are currently being investigated to address state and federal management needs. Examples of this can be seen in recent efforts by the South Atlantic Fishery Management Council's (SAFMC) *SAFMC Release* project and North Carolina Division of Marine Fisheries' (NCDMF) *Catch U Later* project. These projects work with recreational and commercial fishermen to collect information to better characterize Scamp Grouper and flounder discards, respectively, via the use of mobile applications.

Discard mortality has been an increasing component of the total mortality experienced by many stocks and is a major source of mortality for Red Drum (SEDAR 44[1]) and Red Snapper (SEDAR 73[2]). Released fish are not available for sampling by typical dockside monitoring programs and observer coverage ranges from limited in commercial and for-hire fisheries to non-existent in private recreational fisheries in the South Atlantic region. As such, there is often no or limited information available to characterize these losses for stock assessment modeling. Improving information on released fish is a common stock assessment research recommendation

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[1] SEDAR. 2015. SEDAR 44 – Atlantic Red Drum Stock Assessment Report. SEDAR, North Charleston SC. 890 pp. available online at: http://sedarweb.org/sedar-44.

[2] SEDAR. 2021. SEDAR 73 – South Atlantic Red Snapper Assessment Report. SEDAR, North Charleston SC. 194 pp. available online at: http://sedarweb.org/sedar-73.

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and is often a top priority in agency research plans. In the ACCSP request for 2022 proposals, information on releases and discards as well as APAIS/MRIP independent biological sampling for recreational fisheries are the #2 and #4 priorities, respectively. During the August 2022 ACCSP Coordinating Council meeting, "Citizen Science" was one of three additional suggested recreational priorities for the 2022-2026 implementation period. Discard characterization and information on discard reduction practices are priorities in the South Atlantic Fishery Management Council's (SAFMC) Research and Monitoring Plan for 2021-2025 and for the SAFMC's Citizen Science Program.

In North Carolina, flounders, Red Drum, Spotted Seatrout, and Weakfish are among the most targeted recreational species. As fisheries management implements creel and size limits, as well as seasonal closures, the ratio of discarded fish to legal harvest has continued to grow. Indeed, between 2012 and 2017 discard ratios have ranged between 84-90% for flounder species, 77-97% for Red Drum, 77-95% for Spotted Seatrout, and 77-93% for Weakfish. Despite high angler preference for flounder and trout, ambiguity exists concerning correct identification within both genera. This confusion presents a unique challenge for fisheries management because discard information provided by the recreational angling community may be inadvertently errant. To date, the partitioning of discarded catch for these species is accomplished by applying the ratio of species within the observed harvest. However, this methodology is not ideal due to the assumption that discarded individuals share the same spatiotemporal distribution as those harvested. The ability to characterize ambiguous discarded fish (e.g. flounders) to species and obtain associated biological data is perennially highlighted as a research priority by the NCDMF Biological Review Team Research Priority Subcommittee.

The SAFMC developed the reporting application *SAFMC Release* through its Citizen Science Program to provide information on released Scamp Grouper to be considered for use in an upcoming stock assessment and future management. *SAFMC Release* provides a streamlined approach for fishermen to provide a picture of discarded fish along with additional details such as length, release location and depth, condition, and use of barotrauma mitigation techniques. Because there is a severe lack of details on discarded fish across all fishery sectors, this app was developed for and is being promoted to all sectors - commercial, for-hire, and private recreational fisheries. The NCDMF has developed *Catch U Later,* a reporting app for recreational discards to enable the separation of generic flounder discards into individual species, to collect information on the size of released fish, and information on capture location. Data collected from the *Catch U Later* application will be used to determine the ratio of constituent flounder species within generic flounder discards thereby increasing the reliability of discard information used in stock assessment models.

ACCSP and Harbor Light Software have been key partners in the development of both projects. ACCSP provides a portal for data submission and warehousing, and Harbor Light Software developed programming for both applications. While both the SAFMC and NCDMF projects are quite different, there is a strong similarity in the tools – the apps – used by each. The **FY20 ACCSP project combined these two apps under a new ACCSP citizen science mobile**

application, SciFish, providing a single discard reporting tool that can be adapted by other partners in the future. It also expanded the species that can be reported through the application to all shallow-water grouper (Red, Gag, Black, Scamp, Yellowfin and Yellowmouth Groupers; Red Hind; Rock Hind; Coney and Graysby) for the *SAFMC Release* project. This proposal will continue data collection under the *SAFMC Release* and *Catch U Later* projects expanding the species collected within each project. *SAFMC Release* will begin collecting data on Red Snapper in addition to all shallow water grouper. NCDMF's *Catch U Later* will begin collecting data for Red Drum, kingfish, Spotted Seatrout, and Weakfish in addition to flounder.

Importantly, the implementation of NCDMF's *Catch U Later* was substantially delayed due to the COVID-19 pandemic. Specifically, the original methodology had budgeted for a series of in-person workshops to train participants on using the mobile application and identification of flounder. This COVID-related delay realigned the timeline to better coincide with the merger of both applications into SciFish. The *SAFMC Release* and NCDMF *Catch U Later* projects in the SciFish application are nearing completion of beta testing. SciFish will move into the production phase in August 2021, and data collection will begin in NCDMF *Catch U Later* and expand to include all shallow water groupers for *SAFMC Release*. One focus of the FY22 proposal will be on the expansion of the application to include the aforementioned species that were not completed in FY2020. The *Catch U Later* funding earmarked in the FY20 proposal for a temporary data QA/QC technician was reallocated to assist in paying for an outside facilitator for the customizable citizen science app scoping meetings held in spring 2021.

Collecting information on released fish is just one of the challenges ACCSP partners face that can be addressed through innovative electronic tools. The astounding proliferation of smartphone applications impacts nearly all aspects of people's lives. The willingness of the public to openly share information and experiences supports smartphone applications as a promising approach for collecting fisheries data. Electronic applications offer obvious benefits to the challenge of collecting fisheries data not available to traditional sampling efforts and can be customized to address nearly any fisheries data collection need. Additionally, applications reduce data entry errors, improve timeliness, and lower labor demands as has been demonstrated in the transition of MRIP APAIS from paper to electronic data collection. The relative ease with which applications can be developed may be good for finding innovative solutions to gather data, but it carries the risk of excessive "stovepiping" that results in unique data streams that are difficult to coordinate with other data streams. There is also the risk that a multitude of highly specific applications will impose excessive maintenance costs and lead to confusion amongst the fishing and scientific communities. Therefore, oversight and intentional design are required to ensure that applications collect valid information and that the data collected can be used in management, both of which are core elements in the SAFMC's Citizen Science Program. The SAFMC Citizen Science Program is uniquely situated to address design and data quality concerns through its existing structure to review and support citizen science project development, and to provide coordination through its regional partnerships and infrastructure.

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The SAFMC's Citizen Science Program was developed over the course of several years with guidance from a wide array of stakeholders and partners. The program's overall approach is to support projects that fill data gaps and address research needs; to complement existing programs and partnerships; to foster fishermen and scientist collaboration; and to implement intentional project design so there is a direct application of the data for use in management or stock assessments. As part of this intentional design, projects supported by the program are encouraged to form a design team of diverse stakeholders (e.g. fishermen, scientists, managers, etc.) to provide guidance throughout the development and implementation of a project. Scientific input is critical to ensure projects are designed so that data collected can meet its intended use. Fishermen and other stakeholders' input helps ground projects in reality to ensure data collection methods are feasible. Through the development of its Citizen Science Program, the Council worked with stakeholder driven action teams to create Standard Operating Policies and Procedures (SOPPS), which include program and project support resources available through the SAFMC's website.

Funding for citizen science is often limited and developing a comprehensive and flexible app that can be used to collect information from a variety of sources would be extremely helpful in reducing costs for different projects, reducing time needed to create an app from the ground up, and increasing consistency in data fields and structure. The SAFMC and NCDMF's FY20 ACCSP project began planning for the development of a comprehensive and flexible reporting tool that could be applied to a variety of fisheries data issues. **The long-term goal is to develop a menu-driven tool administered through ACCSP that partners could use to easily create a customized app or 'project' by selecting specific data fields, without the need to develop stand-alone apps for each new project or data challenge**.

Through FY20 project funding, a series of scoping meetings was held in spring 2021 bringing together fishermen, scientists, and managers along the Atlantic coast to share their knowledge and perspectives on the development of a customizable citizen science application. An organizing committee with representatives from SAFMC, NCDMF, ACCSP, Harbor Light Software, Georgia Department of Natural Resources (GADNR), and Rhode Island Department of Environmental Management (RIDEM) helped plan, coordinate and conduct these meetings. The scoping meetings initially explored the needs of the broader fisheries community by gathering information through an online questionnaire and two town hall meetings. Next a series of three half-day workshops was held with a core group of individuals who participated in the questionnaire or town halls or were identified through earlier outreach efforts. There was a total of 46 microlab participants representing fishermen, scientists, and managers from 23 organizations across 15 different states. The workshops focused on identifying data gaps and deficiencies that could be addressed through a citizen science approach; the data needed to fill these gaps that could be reasonably collected; and app usability (i.e. how to make the app as user friendly as possible and what positive feedback loops could help with recruitment and retention). Using the information gained through these scoping meetings, SAFMC's FY21 ACCSP project will focus on building the customizable citizen science app prototype which will

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include the expansion of the app to support the project types and data fields prioritized through the FY20 scoping meetings, as well as the development of a project builder interface.

Through this proposal, the SciFish platform prototype (application and project builder) developed during the FY21 project will move from beta testing into production, making it available to all ACCSP partners. A secondary focus will be to incorporate features into the application identified through the FY20 scoping meetings that could help with participant recruitment and retention (e.g. weather, regulations, etc.). Additionally, it became clear through the FY20 scoping meetings that more work would be needed to develop policies and procedures for project managers who want to utilize the SciFish platform. To address these issues, this proposal will work with ACCSP leadership and partners to develop guidelines for the SciFish platform which will include:

- Standards for the development of projects within SciFish
- Processes for project managers to build and test projects before launching
- Processes for adding new data fields into the application and project builder
- Standards for SciFish branding, accessibility, transparency, confidentiality and privacy, and create template user agreements
- Training materials for the project builder interface and resources to assist with citizen science project development
- Clarifying next steps as the SciFish app transitions to ACCSP ownership and becomes available to all partners

This proposal will also pilot the policy and procedure development by collaborating with two additional project managers through the NCDMF *Tagging Program* and the UNE *Mail-A-Scale* program to build two new projects within the SciFish app. Project managers for these programs requested to be part of the SciFish beta testing, helping provide further 'proof of concept' that the application can be adapted to fit different partners' projects and data collection needs. The primary objective of the project managers for NCDMF *Tagging Program* and UNE *Mail-a-Scale* is to augment existing citizen science data collection programs. The NCDMF *Tagging Program* seeks to allow fishermen to report tag returns more quickly than current protocols (i.e. filling out paper forms, reporting tags physically at NCDMF offices) as well as collect additional biological data (i.e. length). Similarly, the UNE *Mail-a-Scale* project seeks to expand and enhance the Gulf of Maine Research Institute's (GMRI) *Snap-a-Striper* Project. Currently, the GMRI *Snap-a-Striper* protocol involves recreational anglers submitting a photograph of recreationally harvested striped bass that includes a paper reporting card as well as biological data (i.e. otoliths) from legally harvested fish. Importantly, UNE *Mail-a-Scale* uses the same reporting card as GRMI *Snap-a-Striper* and seeks to develop an electronic reporting application in lieu of the paper reporting card. Additionally, UNE *Mail-a-Scale* seeks to collect non-lethal biological data (scales) from recreationally discarded Striped Bass. Advantages of developing a reporting application through the SciFish project builder interface will allow anglers to report data more quickly and accurately, allow staff to QA/QC and process data more efficiently, and archive data into the database sooner. These benefits serve to streamline data collection while

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simultaneously reducing associated costs. More details on the NCDMF *Tagging Program* and UNE *Mail-A-Scale* projects can be found in Appendix 1.

The SAFMC's Citizen Science Program and NCDMF are in a position to lead and coordinate efforts with other partners in the continued development of this flexible fisheries citizen science application. The SAFMC's Citizen Science Program has experience working with stakeholders as well as state and federal partners in developing programmatic level policies and procedures through the development of its own SOPPS which can be used as a starting point and adapted when developing policies for the SciFish platform.

RESULTS AND BENEFITS:

This project will continue developing the ACCSP customizable citizen science app, SciFish, moving the platform into production and enhancing the features available in the app and project builder; developing the policies and procedures needed to guide and support partners' use of this innovative platform; and expanding data collection within the *SAFMC Release* and NCDMF *Catch U Later* projects.

The role of citizen science is an evolving and potentially powerful tool that can be used to better understand marine fish populations and fisheries along the Atlantic coast. The SciFish platform is flexible and scalable to meet different partner and management needs and will be able to support multiple projects that can be configured to address specific questions across fisheries sectors and jurisdictions. This approach is similar to the Cornell Lab of Ornithology's eBird that supports multiple projects to collect information on bird distribution and abundance through one platform. Although the individual projects in eBird may appear different, they feed into one database and use consistent data fields. This will reduce costs and the time needed to develop a new app to collect important data, will improve consistency across apps from multiple agencies for data fields, and enable researchers to focus on recruitment and retention of project participants. The diverse participation in and success of the FY20 customizable app scoping meetings demonstrate the interest of ACCSP partners in the continued development of the SciFish platform. Project partners are also engaging with other groups who have developed similar citizen science data collection platforms, like eBird and citsci.org, to learn from their experiences. Rick Bonney, Director Emeritus of the Public Engagement in Science Program at the Cornell Lab of Ornithology and a co-founder of eBird, participated in one of the FY20 scoping meetings giving a presentation which shared insights on the development of eBird. Additionally, SAFMC and ACCSP staff had a call with a co-founder of citsci.org, a platform that supports data collection for a variety of citizen science projects. Developing a customizable platform with ACCSP, an established data management leader on the Atlantic coast, will help increase accessibility to the data for a variety of partners.

This proposal will build on the work done in the FY20 and FY21 projects. The FY20 project was envisioned as the first step in the development of the customized data collection tool. It built an innovative released fish information platform (SciFish), consisting of a core application used by anglers with iOS and Android functionality for both phones and tablets, and specific profiles, created by the Project Builder interface, tailored to two unique projects (*SAFMC*

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Release and NCDMF's *Catch U Later)*. Additionally it worked with ACCSP partners and other interested parties through a series of scoping meetings to outline a framework for the continued development of the application by identifying key data gaps that could be addressed through a citizen science approach and the corresponding data fields that would help meet those gaps. The FY21 project will create a project builder application prototype that works with the expanded list of data collection fields identified and prioritized through the FY20 scoping meetings to build partner project-specific data collection interfaces. The intent of this project will be to move the SciFish prototype developed into production, to work towards incorporating features that could help with recruitment and retention, and to develop the corresponding policies and procedures needed to guide and support use of the SciFish platform. The development of these policies is critical to help ensure projects are designed to answer specific research questions and meet identified data gaps; are developed with intentional design so data collected are fit for purpose and meet their intended use; and to provide general oversight for use of the platform. The ability to identify and communicate these policies to potential users will increase the efficacy of subsequent SciFish projects by mitigating potential limitations and deficiencies on the front end. Importantly, onboarding the NCDMF *Tagging Program* and UNE *Mail-A-Scale* projects will better inform the development of these procedures and policies while simultaneously addressing two of the data needs, "Fish Distribution and Movement" and "Life History", identified during the scoping meetings conducted during the FY20 project.

Additionally, this project would continue the collection of data on released fish via *SAFMC Release* and *Catch U Later* and expand the species that can be reported through each project. Observer funding across most fisheries along the Atlantic Coast has never been adequate. Many fisheries, such as the private recreational or the commercial snapper grouper hook and line, are challenging to sample through conventional observer techniques due to their sheer volume of participants and small vessels which could present safety concerns. Although a few specific fisheries are highlighted in this project, the proportion of catch attributed to releases is increasing in many popular fisheries along the Atlantic Coast, indicating that other ACCSP partners likely share the needs and could benefit from the SciFish platform developed through this project. For example, the Atlantic States Marine Fisheries Commission's Bluefish Technical Committee recently received a presentation on the *SAFMC Release* and *Catch U Later* projects to explore whether a project like this could be developed for Bluefish to help meet data gaps to characterize the size of released fish.

Partners would benefit by being able to create and use an electronic tool without incurring extensive development costs which hinders citizen science or other voluntary data collection programs where resources are often limited. Reducing the development cost means more of the limited funds would be available for volunteer engagement which is critical for project success and is labor intensive. It would also give partners more flexibility in responding to timely research and management needs by allowing them to build and deploy project specific apps quickly with standardized data fields. ACCSP would benefit by reducing the need for continual Application Programming Interface (API) and report development. A generic tool of this type could prove particularly useful as ACCSP moves from the traditional catch and effort data

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sources and into warehousing the next tier of fisheries data - biological and socio-economic. Project partners anticipate this platform will be further improved and expanded through future projects. Developing the SciFish platform within the SAFIS system will ensure it meets ACCSP data quality and accessibility standards, is compatible with existing data collection programs, available to all partners, and kept up to date. ACCSP staff were involved in the development of this proposal. If funded, database structures will be built or modified in SAFIS and the Data Warehouse, as needed, and adequate storage is available to support this project. See Appendix 2 for a memo describing the ACCSP staff workload for this proposed project.

Primary Program Priority Addressed by this Project
The SciFish customizable reporting application and the supporting project builder developed as part of this project will continue to further expand a tool to collect biological information on the component of catch that is released, addressing the ACCSP FY22 Request for Proposal priority 1b and Recreational Technical Committee priority 2.   The *SAFMC Release* and NCDMF *Catch U Later* projects within SciFish will continue to collect biological and fishery data that is independent of APAIS/MRIP, addressing Recreational Technical Committee priority 4. The onboarding of the NCDMF *Tagging Program* and UNE *Mail-A-Scale* projects will also address ACCSP FY22 Request for Proposal priority 1b and Recreational Technical Committee priority 2.

The specific benefits to each data type and the rank of the target species within priority matrices included in the app are addressed below for each project.

Primary Program Priority: Biological Sampling: 90%
For the SAFMC portion, biological information from both the commercial and recreational fisheries will continue to be collected on released shallow-water groupers (Red, Gag, Black, Scamp, Yellowfin and Yellowmouth Groupers; Red Hind; Rock Hind; Coney and Graysby) and expanded to include Red Snapper. Scamp, Gag, Red Grouper, and Red Snapper are in the top 25% of the ACCSP biological sampling priority matrix. The commercial snapper-grouper hook and line fleet is #5 in the ACCSP bycatch priority matrix. The SAFMC *Release* portion includes:
● Data collected for each trip: trip type (commercial, recreational, headboat, charter), date, user (ACCSP ID)
● Data collected for each fish released: species (user's determination), length (based on ACCSP standards), location, depth, time, fate (dead or alive release), hook type, hook location, use of barotrauma mitigation (descending device, venting, line cut), shark predation, and photograph (to validate and evaluate user IDs and lengths)
● Users may also file a 'no fish released' report

For the NCDMF *Catch U Later* portion, biological information will continue to be collected on recreational releases for three species of flounder (Summer, Gulf, and Southern) and be expanded to include Red Drum, Kingfish, Spotted Seatrout, and Weakfish. The NCDMF *Catch U Later* portion includes:

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- Data collected for each trip: trip type (private boat, headboat, charter, manmade structure, bank/shore), date, user (ACCSP ID)
- Data collected for each fish released: species (user's determination), area fished, length (based on ACCSP standards), location, fate (dead or alive release), hook type, hook location, and photograph (to validate and evaluate user IDs and lengths)

For the NCDMF *Tagging Program* portion biological information will be collected for a variety of species including Cobia, Spotted Seatrout, Striped Bass, Southern Flounder, and Red Drum. Cobia is in the top 25% of the ACCSP biological priority matrix.
- Data collected for each trip: trip type (private boat, headboat, charter, manmade structure, bank/shore), date, user (ACCSP ID)
- Data collected for each fish: species, area fished, length (based on ACCSP standards), location, fate (dead or alive release), hook type, hook location, and photograph(s) (tag ID and fish).

For the UNE *Mail-A-Scale* portion biological information will be collected on recreationally caught Striped Bass.

Secondary Module as a by-product: Catch and Effort: 10%
A ratio of Southern, Summer, and Gulf flounder to total flounder by year, wave, and area fished will be determined from a statistically drawn and trained panel of NC *Catch U Later* users. These proportions will be applied to the estimates of left-eyed flounder released catch to produce estimates of discards for each of the specific flounder species. Similar data limitations and associated methodologies are applied to other ambiguous species including kingfish (Northern, Southern, Gulf) as well as Spotted Seatrout and Weakfish. As the application is expanded to include these species, their specific contributions to unobserved catch records will be evaluated.

Stock Assessment and Management Benefits and Impact:
By continuing data collection on released fish through the *SAFMC Release* and *Catch U Later* projects, as well as expanding the opportunity for other partners to collect data on released fish, the positive impact of this project to stock assessments could be substantial and realized by many ACCSP partners. Stock assessments rely upon accurate information on total catch and removals from the stock and accurately allocating those removals to year classes. For fish that are landed, these requirements can be addressed through straightforward methods such as catch reporting or creel surveys to estimate removals and dockside sampling to collect length measurements and age samples. Surveying and dockside sampling approaches cannot work when the fish are released on the water. Using the South Atlantic as an example that is in no way unique, very limited information is available to classify the size composition of released fish in the commercial snapper grouper hook and line fleet, the private recreational fleet, or the charter fleet. In some areas, fisheries observers are used to collect information on released fish. Observer coverage is limited due to high cost. Moreover, even if funding were available, logistics and liabilities remain a concern for some fisheries. Examples include the commercial

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hook and line snapper grouper fishery, which is prosecuted mostly by small vessels, and private recreational fisheries. Limited observer coverage is available for the headboat fleet, but changes in fleet size and behavior raise concerns about the validity of such data to characterize removals from other fishery sectors. This lack of information is a major source of stock assessment uncertainty, as assumptions must be made to assign released and discarded fish into length and thus age classes.

In years past the lack of accurate information on discarded fish was not a major assessment concern or source of uncertainty as landed fish generally accounted for the majority of stock removals. However, this is changing as regulations and fishing behavior are leading to increased discarding. For example, in the recent assessment of Red Drum (SEDAR 44[3]), the Review Panel noted catch and release fishing was increasing and as a result estimated total removals from the stock was increasingly sensitive to discard mortality rates and discard losses. The Panel also questioned the validity of an assumption that the length frequency of discarded fish was similar to tagged fish. The assumption was necessary due to the lack of any data on the size of released fish that could be used to assign mortalities from release to appropriate length classes. There are several reasons why such an assumption may be invalid and a source of bias in the assessment results, but the total lack of data precludes even an effort to determine the direction of bias or magnitude of uncertainty. The Review Panel considered this data lack significant and an important issue in the Red Drum assessment. The addition of the NCDMF *Tagging Program* will provide critical Red Drum data including migration patterns, growth, and habitat use. Finally, the expansion of NCDMF *Catch U Later* to include Red Drum can be used in concert with the NCDMF *Tagging Program* to address the aforementioned data limitations thereby increasing the reliability of stock assessment models and associated management measures.

Consider other examples of the target fish in this study. The most recent assessment (SEDAR 53[4]) indicated that over fifty percent of the fishing mortality experienced by Red Grouper is due to discard losses. Given that this stock was found to be overfished and overfishing was occurring, these discard removals are significant, and therefore the assumptions made regarding their size and composition are critical. In this instance, the length composition and selectivity for the discard losses was based on observer records from the headboat fishery and it was assumed these data were representative of all fishery sectors. As noted above, there is no data to test this assumption so its impact on assessment uncertainty and bias is unknown. In SEDAR 73, the most recent South Atlantic Red Snapper assessment, the stock was found to be overfished and undergoing overfishing. In recent years, discards have accounted for over 90% of removals so characterizing their size is critical. Length compositions and selectivity for discards were based on limited commercial, headboat, and charter (Florida only) observer data. Sampling recommendations in the report noted that it remains important to monitor discards year-round

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[3] SEDAR. 2015. SEDAR 44 – Atlantic Red Drum Stock Assessment Report. SEDAR, North Charleston SC. 890 pp. available online at: http://sedarweb.org/sedar-44.

[4] SEDAR. 2017. SEDAR 53 – South Atlantic Red Grouper Assessment Report. SEDAR, North Charleston SC. 159 pp. available online at: http://sedarweb.org/sedar-53.

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and any potential methodological or sampling improvements should be implemented if possible. Having additional information to help characterize the substantial discards could help meet this critical need.

<mark>A similar lack of information exists to classify the depth where fish are captured and released and the use of barotrauma reducing actions such as venting or descending. Fishing depth and barotrauma are positively correlated with release mortality rates for most species. However, it is difficult to incorporate depth and barotrauma into the overall release mortality rate applied for a stock assessment without additional information on released fish.</mark>

<mark>Small improvements in estimates of discard mortality, based on data rather than assumption, can result in large changes in the estimated removals from a fish stock.</mark> Based on the results of ACCSP-funded headboat observer studies, as cited in the 2019 Recreational Technical Committee proposal, the Red Snapper release mortality was reduced from 37% to 28.5% due to the use of circle hooks. Applying this percentage change to the estimated 2018 MRIP discards reduced the discard losses to the population by 274,000 fish. This is quite a difference when compared to the 2018 recreational annual catch limit of 29,656 fish. This is also relevant for species such as flounder, kingfish, Spotted Seatrout, and Weakfish given the current method applies a ratio of observed landings, which may not be an accurate representation of released fish. The ability to accurately characterize discards could substantially improve stock assessments and management decisions.

The SAFMC's Snapper Grouper Regulatory Amendment 29, which requires descending devices on-board vessels fishing for or possessing snapper grouper species, was recently implemented in July 2020. Federal law requires comparing the No Action alternative (not requiring) with proposed management actions. Having information on usage of descending devices would have benefited the analysis for impacts of requiring a descending device both in the cost to anglers and for estimating changes in the estimate of discard mortality. Luckily, most stakeholders regarded this as a positive management action. But quantitative information on fishing practices that can be collected through a flexible data collection app could be used to make more informed decisions on the impact of management actions. When reviewing the SEDAR 73 (South Atlantic Red Snapper) assessment at their April 2021 meeting, the SAFMC's Science and Statistical Committee raised concerns about the level of descender device usage due to the lack of information on how widespread usage is in the fishery. This is of note since the assumed level does have an impact on management quantities - highlighting the need for this type of information.

In 2019, stock assessments determined that North Carolina's Southern Flounder stock is overfished, and overfishing is occurring. State law requires management actions be taken to end overfishing within 2 years and recover the stock from an overfished condition within 10 years. To meet these legal requirements, the NCDMF determined that significant reductions in harvest were necessary. As such the North Carolina Marine Fisheries Commission adopted Amendment 2 to the Southern Flounder Fishery Management Plan and included a 62% reduction in total

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removals in 2019 and 72% reduction in total removals in 2020 across recreational and commercial fishing sectors. To achieve these management measures, no flounder can be harvested outside of the open season and gears targeting Southern Flounder are removed from waters outside of the season. The adoption of Amendment 2 was predicated on the immediate development of Amendment 3 which would include better characterizing the fishery and exploring alternate management strategies. Information collected through the *Catch U Later* app will be invaluable for the development of Amendment 3 by providing species specific discard length data to better inform stock assessment models. Additionally, the application will help researchers evaluate self-reported discard data from dockside interviews and help educate the angling public on flounder identification.

Data Delivery Plan:
Data collection projects will be defined by the project builder application and will be stored in SAFIS, where they can be downloaded and interpreted by the fisherman application to a phone or tablet. The fisherman application for all projects will collect and deliver data directly to ACCSP through an API, building on the existing API that currently accepts data from *SAFMC Release* and *Catch U Later*. Data can be entered by fishermen when no internet connection is available and later uploaded to SAFIS when a connection exists.

APPROACH:

Task A: Move the SciFish platform prototype (application and project builder interface) developed from the FY21 project from beta test into production. Explore the incorporation of additional features identified during FY20 project scoping meetings that could help with participant recruitment and retention (e.g. weather).

Harbor Light Software
- Productize the technology incorporated into the Project Builder application development during the FY21 project into a package which can be distributed as a fully supported Production-level application. This will include the creation of project templates and documentation to assist new project developers. Additional work is expected to address feedback from users during both the FY21 and FY22 timeframes to improve the performance, usability, and functionality of the application, including incorporating support for participant recruitment and retention features.
- Continue to update the client angler application as needed to support new features for application functionality, project management and reporting based on feedback from end users and project creators/managers.
- Add additional identified species and data fields that were not supported during the FY21 project.
- Incorporate analytics data to gain insights into usage patterns of the application such as geographic usage or ease of use of particular features. Similarly, incorporate error reporting

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features to proactively be alerted to reliability issues with the application after it has been deployed.
- QA/QC the application before release.
- Manage the deployment of the application directly to beta users, maintaining a presence in the Google Play Store and Apple App Store.
- Provide second-tier technical support for issues found with the application, including correcting errors found in the implementation of the required feature.
- Investigate features and or modifications which increase the continued use of the application by the citizen science community.

SAFMC, NCDMF, & UNE
- Add additional species to the *SAFMC Release* (Red Snapper) and NCDMF *Catch U Later* (Red Drum, kingfish, Spotted Seatrout, and Weakfish) projects via the Project Builder.
- Develop new projects within SciFish via the Project Builder for the NCDMF *Tagging Program* (Cobia, Red Drum, Spotted Seatrout, Striped Bass, and Southern Flounder) and UNE *Mail-A-Scale* (Striped Bass).
- QA/QC and test application.

ACCSP
- Build appropriate API or modify existing API as needed.
- Update and/or build procedures, database objects, and reports as needed, and allow easy access to photos that are linked to the trip records.

Task B: Public Outreach (SAFMC and NCDMF)
- Recruit new participants in the existing projects, *SAFMC Release* and NCDMF's *Catch U Later* and expand participation for the new species.
- Apply engagement strategies to retain current participants in both projects.
- Notify ACCSP partners when new versions of SciFish are available.

Task C: SAFIS Application Deployment (ACCSP)
- SAFIS SciFish application will be deployed by this time.
- Reports are currently available in Data Warehouse to view/download data.

Task D: Data collection, QA/QC, and analysis (SAFMC, NCDMF, & UNE)
- Data successfully submitted via app to SAFIS/Data Warehouse.
- SAFMC, NCDMF, & UNE provide QA/QC for data collected through their projects; edit/correct as necessary.
- Data made available for assessment and management, as necessary.
- Continue to explore long term solutions for addressing QA/QC and validation needs of the data (e.g. photographic and species identification), considering volunteers and citizen science approaches.

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Task E: Development of policies and procedures for use of the ACCSP SciFish Platform
- Engage ACCSP leadership to outline a process to develop policies and procedures for partners who want to utilize the SciFish platform.
- Organize a design team including SAFMC, NCDMF, ==UNE,== ACCSP, Harbor Light Software, ACCSP committee representatives, and other interested parties to develop policies and procedures via a series of virtual meetings. ==The NCDMF *Tagging Program* and UNE *Mail-A-Scale* projects will be used to inform and pilot the procedures developed.==

GEOGRAPHIC LOCATION:
The SAFIS application will collect data in NC inshore and coastal waters via the NCDMF *Catch U Later* ==and *Tagging Program* projects== and collect data in coastal South Atlantic waters from North Carolina through the East Coast of FL to the FL Keys via the SAFMC *Release* project. ==The UNE *Mail-A-Scale* project will collect data in ME inshore and coastal waters.== The geographic scope of the proposal includes all ACCSP partners in all regions, as they will be able to use or modify the SciFish application to meet specific project needs. The Rhode Island Division of Marine Fisheries has provided a letter for support for this proposal (see ==Appendix 3==).

FUNDING TRANSITION PLAN:
Project contains a defined end point. This is a one-year project. PIs anticipate that SciFish will transition to ACCSP ownership and be available to all partners at the end of this ==FY22== project.

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MILESTONE SCHEDULE:
Table 1. Milestone Schedule

Task	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Create app enhancements to existing base code and project builder	x	x	x	x	x	x	x	x	x	x	x	x
Update API and reports	x	x	x	x	x	x						
Testing & feedback from users; incorporating changes/fixes in application			x	x	x	x	x	x	x	x	x
Development of new test projects in SciFish			x	x	x	x	x	x	x	x		
Public/Partner Outreach	x	x	x	x	x	x	x	x	x	x		
SAFIS Application Deployment								x				
Data Collection, QA/QC & Analysis	x	x	x	x	x	x	x	x	x	x		
Development of SciFish policies and procedures		x	x	x	x	x	x	x	x	x		
Semi and Annual Report Writing						x				x	x	x

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PROJECT ACCOMPLISHMENTS MEASUREMENTS:

Table 2. Project Accomplishments Measurements

Project Component	Goal	Measurement
Add enhancements to SciFish application and project builder	Migrate prototyped functionality into a fully supportable production status	SciFish application and project builder modified to incorporate additional features not addressed in FY21 project; updated application tested and ready for deployment
Public Outreach	Continue to promote *SAFMC Release* and NCDMF *Catch U Later* projects	New users recruited and current users retained for *SAFMC Release* and NCDMF *Catch U Later* projects
SAFIS Application Deployment	Have application easily accessible and available	Application accessible through app stores
Data Collection, QA/QC, and Analysis	Users continue to submit data on the targeted species using the application	QA/QC completed; data available for management and stock assessment, as needed
Development of SciFish platform policies and procedures	Describe the standards and processes needed to support the use of the SciFish platform by ACCSP partners	Policies and procedures document created for the SciFish platform
New projects created in SciFish platform	SciFish platform supports development of new projects by ACCSP partners	NCDMF *Tagging Program* and UNE *Mail-A-Scale* projects built and deployed within the SciFish platform

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FY22 COST SUMMARY (BUDGET):

Item	ACCSP Share	Partner Share	Total
PERSONNEL COSTS			
SAFMC Personnel Julia Byrd, Citizen Science Program (15%) Chip Collier, Deputy Director (5%)		$12,357 $5,713	$18,070
SAFMC Project Coordinator	$45,760		$45,760
NCDMF Personnel Ami Staples, Biologist II (15%) Drew Cathey, Biologist Supervisor (5%)		$7,426 $3,000	$7,951
UNE Personnel John Mohan, Assistant Professor (3.7%)		$3,683	$3,683
CONTRACT			
Contractor Software Development	$55,000		$55,000
TRAVEL			
Support for travel to support outreach and promotional opportunities for *SAFMC Release*	$3,500		$3,500
SUPPLIES			
Recruitment/Retention Promotional Items	$6,000		$6,000
Virtual meeting facilitation tools	$360		$360
Indirect Costs (10% of non-contract costs)	$5,562		$5,562
TOTAL	**$116,182**	**$32,179**	**$148,361**
Percentage	**78%**	**22%**	**100%**

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FY22 BUDGET NARRATIVE:

Personnel ($45,760): Personnel funds of $45,760 will be used by SAFMC to hire a Project Coordinator to help oversee the *SAFMC Release* project and help coordinate the continued development of the SciFish platform and the creation of SciFish policies and procedures. Personnel cost is estimated at $22/hour for a year (2080 hours).

Contractual ($55,000): Harbor Light Software will provide software development services to enhance the *Release + Catch U Later* application developed in FY20, and to build a "Project Builder" application. The latter app allows project owners to create customizable data collection applications. Harbor Light Software will test the software prior to release and manage the applications in the app stores. Costs are based on estimates of 270 hours of software development at $170/hour and 180 hours of QA/QC at $50/hour.

Travel ($3,500): Travel by the project coordinator will be used to promote SciFish and recruit users to participate in *SAFMC Release* by visiting tackle shops, fishing clubs, fish houses, charter operations, and other related venues to allow for distribution of outreach and promotional materials.

Supplies ($6,360): Partners will utilize funds to print promotional materials (e.g. wallet cards, postcards, rack cards, etc.) to promote SciFish and its existing projects (*SAFMC Release* and *Catch U Later*), as well as to recruit *SAFMC Release* users. Cost for print materials range from wallet cards (~$0.05 each) to rack cards (~$0.30 each). Using an average cost of ~$0.23 per item, $1000 will allow us to print ~4,400 items for distribution. Funds will also be used to purchase small promotional items (e.g. fishing towels, measuring tapes, stickers, etc.) to help increase recruitment and retention of participants. Cost for promotional items range between stickers (~$1.50 each) to towels (~$4.50 each). Using an average cost of $3.00 per item, $5,000 will allow us to distribute ~1,665 items to participants.

Virtual meeting facilitation tools will be used for the series of meetings held to develop SciFish policies and procedures. Costs are estimated at $30/month for 12 months for a total of $360.

Indirect charges of 10% are applied to the non-contract budget items for a total of $5,562. The Harbor Light Software contract will be administered through ACCSP, so was excluded from the indirect calculations.

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FY21 COST SUMMARY (BUDGET):

Item	ACCSP Share	Partner Share	Total
PERSONNEL COSTS			
SAFMC Personnel Julia Byrd, Citizen Science Program (10%) Chip Collier, Deputy Director (5%)		$8,156 $5,656	$8,156 $5,656
SAFMC Project Coordinator	$45,760		$45,760
Graduate student to conduct survey work	$2,400		$2,400
CONTRACT			
Contractor Software Development	$55,000		$55,000
TRAVEL			
Support for travel to support outreach and promotional opportunities for SAFMC Release	$4,200		$4,200
SUPPLIES			
Recruitment/Retention Promotional Items	$2,000		$2,000
Indirect – 10% of non-contract costs	$5,432		$5,432
TOTAL	**$114,792**	**$13,812**	**$128,604**
Percentage	**89.3%**	**10.7%**	**100%**

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FY21 BUDGET NARRATIVE:
Personnel ($48,160): Personnel funds of $45,760 will be used by SAFMC to hire a Project Coordinator to help oversee the *SAFMC Release* project and help develop and implement the new project identified during the FY20 scoping meetings. Personnel cost is estimated at $22/hour for a year (2080 hours).

Additionally, $2,400 will be used to contract with a graduate student to conduct a survey of *SAFMC Release* participants to get their feedback on the overall app and the transition to the customizable ACCSP release app. Survey results will help inform the expansion of the customizable app in this proposal and be used to better design the app and improve volunteer engagement. Costs are estimated for 120 hours of work at $20/hour.

Travel ($4,200): Travel by both the project coordinator and the graduate student will be used to educate the public, partners, and meeting attendees about the *SAFMC Release* project. Promoting the program by visiting tackle shops, fish houses, charter operations and other related venues that will allow for the distribution of outreach and promotional materials will also be used to raise awareness of the project.

Contractual ($55,000): Harbor Light Software will provide software development services to enhance the *Release + Catch U Later* application developed in FY20, and to build a "Project Builder" application, which allows project owners to create customizable data collection applications. Harbor Light Software will test the software prior to release and manage the applications in the app stores. Costs are based on estimates of 270 hours of software development at $170/hour and 180 hours of QA/QC at $50/hour.

Supplies ($2,000): SAFMC will utilize supply funds to print promotional materials (e.g. wallet cards, postcards) to recruit users for the *SAFMC Release* project and the new project identified during the FY20 scoping meetings. Funds will also be used to purchase small promotional items (e.g. fishing towels, measuring tapes) to help increase recruitment and retention of participants.

Indirect charges of 10% are applied to non-contract charges for a total of $5,432.

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FY20 COST SUMMARY (BUDGET):

Item	ACCSP Share	Partner Share	Total
PERSONNEL COSTS			
SAFMC Personnel Julia Byrd, Citizen Science Program (10%) John Carmichael, Deputy Director (5%)		$7,800.00 $6,961.20	$14,761.20
SAFMC QA/QC process part time position	$24,000		$24,000.00
NC DMF Personnel Drew Cathey, Biologist II (10%) Chris Wilson, Biologist Supervisor (5%)		$4,710.10 $3,277.80	$7,987.90
NC DMF QA/QC process part time position	$24,000		
CONTRACT			
Contractor Software Development	$45,000		$45,000
SUPPLIES			
Recruitment/Retention Promotional Items	$500	$1000	$1500
TRAVEL			
In-person meeting	$25,000		$25,000
TOTAL	**$118,500**	**$23,749**	**$142,249**
Percentage	**83%**	**17%**	**100%**

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FY20 BUDGET NARRATIVE:

Personnel ($48,000): Personnel funds will be used by SAFMC and NC DMF to each hire QA/QC process part time position. Personnel cost is estimated at $20/hour for a total of 1200 hours for each position. The positions will assist with Task D: Data Collection, QA/QC, and Data Analysis. Job duties will include assisting with QA/QC and exploring long term solutions for addressing QA/QC and validation needs of the photographic and species identification data, considering volunteers and citizen science approaches.

Supplies ($500): SAFMC will utilize supply funds to print promotional materials (e.g. wallet cards, postcards) to inform users of transition to new SAFIS application and recruit new users. Funds will also be used to purchase small promotion items (e.g. fishing towels, measuring tapes, etc.) to help increase recruitment and retention rates of participants.

Contractual ($45,000): Harbor Light Software will develop the application software, using the software written for the existing *SAFMC Release* and NC DMF *Catch U Later* applications as core reference with enhancements for branding, additional species, modifications to the ACCSP API and flexibility for supporting different data collection profiles. Harbor Light will also provide second-tier technical support, management of the deployment of the application through respective app stores, perform technical feasibility analysis of image-based length determination technologies and identify architectural enhancements to support a wider range of data collection applications.

Travel ($25,000): Travel funds will be used for the in-person workshop associated with Task E to develop needs and objectives for an integrated, flexible application. Workshop will be two days with approximately 20 participants. Estimated costs include meeting space ($5000), participant travel ($10,000) and lodging, per diem, and miscellaneous participant costs ($10,000).

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Table 3. Maintenance Project History

Fiscal Year	Title	Cost	Results
2020	SAFIS Expansion of "*SAFMC Release*" and "*NC DMF Catch U Later*" Discard Reporting Applications	$118,500	This project combined two similar released fish reporting applications (*SAFMC Release* and NC DMF's *Catch U Later*) into a new ACCSP customizable citizen science application, SciFish, that will be available to other partners and expanded the application to increase the species that can be reported through the *SAFMC Release* project. Beta testing for both projects in SciFish is wrapping up now and SciFish production will launch in August 2021. Additionally, a series of scoping meetings were held in Spring 2021 to outline a framework for the continued development of the ACCSP customizable citizen science data collection application that can support multiple project types. The scoping meetings consisted of an online questionnaire, two virtual town hall meetings, and 3 half day microlab workshops. Just under 200 individuals completed the questionnaire and just under 60 people attended the town halls. There was a total of 46 microlab participants representing fishermen, scientists, and managers from 23 organizations across 15 states. The microlabs focused on identifying data gaps and deficiencies that could be addressed through a citizen science approach; the data needed to fill these gaps that could be reasonably collected; and app or platform usability. Additional details on the FY20 project results will be included in the final grant report available in September2021.
2021	SAFIS Expansion of Customizable Fisheries Citizen Science Data Collection Application	$114,792	Using the information gained through the FY20 scoping meetings, the FY21 project will focus on building the customizable citizen science app prototype which will include the expansion of the app to support the project types and data fields prioritized through the FY20 scoping meetings, as well as the development of a project builder interface. Additionally it will continue data collection in *SAFMC Release* on shallow water grouper releases. The FY21 project will begin in late summer 2021.

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Summary of Proposal for Ranking

Proposal Type: Maintenance

Primary Program Priority: Biological Sampling - 90%

- The released fish reporting application incorporated in SAFIS will provide a tool for collecting biological information on the component of catch that is released, addressing ACCSP FY22 Request for Proposals priority 1b and Recreational Technical Committee priority 2. The application will collect biological and fishery data that is independent of APAIS/MRIP, addressing Recreational Technical Committee priority 4.
- For the SAFMC portion, biological information will be collected on released shallow water groupers and expanded to collect data on Red Snapper, in both commercial and recreational fisheries. Scamp, Gag, Red Grouper, and Red Snapper are in the top 25% of the biological sampling priority matrix. The commercial snapper-grouper hook and line fleet is #5 in the bycatch priority matrix.
- For the NCDMF *Catch U Later* portion, biological information will be collected on recreational releases for three species of flounder (Summer, Gulf, and Southern) and expanded to collect data on Kingfish, Spotted Seatrout, Weakfish, and Red Drum.
- For the NCDMF *Tagging Program* portion, biological information will be collected on tagged fish including Cobia, Red Drum, Spotted Seatrout, Striped Bass, and Southern Flounder. Cobia is in the top 25% of the biological sampling matrix.
- For the UNE *Mail-A-Scale* portion, biological information will be collected on recreational Striped Bass.

Data Delivery Plan:

- Data collection projects will be defined by the project builder application and will be stored in SAFIS, where they can be downloaded to a phone or tablet. The fisherman application for all projects will collect and deliver data directly to ACCSP through an API, building on the existing API that currently accepts data from *SAFMC Release* and NCDMF *Catch U Later*. Data can be entered by fishermen when no internet connection is available and later uploaded to SAFIS when a connection exists.

Project Quality Factors:

- **Multi-partner/Regional impact including broad applications:** This project will continue the development of the ACCSP customizable citizen science application, SciFish, moving the platform into production and enhancing the features available in the app and project builder, as well as, developing the policies and procedures needed to guide and support partners' use of this platform into the future. The geographic scope of the project includes all ACCSP partners in all regions, as they will be able to modify the application to meet specific project needs. The *SAFMC Release* component collects data through the South Atlantic and across all sectors for species with significant release mortality concerns. The NCDMF *Catch U Later* component collects data from North Carolina's recreational sector for species with acute data needs. Two additional projects, NCDMF *Tagging Program* and

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UNE *Mail-A-Scale*, will be built in SciFish to pilot the policy and procedure development. The NCDMF *Tagging Program* component collects life history and movement data for a variety of state and federally managed species. The UNE *Mail-A-Scale* component collects data from Maine's recreational sector. The Rhode Island Division of Marine Fisheries provided a letter of support for this proposal (see Appendix 3).

- **Contains funding transition plan:** Project contains a defined end point. This is a one-year project. PIs anticipate that SciFish will transition to ACCSP ownership and be available to all partners at the end of this FY22 project.

- **In-kind contribution:** 22%

- **Improvement in data quality/quantity/timeliness**
  - Provides improvement in data quality and quantity.
  - There are currently no data available to assign released shallow water groupers to length classes other than limited commercial and for-hire observer effort. *SAFMC Release* collects data on the length of released shallow-water grouper for commercial, for-hire, and recreational fishermen.
  - There is limited information available to classify the depth where fish are captured and released and the use of barotrauma reducing actions such as venting or descending. Depth and barotrauma reduction are significantly correlated with release mortality rates. The data collected through *SAFMC Release* provides finer scale information on released fish which can help refine the overall release mortality rate applied for a stock assessment.
  - There are currently no data available to assign recreational generic left-eye flounder discards to species (Summer, Southern, Gulf). NCMDF *Catch U Later* collects species-specific discard data as well as associated biological data (e.g. length). These data will better characterize North Carolina's recreational flounder fishery and improve the reliability of stock assessment models.
  - Significant data gaps exist in characterizing migration, growth, and habitat use for multiple commercially and recreationally valuable species. The NCDMF *Tagging Program* will collect these critical data for Cobia, Red Drum, Spotted Seatrout, Striped Bass, and Southern Flounder to better inform stock assessment models and associated management actions.
  - The continued development of the SciFish platform would allow partners to create and use an electronic tool without extensive development costs which would be helpful for citizen science or other voluntary data collection programs where resources are often limited. It would allow more funds to be available for volunteer engagement which can improve data quality and is critical for project success.

- **Potential secondary module as a by-product: Catch and Effort - 10%.** A ratio of Southern, Summer, and Gulf flounder to total flounder by year, wave, and area fished will be determined from a statistically drawn and trained panel of NC *Catch U Later* users. These proportions will be applied to the estimates of left-eyed flounder discarded catch to

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produce estimates of discards for each of the specific flounder species. Similar data limitations and associated methodologies are applied to other ambiguous species including kingfish (Northern, Southern, Gulf) as well as Spotted Seatrout and Weakfish. As the application is expanded to include these species, their specific contributions to unobserved catch records will be evaluated.

- **Impact on stock assessment**
  Stock assessment impacts are significant. Assessments rely upon accurate catch data for individual species, accurate assignment of catches to length and thus age classes, and accurate accounting of total population removals including release mortality. Additionally, assessments incorporate a variety of life history data including growth, migration, habitat use, and natural mortality among others. This project will help provide such information for multiple fisheries that are currently lacking.

Other Factors:
- **Properly prepared**
  This proposal follows the guidelines under the ACCSP Funding Decision Process Document.

- **Merit**
  The project is continuing the development of an ACCSP innovative, customizable citizen science platform, SciFish. This proposal will move the SciFish platform from beta testing into production, making it available to all ACCSP partners and will develop the policies and procedures needed to guide and support partners' use of the platform into the future. Partners would benefit from being able to create and use an electronic tool without incurring extensive development costs, and it would give partners more flexibility in responding to timely research and management needs by allowing them to build and deploy project specific apps quickly.

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Summary of Proposal for Ranking – Abridged Version

- **Achieved Goals:** The FY20 project will: combine two similar released fish reporting applications (*SAFMC Release* and NC DMF *Catch U Later*) into a new ACCSP citizen science application, SciFish, and expand the *SAFMC Release* project to all shallow water grouper species. Currently, the *SAFMC Release* and *Catch U Later* projects in the SciFish application are nearing completion of beta testing. SciFish will move into the production phase in August 2021, and data collection will begin in *Catch U Later* and expand to include all shallow water grouper for *SAFMC Release*. Additionally, a series of scoping meetings was held in Spring 2021 bringing together fishermen, scientists, and managers along the Atlantic coast to share their knowledge and perspectives on the development of a customizable citizen science application. An organizing committee with representatives from SAFMC, NCDMF, ACCSP, Harbor Light Software, Georgia Department of Natural Resources (GADNR), and Rhode Island Department of Environmental Management (RIDEM) helped plan, coordinate and conduct these meetings. The scoping meetings initially explored the needs of the broader fisheries community by gathering information through an online questionnaire and two town hall meetings. Next a series of three half-day workshops was held with a group of 46 core group members representing fishermen, scientists, and managers from 23 organizations across 15 different states. The workshops focused on identifying data gaps and deficiencies that could be addressed through a citizen science approach; the data needed to fill these gaps that could be reasonably collected; and app usability (e.g. how to make the app as user friendly as possible and what positive feedback loops could help with recruitment and retention). A report synthesizing the information gathered through the scoping meetings is in progress. Additional details on the FY20 project results will be included in the final grant report available in September 2021.

  Using the information gained through the FY20 scoping meetings, the FY21 project will focus on building the customizable citizen science app prototype which will include the expansion of the app to support project types and data fields prioritized through the FY20 scoping meetings, as well as the development of a project builder interface. Additionally, it will continue data collection in *SAFMC Release* on shallow water grouper releases. The FY21 project will begin in late summer 2021.

  The FY22 project will continue the development of the customizable citizen science app, SciFish, moving the platform into production and enhancing the features available in the app and project builder; develop the policies and procedures needed to guide and support partners' use of this platform. Two new projects will be onboarded to provide perspective on the development of policies and procedures. These projects are the NCDMF *Tagging Program* and UNE *Mail-A-Scale*. There will be continued and expanded data collection within the *SAFMC Release* and NCDMF *Catch U Later* projects.

- **Data Delivery Plan:** Data collection projects will be defined by the project builder application and will be stored in SAFIS, where they can be downloaded to a phone or tablet. The fisherman application for all projects will collect and deliver data directly to ACCSP

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Green highlighted text indicates changes from initial submission.

through an API, building on the existing API that currently accepts data from *SAFMC Release* and NCDMF *Catch U Later*. Data can be entered by fishermen when no internet connection is available and later uploaded to SAFIS when a connection exists.

- **Level of Funding:** This is a Year 2 maintenance proposal. Funding for the FY22 proposal increased from the FY21 proposal by 1% but remains below the initial FY20 proposal by 2%.

- **Properly Prepared:** This proposal follows the guidelines under the ACCSP Funding Decision Process Document.

- **Merit:** The project is continuing the development of an innovative, customizable citizen science platform, SciFish. This proposal will move the SciFish platform from beta testing into production, making it available to all ACCSP partners and will develop the policies and procedures needed to guide and support partners' use of the platform into the future. Partners would benefit from being able to create and use an electronic tool without incurring extensive development costs, and it would give partners more flexibility in responding to timely research and management needs by allowing them to build and deploy project specific apps quickly.

Yellow highlighted comments indicate sections that help with the ranking process.
Green highlighted text indicates changes from initial submission.

Appendix 1: NCDMF's Tagging Program and UNE's Mail-A-Scale Objectives

UNE *Mail-a-Scale* objectives:
- Engage Maine's recreational anglers as citizen scientists to expand collection of biological data on striped bass through digital images as part of the ongoing *Snap-a-Striper* project and support a proposed project in review with Maine Sea Grant called *Mail-a-Scale* that incorporates non-lethal scale sample collection of released stripers and otolith collection of legally harvested stripers.
- Build upon existing user-friendly mobile applications that were developed with support from ACCSP to be customizable (*SAFMC Release* and *NC DMF Catch U Later*) to expand data collection of recreational caught striped bass in Maine. Currently, *Snap-a-Striper* and the proposed *Mail-a-Scale*, use paper data cards, so a digital application could expand angler participation and data collection.
- Utilize scale chemistry and digital images provided from the application to assess morphological features that could distinguish if striped bass captured in recreational fisheries are from Maine (Kennebec River) or sourced from outside stocks (i.e. Hudson, Delaware, Chesapeake).

NCDMF Multi-species *Tagging Program*
- The North Carolina Division of Marine Fisheries Multi-Species Tagging Program is seeking ways to increase angler tag return reporting and accuracy of data through novel approaches. Currently, anglers can report their tagged fish by calling our 1-800 phone number, filling out a tag return form on our website, or visiting one of our six Division offices. Information collected from tag returns is very similar to data collected through the Catch U Later (CUL) Flounder Discard application.
- Through this grant, we would like to create an easy-to-use tagged fish reporting application based on CUL. Modifications to CUL would include the addition of data collection fields (e.g., fish species, tag color, tag number, type of angler, angler contact information, reward, etc.) and new branding of the tagged fish reporting application.
- The tagged fish reporting application allows anglers to report tag returns more quickly (in the boat while fishing), report more accurate data (reporting the fish right after it is caught instead of multiple day or week-long delays), allows Division staff to process tag returns more efficiently, and enter data into the Division's database sooner.
- Development of the tagged fish reporting application provides a framework for the Division to pursue additional citizen science research initiatives related to the Multi-species Tagging Program. These initiatives include volunteer tagger reporting, verification of species identification and capture location, and citizen science projects that address data gaps (e.g., discard lengths, effort and catch from private docks, etc.).
- Promotion of the application allows for increased public outreach for the Multi-species Tagging Program and a modernized method to distribute educational materials to the public.
- The Division is willing to give in-kind support through staff time to develop and test the application, and to assist in the development of the policies and procedures for the customizable SciFish mobile application.

Appendix 2

Atlantic Coastal Cooperative Statistics Program
1050 N. Highland Street, Suite 200A-N | Arlington, VA 22201
703.842.0780 | 703.842.0779 (fax) | www.accsp.org

TO: ACCSP Operations and Advisors Committee Members

FROM: Julie DeFilippi Simpson, ACCSP Deputy Director

DATE: June 10, 2021

SUBJECT: ACCSP Staff Workload for Proposed Project

Project Title:
FY22: SAFIS Expansion of the SciFish Customizable Fisheries Citizen Science Data Collection Application

Project Type: Maintenance Project

Principal Investigators: Julia Byrd (SAFMC), Dr. Andrew M. Cathey (NCDMF)

ACCSP Staff Workload Comments: *
In order to achieve the project objectives listed below, ACCSP staff will be need to be dedicated to these tasks.

- Continue development and construction of SciFish, a customizable fisheries data application, to standardize provide more efficient data collection, increase data availability, and reduce future needs for future and existing projects to invest additional costs in individual applications.
- Develop policies and procedures needed for partners to build and support projects within the SciFish mobile application.
- Continue data collection under the ACCSP citizen science app, SciFish, via the SAFMC Release and NCDMF Catch U Later projects and expand the species that can be reported.

Tasks A and E, outlined in the proposal and associated with these objectives, would require ACCSP staff time. Specifically, ACCSP staff would be responsible for building/modifying an API and updating and/or build procedures, database objects, and reports as needed to allow easy access to trip records and linked photos. Additionally, ACCSP staff would be actively involved in scoping exercises and the development of policies and procedures. This workload would be assumed by the Software Team and Deputy Director. Much of the technical work will build on existing APIs and database procedures and objects. As such the overall workload to the ACCSP is expected to be moderate (~200 person-hours). It is the opinion of the ACCSP leadership that this project is feasible.

* Comments and opinions are based on evaluation of this project individually as opposed to all proposed projects as all projects have yet to be submitted.

Our vision is to produce dependable and timely marine fishery statistics for Atlantic coast fisheries that are collected, processed, and disseminated according to common standards agreed upon by all program partners.

RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

DIVISION OF MARINE FISHERIES
Three Fort Wetherill Road
Jamestown, Rhode Island 02835

Julia Byrd
4055 Faber Place Dr. Suite 201.
North Charleston, SC 29405

Dear Ms. Byrd,

Please accept this letter of support from the Rhode Island Division of Marine Fisheries for your proposal entitled "FY22: SAFIS Expansion of the SciFish Customizable Fisheries Citizen Science Data Collection Application" The creation of a smart device modular application for citizen science is a great approach and will foster more engagement with citizen scientists in all partner states including Rhode Island.

Rhode Island has always valued projects promoting electronic data reporting. Rhode Island's recreational community is very supportive of initiatives that aim to improve data collection and collaboration with fisheries managers. As of this year, we are partnering with our large recreational fishing organization, the Rhode Island Saltwater Angler Association (RISAA) to develop a volunteer angler data collection application. This application will collect fishery dependent data from recreational anglers which will be shared with managers to contribute to stock assessment. When complete RIDMF wants to make this data available to other entities as well as foster other ways to further our understanding of recreational fishing. Our application is being developed by the same software company (Harbor Light Software) as the proposed citizen science application and should be compatible with this project. This proposal represents a potential avenue for the data from our app to be disseminated into a broader community as well as create a platform to initiate other citizen science projects with participating anglers.

Industry buy in to electronic reporting is essential to its success. The outreach already conducted in the first phase of this project is a sound approach for promoting buy in and sustained use by recreational anglers and should lead to a successful project.

We look forward to continued collaboration with you on the project.

Sincerely,

Conor McManus
Chief RIDEM, Division of Marine Fisheries

Telephone 401.423.1923 | www.dem.ri.gov | Rhode Island Relay 711

JULIA ISOBEL BYRD

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Hometown: Asheville, NC   Email: juliabyrd@hotmail.com

EDUCATION: UNIVERSITY OF CHARLESTON, SC, Charleston, SC
-**Masters of Environmental Studies**, focus on environmental and marine biology,
December 2004

WAKE FOREST UNIVERSITY, Winston-Salem, NC
-**Bachelor of Science** in **Biology**, Minor in **Environmental Studies**, Cum Laude, May 2000

WORK EXPERIENCE:

Citizen Science Program Manager, South Atlantic Fishery Management Council (SAFMC; March 2019 – present)
- Provide programmatic leadership and support for the SAFMC's Citizen Science Program. Duties include project development and management, strategic planning, problem solving, brainstorming strategies, and facilitation.
- Foster collaboration between researchers, scientists, and fishermen to support citizen science projects
- Develop grant proposals for citizen science projects and assist program partners in developing grants
- Serve as PI or co-PI on grant supported citizen science projects addressing SAFMC research priorities
- Assist in developing and delivering outreach materials and training related to the Citizen Science Program and projects
- Work with partners and advisory committees to develop and implement strategic plan for Citizen Science Program, including development of goals, objectives, strategies, indicators, and evaluation plan.
- Conduct presentations for advisory committees, the general public, fishermen, and scientists on the SAFMC's Citizen Science Program and projects
- Communicate scientific, technical issues to a variety of audiences
- Build relationships with fishery professionals and stakeholders throughout the Southeast U.S. to develop program partnerships and help engage more people in the SAFMC's Citizen Science Program
- Staff lead for Citizen Science Projects Advisory Committee and Operations Committee
- Supervise Citizen Science personnel (staff and students) working on citizen science projects
- SAFMC Outreach Team member providing input and participating in Council related outreach activities
- Represent the SAFMC on various citizen science related working groups

Southeast Data Assessment and Review (SEDAR) / SAFMC SEDAR Coordinator (August 2012 – February 2019)
- Plan, coordinate and manage SEDAR stock assessment projects and procedural workshops. Duties include project management, work planning, timeline development, brainstorming strategies, problem solving, event planning, and facilitation.
- Chair and/or facilitate SEDAR stock identification, data, assessment and procedural workshops. Experience includes facilitating variety of group discussions engaging scientists, managers, fishermen, and other stakeholders in order to lead groups through productive discussions and explore different points of view.
- Build relationships with fishery professionals and stakeholders throughout the Southeast U.S. to help engage more people in the SEDAR Stock Assessment Program.

- Communicate scientific, technical issues to a variety of audiences
- Lead re-design of the SEDAR website and serve as SEDAR webmaster.
- Assist with coordination and facilitation of SAFMC's Snapper Grouper Visioning Project
- Assist with the development of the SAFMC's Citizen Science Program. Duties included helping coordinate and facilitate SAFMC's Citizen Science Workshop, helping develop SAFMC's Citizen Science Blueprint, and assisting the Citizen Science Program Manager in developing infrastructure for the Program.
- Atlantic Coastal Cooperative Statistics Program Operations Committee
- Instructor for Marine Recreational Education Program, Southeast – Science Workshop 2017
- Participate in SCDNR's in-water sea turtle regional abundance and health assessment survey as Chief Scientist or Scientific Crew

TRAINING:
- Management Assistance Team (MAT) Leader as Communicator Training
- Smithsonian's Communication & Facilitation Skills for Conservation Managers Course
- Technology of Participation (TOP) Facilitation Methods
- NOAA Coastal Service Center Planning and Facilitating Collaborative Meetings
- NOAA Coastal Service Center Project Design and Evaluation Workshop
- NOAA Coastal Service Center Public Issues and Conflict Management Workshop
- University of Maryland's Communicating Science Effectively Workshop
- Atlantic States Marine Fisheries Commission Stock Assessment Training Workshop Series

PROFESSIONAL MEMBERSHIPS:
- Citizen Science Association
- American Fisheries Society
- ACCSP Operations Committee (2015-present)

SELECTED PUBLICATIONS AND PRESENTATIONS:
- Bonney, R., J. Byrd, J. T. Carmichael, L. Cunningham, L. Oremland, J. Shirk, and A. Von Harten. 2021. Sea Change: Using Citizen Science to Inform Fisheries Management. BioScience: 71(5): 519-530.
- Byrd, J. C. Collier, and A. Iberle. 2020. The SAFMC's Citizen Science Program: Designing a program to support fisheries science and management decision making. American Fisheries Society Annual Meeting (held virtually). (Oral presentation)
- Brown, S.K., M. Shivani, R. Koeneke, D. Agnew, J. Byrd, M. Cryer, C. Dichmont, D. Die, W. Michaels, J. Rive, H. Sparholt, and J. Weiberg. 2020. Patterns and practices in fisheries assessment peer review systems. Marine Policy: 117,103880.
- Byrd, J., J. Carmichael, and J. Neer. 2017. The Importance of Peer Review in SEDAR Stock Assessments. American Fisheries Society Annual Meeting, Tampa, FL. (Oral presentation)
- VonHarten, A. and J. Byrd. 2016. Building a Fishery Citizen Science Program in the U.S. South Atlantic to Improve Management and Policy. 4th International Marine Conservation Congress. (Oral presentation and helped facilitate focus group.)
- Carmichael, J., A. VonHarten, and J. Byrd. 2016. Efforts to Develop a South Atlantic Fishery Management Council Citizen Science Program. NOAA Fisheries Quantitative Ecology and Socioeconomics Training Program Webinar Series. (webinar presentation)
- SEDAR. 2015. SEDAR Procedural Workshop 7: Data Best Practices. SEDAR, North Charleston, SC. 151pp. (editor)

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Personal:

Birth date: 30 May, 1981
Birth place: Asheville, North Carolina
Citizenship: United States of America

Professional Preparation:

East Carolina University, PhD, Interdisciplinary Biological Sciences, 2013
Appalachian State University, BS, Ecology and Environmental Biology, 2004

Professional Experience:

Program Supervisor, Coastal Angling Program, North Carolina Division of Marine Fisheries: Jan 2021-present
Chief Data Analyst/Coastal Angling Program, North Carolina Division of Marine Fisheries: Nov 2017-Dec 2020
Statistician/Coastal Angling Program, North Carolina Division of Marine Fisheries: Jul 2014-Nov 2017
PhD Candidate, East Carolina University: Oct 2011-Dec 2013
Graduate Research Assistant, East Carolina University: June 2007-Oct 2011
Research Specialist, Brody School of Medicine, East Carolina University: 2005-2007

Research:
Area of professional expertise:

Recreational Fisheries, Statistics, Fisheries Management, Bivalve Larval Ecology, Benthic Ecology

Awards:

"Best Graduate Student Oral Presentation" Southeastern Estuarine Research Society; Semiannual Meeting, Morehead City and Beaufort, North Carolina. April 11-13, 2012.

"National Shellfisheries Association Sandra Shumway Best Student Paper in the Journal of Shellfish Research Award" In Volume 33: Spatiotemporal Stability of Trace and Minor Elemental Signatures in Early Larval Shell of the Northern Quahog (Hard Clam) Mercenaria mercenaria.

Publications and Technical Reports:

Cathey AM (2016). Evaluating an Ongoing Recreational Flounder Gigging Mail Survey using Dockside Intercepts. North Carolina Division of Marine Fisheries Final Project Report. Grant Number 2007-F206

Cathey AM (2015). Assessing Electronic Mobile Devices for the Collection of Recreational Fishing Data. NOAA Final Project Report, Task Title: Assessing the Use of Electronic Mobile Devices in Recreational Angling Data, Grant Number EA-133F-12-BA-0034

Cathey AM, Miller NR, Kimmel DG (2014). Spatiotemporal Stability of Trace and Minor Elemental Signatures in Early Larval Shell of the Northern Quahog (Hard Clam) Mercenaria mercenaria. Journal of Shellfish Research 33(1):247-255

Cathey AM, Miller NR, Kimmel DG (2012) Microchemistry of Juvenile Mercenaria mercenaria shell: Implications for Modeling Larval Dispersal. Marine Ecology Progress Series 465:155-168

Contracts and Grants Awarded:

$118,500. Standard Atlantic Fisheries Information System (SAFIS) Expansion of "SAFMC Release" and "NC DMF Catch U Later" Discard Reporting Applications. National Marine Fisheries Service/Atlantic Coast Cooperative Statistics Program. 10/30/2019 Co-PI: Cathey AM, Co-PI: Julia Byrd

$199,340. Annual surveys of recreational license holders. North Carolina Division of Marine Fisheries Coastal Recreational Fishing License Grant. 07/01/2018 06/30/2023. PI: Cathey AM

$72,500. Determination of species specific size compositions of recreationally discarded finfish species. North Carolina Division of Marine Fisheries Coastal Recreational Fishing License Grant. 07/01/2018 06/30/2020. PI: Cathey AM.

$142,000. Evaluating an Ongoing Recreational Flounder Gigging Mail Survey using Dockside Intercepts. North Carolina Division of Marine Fisheries Coastal Recreational Fishing License Grant. 01/01/2016 11/30/2016. PI: Cathey AM

$29,042. Assessing Electronic Mobile Devices for the Collection of Recreational Fishing Data. National Marine Fisheries Service. 08/01/2013 12/15/2014. PI: Cathey AM

Presentations:

Cape Hatteras Surf Fishing Heritage Celebration - Cape Hatteras National Seashore (U.S. National Park Service), November 2, 2019. Oral Presentation: Trends in Recreational Surf Fishing on the Northern Outer Banks.

American Fisheries Society, 145th Annual Meeting. Portland Oregon, August 16-20, 2015.
Oral Presentation: Assessing Electronic Mobile Devices for the Collection of Recreational Fishing Data.

Coastal and Estuarine Research Federation, The Changing Coastal and Estuarine Environment a Comparative Approach. Mar Del Plata Argentina, November 11-14, 2012.
Oral Presentation: Shell Microchemistry of Juvenile and Larval Mercenaria mercenaria: Implications for modeling Larval Dispersal.

South Eastern Estuarine Research Society. Morehead City and Beaufort North Carolina, April 11-13, 2012.
Oral Presentation: Shell Microchemistry of Juvenile Mercenaria mercenaria: Spatiotemporal Patterns and Implications for Modeling Larval Dispersal.

Coastal and Estuarine Research Federation, Society, Estuaries, and Coasts: Adapting to Change. Daytona Beach Florida, November 6-10, 2011.
Poster Presentation: Shell Microchemistry of Juvenile Mercenaria mercenaria: Spatiotemporal Patterns and Implications for Modeling Larval Dispersal.

Professional Memberships:

Coastal and Estuarine Research Federation
South Eastern Estuarine Research Society
American Fisheries Society
Sigma Xi

Teaching:

| 08/01/12-05/06/13 | Instructor of Record-East Carolina University, Greenville, North Carolina, Ecology |
| 08/01/08-05/06/11 | Teaching Assistant-East Carolina University, Greenville, North Carolina, Introduction to Biology Laboratory |