Citizen Science Volunteer Training: Basic Orientation

- All training materials should contain:
  - **Mission statement to develop direction and expectations for project**

    Program Vision: "more collaboration + more data + more trust = better management"
    Program Mission: Improve fisheries management through collaborative science

    - The SAFMC aims to improve the efficiency and quality of fisheries management as well as inform the fishing community through the implementation of citizen science projects.
  - **Background science, in advance, to illustrate importance of citizen science project**
    - This can be done in a general sense. Funds are almost always limited, and as a result, many fisheries fall by the wayside when it comes to data collection. This is where citizen science comes in: while the data may not always be the cleanest, we live in a world of "best available science," so there can be potential there.
    - Basic orientation - Maybe add overview of existing data collection programs (state/federal; all sectors) and how it feeds into the management process here?
    - Project Specific orientation - discuss in this section the specific data gaps/research needs that are trying to be addressed with the project and any fishery related background information (life history, concerns about stock, etc.)
  - **Description of sampling design and compilation of results**
    - Not applicable to "Basic Orientation" component of Volunteer Training
    - May be more specific to projects?
    - Maybe combine this section with the next section below?
    - Need to be sure to discuss about the importance of "zeros" and how this is a data point as well.; minimizing bias
  - **Explanation of how data will be used to help manage expectations of participants (including scientists)**—explain both benefits and caveats; for example, data sets can take multiple years to become valuable/usable.
    - This can be done in a general sense. If possible, there should be an introductory message on the difference between statistically designed surveys and volunteer, "opt-in" projects. It will only hurt the success of these projects if we avoid the discussion about what sort of analysis these datasets will go through before being used in a stock assessment or by management agencies. Scientists can be very wary of programs without rigorously designed data collection procedures, but many citizen science projects are only possible with less structured designs. This may not be a problem, as most of these types of projects arise precisely because there is not a lot of information being produced by conventional surveys. In these situations, managers have the potential to be more forgiving, as they are balancing the science with the needs of their communities, and the trade-off of "sampling design vs. sample size" may come into play.
    - Multiple ways to collect data
    - Projects will go through a rigorous review process when proposed to ensure design meets the criteria for Cit Sci Program endorsement

- The way the project is designed is how to accommodate/address potential bias. Explaining potential bias and validation of data is also important to include in explanation (before or after the project). (Sample size, spatial distribution, etc.)

Additional Items to address from our 3/29 Discussion:

Who is the Council?

Why is the Council pursuing cit sci?

- Describe the SAFMC Snapper Grouper Visioning Project and how cit sci was discussed as an opportunity for expanding data collection and engaging fishermen
- Mention Crowdsourcing and Citizen Science Act of 2017 – directed federal agencies to pursue this approach for research (use example of ACCSP; explore rarely encountered species)
- Another way for fishermen to engage in the management process in a different way – make this a more empowering way to get involved on the science/data collection aspect of management because they have a hand in the data that is being collected; help to build trust

Additional ideas to address:

- Maybe provide an example of how cit sci or other data collected by fishermen has been used in the past to supplement management decisions? Talk about successes and also discuss what makes a randomized well-designed survey different from a less structured project; adds to some scientific uncertainty (address the challenges that may arise)
- Sampling design and standardized data collection- needs to be explained early on and how that fits into the model; need to show the pieces of the puzzle (fishery dependent; fishery independent; how this data gets incorporated into the Council process)
- Need to be consistent in how we communicate to the managers as well
- Need to consider the audience for this material – not just fishermen but also scientists/researchers/managers; may need to include information about the concerns over the validity of cit sci collected data and how the Council's intent is to ensure the design of projects
- Also be sure to give some of the hard truths – help to manage expectations up front with this information to be sure participants understand what can and can't be done with the data collected by a project
- Basic Orientation modules - Maybe break up the basic orientation into modules and create a certification process for participants to complete each module to participate in a project.

Basic Orientation for Volunteers
Citizen Science Program
South Atlantic Fishery Management Council

Who is the Council?
The South Atlantic Fishery Management Council, headquartered in Charleston, S.C., is responsible for the conservation and management of fish stocks in federal waters spanning from 3-miles to 200-miles off the Atlantic coasts of North Carolina, South Carolina, Georgia and east Florida to Key West. The role of the councils is to develop fishery management plans needed to manage fishery resources within federal waters.

Citizens from each of the southeastern states (NC, SC, GA and the east coast of FL) who are knowledgeable of some aspects of the fisheries are eligible to become Council members. Members serve three-year terms and are appointed by the Secretary of Commerce from lists of nominees submitted by the governors of the states. The Council consists of 17 total members made up of 13 voting members and four non-voting members to include:

- The Southeast Regional Administrator of the National Marine Fisheries Service.
- The directors or designees of the four South Atlantic state marine resource management agencies.
- Eight citizens (two per state) of the southeastern states.
- Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard, State Department, and Atlantic States Marine Fisheries Commission.

Citizen Science Program
Program Vision: "more collaboration + more data + more trust = better management"
Program Mission: Improve fisheries management through collaborative science

Describe the SAFMC Snapper Grouper Visioning Project and how cit sci was discussed as an opportunity for expanding data collection and engaging fishermen

Utility of Citizen Science for Fisheries Management
The Council, like many fisheries agencies across the country, is tasked with managing many fisheries, and every fishery can only be properly managed with sufficient data. However, funds can be limited for smaller or rarely encountered fisheries, and managers are forced to make decisions with limited data. This is where citizen science has the potential to supplement current data collection efforts, and there are examples of it already being used in both stock assessments and management decisions.

- In the management arena, citizen science data was recently used to help set season and vessel limits for recreational cobia fishing in Virginia. In 2018, the Virginia Marine Resources Commission received an endorsement from the Atlantic States Marine

Fisheries Commission to utilize its carcass donation program data to estimate the average weight for cobia while predicting harvest and setting 2018 regulations.

- The Angler Logbook program, Logbooks have been distributed to guides, recreational anglers, and shore-based anglers on both coasts. Since 2002, nearly 200 participants have recorded trip data for over 9,000 directed snook fishing trips (successful or not) where snook is the primary target and have provided lengths of over 30,000 snook. Anglers record date, county fished, number of anglers, hours fished, numbers of snook caught, kept, and released, and the total lengths (to the nearest ¼") of as many snook as possible. These data are used to calculate fishery-dependent indexes of catch, effort, and release rates as tuning indices for the stock assessment. Most importantly, the size composition of the snook fishery (the exact lengths of snook caught) is directly included stock assessment models.
- Between 2014-2016, charter boat captains and 100 volunteer anglers collected 100 rare rockfish in the Northwest's Puget Sound region. Three species had been listed as threatened or endangered, and NOAA looked to local ecological knowledge for the scientific sampling required for recovery. Genetic analyses from these fishing trips provided new information and contributed, in 2017, to the delisting of Canary Rockfish and expanded protective boundaries for Yelloweye Rockfish. Copied from: http://noaa.maps.arcgis.com/apps/Cascade/index.html?appid=de0010822e1c41569c03aecdadf32aca
- In the Gulf of Mexico, closed seasons and size limits require many fish to be returned to the water after being caught. Recreational anglers are often concerned with uncertainty surrounding discard mortality estimates used in stock assessments. Gulf recreational anglers approached scientists to create a project that would better quantify survival of discarded fish. These recreational anglers provided boat trips and caught all of the fish that were tagged with acoustic transmitters, which allowed fish to be monitored for weeks to months after release. With help from the fishing community, scientists are able to better quantify actual discard mortality after recreational catch and release. Acoustic tagging of Gag grouper after catch and release is helping to better define recreational discard mortality on the West Florida Shelf
- The recovery of the Goliath grouper population in the US is a success story for Florida. Cooperative research with the diving and angling community continues to provide data on this fish's behavior, distribution and abundance. A fin clip program is in place at FWC to assist genetic research and permitted anglers are able to provide data that assist with stock assessment. An annual Great Goliath Grouper Count takes place each June and gives divers a chance to contribute data regarding Goliath grouper abundance at their favorite dive sites – these data are also incorporated into stock assessments. Stakeholders are able to contribute data online to the Gulf Council through the Goliath Grouper Web Reporting Module: http://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=121fc5a8c5284c079d3c1e3af5ab618c

Further, there has been an increased interest in developing and utilizing citizen science data. In 2016, Congress passed the Crowdsourcing and Citizen Science Act, to encourage and increase the use of crowdsourcing and citizen science methods within the Federal Government to advance and accelerate scientific research, literacy, and diplomacy The Act recognizes that

crowdsourcing and citizen science are a cost effective means to accelerate scientific research, address societal needs, and facilitate broader public participation in Federal science agency missions. (maybe have a sidebar here with definitions of "citizen science" and "crowdsourcing"). This could be a good segue into a brief description of how stock assessment data goes to SSC/SEDAR, then Council, then to NOAA where it becomes regulation in Federal Register…(or a diagram)

Understanding the Scope of Citizen Science

Although there are examples of citizen science being used successfully in fisheries management, there are concerns and limitations regarding such programs. Surveys that are designed and conducted by professional researchers generally have rigorous statistical designs that are tailored for usage in analyses like stock assessments. Citizen science projects, on the other hand, may have designs that are driven more by the ability to gather interest and participation from the citizens themselves. Because of this, researchers need to take extra caution to ensure these datasets have an acceptably low level of bias.

For example, in some catch reporting programs in the past, recreational anglers and captains have only reported trips resulting in the targeted fish being caught, but not those where the fish was not caught. Leaving out these "zero-catch" trips can introduce bias into catch rates and limit the dataset's appropriateness to serve as an index of that fish's abundance over time. Other projects have been limited by drop-offs in participation, where data submission by citizens is high at the beginning, but falls off in later years. However, datasets may only become useful if they have consecutive years of comparable data collection procedures and high levels of participation. It is very important that these data streams are maintained, for it really takes at least 5 years of data collection to become statistically significant. Finally, many citizen science programs collect data without undergoing formal validation studies, where a team of researchers compares the dataset to another, similar program. Because many such initiatives have lacked the rigorous design of more formal surveys, managers desire that they be tested against traditional survey methods. However, the Council's program hopes to overcome some of these challenges by involving scientists, managers, and fishermen in the entire process of project development (design, data collection, and results) to ensure the project is designed and conducted in a way that can stand up to the standards that need to be met for use in management.

Where Citizen Science Fits into Fisheries Management

Citizen Science can be described as a form data collection, but data used for fisheries management is generally further classified into two categories. The first is fisheries-independent sources, where samples are collected directly by researchers or fisheries professionals through a specific design. The second is fisheries-dependent, where the samples come specifically from either commercial or recreational fishing trips. While these may still be collected or measured by researchers, they are defined by the fact that they come from fishing trips, where users do not go out and "collect fish" based on a statistically designed protocol. .

One benefit that citizen science projects often have is a relatively large sample size, at least compared to the small or rarely sampled fisheries they're created to supplement. However, having a large number of samples is only one half of the equation when it comes to providing high-quality data. The other half is ensuring these data are representative of the study population in question, and this is why project design is very important. . The Council is trying to support projects that involve both fishermen and researchers in the project design phase so that the

project is grounded in reality from both a scientific perspective and from a fishery perspective. Researchers involved in designing the citizen science project can help clearly communicate the research question and data needs to the volunteers. Fishermen (volunteers) involved in designing the citizen science project can help clearly communicate the feasibility of proposed data collection methods from their perspective and will be able to collect the data in the prescribed way. As a result of this co-created project design, the quality of the data increases. At this point, it only then becomes a matter of time to allow the project to continue and create a time series of data points over the years. In the case of data-poor fisheries, well-designed and well-executed citizen science projects have become more attractive as decision-making tools.