Decoding the Motivations of Fishers Considering Participation in Citizen Science Projects

A final report prepared for the South Atlantic Fisheries Management Council in completion of Contract Number SA-23-95

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This report details research that was conducted in response to the South Atlantic Fisheries Management Council (SAFMC) request for researchers to "study and document the interests, motivations, and concerns of fishermen who might participate in the SAFMC's growing Citizen Science Program." The South Atlantic region is distinctive in its efforts to build a citizen science framework to guide future projects in the region, which offers a unique opportunity to systematically assess possible collaboration in the region.

We addressed this information need by combining (1) a qualitative interview-based mixed method research strategy that provides an in-depth understanding of fisher's motivations and experiences with (2) a tailored sampling and robust recruitment strategy to ensure representative data gathering. This has resulted in a nuanced analysis of fishers' reasoning surrounding their decisions about participating in future SAFMC citizen science efforts.

STUDY CONTEXT

The 2006 Magnuson-Stevens Act reauthorization placed stringent requirements on regional Fishery Management Councils to ensure that no fish stocks in federal waters be undergoing overfishing, and that all overfished stocks be under an active stock rebuilding plan (Crosson 2013). This mandate resulted in more extensive regulation of commercial and recreational fishing than had been previously experienced. In the South Atlantic, two of the species requiring the most regulation are cultural and economic touchstones of the region: the snapper/grouper complex and mackerels[1].

Citizen Science

The South Atlantic Fishery Management Council (SAFMC) is unique in its efforts to engage fishers to incorporate their knowledge into the management process by building a citizen science framework. Recognized by the federal government in 2016 as part of the Crowdsourcing and Citizen Science Act, citizen science seeks to advance and increase scientific discovery via collaborations between individuals or organizations and scientific researchers (US Congress 2016), by incorporating volunteers to collect and/or process data as part of a scientific endeavor (Silvertown 2009). The research technique is based on public participation in gathering scientific information (Bhattacharjee 2005; Bonney et al. 2009). Citizen science has been commonly used in natural resource contexts, ranging from recording data about Oregon white oak stands (Galloway et al. 2006), to tracking snails (Jones et al. 1977), or analyzing ecological systems (Hochachka et al. 2009). Citizen science on bird populations has been a prolific field of study (Bonney et al. 2009; Wells et al. 1998; Cooper et al. 2007, Bonter and Harvey 2008, 122 Hames et al. 2002).

[1] The snapper/grouper complex contains numerous species, and both commercial and for hire permits cover the entire complex. Mackerels have commercial permits for King Mackerel and Spanish Mackerel separately, while the for hire sector Coastal Migratory Pelagic permits cover King and Spanish Mackerel as well as Cobia. While we acknowledge and understand these distinctions, we have used the terms "snapper/grouper" and "mackerels" throughout this report for brevity.

Citizen science is attractive to fisheries management because as individuals regularly engaged with the ecosystem, fishers have important knowledge and insights. Also, fishers may be able to routinely collect fundamental data. Data collection that would inform fisheries management could be carried out in collaborations between fisher volunteers and scientists to better inform future regulations, and potentially improve the relationships between fishers and management bodies because of this transparency in the process (Bonney et al. 2021).

However, unlike citizen science projects that solicit interested but independent volunteers, citizen science with fishers would involve parties who are regulated by the group that is soliciting their cooperation. Because the results of their participation could inform regulation, it could have negative economic or social impact on participants. Before assuming willing participation, a citizen science program focused on current fishery conditions needs to better understand fishers' motivations to participate, and their trust in fisheries institutions. With this in mind, SAFMC contracted for this research project to better understand these dynamics.

Trust

Fishery management depends on fishery and ecosystem data. As individuals regularly engaged with the ecosystem, fishers have important knowledge and insights and may be able to routinely collect fundamental data. However, information sharing requires trust between all parties involved (Bonney et al, 2021), is crucial for building and maintaining robust institutions, and is discussed extensively in psychology and political science literature (e.g. Tschannen-Moran and Hoy 2000; Rousseau et al. 1998; Maloy 2009). Additionally, the success or failure of institutions that manage natural resources can be correlated with the trust in those institutions (Schusler, Decker, and Pfeffer 2003; Adger, Brown, and Tompkins 2005; Ostrom 2009). Within fisheries management, Yandle et al. (2011) found that industry members with moderate levels of trust have the highest levels of participation in fisheries management; and institutional trust is not monolithic, with fishers' trust varying by institution (Yandle et al, 2011, Grey et al., 2012) and institutional trust and participation varying by institutional scale (Yandle, Tookes, and Grace-McCaskey 2020). However, the role of trust in fisheries management is an under-studied topic, and the relationship between trust in management and impact on citizen science efforts is limited (Bonney et al 2021).

METHODOLOGY:
TAILORED FOR THE SOUTH ATLANTIC

Fisheries in the SAFMC region[2] are complex—both biologically and socially. Providing accurate analysis of fishers' decision-making about whether to participate in citizen science, on a tight budget and limited timeframe, required a carefully targeted in-depth research strategy such as the one we have completed and describe below.

Our in-depth interview-based approach illuminates motivation

While it can be appealing to cast a wide net over a massive potential study population to obtain a survey with a high sample size, it was not an approach that would have provided answers to the core questions proposed by SAFMC. A quantitative survey approach could have provided coverage across a large number of people and provided simple, topical findings. Indeed, typical closed-ended question surveys (e.g., ranking, Likert, multiple choice) are excellent tools for understanding *what* people do, and this project included quantitative analysis to provide this insight.

However, the limiting nature of closed-ended questions means high volume surveys have limited utility for understanding *why* people make specific choices. By necessity, the construction of survey questions limits respondents to what the researchers pre-suppose are the most likely answers. They also provide limited or no opportunity for respondents to explain their answers. For a study focused on *why* people choose to participate (or not participate) in citizen science, individual qualitative interviews are needed. This provides ample opportunity for participants to discuss the complexity of their decision-making, then provides the data necessary for thematic analysis to determine key barriers, and motivations. This makes it the best strategy to meaningfully answer the research question. Our combination of qualitative and quantitative methods has provided insight not only into *what* people think when forced to choose between limited options, but also *why* they hold these perceptions and how their responses can be situated into a larger understanding of their worldviews.

A robust sampling frame[3] ensured representative voices

Because fishers in the South Atlantic are typically a population that is challenging to reach, research runs the risk of disproportionately sampling and representing (1) participants involved in management to some extent, (2) fishers who are financially and socially secure enough to participate in existing management or citizen science efforts despite their livelihood commitments, and/or (3) fishers connected to the social and economic circles of these groups. To address these issues, we implemented randomized, purposive sampling across two distinct fisheries, encompassing all three sectors (recreational, for hire, and commercial) and spanning

[2] Federal waters between the North Carolina/Virgina line and Key West, FL (See Figure 1)
[3] Sampling frame: a list from or device by which individuals are drawn to investigate an area of interest. Common sampling frames include phone number lists, zip code lists, and electoral registers.

four geographic regions. This approach aimed to amplify diverse perspectives to inform decisions about the potential for citizen science research collaborations.

Our goal was to gather information from a representative sample of the fishing population. The geographic, economic, racial, ethnic, and cultural diversity of fishers in the SAFMC region is evident to those familiar with the population, but not quantified at the population level. Thus, we were not able to simply sample based on available demographic data. Instead, we conducted carefully crafted, randomized sampling of individuals who met the purposive criteria for our study population based on fishery, sector, and geographic segments. This required a series of systematic and deliberate methodological decisions to ensure that this sampling remained as representative as possible. To clarify these steps discussed below, common social science sampling methods are discussed in Table 1.

Table 1: Common social science sampling methods

	Definition	**Pro**	**Con**
Convenience Sampling	A sample of individuals are drawn from the close-to-hand, readily available part of the population that are easy to access; no sampling frame used	· Simple and easy to implement · Allows researcher preference in subject selection	· Not representative of a population · Results likely to be biased by researcher selection of participants or common attributes of the readily available people · Likely to not be a diverse population
Snowball Sampling	Begin by identifying a few individuals who meet inclusion criteria, then ask them to recommend others who meet this criteria; no sampling frame used	· Good for hard-to-reach or small populations · Useful when no sampling frame is available	· Results likely to be more similar amongst participants because of their proximity and relationships to each other · Not representative of a population · Individuals not linked to the original participants will be excluded, thereby reducing diversity in the population
Purposive Sampling	A particular population is purposefully selected for research in order to ensure they have existing knowledge on the research subject; this determines the sampling frame	· Sample will be knowledgeable about the topic · Allows elimination of non-relevant individuals from a sampling frame · Can intentionally target slightly different populations for comparison	· Sampling is more time and energy intensive · Potential participants in a sampling frame are decreased, possibly resulting in more difficult recruitment
Randomized Sampling	A sampling frame is selected, and all individuals in that frame have equal opportunity to be selected A random number generator (or random number table) indicates which individuals in the sampling frame should be recruited	· Sample will be unbiased · All individuals in the sampling frame have an equal possibility of being selected · More likely to be generalizable data resulting from this population · Increases diversity in participants	· Recruitment is more difficult · Lack of existing networks mean more intensive efforts at contacting people

(Bernard 2006, Bhattacherjee 2019, Maxwell 2013)

Contrasting fisheries support experiential diversity

When this research was conducted, the intention was to analyze two contrasting fisheries with the objective of teasing out how fishery conditions may influence fisher behavior and decision-making. In consultation with the SAFMC Social and Economic Panel, and several members of Council staff, we focused on two culturally significant fisheries with contrasting conditions:

- The Snapper/Grouper complex is a vast complex that incorporates many species. There is strong competition between sectors, and most species are under heavy catching pressure, with many listed as overfished or experiencing overfishing. Management decisions are often contested, and there are fisher concerns over catch limit reductions and possible closures.

- The coastal migratory pelagic King Mackerel fishery also has engagement from all sectors, but is neither over-fished nor experiencing overfishing and is broadly considered a healthy fishery. There is some camaraderie and collaboration among its members who have proactively approached managers seeking additional regulatory protection for the species.

Three sectors included in study sampling

Three distinct sectors (recreational angler, for hire, and commercial) are represented in most SAFMC-managed fisheries. Thus, we purposefully included all three in our sampling.

Table 2: Eligible population by sector

	Snapper/ Groupers	**Mackerels**
Commercial Fishers	536	1237
For Hire Fishers	1664	1635

Commercial and For hire sectors:

Comprehensive information about the population of these two sectors (registered permit holders) is available in the NOAA Database of All Southeast Regional Office Vessel Permits. We downloaded the database in January of 2023, and used that "moment in time" list as the sampling frame for all subsequent research. We refined the database to focus on fishers with the clearest ties to the region: License holders with addresses outside the four-state region were eliminated, as were permits held by corporations or businesses without addresses.[4] We reviewed all Florida communities, and removed those that were oriented towards the Gulf. Applying these restrictions to the two selected fisheries, we derived the populations in Table 2.

[4] These "out of region" or "lack of" addresses indicated more complexity in license-holder identity, which would decrease probability of accessing permit-holders with relevant perspectives and opinions who would be interested in and willing to engage with citizen science.

Recreational Fisher Sector:

The angler (or individual "recreational fisher") sector lacks comprehensive Federal licensing. Furthermore, a relatively high number of anglers may only participate once every few years. Thus, determining the population of resident anglers for this study was difficult. After extensive discussion and input from Council Staff, the SAFMC Citizen Science Operations Committee, and the Social and Economic Panel, we focused on resident anglers with a "demonstrated interest in recreational fishing" who self-selected by choosing to engage with us via multiple pathways. Recruitment for this sector is described below.

Four geographic segments provided a diversity of voices across the region

To identify the communities most engaged with our targeted fisheries we used data on top landings in both Commercial and For hire sectors by community in the publicly available NOAA's "Snapshots of Human Communities". While the landings data on which these snapshots were based was several years in the past (2013 data), we confirmed with NOAA scientists that more current Snapshots were not yet available, and that was the best information available from them at the time. Then we evaluated the top landings in each community to assess whether these communities have a particularly strong relationship with the targeted fisheries.

We were able to update this information in May of 2023 when Council Staff shared updated landings data on Snapper/Grouper (both commercial and for hire) and King Mackerel via landings maps. The researchers compared this new county-level landings data to the community-level landings data from 2013, and adjusted the sampling frame accordingly.

Any communities identified by the 2013 data that were no longer landing in the third ranked category over a three year period ending in 2023 were eliminated from the Geographic Segments sampling frame.[5] The new landings data ranked each county by landings quantity, ranging from level 1 of 0-5675 pounds of King Mackerel and 950-60,402 of Snapper/Grouper to level 8 of approximately 2-3 million pounds of King Mackerel and 4-13 million pounds of Snapper/Grouper for the three year period (as shown in Table 3 below).

[5] The sole exception to this cut-off was McIntosh County Georgia, which was included purposively, as the county with the highest landings in the state of Georgia– and the only county representing the state in this sampling frame.

Table 3: 2022 Landings Data Updates

2022 Landings Data Quantities by Fishery from SAFMC Maps Total landings by fishery over a 3 year period, separated into 8 categories		
	Snapper/Grouper	King Mackerel
1	950-60,402	0-5,675
2	60,403-242,384	5,676-14,472
3	242,385-542,491	14,473-61,949
4	542,492-866,647	61,950-108,449
5	866,648-1,517,133	108,450-417,249
6	1,517,134-2,497,216	417,250-741,402
7	2,497,217-4,631,908	741,403-2,078,249
8	4,631,909-12,845,019	2,078,250-3,103,320

The researchers evaluated the rankings for each county for both Snapper/Grouper and King Mackerel landings, and added those two rankings together for a total "landings score" for each county (Table 4). By evaluating both this landings score and its relationship to the original Fishing Communities, the researchers were able to prioritize the top areas in which to conduct this research, with the highest long-term commitment to these two fisheries AND the highest levels of current landings. It is important to note that we identified study populations by home port city, not the home address of the permit-holder.

Table 4: Combined landings data "scores"

Total "score" for combined Snapper/ Grouper & King Mackerel	2022 Landings Data from SAFMC Maps Scale: 1 2 3 4 5 6 7 8			Original Geographic Sectors Based on 2013 NOAA Community Profiles					
	COUNTY	S/G	KM	Community	Grouper	Snapper	Jacks	Spanish Mackerel	King Mackerel
Draft Segment 1: Approximately Homestead south to Key West									
12	Miami-Dade	7	5	Homestead, FL	X	X			
12	Monroe	8	4	Key Largo, FL	X	X	X		
12	Monroe	8	4	Islamorada, FL	X	X	X		X
12	Monroe	8	4	Marathon, FL	X			X	X
12	Monroe	8	4	Cudjoe Key, FL	X	X			X
12	Monroe	8	4	Key West, FL	X	X			X
Draft Segment 2: Approximately Miami north to Cape Canaveral									
15	St. Lucie	8	7	Fort Pierce, FL				X	X
14	Palm Beach	6	8	Palm Beach Shores, FL	X	X			
14	Palm Beach	6	8	West Palm Beach, FL	X			X	X
14	Palm Beach	6	8	Boynton Beach, FL	X			X	X
12	Miami-Dade	7	5	Miami, FL	X		X	X	X

Draft Segment 3: Approximately Darien south to New Smyrna Beach, FL									
5	McIntosh	2	3	Darien					
13	Nassau	7	6	Fernandina					
12	St. Johns	7	5	St. Augustine, FL	X	X	X		
13	Volusia	7	6	Port Orange, FL					X
13	Volusia	7	6	New Smyrna Beach, FL	X	X	X		X
Draft Segment 4: Approximately Wilmington south to Murrells Inlet									
12	Dare	5	7	Kill Devil Hills or Hatteras					
12	Carteret	7	5	Harker's Island or Beaufort					
10	New Hanover	4	6	Wilmington, NC	X			X	X
10	New Hanover	4	6	Carolina Beach, NC	X	X			
12	Brunswick	6	6	Oak Island, NC	X	X	X		X
12	Brunswick	6	6	Southport, NC	X	X	X		X
8	Horry	5	3	Little River, SC	X	X	X		
9	Georgetown	6	3	Murrells Inlet, SC	X	X	X		
10	Charleston	6	4	Charleston, SC					

Finally, we divided these communities into four segments, in which towns and ports with geographic and fishing affinities are grouped together (tentatively in Table 4, and geographically in Figure 1). These segments better aligned with fishing community structure than a simple division by state. Correspondence between these geographic segments and target fisheries are summarized in Table 5. We focused recruitment in these communities and counties. This did not mean we successfully reached a willing participant in each of these sites, but that we targeted recruitment in the geographic segment as a whole, with efforts to space them across these communities.

Identification & Recruitment of Target Study Populations

For each population in Table 2 (commercial and for hire) we systematically randomized participant selection to avoid bias in selection. Given the unknown demographic characteristics of the populations, randomized recruitment offered all members of the population an equal chance of participating in the research. This enhanced diversity compared to strategies such as snowball sampling or convenience sampling. To do this, we combined the lists of commercial permits for each geographic segment in both fisheries, then used https://www.random.org/ to randomly select 20 of each type of permit-holder from that list to be specifically recruited to participate in the study from each geographic segment. This process was repeated for all for hire permits.

Figure 1: Research region separated into geographic study segments

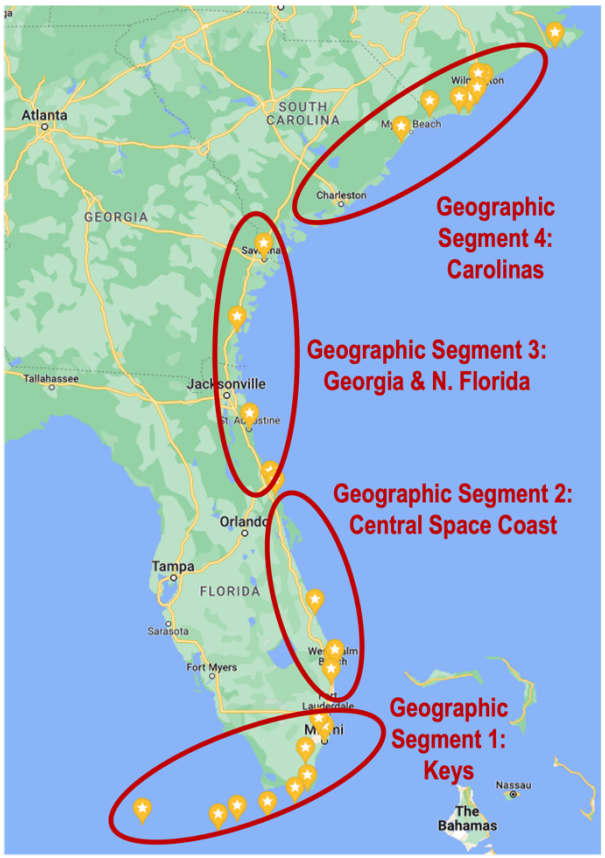


Table 5: Geographic segments by city and relevance to target fisheries

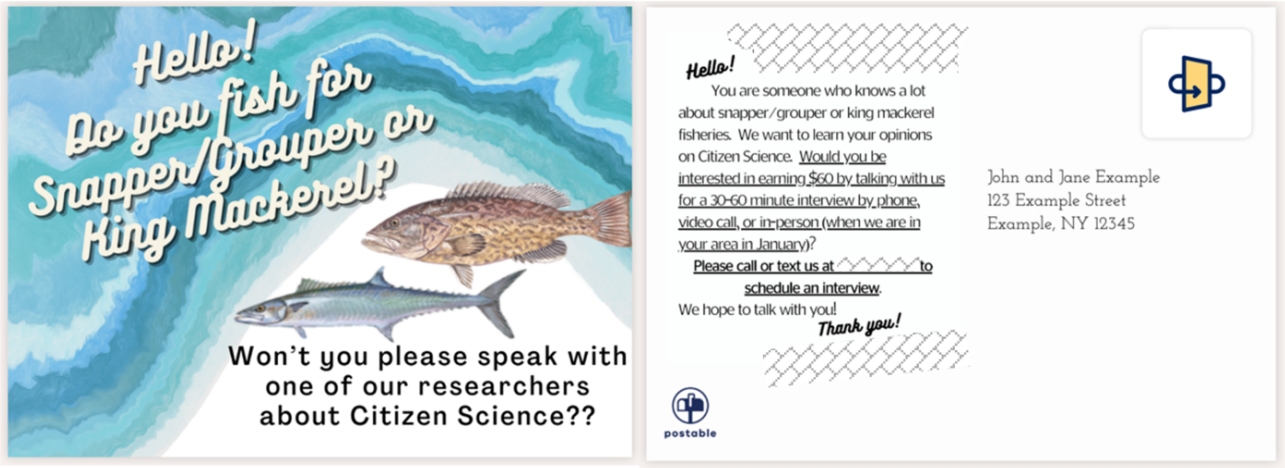
Target Community	Grouper	Snapper	Jacks	Spanish Mackerel	King Mackerel
Keys (Homestead, FL to Key West, FL)					
Homestead, FL	X	X			
Key Largo, FL	X	X	X		
Islamorada, FL	X	X	X		X
Marathon, FL	X			X	X
Cudjoe Key, FL	X	X			X
Key West, FL	X	X			X

Space Coast (Ft. Pierce, FL to Miami, FL)					
Fort Pierce, FL				X	X
Palm Beach Shores, FL	X	X			
West Palm Beach, FL	X			X	X
Boynton Beach, FL	X			X	X
Hialeah, FL	X	X	X		X
Miami, FL	X		X	X	X
Georgia/N. Florida (Savannah, GA to New Smyrna Beach, FL)					
Savannah, GA			X	X	X
Brunswick, GA			X	X	X
St. Augustine, FL	X	X			
Port Orange, FL					X
New Smyrna Beach, FL	X	X			X
Carolinas (Wrightsville Beach, NC to Murrells Inlet, SC)					
Wilmington, NC	X		X	X	X
Wrightsville Beach, NC	X	X	X	X	X
Carolina Beach, NC	X	X			
Oak Island, NC	X	X			X
Southport, NC	X	X			X
Murrells Inlet, SC	X	X			
Little River, SC	X	X			

Recruitment of commercial and for hire fishers

The researchers carried out a personalized, targeted, two-prong recruitment strategy to permit-holders on each randomized list in order to solicit study participants. First an invitation postcard (see sample in Figure 2) was sent to the home address for the targeted permit-holders, informing them about the project, about the researchers upcoming in-person visit to the relevant geographic segment, and providing a phone number they could contact for more information. This was a Google voice number created for this project, and only the research team responded to messages sent to this number.

Figure 2: Sample postcards sent to each segment (identifying information is obscured)



Once postcards were mailed, the second-prong of this targeted recruitment strategy commenced. Phone numbers and emails for the permit-holders were sought using online sources such as Google or free websites such as Spokeo.com and FastPeopleSearch.com. Once phone numbers were identified (preferably cell numbers when available), a solicitation text was sent to the number, without any personal identification of the permit-holder attached. Samples of the initial messages can be found in Table 5 below.

Table 6: Sample recruitment text messages

Initial Text Message Content			
Commercial Snapper /Grouper	Commercial King Mackerel	For hire Snapper/Grouper	For hire Coastal Migratory Pelagic
Hi Captain! I'm texting because you (or someone who shares this number?) hold a commercial snapper/grouper permit and I'm hoping to get your perspectives on the fishery for a research project. We sent you a postcard about the project, and will be in your area from XX-XX to talk to people about snapper/grouper and citizen science. Can we talk with you for	Hi Captain! I'm texting because you (or someone who shares this number?) hold a commercial king mackerel permit and I'm hoping to get your perspectives on the fishery for a research project. We sent you a postcard about the project, and will be in your area from XX-XX to talk to people about king mackerel and citizen science. Can we talk with you for about 30-60 minutes	Hi Captain! I'm texting because you (or someone who shares this number?) hold a for hire permit for snapper/grouper and I'm hoping to get your perspectives on the fishery for a research project. We sent you a postcard about the project, and will be in your area from XX-XX to talk to people about snapper/grouper and citizen science. Can we talk with you for about 30-60 minutes	Hi Captain! I'm texting because you (or someone who shares this number?) hold a for hire permit that covers king mackerel and I'm hoping to get your perspectives on the fishery for a research project. We sent you a postcard about the project, and will be in your area from XX-XX to talk to people about king mackerel and citizen science. Can we talk with you for about 30-

about 30-60 minutes on one of those days (or via phone on a different date?)? We are offering a $60 gift card to thank you for your time! I'm happy to answer any questions you may have! ~Jennifer	on one of those days (or via phone on a different date?)? We are offering a $60 gift card to thank you for your time! I'm happy to answer any questions you may have! ~Jennifer	on one of those days (or via phone on a different date?)? We are offering a $60 gift card to thank you for your time! I'm happy to answer any questions you may have! ~Jennifer	60 minutes on one of those days (or via phone on a different date?)? We are offering a $60 gift card to thank you for your time! I'm happy to answer any questions you may have! ~Jennifer
Follow-Up Text Message Content (no difference between sectors on second message)			
Commercial Snapper Grouper	Commercial King Mackerel	For hire Snapper Grouper	For hire Coastal Migratory Pelagic
Hi Captain, this is Jennifer from the citizen science research team again! We are heading up to your area on XX and will be there through X. We would really like the chance to talk with you (and can offer a $60 gift card to thank you for your time). Hope to hear from you!			

Potential participants who did not respond after one mailed postcard and two text messages over a 48 hour span, or who declined participation, were removed from the database, and the recruitment continued with the next name on the randomized list.

Recruitment for recreational fishers (anglers)

For each geographic segment, fishing organizations in the relevant communities were approached with a request to recruit for the study. Organizations were selected based on appearing on the International Gamefish Association website, the Marine Waypoints website, and the Coastal Conservation Association (CCA) local chapters. CCA was included as they could have relationships with recreational anglers who chose not to join a formal fishing club. In addition, Facebook was searched for clubs that had social media, but no other web presence[6].

Table 7: Recreational angler organizations

	Carolinas	Georgia / N. Florida	Space Coast	Keys
Organizations identified	13	26	20	6
Organizations emailed	9	13	8	5

Each organization was then extensively researched online to confirm whether they met study criteria, and to identify the appropriate contact(s) and email address(es). Usually this was the president or secretary of the club, however, sometimes an individual could not be identified and a generic salutation needed to be used. Table 7 summarizes the number of organizations identified and emailed in each segment. It

[6] Facebook proved to be an unpromising source of leads, though there are some interesting women's fishing groups in Florida that appear to specialize in "catfishing."

is impossible to know how many clubs forwarded this solicitation to their members as we had no means of monitoring private club communication.

Table 8: Sample recruitment email

Initial outreach email to organizations soliciting participation
Dear **[Mr/Ms Lastname]** We are contacting you because you are the **[role]** of the **[organization]**, which is involved in the recreational fishing community. We are researchers who want to learn from your members about their opinions on both the conditions in the snapper/grouper and king mackerel fishery, as well as citizen science. We are reaching out to you today because we are hoping you would be willing to share our interview invitation with your members. We want to hear your members' opinions through an approximately 30-60 minute interview, by phone, video call, or in-person when we are in your area (whichever they prefer!) and are paying $60 as compensation for participants' time. We will be in your area in person from **[date]** to **[date]**, and would like to schedule interviews with your members soon! Below and attached is a user-friendly announcement you could email to your members or post to social media. Please also share the link to a quick form to share their contact info: https://forms.gle/e73sPsQ5wt8mynef8 We are happy to talk with you to answer any questions you may have about this research project. It is very important to us that the recreational fishing perspective is included in this research, so we really hope that you will encourage your members to participate! Please feel free to reply to this email, or call/text us at: XXX if you have any questions. We hope to hear from you and your members soon! Kind regards, Jennifer Sweeney Tookes and Tracy Yandle Co-Founders, Working Waterfronts

Each club contact was emailed using the template (Table 8) and asked to encourage their members to participate. Depending on the organization's preference, recruitment took a variety of forms such as: the research team directly emailing members, an announcement of the study included in regular organization communications, a posting in organization social media, or other similar outreach. Recreational anglers interested in participating signed up online, and then were approached by the research team via phone, text, or email as they preferred. While initial plans were to pool and randomly select participants in each segment, recruitment numbers did not allow this. Instead the entire population of volunteers who followed through to an interview participated in the research.

Figure 3: Promotional materials provided to organizations for sharing with members (link in graphic led to online registration form; link also provided in email text).

Sampling goals supported representation across sectors and geographic segments

For each geographic segment and fishery sector, we established goals for the number of interviews to be conducted. This segmentation supported our efforts to ensure that sampling was representative and increased the probability of achieving meaningful diversity (Table 9). A similar table of actual participants is included below.

Interviewing process designed for participants

Our interview process was designed to prioritize fisher preference and convenience. This included timing, modality, and the design of the interview guide.

Table 9: Summary of sampling goals

Geographic Segment & Fishery Sector	Commercial	Charter	Angler
Keys	3-5	3-5	3-5
Space Coast	3-5	3-5	3-5
Georgia/N. Florida	3-5	3-5	3-5
Carolinas	3-5	3-5	3-5
Target Study Sample	12-20	12-20	12-20

Participants were offered several interview modalities

In-depth qualitative interviews took place in one of several modalities. Participants in all sectors in each region were offered a choice of the three options so they could choose the one that best fit with their own schedule and lifestyle. A financial incentive of a $60 gift card was given to the participant at the end of each interview. A unique strength of our dual-hemisphere research team

is that a researcher was available for an interview at nearly every hour of the day and night, which allowed us to better accommodate our participants and their schedules.

1. Telephone Interviews: Participants were offered a variety of potential interview times, including early mornings, late evenings and weekends. The strength of this modality was participant ease with the technology, and experience and comfort level common with telephone communications. This modality easily fit into fisher lifestyles, as they were able to participate in the interview from any location at any time, and some participants preferred phone over the other modalities.
2. Video Interviews: Participants were offered a variety of potential interview times, including evenings and weekends. This video option would have been preferable to the phone option, as it would have allowed the researcher to evaluate body language during the interview, and adjust questions appropriately. Unfortunately, no participants selected this option.
3. In-Person Interviews: These were scheduled with the researchers on specified dates when they were in the region. This option was most preferable for human subjects research because it allowed for a better assessment of participant engagement and emotional reaction as well as the ability to adjust questions in accordance with participant non-verbal communication. Our research experience in the region has demonstrated that in-person interviews result in the highest quality and largest quantity of human subjects data. The only weakness of this method was the limited dates that could be offered to the participants because of travel limitations.

Table 10: Timing of research travel by geographic segment

Carolinas (Segment 4)	**Georgia – N. Florida** (Segment 3)	**Space Coast** (Segment 2)	**Florida Keys – Miami** (Segment 1)
February 2024	December 2023	September 2023	July 2023

Once interviewing was complete, we were able to review distribution of fishers across the geographic segments (Table 11). This analysis shows that fisher sector distribution across segments is relatively even, although commercial and for hire is under-represented in the Keys segment. This was likely due to timing of field work in the region, which overlapped with the start of the brief red snapper season which was announced very shortly before field work commenced (and after travel arrangements were confirmed). In addition, recruitment in the northern portion of the region was far less productive, and there were fewer willing participants. It is likely that what appears to be an under-representation of recreational anglers in the Carolinas may be due to higher proportion of retirees who live in the Space Coast and the Keys, many of whom are drawn to the region for the recreational fishing.

Table 11: Distribution of fishers across geographic segments

	Carolinas Percent (number)	**Georgia/ N. Florida** Percent (number)	**Space Coast** Percent (number)	**Keys** Percent (number)	**Total** Percent (number)
Commercial	44.44% (4)	45.45% (5)	27.27% (3)	11.11% (1)	100% (13)
For Hire	33.33% (3)	45.45% (5)	36.36% (4)	33.33% (3)	100% (15)
Recreational	22.22% (2)	9.09% (1)	36.36% (4)	55.56% (5)	100% (12)
Total	100% (9)	100% (11)	100% (11)	100% (9)	100% (40)

Our analysis also showed that in all sectors (commercial/for hire/recreational) there was significant overlap between participants in each fishery. (i.e., a large proportion of each sector's fishers participate in both fisheries.) Below, this is illustrated quantitatively for the commercial and for hire sectors and our qualitative analysis of the recreational sector confirmed a similar pattern. This self-reported data shows the that of all interviewed fishers, many commercial and for-hire fishermen held a diverse portfolio of permits, which included both snapper/group permits and king mackerel/pelagic permits. Recreational anglers are a separate category. Percentages are calculated across all interviewee, not by sector.

As a result, teasing apart differences associated with each fishery was not informational. While this analysis was not fully performed, we are confident that designing our methods to capture fishers from both fisheries helped ensure the experiential diversity of our sample

Proven research instruments

This project used semi-structured, ethnographic interviews to gather qualitative and quantitative data about fisher trust in science and management, motivations for engagement, and barriers to participation in citizen science. In-depth interviews allowed for a deep understanding of the research topic, encapsulated the lived experience of these individuals, and revealed how their careers have been shaped by federal regulations. As these were semi-structured, open-ended interviews, they allowed for new information to emerge, but also followed a general script in order to cover a list of desired topics (Bernard 2006, 210).

The research team drew on interview guides used in previous projects and developed additional questions for this specific project. Research instruments for this project were based on previously conducted studies (Yandle et al, 2011, Yandle, Tookes, and Shamshak. 2019; Yandle, Tookes, Grace-McCaskey 2020) and were revised after valuable feedback from SAFMC staff and the Citizen Science Operations Committee.

Limitations of data gathering approach

This project operated under several limitations, including a limited budget and a tightly constrained time frame (all field work had to take place within a nine month period). These constraints necessitated interviewing during less than optimal time frames (e.g., during the short red snapper season), and a smaller sample size. The project design prioritized qualitative data collection, and while 40 interviews are perfectly adequate for qualitative analysis, it restricts the types of statistical/quantitative analyses that can be performed. Additionally, despite all efforts made to broaden the recruitment to include randomized participants, bias will be evidenced in the types of individuals who elected to answer our recruitment texts or respond to our recruitment postcards.

Inductive Mixed Methods Analysis

This study was purposefully designed for mixed methods (complementary use of qualitative and quantitative) analysis. Closed-ended questions (e.g., Likert, multiple choice) are excellent tools for understanding *what* people do, and this project included four quantitative sections to provide this insight. In order to understand *why* people held these perspectives, individual qualitative interviews provided the opportunity for participants to discuss the complexity of their decision-making. Our combination of both methods addressed what people think when forced to choose between limited options, but also why they hold these perceptions and how their responses can be situated into a larger understanding of their worldviews.

The mixed method research approach utilized for this project was based on grounded theory (Glaser and Strauss 1967), which relies on inductively developed understandings that emerge during the course of a study. These themes are in constant interaction with the emerging data, allowing continual revision. In contrast to conceptually developed theory that is simply tested, grounded theory is rooted in the data from the given study, and thus more accurately reflects participant thoughts. As such, the analysis for this project has indicated that fishers across the South Atlantic perceive overarching issues relating to: trust and engagement with management, how science is performed and prioritized, and the viability of combining citizen science efforts with activities that provide livelihoods for commercial and for hire fishers.

Qualitative data analysis methods

Qualitative analysis for this project commenced with AI transcription which was then reviewed and corrected by the research team. Each AI transcribed interview was approximately one-half to two-thirds accurate, and human review and editing was crucial to ensure accuracy. These interview transcripts were uploaded into qualitative data analysis software Atlas.TI, to facilitate review by the team. Upon carefully reading and rereading the transcripts, we were able to identify themes, patterns, and variations in the data. Once these recurring ideas began to emerge, open coding (Emerson et al. 2011) was used to identify analytic categories and predominant themes. These themes illustrate the foundational data incorporated into this report to provide nuanced insights into the opportunities and barriers to participation in citizen science, and prospects for increasing fisher participation in the region.

Quantitative data analysis

Because of the relatively small number of participants (40) and the fact that responses to closed-ended questions were categorical (e.g., never/sometimes/usually) quantitative analysis is limited to descriptive statistics. While some non-parametric statistical analysis may be possible, these tests are not necessarily appropriate for the characteristics of this data set and the questions we are asking (Siegel 1998), a more conservative approach is to simply provide cross tabulations that are used in conjunction with the qualitative analysis. In addition to the characteristics of

fishers participating in the research (presented above), quantitative analysis provided insight into fishers' participation in fishery management activity, their trust in various institutions, and their world view as it relates to fisheries management

RESULTS

Results are presented below. First these are presented by sector, then by geographic segment. For each analysis, fisheries management activity, trust, world view, and willingness to participate in citizen science are assessed using quantitative methods to explain the "what" and then illustrated with qualitative data to describe the "why." Analysis by sector proved much more insightful and is presented first. A more limited analysis of fisher responses by geographic segment follows.

Fisher response by sector

Analysis by sector (commercial, for hire, and recreational) proved the most fruitful, and is presented in the most detail.

Results: Fisheries Management Activities

Quantitative analysis

The table below presents fishers responses to closed ended questions on how often they participate in various activities related to fisheries management. This is based on previous fisheries management research in New Zealand (Yandle et al, 2011). "Usually do this" and "sometimes do this" cells are coded in green when over 50% participate, with the shade of green becoming darker at 10% intervals (e.g., 50% -- 60% is lighter than 60% -- 70%). Conversely "Never do this" cells are coded in red when more than 50% never participate with the shade of red becoming darker at 10% intervals (e.g., 50% -- 60% is lighter than 60% -- 70%).

Table 12: Engagement in fishery management activities by sector

	Commercial	For Hire	Recreational	Total
	Percent (Number)	Percent (Number)	Percent (Number)	Percent (Number)
Informally discuss				
Never do this	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)
Sometimes do this	30.77% (4)	33.33% (5)	16.67% (2)	27.50% (11)
Usually do this	69.23% (9)	66.67% (10)	83.33% (10)	72.50% (29)
Read Federal materials				
Never do this	0.00% (0)	6.67% (1)	8.33% (1)	5.00% (2)
Sometimes do this	30.77% (4)	33.33% (5)	83.33% (10)	47.50% (19)
Usually do this	69.23% (9)	60.00% (9)	8.33% (1)	47.50% (19)

Attend government meetings[7]				
Never do this	30.77% (4)	66.67% (10)	50.00% (6)	50.00% (20)
Sometimes do this	53.85% (7)	13.33% (2)	33.33% (4)	32.50% (13)
Usually do this	15.38% (2)	20.00% (3)	16.67% (2)	17.50% (7)
Attend meetings held by other groups[8]				
N/A	15.38% (2)	0.00% (0)	0.00% (0)	5.00% (2)
Never do this	30.77% (4)	33.33% (5)	8.33% (1)	25.00% (10)
Sometimes do this	15.38% (2)	46.67% (7)	50.00% (6)	37.50% (15)
Usually do this	38.46% (5)	20.00% (3)	41.67% (5)	32.50% (13)
Discuss fishing issues on internet				
Never do this	69.23% (9)	46.67% (7)	58.33% (7)	57.50% (23)
Sometimes do this	15.38% (2)	33.33% (5)	16.67% (2)	22.50% (9)
Usually do this	15.38% (2)	20.00% (3)	25.00%	20.00% (8)
Attend federal meetings				
Never do this	53.85% (7)	60.00% (9)	58.33% (7)	57.50% (23)
Sometimes do this	38.46% (5)	33.33% (5)	41.67% (5)	37.50% (15)
Usually do this	7.69% (1)	6.67% (1)	0.00% (0)	5.00% (2)
Speak at meetings held by other groups				
N/A	15.38% (2)	0.00% (0)	0.00% (0)	5.00% (2)
Never do this	38.46% (5)	46.67% (7)	16.67% (2)	35.00% (14)
Sometimes do this	15.38% (2)	40.00% (6)	50.00% (6)	35.00% (14)
Usually do this	30.77% (4)	13.33% (2)	33.33% (4)	25.00% (10)
Speak at Federal meetings				
Never do this	46.15%	80.00%	83.33% (10)	70.00%
Sometimes do this	15.38% (2)	20.00%	8.33% (1)	15.00% (6)
Usually do this	38.46% (5)	0.00%	8.33% (1)	15.00% (6)

All sectors participate in "easier" activities (such as discussing fishing) more than harder ones, and the recreational sector engages in these easiest activities the most. Across all sectors, attending Federal meetings remains extremely rare, and speaking at them even rarer. However,

[7] This refers to any meetings held by any government agencies. This is in contrast to the later question that specifically narrows down to "federal meetings."

[8] This refers to meetings related to fishing held by non-government organizations. E.g., fishing clubs, conservation organizations, Rotary Clubs, neighbourhood groups, etc.

commercial fishers report engaging in harder activities (e.g., attend Federal meetings and speaking at them.)

Qualitative analysis

Engagement in Management

Our qualitative data provides insights into the *reasons* for fishers choosing to not participate in more in-depth activities and the implication of these decisions. These motivations ranged from convenience, to frustration, to feeling defeated.

Significant Qualitative Themes

Reasons for fisher non-engagement include:

- Feeling that engagement and participation is fruitless
- Financial and temporal commitment needed to attend a meeting that is often several hours from their home
- Confusion about what agencies perform which roles in the management process—the "black box" of fisheries regulations

Participation is useless

Many fishers explained that they felt it was pointless to attend meetings or to try to speak at meetings. One said: " I used to bend over backwards to try and participate in the regulatory process, and I just saw most of it fall on deaf ears. They all had their agenda and it was pro-tourism, pro-sports fishing, and commercial fishing is bad." (Commercial Fisher). Another agreed, explaining "I'm not going to go up there for a meeting… what is my two cents gonna do in this meeting up there? I feel it doesn't go anywhere. They're gonna listen, and [say] 'Yeah, we had the meeting, but we're still just gonna pass our law and do what we do." (For hire Fisher). Similarly, "I basically read stuff that I think is going to be pertinent to me… I do read quite a bit of it that I don't really like, like when they're in scoping…I used to get involved in it. I used to do a lot more, because I used to think that our voices interjecting information would have some impact. And once I realized that it didn't. I sort of just backed off" (Commercial Fisher). When asked what he thought of the statement that recreational anglers had a voice in management, one responded "Absolutely disagree with it. They have no voice whatsoever." Similarly, this commercial fisher expressed a common sentiment:

> "Usually … they have a scoping process. That's how they developed the rules. It's got a bunch of steps in it… they have scoping, and then they have proposed alternatives. And then they have all these different steps. And then, on one of them, they say, 'seeking public comment, on rule blah, blah, blah' and they'll describe what it is. And then 100% of the time, whatever their preferred alternative is, is what the law ends up being. All of the public comments will always oppose it vehemently, and it'll still go through. So after years and years of taking the time to comment, you realize that it really doesn't matter."

Most responses were short and succinct as this one: “I haven't been going to meetings because it doesn't do any good.” (Commercial Fisher).

Engagement is difficult and costly

Some fishers described what they feel is deep conflict between the way participating in management needs to happen, and the daily routines of their lives: “I'm working. I can't make it most of the time” (For hire Fisher); and “I have another business. So it's hard to carve out the time but I’ve listened to meetings, like on the, I guess it's Skype or whatever they do it on. I've listened to the meetings just to know what their reasoning behind stuff is.” One contrasted this dilemma with the way other types of people might experience the same meetings: “these environmental groups; when they go to meetings, they're all getting a paycheck to go sit at this meeting…We have to take time off of our work, and [are] not getting paid, not getting any reimbursements to go play for our living and livelihoods.” (Commercial Fisher).

A commercial fisher explained: “There's no time for a fisherman to be affiliated with any of that. They're too busy trying to feed their families and keep their boats running.” It was common for fishers to point to other people who they believed engaged in the process in lieu of themselves, such as this for hire fisher: “[That guy] you may interview later this morning, he seems to keep up a little more on some of that stuff than I do.”

When asked if they felt welcome at federal meetings if they did choose to attend, a few mentioned the intimidation factor when there is a law enforcement presence: “I mean, they have sheriff's departments and sheriff's deputies in there and FWC lawmen, with guns on ’em so yeah, I disagree.” (For hire Fisher)

The management process is opaque

These limited levels of engagement with the management process can be linked to a key theme that emerged in the qualitative results: there was frequently an essential confusion about the different agencies involved in fisheries management in the South Atlantic. Before asking the quantitative questions discussed above, we began with a very general open-ended question: “What do you know about how fisheries are regulated in this whole South Atlantic region?” Responses commonly grouped around these over-arching ideas:

Lack of knowledge, particularly amongst recreational anglers:

- “I know nothing. of any of them all. I know. NOAA gives me my hurricane stuff. I don't know anything about it.” (Recreational angler)
- “I don't know anything about how they manage it. All I know is I use Fish Rules to find out what I can keep… so I truly know nothing about the management…I know that they get their quotas from somewhere and I don't know who even turns in their numbers to them. So I don't know how they get their information.” (Recreational angler)
- “I don't know anything really. I know there's a state component and there's a federal component. I have no idea. I know there are seasons and there's bag limits. And

…sometimes there's closure and whatnot, but I don't have any idea how it works because I just want to fish." (Recreational angler)

- "Not too much comes to mind. I know they exist. And now you've got to have your federal permit to take certain fish, but I don't think you need it for [others]. Yeah, it's just kind of weird. But I could be wrong, things change." (Recreational angler)

Slippage between agencies:

- "I think NOAA makes the decisions and I think the states kind of tag along. You know, some states do fight it. Some fight the federal regulators, because it's their state and they want to do certain ways." (Commercial Fisher)

Finally, a key issue that arose repeatedly across interviews and amongst all 3 sectors was an underlying confusion about the differences between each entity in the management process. Frequently, people would make statements along the lines of "council or NOAA or whatever" was responsible for the regulation they were discussing, without much apparent conviction, or concern, that they were naming the appropriate agency. Federal fisheries management is a black box to many fishers, rife with acronyms and confusing guidelines about which agencies handle which issues or regulations.

Results: Trust

Quantitative analysis

The table below presents fishers responses to closed ended questions the degree to which they trust various actors in fisheries management. This is based on previous research in New Zealand and the US Virgin Islands (Yandle et al, 2011; Yandle, Tookes and Grace-McCaskey 2020), as well as the broader political science and sociology literature on trust (Grey et al, 2012; Wheeless and Grotz 1977; Tschannen-Moran and Hoy 137 2000; Rousseau et al. 1998; Maloy 2009). In this analysis, cells are shaded green if the level of trust/distrust is more positive than the level of generalized trust/distrust. Cells are shaded red if the level of trust/distrust is more negative than generalized trust/distrust. In this analysis, variations in shading intensity was inappropriate. For example, among commercial fishers, 46% agreed that state regulators can be trusted (which is greater than their measured level of generalized trust). Meanwhile, only 20% of recreational anglers agreed that state regulators can be trusted (which is lower than their measured level of generalized trust).

Table 13: Fishers' trust by sector

	Commercial	For Hire	Recreational
	Percent (Number)	Percent (Number)	Percent (Number)
People in general (generalized trust)			
Can be TRUSTED (generalized trust)	30.77% (4)	33.33% (5)	50.00% (6)
You can't be too CAREFUL (generalized distrust)	46.15% (6)	66.67% (10)	50.00% (6)
N/A	7.69% (1)	0.00% (0)	0.00% (0)
Refuse	15.38% (2)	0.00% (0)	0.00% (0)
Other people in your sector			
Can be TRUSTED	38.46% (5)	33.33% (5)	41.67%\ (5)
You can't be too CAREFUL	53.85% (7)	60.00% (9)	50.00% (6)
N/A	0.00% (0)	6.67% (1)	0.00% (0)
Refuse	7.69% (1)	0.00% (0)	8.33% (1)
State regulators			
Can be TRUSTED	46.15% (6)	20.00% (3)	50.00% (6)
You can't be too CAREFUL	46.15% (6)	73.33% (11)	50.00% (6)
N/A	7.69% (1)	6.67% (1)	0.00% (0)
Federal regulators			
Can be TRUSTED	38.46% (5)	0.00% (0)	41.67% (5)
You can't be too CAREFUL	61.54% (8)	93.33% (14)	58.33% (7)
N/A	0.00% (0)	6.67% (1)	0.00% (0)
The CCA			
Can be TRUSTED	15.38% (2)	53.33% (8)	33.33% (4)
You can't be too CAREFUL	69.23% (9)	40.00% (6)	41.67% (5)
N/A	15.38% (2)	6.67% (1)	8.33% (1)
Refuse	0.00%	0.00%	16.67% (2)

Environmentalists			
Can be TRUSTED	7.69% (1)	26.67% (5)	33.33 (4)
You can't be too CAREFUL	92.31% (12)	66.67% (10)	66.67% (8)
N/A	0.00%	6.67% (1)	0.00% (0)

Levels of trust in the US population is estimated to be 37% in the integrated values survey (Integrated Values Survey, 2022). This is broadly in line with the survey as a whole (37.5%), however, trust varies considerably between sectors. Recreational anglers have a notably higher level of generalized trust than the US population (50%) which commercial and for hire both have less than the US population.

When examining trust and distrust of various parties engaged in management, a complex picture emerges. In Table 14, red cells indicate trust levels lower or distrust levels higher than for people in general, which green cells indicate trust levels higher or distrust levels lower than for the general population. Generally speaking and most relevant to this project, levels of distrust in Federal regulators is higher than for people in general across all sectors, with for hire fishers reporting the highest levels of distrust at 93%. Fishers also universally reported higher levels of distrust for Federal regulators compared to state regulators or other people in their own sector.[9]

In addition, two questions from the world view section of the survey are relevant to trust. These are presented below. These asked fishers whether they agreed or disagreed with statements. While questions were asked using a four-point Likert Scale, they were consolidated to "Agree" or Disagree statements to clarify fisher perspective. Answers are shaded in red if less then 50% agreed with the statement.

Table 14: Fishers trust in SAFMC and science by sector

	Commercial	**For Hire**	**Recreational**
	Percent (Number)	**Percent (Number)**	**Percent (Number)**
I trust Federal regulators to make the right decision			
Agree	15.38% (2)	6.67% (1)	25.00% (3)
Disagree	84.62% (11)	93.33% (14)	75.00% (9)
I trust the science that Federal regulators use in their decision makers			
Agree	30.77% (4)	20.00% (3)	41.67% (5)
Disagree	69.23% (9)	80.00% (12)	58.33% (7)

[9] However, for commercial fishers while *distrust* in Federal regulators, is higher than for the general population, level of *trust* is also higher for the general population.

These results show low level of trust of Federal regulators. The most stark example of this is less than 7% of the for hire sector trusting regulators to "make the right decision". The highest level of trust is shown among recreational anglers, but even here only 25% of recreational anglers trust Federal regulators.

Qualitative analysis

Distrust

A lack of trust in the process arises in a variety of different contexts. Distrust is expressed related to the honesty or practices of the other fishing sectors, the qualifications and motivations of those in management, as well as the validity of the data being used. The qualitative data below explains the reasoning behind some of the quantitative data above.

Significant Qualitative Themes

Fishers express distrust with the management process and people involved in fishing and management in these ways:

- Fishers in each sector believe their sector (or their portion of the sector) is not receiving a fair share of the catch quota
- They question the qualifications of regulators to make decisions
- There is concern about accidental or intentional data manipulation or the use of questionable science
- Some believe regulations may be influenced by the personal biases of individuals involved in management

Inter-sector conflict

Both qualitative and quantitative data revealed tension between the sectors, with each pointing to the others as having a larger share of the catch.

·"You got so many weekend warriors out here, and it's not like they're all out there catching hundreds of fish, but hundreds of boats catching a couple fish add up…But there's no way they can keep track of any of that, because on the recreational side, aside from a for hire boat, there's no trip logs there, you know, nothing. The dock surveys are pretty much non-existent. And that would be state [agencies]. I've ever seen federal dock surveys-- if there is such a thing?" (Commercial Fisher)

- "I know commercial fishermen say that they only take 10% of [the quota] …we [for hire] only take 10%, Maybe 25% The rest of it's done from recreational catch? When you talk to most commercial guys, that's what they say-- most of the catch is caught by the recreational fishing, and the recreational fishing says most of the catch is caught by the commercial fishing. The government is pitting us against each other for so many years. It's just like Republican- Democrat. That's how it is now." (For hire Fisher).

- "I don't trust the commercial industry too much at all…they've kind of ruined it for the recreational fishermen. I mean, we have a [bone] to pick with them, because they get actually much more as far as what they can take, and if they do take more, then it shuts off the recreational industry. When the commercial fishermen catch a limit of the

kingfish then the recreationals can't [fish]—it stops. Same thing happens within the stone crab fishery or the lobster fishery. It's gotten crazy." (Recreational Angler)

Management qualifications

It was common for fishers to argue that the people involved in the regulatory process are not qualified to assess fisheries. In many cases, this is because of conflict and distrust between the three sectors, and a belief that any representative on the Council who belongs to one sector or any other will assuredly be biased against the other sectors. One fisher reflected on the early years of management councils: "When we got the [council], it was a conflict of interest for a commercial fisherman to be on the board. But it was okay for tackle manufacturers and for hire boat captains and all those kinds of people to be on the board. That seems strange…and that's the kind of stuff we're up against" (Commercial Fisher). Another identified the same problem, but offered a solution: "We got people on the board that shouldn't be on the board. I think commercial fishing should be regulated by commercial fishermen. Not people [wearing] suits, because they just don't understand it. And not just any regular old fisherman, it would have to be appointed by fishermen. You know, because we could have somebody that [thinks] 'Well, I'm gonna die in the next 30 years, so, to hell with it. Let's just make it wide open!' So it would have to be voted in by fishermen, for fishermen. And you could have somebody oversee it as an outside resource, but, you know, the fishermen are your best resource to get data. Not a million dollar ship trying to go and catch red snapper in a crab pot" (Commercial Fisher).

Data accuracy and reliability

This frustration and distrust between the sectors and with managers is also directed towards the sources consulted to craft regulations. The data utilized in the management process does not seem accurate or truthful to commercial and for hire fishers. Some believe that there is accidental or deliberate data manipulation occurring. One fisher considered potential issues with data gathered by citizen science, then reflected on his position mid-thought: "There's so many ways that the data can be corrupted… but it's happening already! So, there's not any worse than what's happening now" (Commercial Fisher). Some questioned the accuracy of the stock assessment process, saying "I do know is there's a lot of fudging. And the reason I know there's a lot of fudging [is they are] multiplying…You can't just multiply, you got to have raw data and go from it. You can't just multiply the data that you have that makes it incorrect. They cannot do that. And I think that's what they do." (For hire Fisher) Many believe the root cause of most of these issues is management distrust of fishers: "They distrust the fishermen. They do not believe that we will tell them the truth. And it works both ways. We don't believe that because they don't tell the truth." (Commercial Fisher)

Bias in regulators

This distrust extends beyond the inter-sector wariness to the scientists and managers. Some feel that regulators are operating with existing biases and preferences that take precedence over any data provided or perspectives expressed by fishers. "There's a lack of trust. The for hire

community doesn't trust the officials. Because … if you report a lot of fish, they're gonna say 'Oh, you're catching too many. We need to take back some of what you're catching.' You report too few fish? They shut it down because they think there's a reduction of fish. So it's the lack of trust" (For hire Fisher). Another agreed, saying "A lot of scientists, especially a lot of the younger ones, they have agendas and they've gone to school [and] been brainwashed...they're biased when they come into looking at how regulations are made, and what's going to affect people in real life…A lot of these regulations are made by people [who] think they've learned something, but in real life, practicality, it has no bearing. All it does is cause more hardship and expense to the fishermen." (Commercial Fisher)

One for hire fisher we interviewed had been employed as a fisheries scientist before he left that career to run a fishing business. He explained distrust with considerable insight: "It was very easy to be closed minded as a manager– and I fished my whole life before I started doing management, but it is very easy to be closed minded. When I was thinking about the management of the species, I was no longer thinking about the guy that's out there that spent his last dollar to put gas in his boat… to buy that dozen minnows to go fishing– where he can only keep one fish, but he needed to feed his family" (For hire Fisher).

Results: World view

Quantitative analysis

The table below presents fishers responses to closed ended questions that measured their world view in regards to Federal fisheries management. This is based on previous research in New Zealand (Yandle et al, 2011), and in Georgia (Tookes et al. 2018). These questions asked fishers whether they agreed or disagreed with a series of statements. While responses were limited to a four point Likert Scale, they were consolidated to "Agree" or Disagree statements for clarity. "Agree" answers are shaded in red as they illustrate a negative view of fisheries management, and green if they portray a positive view of fisheries management.

Table 15: Fishers world view on Federal fisheries management by sector

	Commercial	For Hire	Recreational
	Percent (Number)	Percent (Number)	Percent (Number)
Fishers have a voice			
Agree	38.46% (5)	33.33% (5)	16.67% (2)
Disagree	61.54% (8)	66.67% (10)	75.00% (9)
N/A	0.00% (0)	0.00% (0)	8.33% (1)

I feel welcome at meetings			
Agree	84.62% (11)	86.67% (13)	75.00% (9)
Disagree	15.38% (2)	13.33% (2)	25.00% (3)
I believe information presented by fisheries managers			
Agree	30.77% (4)	33.33% (5)	58.33% (7)
Disagree	69.23% (9)	60.00% (9)	41.67% (5)
Refuse	0.00% (0)	6.67% (1)	0.00% (0)
The people in charge of fisheries management are fair to everyone			
Agree	30.77% (4)	20.00% (3)	25.00% (3)
Disagree	69.23% (9)	80.00% (12)	66.67% (8)
N/A	0.00% (0)	0.00% (0)	8.33% (1)
The opinion of ___ fishermen are taken seriously			
Agree	30.77% (4)	40.00% (6)	33.33% (4)
Disagree	69.23% (9)	60.00% (9)	66.67% (8)
___ fishers have a responsibility to participate in fisheries management			
Agree	92.31% (12)	100.00% (15)	83.33% (10)
Disagree	7.69% (1)	0.00% (0)	16.67% (2)
____ fishers should be willing to share info about fishing activities with regulators			
Agree	46.15% (6)	60.00% (9)	91.67% (11)
Disagree	53.85% (7)	40.00% (6)	8.33% (1)
Fisheries regulation help preserve my fishery			
Agree	61.54% (8)	73.33% (11)	91.67% (11)
Disagree	38.46% (5)	26.67% (4)	8.33% (1)
I work hard to make sure my activities do not harm my fishery			
Agree	100.00% (13)	93.33% (14)	100.00%
Disagree	0.00% (0)	6.67% (1)	0.00% (0)
The ocean is large and there is no way we can overfish it			
Agree	7.69%	13.33% (2)	0.00% (0)
Disagree	92.31%	86.67% (13)	100.00% (12)

The environment is important to me			
Agree	100.00%	100.00% (15)	100.00% (12)
Disagree			
Fishing regulation threatens my livelihood/cherished hobby			
Agree	69.23%	60.00% (9)	41.67% (5)
Disagree	30.77%	40.00% (6)	58.33% (7)
I feel a strong connection to other ___ fishermen			
Agree	100.00%	80.00% (12)	91.67% (11)
Disagree	0.00% (0)	20.00% (3)	0.00% (0)
Refuse	0.00% (0)	0.00% (0)	8.33% (1)

Fishers' world view about fisheries management was (with a few exceptions[10]) surprisingly consistent across sectors, and presented a nuanced understand of fisheries management. In the table above statements are coded green if over 50% agree with the statement and red if less than 50% agree with the statement. Broadly speaking:

- Fishers feel welcome at meetings. However, they do not believe their voices are heard, do not agree that their opinions are taken seriously, and do not agree that that regulators are fair to everyone.

- The theme of distrust of Federal management emerges again, with less than 50% trusting the science used by Federal fisheries managers, and less than half trusting Federal managers to make the right decisions. Less than half of commercial and for hire fishers believed the information presented by Federal fisheries managers.

- Fishers have complex beliefs about fishing regulations. Across sectors, they agree that regulations help preserve their fishery, yet commercial and for hire fishers also agree that these regulations threaten their livelihoods. The juxtaposition of these statements suggests they believe fisheries regulation is necessary, yet are frustrated with how it is carried out and the impact is has on them.

- While fishers report relatively low levels of participating in management activities (particularly Federal management activities), a remarkably high proportion (83-100%) agree that they have a responsibility to participate in management. The majority of recreational and for hire fishers (who have the lowest reporting requirements) also agree that they have a responsibility to share additional information with regulators.

[10] Recreational fishers disagreed with commercial and for hire on whether regulations threatened fishing, and whether they believe the information presented by fisheries managers. Commercial fishers disagreed with for hire and recreational on whether they should share information beyond that required by law.

- Fishers agree that they work hard to preserve their fishery, and feel connected to other fishermen. They also agree that the environment is important to them, and disagree with the view that "the ocean is large and we cannot over-fish it." Together, these statement suggest that fishers perceive themselves as guardians of their fisheries

Qualitative analysis

World View Dissonance

A key theme that emerged in the qualitative data highlighted conflict between what fishers experienced in their daily lives on the water, and the methods or restrictions of management. This dissonance was particularly evident in regards to how fisheries science is conducted, and the focus of the federal management system on individual species.

Significant Qualitative Themes

Fishers are experiencing dissonance between their own experiences and scientific information:

- Fishers engage in frequent environmental observations that often do not mesh with the scientific information used by management
- Scientific sampling techniques conflict with fisher's fishing strategies
- Offers to share their techniques or local knowledge with scientists are not accepted
- Regulations on single species and other environmental impacts affect the ecosystem in broad ways that are not acknowledged

Fishing techniques and scientific sampling techniques do not align

Many fishers explained that successful fishing strategies are quite different from the scientific sampling strategies used by stock assessment scientists. One commercial fisher described what he would like to say to fisheries scientists: "You're a bird watcher. Stick to the bird watching. And if you want to see how to catch the fish, let the fishermen catch the fish and then do your stock assessment…Because your stuff failed and our stuff works. You know, we're adapting with the times and the changes. You are not…so I think the council doesn't really understand it." They expressed frustration with the discrepancies between their own observations and the science they believed management is relying on. Many responses were similar to this one: "I do not think they [managers] have the best information and that's part of the problem." (Commercial Fisher). Some felt that this was due to limits on whose data was being valued, clarifying "They listen to …the 'scientific data' developed by pencil pushers at the desk. They're not listening to the commercial sector" (Commercial Fisher).

Concern about scientist knowledge

In some cases, this dissonance was confirmed by their interactions with scientists, particularly when the scientists appear to learn new things. One described his parking lot chat with a friend of a friend that was rife with incorrect statements about the recent offshore weather, barometric pressure, and whether or not sharks ate live fish, then his horror at discovering that the

problematic statements were coming from a marine scientist working in conservation in the area. Another described his experiences: “I've worked with several scientists over the years doing real research projects, and the ones that actually work with us and hire our boats to go out and deploy their gear and do their monitoring for them – they actually get a better grasp on reality because they're seeing the more practical side of it. They go out on a NOAA vessel or something like that—it’s totally different. They're not seeing what it really takes to catch fish and what we have to go through…I've personally had scientists say ‘Oh, wow, I didn’t realize that!’ and it’s something they don't even think about…a different perspective is what they need.” (Commercial Fisher)

Attempts to bridge the divide

Fishers describe trying to fill these knowledge gaps by offering their assistance, and several mentioned taking actions similar to this fisher’s attempt: “When they were having the talks on the red snapper season, I sent them an email– a very, very nice email– outlining my expertise in the area and inviting them for free, [saying] ‘I will take you out as many times as you want, four people per trip and I will show you the real facts of what's out there in red snapper off of … Florida. Trip’s on me!’ Nobody took me up on that.” (For hire Fisher). A different for hire in a different region said something very similar: “there's some [people] that are practically begging for somebody to go with them and let them show them what it is out there!” This frustration with the lack of interest they receive in their efforts to engage and interact with managers, even if this type of activity is not necessarily useful for data collection, colors their view of the management structure and its reliability.

Implications of single-species management

There is a gap between their own lived experience and what they are told about fish stocks and the ocean. This issue often emerges in the context of single-species management. Fisher decisions about which species to target any given day viscerally reinforces the intricacies of ocean ecosystems. Many feel that single-species regulations are not appropriate for responsibly managing the larger ecosystems, and that often regulations are not being responsive to the conditions that fishers are witnessing in the fisheries. One argued that “The fishery is being destroyed because of the regulations and nobody seems to grasp that except commercial fishermen. They just don't get it. When you put limitation on vermillion snapper, for example: They are a very ferocious eating fish. So are red snapper and they're killing the grouper …because they're ferocious eaters, they overrun our coast and the vermillion snapper overrun our coast, like the lionfish are trying to do. Nobody at NOAA can wake up to that fact. They just can't. They don't get it. (Commercial Fisher) Similar sentiments were shared across the Keys in regards to the voracious Goliath grouper.

Concerns about preserving fish stocks

Fishers have a front row seat to the consequences of the complex and legalistic process of US fisheries management. The system that makes it extraordinarily difficult for managers to be

flexible results in observations such as this one: “Cobia specifically is one of my pet peeve species. That was one of my favorite fish to catch and fish for. I've watched the numbers significantly dwindle in the last 15 to 20 years, to the point to where I've been trying to send things to the Fishery Council to tell them ‘Listen! You need to address this issue now!’ [It’s] just like it falls on deaf ears…what they did this past year with regulation of the cobia was too, too much too late.” (For hire Fisher)

Non-fishing pressures on fisheries

Fishers are witnessing larger scale environmental shifts and impacts of numerous factors beyond just fishing, but do not see management acknowledgement of them in meaningful ways. Interviews in the central section of Florida rarely avoided the topic of the pesticide and fertilizer runoff that was travelling from Lake Okeechobee to the coastal waters, and fishers in the Keys often mentioned the coral reef bleaching in summer of 2023, which was later identified as the worst ever recorded in Florida (FWC 2023). They see the impacts of these larger issues on their fisheries, and feel that rather than collaborating with them in support of the industry, management is compounding their difficulties. One explained: “It's an environmental concern and they think that regulating the catch improves the stock. But when they get into managing nature to the extent they've done this…the fishery is off balance” (Commercial Fisher).

Local ecological knowledge dismissed

Despite federal mandate that public (e.g. fisher) perspectives be solicited, fishers do not think their opinions are valued. It was common to hear their expertise, insights, and ecological knowledge “dismissed” as though they were simply boxes to be checked in the management process. One described it thusly: “They don't listen to anything that's being said. They just think it's a perfunctory [thing] required by their for hire. Why [do] they waste our time getting public opinion? They don't pay attention to it” (Commercial Fisher). A fisher who had engaged with the regulatory process for years explained his current stance: “I used to bend over backwards to try and participate in the regulatory process. And I just saw most of it fall on deaf ears. They all had their agenda and it was pro-tourism, pro-sports fishing, and commercial fishing is bad” (Commercial Fisher). This frustration came through emphatically from a commercial fisher who said that “NOAA or SFMC, should wake up to what they've already got, and quit trying to figure out how much more they can impose or ask for and start with their own house. Clean up their daily data. They’ve got all this data.”

Many of the interview participants demonstrated emotional dismay when sharing perspectives. This fisher was visibly distressed when he told us: “I'm 72. I'm done fishing. I'll never see another day of good fishing out here as long as I live. Which to me is a bloody shame…Who is ruling who here? This is just backwards, and then they're destroying something that generation after generation, family after family [enjoyed]. My love for fishing kept me out of so much trouble!”

While the data presented in this section on trust and world view do not directly address the topic of citizen science, they are crucial background issues that will underlie any future citizen science efforts in the region. Research, whether human subjects or fishery focused, does not take place in a vacuum, and understanding of the potential audience for collaboration will support the creation of stronger potential projects.

Results: Citizen Science Participation

The table below presents fishers responses to closed ended questions on their willingness to participate in various citizen science activities. These potential activities were selected in conjunction with SAFMC staff and the Citizen Science Advisory Panel. Cells are coded in green when over 50% are willing to participate, with the shade of green becoming darker at 10% intervals (e.g., 50% -- 60% is lighter than 60% -- 70%). Conversely cells are coded in red when more than 50% do not want to participate, with the shade of red becoming darker at 10% intervals (e.g., 50% -- 60% is lighter than 60% -- 70%).

Table 16: Fishers willingness to participate in citizen science by sector

	Commercial Percent (number)	**For Hire** Percent (number)	**Recreational** Percent (number)
Save gonads			
No	46.15% (6)	20.00% (3)	16.67% (2)
Yes	53.85% (7)	80.00% (12)	83.33% (10)
Save otoliths			
No	53.85% (7)	40.00% (6)	16.67% (2)
Yes	46.15% (6)	60.00% (9)	83.33% (10)
Record catch information			
No	30.77% (4)	33.33% (5)	0.00%
Yes	69.23% (9)	66.67% (10)	100.00% (12)
Record discard information			
No	25.00% (3)	6.67% (1)	16.67% (2)
Yes	75.00% (9)	92.30% (12)	83.33% (10)
Collect fin clips			
No	61.54% (8)	0.00% (0)	0.00% (0)
Yes	38.46% (5)	100.00%	100.00%
Record GIS location info on infrastructure			
No	23.08% (3)	13.33%	16.67% (2)
Yes	76.92% (10)	86.67%	81.81% (9)

Record environmental info			
No	23.08% (3)	13.33% (2)	8.33% (1)
Yes	76.92% (10)	86.67% (13)	91.67% (11)
Data limited species info			
No	23.08% (3)	0.00%	0.00%
Yes	76.92% (10)	100.00% (15)	100.00% (12)
Fish observations[11]			
No	61.54% (8)	60.00% (9)	52.94%% (9)
Yes	38.46% (5)	40.00% (6)	47.06% (8)
Shark depredation			
No	0.00% (0)	0.00% (0)	0.00% (0)
Yes	100.00% (13)	100.00% (13)	100.00% (12)

With a few exceptions[12], over half of fishers in each sector expressed willingness to participate in citizen science activities. However, it is likely this is an over-estimate of willingness to participate compared to the broader fishing community, as this data is drawn from fishers who were willing to participate in our interviews. Broadly speaking, while there is distrust, there are still some opportunities to collaborate. Our analysis below explores this in more detail

While there was some variation by activity, broadly speaking, recreational anglers had the greatest enthusiasm for participating in citizen science and commercial fishermen the least. One approach could be to target recreational fishing (which also has relatively limited data due to the lack of reporting mandates) for citizen science programs. If this approach was used, programs should be tailored to their particular interests.

The tables below notes the most popular citizen science activities by sector and by region. Recording shark depredation is a universally popular activity, so would be a natural fit for citizen science. Other widely popular activities include collecting fin clips, and information on data

[11] For the question "observations of fish in management areas such as species length, depth, video/photo." N/A was heavily represented in this question in spite of its apparent relevance. qualitative data indicated that many participants in this study were either (1) too far from a protected area to make this question relevant, or (2) unwilling to travel close enough to, or into, a protected area to do any observations due to the legal risk All N/A answers for this question were re-coded to "no" as they expressed an unwillingness to participate in the activity..

[12] Collect fin clips and fish observations among commercial fishers and fish observations among for hire fishers

limited species. Recreational anglers and fishers in the Space Coast and Keys had the greatest interest in participating.

Figure 4: Percent of fishers interested in specific activities by sector

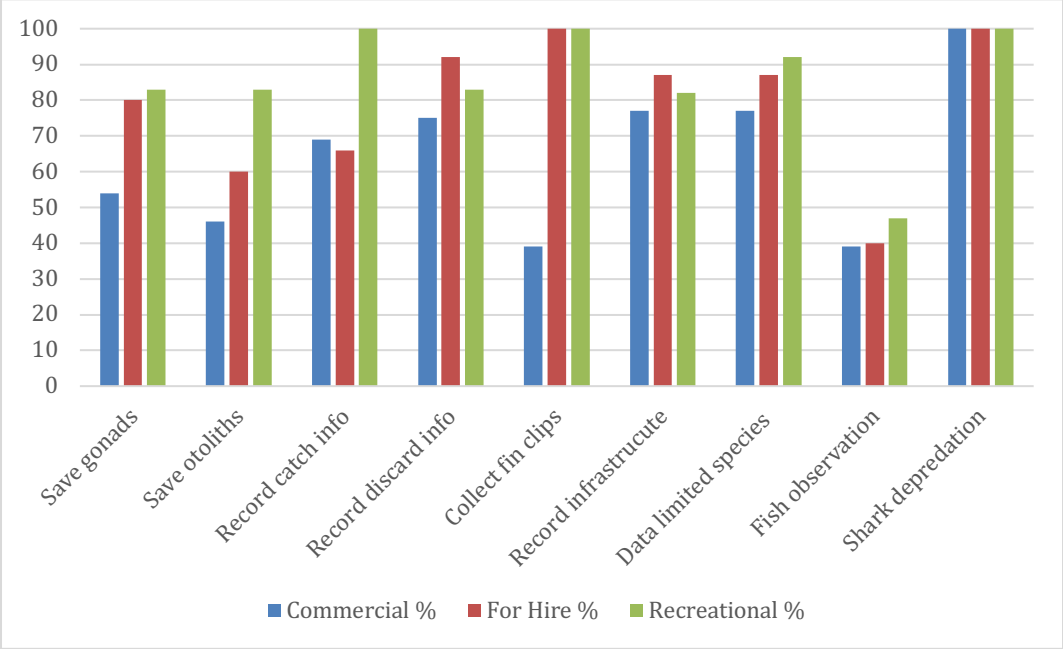
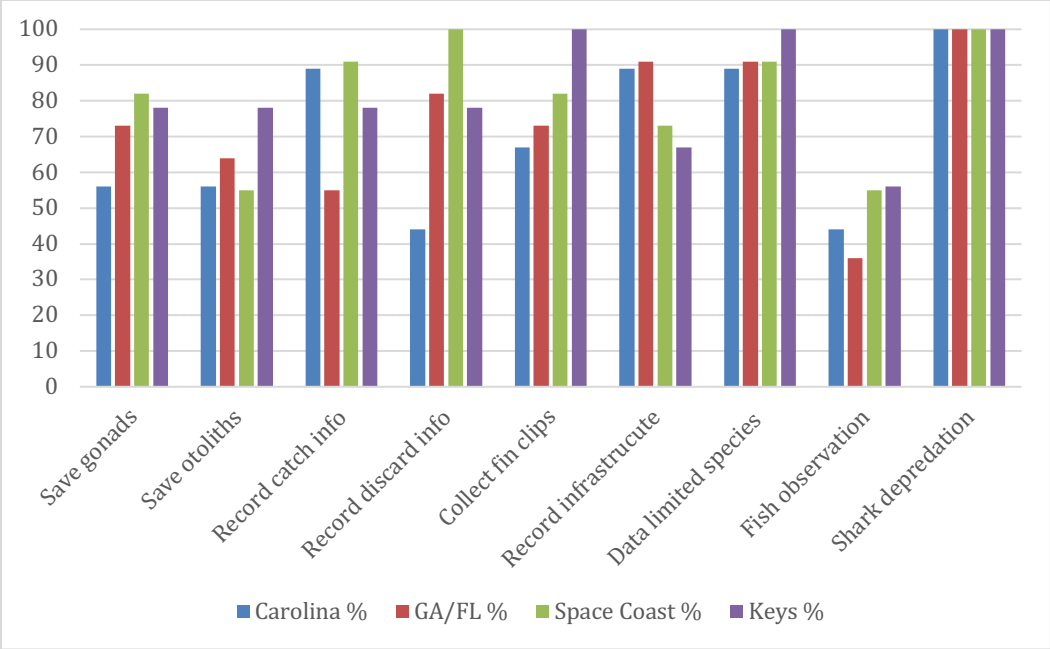


Figure 5: Percent of fisher interested in specific activities by region



During interviews, we asked fishers who were not willing to voluntarily participate in specific citizen science activities if they would be willing to do the same activity if they were paid. Broadly speaking, a relatively small proportion of fishers declined to participate in voluntary activities then were motivated by the offer to pay. No discernible trends were noted in who was motivated by potential payment. As a result, this quantitative analysis is not included in this report, however, qualitative data on this topic is presented below.

Qualitative Results

Introducing citizen science

One of the fishers interviewed reported being aware of SAFMC's Citizen Science focus. He described his previous knowledge to us:

> **For hire Fisher:** "I've heard that citizen science exists. So through the council management meetings, I've heard discussions that have included citizen science. My vague interpretation of citizen science is basically those that are doing the research are coming to the citizens and asking… kind of like what we're doing today. Gathering as much data as I can and taking that data to aggregate whatever it is that you're researching."
> **Interviewer 1:** "We'll tell the coordinator she'll be happy about that."
> **Interviewer 2:** "Yes, she will! You've heard Julia Byrd talk about it?"
> **For hire Fisher:** "Yes, I have!"

Unfortunately, this was an outlier answer, with only one other person being vaguely aware that the SAFMC had some relation to the idea of citizen science.

Significant Qualitative Themes

Fishers expressed varying levels of experience and interest in citizen science

- Many fishers had engaged with collaborative research, particularly fish tagging
- Most were not initially familiar with the term "citizen science" but thought it could be potentially useful
- Suggestions centered around:
  --transparency of project goals and potential use of data;
  --bias and reliability of the data

Previous research experiences

Some fishers equated boat ramp surveys/port data collection to citizen science, believing that by answering questions posed by Florida FWC, they were conducting citizen science. However, some fishers of all sectors described previous experience with citizen science (or citizen science adjacent) projects, primarily fish tagging. These activities took place as part of tournaments, for local biologists, or as part of long-range efforts by NOAA or out-of-area scientists.

One commercial fisher described on on-going relationship with scientists at an agency office near him with whom he had developed a relationship. He explained that he "actually keeps in touch with the scientists over there quite a bit. And I've worked with them over the

years doing tagging stuff," and was able to describe the goals of the various projects, such as determining dolphin migration patterns and growth rates. Similarly, a for hire fisher described a relationship with a state agency scientist who approached them personally to request assistance with cobia research. Likely key to these engagements in the scientific endeavor were the personal nature of the collaborations, and apparent clarity of project goals, as they were able to explain them to the interviewer.

In a handful of examples, fishers of all sectors actually sought out opportunities to engage with scientific efforts, ranging from a recreational anglers development of an app that he hoped fishers would use to collect data, to a commercial fisher who caught one tagged fish and pursued the opportunity further by calling the number on the tag and speaking with the scientist in charge of the project in Maryland, who asked him "Well, would you like to, you know, tag some fish? And I'm like, 'Yeah, sure. You send me some tags.' He sent me like five tags. I'm like, 'Dude, I used those in five minutes. Do you want me to tag fish!? Send me some tags, you know? 100? 200 of em?' That's what he did. And you know, what, we've been tagged thousands of 'em since!"

Some of the fishers who had engaged with the tagging projects described receiving gifts in return for submitting tags or information from the tags, with t-shirts and hats being mentioned most often. There was no consensus on whether this promise of reward was a key factor in their engagement, with some saying they didn't know there would be a reward, but others saying the promise of a gift was key.

Potential for citizen science?

Once participants were clear on the definition of citizen science, they were asked if they thought this was a good idea in the region. Responses were primarily positive, with most responding that more data could be beneficial for managers to have, and saying things like:

- "Absolutely!"
- "If it's beneficial to mankind? Yes"
- "It is very useful because it's good to know."
- "Anything willing to make the fisheries commercial fisheries better, I'm willing to do."
- "I think it's a great way of getting information and would gather hopefully some unbiased information from people that actually care."
- "There's so many thousands of recreational anglers out there…it would be a really useful data source."

- "I think when it comes to government, we need as much citizen help as we can get. Which we have nil to none as far as I can see. So I would love to see the citizens get our country back."

- "I think it's a great idea. It's like crowdsourcing data, and it's helpful if it's done properly."

- "The fishermen are the true scientists. They [managers] did not want to believe this for so long."

- "Probably 75% are not going to be willing would be my rough guess. 75%. It could be more that are just not going to be willing to take any part in it. But in my opinion, if they would take part in it and they could get better numbers, we'd probably get to keep more fish."

However, many responses were qualified by the participants, with three key themes: transparency and usefulness, reliability and bias, and non-compulsory engagement.

Transparent project goals with relevant and useful information

The ultimate usefulness of the data potentially collected by fishers would need to be made clear to participants. As one recreational angler explained, "I think that the more information you give back to us, the more that people would be interested in participating if they see the results being displayed to everybody." Another for hire fisher suggested an approach to explaining the projects to people, recommending scientists tell fishers that their input is needed for "looking after the actual fishery. So we're managing the fishery, so that we can use it and harvest the animals out of it. Not so that we can just shut it down to say goodbye to it, right. We don't want that. We want to utilize it keep it healthy." Nearly all interview participants enthusiastically supported any project involving shark interferences, as this is a daily issue for many (and is discussed in more depth on page 47.

Reliable data collection

The reliability of the data collected by fishers was a concern to many, relating to inexperience with the correct way to collect the data. One for hire fisher proposed that the training be crafted similarly to driving school modules: "I think it's a great idea as long as the people … go through a short little class or instructional video via internet or something, on how to properly tag a fish, properly to do what they need to do. Before they get the tag they have to complete where they watched [a video]. You literally have to sit there and watch the damn thing. You can't just like scroll through. Now you have to sit there and watch… [you've] got to sit there and then you got to click every once in a while because it's a short little piece." However, many stressed that the simpler the better, saying things similar to this for hire fisher: "As long as the reports [are] not a cumbersome thing... Then yeah, it's easy [to participate]."

Avoiding bias in data

Others were concerned that people's ultimate world views would cause them to bias the data, even unintentionally. This for hire fisher explained "Some people do…have a cause. And they're going to skew…towards their cause. And you have to be careful that their data isn't that way…periodically, maybe those people will be checked up on … see what they're posting on Facebook and stuff like that to be checked up on. You still got to make sure that you're getting unbiased people doing the work." A recreational angler said citizen science could be useful "if properly conducted, I mean, I wouldn't want a bunch of citizens who have their own agenda to get together and submit a bunch of bogus data to show 'Oh, my gosh, the fisheries are in great shape. Let me get 8000 redfish!' … I would want to make sure that the data collection methods are sound, and the methodology is sound, and somebody who doesn't have an axe to grind validates that this citizen project has merit and was properly conducted, because, in today's world, I would worry that a bunch of people would get together who have a particular point of view. And oh, lo and behold, the citizen data they collect supports the point of view they have! I would want to be careful."

Concerns and Obstacles

Significant Qualitative Themes

Common concerns and obstacles arose across interviews

- Differing perspectives on voluntary vs. obligate engagement in data collection
- How useful would scientists find the data to be?
- Operationalization of the projects are key to success or failure
- Financial and temporal limits may constrain engagement

This section addresses the concerns that interview participants expressed about the idea and process of citizen science, as well as the obstacles that could prevent meaningful fisher engagement with citizen science. Key themes that arose in the qualitative data include voluntary vs. obligate compliance, validity of data, scientist valuation of citizen science data, operational details, and the time and energy expenditure needed for some of the potential tasks.

Obligatory or voluntary?

A common concern was obligatory data collection. Fishers expressed reservations such as this one: "Certain things would be, I think, but not anything that's going to make my day harder…We need to get keep things simpler. Less is more." A commercial fisher explained "I think they should move ahead. And it might be that they would meet with a greater acceptance if they were voluntary. Seems to be like the commercial fishermen don't like scientific stuff crammed down

their throat… I think you could find a core of 'em that would do that." However, one commercial fisher proposed that citizen science could serve as a reporting mechanism for recreational anglers, and argued that it should be required of them: "You can't make it voluntary. You can't make it voluntary. And you would need to require some sort of [measure]" to make sure that anglers did complete this data submission. When asked if commercial fishers were likely to engage voluntarily, he informed us that the chances of this were "Zero. We feel like all the information gets used against us." Another commercial fisher concurred, explain "You're not going to get a whole bunch of fishermen that are dependent upon a paycheck to give out information like that, that could put money in someone else's pocket." This pointed to a common sentiment shared across a variety of topics across sectors: "I wouldn't be comfortable sharing that information."

Value of data collected by fishers

Some expressed doubt that scientists associated with management would value the data collected by fishers, or that additional data was even needed. A recreational angler pointed to what he described as a vast amount of potential information, mediated by that very concern: "Every fishing club that exists has members who fish, and they compete with catches, they track it. 'Angler of the Year' and all this other stuff. And they've got good records. Now how you analyze those as a scientist? Number one, you probably don't believe it, because they're being collected by non-scientists, but they are boots on the ground." In the same vein, one commercial fisher dismissed the idea, stating "No, they're not gonna dissect fish! They're not going to be science researchers. Don't even go there. What they [could] do wouldn't be trusted by the science community who thinks they [report] false information."

Avoid replication across data sources

Many commercial and for hire fishers felt they already shared a vast amount of data in the required reporting, and doubted anything more they shared would be useful or valued, such as this fisher who said "I would suggest they start with fish reports, the trip reports the commercial fishermen has to provide. I suspect they can gain an answer to your question and better analyze that humongous amount of collected data that comes in… I would suggest that that be a major start." Similarly, this commercial fisher wasn't sure more data collection would actually benefit anyone:

> "I think when you start getting too involved, and you overcomplicate the wheel, it leads to problems.
> [Interviewer: So more information is not better?]
> *Correct* information, *accurate* information—just because we have more numbers doesn't mean it's good numbers. I mean … if you asked for water temperature, it really doesn't do nothing. Because if my machine says it's 78 degrees and your machine says it's 76, well, is yours calibrated correctly? What about water clarity? I call it dirty green, and you call

it dirty blue. So what are we really doing here? We're adding bad, bad data. We're asking more questions that give us no result because it's too vague."

In these examples, the question isn't about honesty, but whether something is needed, and how accurately it could even be collected, regardless of intent of the citizen scientist.

Data accuracy

The flip side of this issue is that other fishers doubted whether the data that could be gathered would be factually correct. This commercial fisher explained "I know that the chances of it being completely accurate without detailed checks and balances in it are going to be tough. Fishermen are… kind of distrusting of that whole group [managers and scientists]. So they're going to feel like if they give you accurate numbers with how many red snapper they're throwing back they're going to be penalized for it, and if they give you low numbers, you're gonna tell them there's not enough fish." After joking that perhaps some fishers might sometimes share less than accurate info, this commercial fisher concluded with "At the end of the day, I think the majority of us are going to give you as much positive, or as much truthful, information as we can, that is not going to impact or hurt what it is that I'm doing." One fisher even ended his response with this plea "Think about what you're asking the guy to do, who's [already] being strangled by fishing regulations and lack of accurate science" (Commercial Fisher).

A for hire fisher pointed out that motivations for participation must be examined, saying "If people are doing it out of the goodness of their hearts, you have to wonder why they're willing to volunteer this information for free? What is in it for them by reporting this info?" One commercial fisher suggested a way to potentially acquire more accurate data: "Instead of just talking to all the offshore guys, you need to target the guys that specialize in that area, and have done it more than two or three years … I think you can get a more accurate assessment of what's going on out there. Versus … these young guys with the big boats that go out there and [say] 'we're not getting this, we're not getting that'—go to the guys that've been doing it for 10 years and they can give you a pretty good of what things are [like] now versus then."

Specialized skills needed?

One of the most commonly reported obstacles to engaging with citizen science had to do with the time and energy investment needed to collect data. Some of the items on the suggested list, such as collecting otoliths or gonads were met with great skepticism, with one for hire fisher saying "It'd be hard to cut that out … that'd be too much work… I think that the inner ear thing would be really hard because that that skull is hard." This sentiment was echoed by this commercial fisher who had experience with otolith removal: "No way, it's too much of a project. You're gonna then require commercial fishermen to have a sharpened chisel, a pair of tweezers and a light? Those are three things you have to have to get otoliths out. So it'd be too hard for most people to handle." The idea was further critiqued by this commercial fisher, "I don't even know

how to get those things out of a fish. No, I would not be collecting them. And they shouldn't be asking us to do that. You could go stand at any fish house that cuts fish, and say, 'Can we stay in here while you're cutting fish? And can we take those things out of the racks when you're done with them?' That's what they should be doing."

Science technique may conflict with buyer requirements

A related issue that arose was that for commercial fishers, this type of body part removal from their fish was not an option. One explained "I'm selling them whole fish. So 'no' to getting those gonads, and I'm not cutting their head in half" because the buyer would not tolerate these disfigured fish. This was less of an issue for recreational anglers handling only their own fish, or for hire fishers who often filleted the fish for their customers and were already tasked with disposing of the carcasses.

Time is money

A significant obstacle volunteered by many fishers was the time and energy needed to actually complete one of the possible citizen science tasks. A for hire fisher explained "I would like to do, but you're adding to my day. Yeah, another question. Before I know it, I got 30 questions I gotta do every day. And as you're adding, you're making my job longer and harder and a lot of people are not gonna want to do it, because we already don't want to do the five minute survey, or the, you know, the Federal permits electronic thing takes literally five minutes to do it." Other common responses from all three sectors fell along these themes:

- "Our job is hard. I am beat [but I've] gotta get up tomorrow morning at 6 and do it again."
- "I'm like a horse [wanting to] go into the barn after a hard day rounding up cows, you know! I don't want to be farting around with anything too long, and dissecting fish heads."
- "It's too much work. We have a lot of work. It's too much work. I'm being straight up honest. I'll work eight hours and then do another four hour trip after. I get home at 10 o'clock at night, 11 o'clock. I wake up at six and do it all over again."
- "[It's] just too time consuming. I barely have enough time to go fishing anyway."
- "No, at the end of a 16 hour day I'm gonna say hell no."

A for hire fisher elaborated on these sentiments: "When I'm sitting there with a thousand or million snappers that I've got to clean I'm not digging [for otoliths. Maybe] in small, small numbers, but only a couple, and they'd need to have convenient locations. Whenever I'm cleaning fish, that's an eight hour day for me. I'm cleaning boats, cleaning fish, cleaning rods,

getting everything packaged up. My first thought in my mind is not 'Let's get these otoliths over 30 minutes away to the DNR station."

Further, despite extensive discussion about the voluntary nature of citizen science, and the focus only on interested participants, this commercial fisher still insisted that this idea would not be welcome, stating that this was the "best way to explain it: On a day trip, you've left the dock 3:30-4am. You're back after dark. You've worked 16 hours. The government's now going to tell me I got to fill out a piece of paper at the end of my 16 hour day. Nope. Not happening, it's just, that's how fishermen are going to look at it."

Logistics of transferring samples

The logistics of how the samples would be transferred to the necessary parties was a significant concern for many of the fishers we interviewed. They questioned where the otoliths or fin clips should be stored, and how much work they would have to invest in freezing or shipping the materials. A recreational angler explained "it's a nuisance—how do I keep this stuff fresh until the scientist guy comes and picks it up from me? And what if he makes a trip over here to get it and I didn't get an otolith for him this week?" Similarly, this for hire fisher stated "Time is money and I'm cleaning fish as fast as I can to get the customers off, because I generally probably have 30 minutes between trips…I would save what they wanted. But they would have to either provide me with a way to keep it cold for them, frozen for them, or whatever… I would do what I could up to a point." Even the idea of retaining the samples to somehow pass along later was a concern, and one commercial fisher laughed at the idea, saying "I can't even keep track of my phone and wallet and all that. There's no way I'm gonna be able to keep track of a plastic bag full of otoliths!"

Many fishers questioned the quantities of data that would be requested. One for hire fisher was concerned about the idea of taking fin clips from all the fish he caught, and explained "the amount of information that you're asking for there is gonna be hard to maintain through a fishing trip. You're asking someone to have a notebook and write every stop? On a given offshore fishing day, if it's a really good day, I've hammered 5 to 10 spots. If it's a slow day I've hit 20 to 30 spots…That would be a like insane amount of data that you needed." Another argued "Yes, I can give you one otolith, but we catch a lot of fish. I ain't got time for—like, today, all 50 of them?!"

More data = more regulations and decreased limits

The most significant concern expressed by the majority of the commercial and for hire fishers interviewed centered around potential use of the data gathered by fishers, and the long term implications of their contributions. While many fishers explained this concern in different ways, this commercial fisher's words reflect the common sentiment:

> "We don't want [for] us to put forth an effort to help, and [have] it be used against us. So there needs to be clear, defined goalposts on where we're trying to get the fishery to ahead of time…we need definitive guidelines on what they think is happening, so that when we give them the information, and it proves otherwise, that we have a metric to measure it against.
>
> …We want to know what their metrics are, what is their final end game that they're trying to achieve? And I'll bet you money that from the first meeting, that they close red snapper, that we already exceeded the metric that they laid out in that meeting that they never told us. And that they just keep moving the goalposts and finding a new reason. Like one of the new reasons is … the numbers have rebounded, but our age year class is not what we want to see. So we believe that the fish are too young for the size that they are. Come on dude! What are you talking about? That's the kind of shit that drives us nuts. I've caught more red snapper in the last 5 years than I caught in the previous 20!"

This excerpt illustrates two key issues: (1) fishers are concerned about the ultimate goals of managers and scientists, anticipating further negative impacts to their livelihoods or cherished hobbies when new information is introduced to the conversation, and (2) fundamental disconnect between the way that scientists understand and view the biomass, and the perspective that is communicated to fishers. In this situation, neither side wants to see the destruction of a fishery, but neither side is able to abandon their own world view and perspective on how to interpret the stocks.

Fisher Proposals for Citizen Science Research

Significant Qualitative Themes

Fishers proposed a myriad of projects for citizen science collaborations, centered around these topics

- Recording size and quantity of fish caught, via a logbook, punch card, or photographic methods
- Focusing photography efforts on charter boats because of existing emphasizing on recording catch pictures
- Documenting water conditions, particularly pollution or clarity
- Typical fish tagging projects, or satellite tagging programs
- Potential for engaging charter clientele in some projects

After discussing the particulars of citizen science and hearing their initial reactions to the concept, we asked participants what types of information they thought fishers could gather to contribute to citizen science projects.

Catch quantity and length

A common response had to do with the number and size of fish being caught. This varied in structure from a recreational angler's suggestion of "basic information about what they're catching—That would be hard to do, because it'd be a pain in the ass and you'd have to sign up to do it because we catch a lot of fish and bring them home. We didn't set out to have a book of some sort and be writing them down and maybe measuring

them and weighing them and all this kind of stuff. But that seems to me to be an easy one or [the] most straightforward one." A recreational angler in a different geographic segment offered the solution of a yearly "punch card" that had to be submitted for any license renewal requests. A commercial fisher agreed with the length idea, arguing "Why wouldn't we take a length of a fish? We already know aging of fish hasn't changed. It's not like something has come out magically and said 'Oh, yeah, we found that the third or fourth ring in the ear is THIS now…' So I think if you did know the length of the fish that would help determine, you know, what kind of school and how healthy your population is."

Photos of fish

This recreational angler agreed, stating "a big issue that I've heard is an indication of a declining species is size…If all of a sudden, you realize three years down the line, 'holy crap, I can't catch a 13 inch sea bass to save my life. And I used to go catch coolers full of them!'" A for hire fisher suggested that for hire boats would be an excellent source of this type of information, "Every fish, just take picture. We're already taking a picture of every fish we catch. It didn't count if you didn't have a picture!"

A commercial fisher furthered the photo idea, suggesting an app or other solution be put in place to auto-share photos: "All you have to do is snap a picture…you can already do it on your phone where it'll measure the distance of everything. So you snap a picture and as soon as you snap picture, it uploads to the fisheries whatever cloud, and it would be able to say 'okay, that fish was caught on this day and was X amount long.' It'd be very generic, but it would give them a better count as to the number of fish that are in the area." However, a different fisher was more concerned about location data, suggesting "an app that would have to be confidential…where everything you posted didn't have any of your information on it."

A unique suggestion for capturing length data was suggested by a for hire fisher, "Use the head boats, the big party boats and [train a camera] on their fish box. Because every time there's a string or a fish, you would you would get a decent sampling because there's usually 40-50 people on the boat…Some of them are good fishermen and some of them suck, but you're gonna get a good sampling of what is at that place where that boat goes." They refined this idea with the further suggestion that the fixed video camera "could be even at the fillet station back at the dock. You could just have a camera observing that because the fishing boat won't mind as much that you got what the fish are, but it won't get where the fish were caught…You can probably get the for hire boat to tell you and still it's gonna be within 20 miles of where it really was anyway." Alternatively, "a lot of guys use Go Pros. They strap them on their foreheads and they fish … [but] think that you would have to find the fisherman that would be okay with that because you're going to be able to tie a lot into that camera: you can get location, you can get quantities, you can get depth, you can get a lot of information on that. It'd be like a virtual buddy!" However, each camera proposal was careful to qualify that this is an approach only some people would be amendable to, and they would need to retain control of when the camera was recording (especially logging GPS data), and when it was not.

Environmental conditions

Fishers of all sectors were also interested in reporting on environment and water conditions, things like "Water temperature, water clarity would be a good one" or another said "water temps, depths [where they are catching specific species], stuff like that." Particularly in Florida, fishers mentioned issues like red tide and coral bleaching, with interest in reporting these unfortunate events. Most who mentioned these topics thought they would be appealing to a wide range of fishers, as "It's sort of a no brainer, you know, everybody realizes you can't have pollution and have a healthy ocean." However, many did caution that any water quality or environmental data would need to not include specific GPS information that could reveal secret fishing spots.

SHARKS

This report cannot overstate the frequency, intensity, or passion with which sharks were discussed by all interview participants. Not a single interview avoided the topic, and fishers were vehement about the troubles they had with shark attacks on their catch, shark interactions with their gear, and the overwhelming nuisance sharks had become over the last few years. An entire report could be submitted on South Atlantic fisher experiences with sharks.

A very brief sample of the observations made by fishers:

- "I'm allowed two a day…, so just fancy that. I got customers on the boat, how am I gonna get the shark in the boat? Where am I gonna put them on my 26 foot boat? And with customers back there? They got teeth, man! They cut people! I don't need that happening…fancy me putting two 8-10 foot sharks on the boat every day. And then what am I gonna do when I get them in back here?!"

- "When you see the sharks up on the surface, [you know you're] not getting anything above them. Maybe if you're lucky. The only thing that works well is when there's a whole bunch of guys out there fishing …and you might get one sacrificial act, you know? But you've got to do that because the shark population is absolutely horrible. Absolutely horrible!"

- "I think sharks are becoming a major challenge. I mean, shoot I was 48 miles offshore yesterday and we caught two sharks and had a king fish eaten by sharks. It's part of what we deal with, but at the same time, it's becoming more and more frustrating because you can't get away from them at times. When they show up you're done. There's a couple of areas within 10 miles on the beach off St. Augustine, where during the summer, if you get there and toss out a bait or two you'll catch a kingfish or two. By the time you've caught your second or third king fish. You can see [sharks] tracking the boat. They know the motors! [They sense] that vibration or that electrical output and they're there."

- "[Sharks] will get a bite off – you know it was a 20 pound fish and you only got 15 pounds. What you'll see the most is when you go bottom fishing the sharks will show up and now you got sharks and dolphins you're competing. You'll see a shark, he'll get behind the boat and you're pulling as fast as you can to get that handline in, and he's just fired up on the surface. Just coming— I've had him hit the boat!"

- When asked if he would be willing to report shark depredation on his catch, one for hire fisher chuckled when he said "That would actually give me pleasure. I would love to tell you how many times I said f*** you to sharks in a day!"

A citizen science project that meets all other needs and criteria and focuses on sharks has the potential to be a very popular endeavor.

Enhanced fish tagging

A creative suggestion that a for hire captain had been mulling over for a while involved a "satellite tagging program. I know that's really expensive, but I think it's necessary. In our day and age, I think we can come up with a satellite tag that doesn't cost that much, that we don't need to recover. As soon as it releases off the fish, it floats to the surface and satellite picks it up, takes all the data, sends it to where it needs to go." He supported this idea with specific suggestions as to how this could be funded, primarily via upselling merchandise to fishers who came from out of the region (described below).

Engage charter clientele

Some for hire fishers in particular discussed the potential for their clients to assist with data collection. Depending on the type of clientele for each business, some felt that "depending on the clients, like if they're like my repeat clients that I've formed a relationship with over the last few years, yeah 100% they would want to do that…they would be more than happy to take information and do that." He further explained that very simple data collection, the type that children could do with a crayon on a single form, could potentially be popular with their clientele. Another for hire fisher agreed, explaining

> "the biggest thing about citizen science would be charter captains are really willing to do it. Most of the time, especially tagging. Tagging is a fun thing to do with customers. If that person wanted to get tags out, it would be pretty easy actually, to go to a place in town where the most charter cabinets run out... In between their charters, you could have a quick conversation with them, and you'd say 'Hey, man, look. So I've got five tags here for red drum, would you mind tagging five fish? All you got to do is take this card here and stick it in your mailbox with a little information on it when you're done.' That's what

> I'd do. They do it you know, because if I get the tag, I'm gonna get a bigger tip on five charters because I get to tag five red fish! It benefits you. They get excited. If you can get your customers excited, and you can take a one fish charter and make it such a cool experience, that they don't even care if they caught one fish."

Several for hire captains mentioned this client involvement could be further encouraged with the use of merchandise such as a shirt or hat mailed to the client's home address after the trip as a longer term souvenir that would further their positive feelings about the trip. One for hire fisher even suggested upselling this merchandise by making further products available ONLY to people who have engaged in citizen science efforts. For example, they could elect to keep a free shirt, OR pay a small fee to the state in order to upgrade to a sweatshirt. He explained "have sweatshirts, because they're from up north it gets cold up there. Don't give them a tank top. Make a $75 sweatshirt or a $65 sweatshirt instead of a $10 [tank top]. You know, quality stuff … you're the *only ones* that can get these sweatshirts!" He was confident that this could fund satellite tagging programs and bring positive attention to citizen science endeavors in general.

Motivating Engagement

Significant Qualitative Themes

Fishers discussed potential routes to motivate engagement across sectors:

- Discuss potential for the data to inform regulatory shifts that would benefit fishers
- Clear, honest, respectful communication of transparent project goals
- Some fishers are likely to participate without compensation, while others would not have the time to do so without monetary incentive

During the interview we asked fishers for their suggestions as to the best ways to introduce the idea of citizen science, and what would make fishers interested in being involved in projects. We received concrete and useful feedback, particularly around how to describe the topic, and the likelihood of needing to compensate people for their time and expertise.

Incentivizing information sharing

A variety of ways to motivate participation in citizen science were suggested. Key to many fishers was that researchers needed to

> "manage the expectation…this isn't going to be an overnight process."

They went on to explain how this could be operationalized by

> "…having a meeting of the collective fishermen in an area and saying, 'Look, this is what we want to do. It's not going to be an overnight process. But we feel very strongly that if we can do it in this fashion, maybe two years from now, maybe three years from now…as opposed to having a two day snapper season, we can open the window and say you know what, for the next two months, you can keep one snapper per person per day in this slot

> limit. Because, let's be honest, that's happened. They're already doing that. I mean, we're not supposed to cull snapper. But I guarantee you, every boat that I know, when they catch a snapper that 16 inches long, they're going [to] put them on the device and send them back. There's bigger fish here. So we're already doing it. So go ahead and make it legal you know?"

Similarly, this type of explanation from a commercial fisher on how to frame an approach to fishing communities illuminated the importance of clear and frank information sharing:

> "National Marine Fisheries would have to bill it as 'Look, we know these regulations are tough on you guys, and we know that it affects you financially. We currently are paying people to go collect this data, what if we can pay you instead, and have a certain protocol for doing it.' If you told every fisherman during red snapper season 'With your 75 pounds of red snapper, we will pay you X amount per fish, if you give us a fin clip, the gonads, or the roe sack, and pull out the ear stone and put them in a little Ziploc bag and keep them [and] catalog them for us with the information from the fish. We'll give you an extra $200 a trip.' Everybody's gonna do it! But if you tell them you're gonna give them 50 bucks and a gift card to Walmart, none of them are going to do it…You have to value that information in accordance with what is going to be required of the people who are going to have to do it."

The tone and content of the outreach was also significant to this for hire fisher, who emphasized

> "How you present has everything to do with the reception. I present to students every single day. And if I present in a fashion that is derogatory immediately, the reception from my student is going to be 'I don't want to hear what you have to say.' But if I present it in a manner of 'Hey, let's talk about this. There's things that are gonna be good and there's things that may not be so good but we're gonna find a way to have a happy meeting spot!' Same thing with the council. Same thing with NOAA. If you present it in an appropriate fashion and it's presented to the data gatherers as 'We would like you to gather this data so that we can assist you in improving your fishery and making it easier to manage, easier to report, and also more lucrative for you.' Then all of us are going to be raising our hands. If it's something that is perceived as 'You're trying to get this from me to take more away from me,' that's when you're not going to get a response."

A similar sentiment was echoed in a different interview, explaining that it is important to "mak[e] sure we as fishermen understand what is wanted, why it's wanted…what's the purpose of it? How can it help us?" He went on to emphasize "It's getting the council to understand if you present to us fishermen in a different way, somehow, I think your response is going to be much, much better received." He felt that there was opportunity for better relationship building in this communication process.

Compensation

A quantitative question in our interview asked fishers if they would be willing to do any of the proposed citizen science tasks they had declined IF they could be paid to do those things. While there was limited quantitative evidence in support of the idea that compensation would make fishers more likely to engage with citizen science, this was still a key theme that arose in the

qualitative data.[13] Most responses remained "no," but were accompanied by clarifying comments that left open a door for potential engagement. Many responses echoed these:

- "It might encourage me to do it. (Commercial fisher)
- "You know, time is money." (For hire fisher)
- "If the pay was relative to the work, yes" and "If the money was worth it." (Commercial fisher)
- "I mean, sure, if you're getting paid, all that stuff changes. I still have concerns. But I think that once you put money into the situation… that most people will be willing to be more helpful." (Commercial fisher)
- "So time is money. Right? How much money are you willing to pay to make it worth it for me to do all that extra stuff …You'd have to put a good tag on it." (Commercial fisher)
- "I'd do a lot of things for money." (Commercial fisher)
- "[It's] just too time consuming...I barely have enough time to go fishing anyway." (Recreational angler)

Most responses centered around the central issue that time on the water is frantically busy work time for commercial and for hire fishers, with little leisure time during which they could be gathering information. When people's livelihoods depend on those efforts, it becomes difficult to volunteer to reallocate some of that work time. As this commercial fisher explained: "Everybody's out there to make a dollar. That's all they want—I mean, that's literally *all* they want. They would have to be paid." While recreational anglers were less likely to resist the request, it was still common to hear responses about fishing time being limited, and anglers not wanting to spend that limited time in non-fishing tasks. Even among those who entertained the idea, there were logical and analytical questions that would have to be answered before they would consider engagement. This interaction with a commercial fisher illustrates the critical thinking going into these decisions:

> "Let's take the fin clips…How many fin clips do you want? And how much are you going to pay me to do it? If you're gonna pay me a quarter a fin clip and you let me turn in 100 clips, I might do it. But [if] you pay me a quarter and you only want 10, I'm gonna laugh in your face…it has to be enough to make me want to do it. You know, if I can't get enough money to buy me a cheeseburger, I ain't gonna do it. [Laughing]

[13] This type of "discrepancy" often arises in mixed methods research, where a close-ended question may elicit a "no" response, but when given the opportunity to discuss further, individuals may actually think of situations in which their response could potentially be "yes." In this case, these qualitative data are illustrative of potential paths forward for citizen science that could occur if funding were available.

A common set of responses indicated that the fishers we were interviewing would not need to be compensated, but that other fishers likely would. Several commercial fishers attempted to clarify that different fishers in particular would have different levels of interest and possible engagement in terms of financial support:

- "Money talks, but other than that, … I think a lot of them [would] do it as long as it's not too much of a burden on them…I would think they'd be more willing to do it as long as it's not some high tech stuff or stuff that takes hours to do."

- "I think there's probably a fair amount of guys like me that are willing to help with the science and there's probably just as many that … want nothing to do with any outsiders messing with their stuff. But you know, money talks! You say 'you may make an extra 100 bucks today by doing this—boy they might change their attitudes."

- "You could get all this information from fishermen if you pay them…I don't think that anybody would be able to do those things for free—Me, individually, I would probably be willing to give certain information for free. Look at me, I spent two hours talking to you! Obviously, I'm a little bit more willing to do this, most of the commercial fishermen you deal with probably just tell you 'I don't have time.'"

This diversity in responses illustrates the range of obstacles and opportunities that await citizen science efforts in the region.

Fisher response by geographic segment

Analysis by geographic segment (Carolinas, Georgia/North Florida, Space Coast, Keys) proved less fruitful than analysis by sector. Broadly speaking, few consistent or remarkable trends emerged across geographic segments. The most notable analysis (participation in citizen science) is presented below. Tables summarizing the remaining analyses are provided in Appendix 1.

Qualitative data presented no significant differences across the geographic segments, and separating themes by geography did not provide any findings different than those presented above. Therefore qualitative analysis is not presented separately in this section.

Citizen science participation

Quantitative analysis

The table below presents fishers responses to closed ended questions on their willingness to participate in various citizen science activities. These activities were selected in conjunction with SAFMC staff and the Citizen Science Advisory Panel. Cells are coded in green when over 50% are willing to participate, with the shade of green becoming darker at 10% intervals (e.g., 50% -- 60% is lighter than 60% -- 70%). Conversely cells are coded in red when more than 50% do not want to participate, with the shade of red becoming darker at 10% intervals (e.g., 50% -- 60% is lighter than 60% -- 70%).

Table 17: Fishers' interest in citizen science activities by region

	Carolinas	Georgia/ Florida	Space Coast	Keys
	Volunteer Number (percent)	Volunteer Number (percent)	Volunteer Number (percent)	Volunteer Number (percent)
Save gonads				
No	44.44% (4)	27.27% (3)	18.18% (2)	22.22% (2)
Yes	55.56% (5)	72.73% (8)	81.82% (9)	77.78% (7)
Save otoliths				
No	44.44% (4)	36.36% (4)	45.45% (5)	22.22% (2)
Yes	55.56% (5)	63.64% (7)	54.55% (6)	77.78% (7)
Catch information				
No	11.11% (1)	45.45% (5)	9.09% (1)	22.22% (2)
Yes	88.89% (8)	54.55% (6)	90.91% (10)	77.78% (7)
Discard information				
N/A	22.22% (2)	9.09% (1)	0.00% (0)	0.00% (0)
No	33.33% (3)	9.09% (1)	0.00% (0)	22.22% (2)
Yes	44.44% (4)	81.82% (9)	100.00% (11)	77.78% (7)
Fin clips				
No	33.33% (3)	27.27% (3)	18.18% (2)	0.00% (0)
Yes	66.67% (6)	72.73% (8)	81.82% (9)	100.00% (9)
GIS info on infrastructure				
N/A	0.00% (0)	0.00% (0)	0.00% (0)	11.11% (1)
No	11.11% ()	9.09% (1)	27.27% (3)	22.22% (2)
Yes	88.89% (8)	90.91% (10)	72.73% (8)	66.67% (6)
Environmental information				
No	22.22% (2)	18.18% (2)	9.09% (1)	11.11% (1)
Yes	77.78% (7)	81.82% (9)	90.91% (10)	88.89% (8)

Data limited species				
No	11.11% (1)	9.09% (1)	9.09% (1)	0.00% (0)
Yes	88.89% (8)	90.91% (10)	90.91% (10)	100.00% (9)
Fish observations				
No	55.56% (5)	63.64% (7)	45.45% (5)	44.44% (4)
Yes	44.44% (4)	36.36% (4)	54.55% (6)	55.56% (5)
Shark depredation				
Yes	100.00% (9)	100.00% (11)	100.00% (11)	100.00% (9)

With large variability depending on activity, broad trends in interest in citizen science are difficult to determine. However, it appears that the Carolinas are the least enthusiastic about citizen science, and the Space Coast and Keys being somewhat more enthusiastic. However, especially with the Keys, this could be an artifact of the proportionally heavier representation of recreational anglers in the sample.

During interviews, we asked fishers who were not willing to voluntarily participate in specific citizen science activities if they would be willing to do the same activity if they were paid. Broadly speaking, a relatively small proportion of fishers declined to participate in voluntary activities then were motivated by the offer to pay. No discernible trends were noted in who was motivated by potential payment. As a result, this analysis is not included in this quantitative results section, but is discussed above in the sector analysis.

Key Findings and Recommendations

The impetus for this research was SAFMC's charge to understand the opportunities and barriers to fisher participation in future citizen science projects. Our mixed methods approach (particularly the qualitative focus on "why") exposed themes of deep frustration with the management process and structure. While these more systematic issues may seem beyond the scope of the project, this context must be acknowledged before attempting any citizen science project. The foundation of successful citizen science is collaboration and trust. If this is not in place, some data might be extracted in the short term, but any program would not be sustainable in the long term. It would also risk further damage to stakeholder/management relationships. Below, we review the ten findings from this research, along with their implications for citizen science and recommendations.

1. Fishers do not feel valued or heard

Key finding

Some fishers across all sectors and regions reported attempting to engage with the federal decision-making process, but often withdrew in frustration. They reported taking time away from their work on the water to make statements in an atmosphere where it felt that the decision was already made. Fishers sensed that while public comment was required, it was legalistic and performative rather than reflective of genuine listening by decision-makers. They felt disempowered, and most saw no point in engaging with management

Recommendations for citizen science

Any citizen science project needs to be aware of and acknowledge this dynamic. A carefully designed transparent citizen science project *could* have a role in addressing this problem by systematically collecting and presenting fishers knowledge in a form that managers and scientists would find actionable. This could even be used to encourage fishers to participate in projects.

Recommendations for management

Analysis of when and how fishers can most effectively and meaningfully provide information for decision making may be useful, along with careful consideration of how to listen and incorporate feedback in a meaningful manner. This would be beneficial not only for citizen science, but more importantly for fisheries management effectiveness.

2. The voices at public comment do not represent the fishery

Key finding

Among interview respondents, commercial fishers were disproportionately most likely to report attending and speaking at federal meetings. However, commercial fishers who did this were a very small minority, and this cannot be considered representative as it is likely there is some unidentified variable (e.g. weather, income, education, age, social network) that is driving their willingness to engage with council. The for hire sector and recreational sector reported even lower levels of engagement with federal management. This means that there is a “silent majority" of fishers in all sectors whose views are not necessarily being expressed at meetings. Some fishers noted this dynamic, along with commenting that environmental groups can afford to financially support someone to monitor and comment at meetings, but this is not a luxury many fishermen feel they have. Fishers who are able to engage with advisory panel activities may be more financially stable than others in their sector, freeing them to engage in management activities.

Recommendations for citizen science:

A well designed citizen science program, developed collaboratively with fishers, based on rigorous outreach and systematic sampling methods, could help address the lack of widespread participation in Council comment processes.

Recommendations for management

If managers seek to understand fisheries from the viewpoints of the fishers, a more aggressive and systematic approach to engagement that meets fishers where they are would be required. A well-designed citizen science program could be part of this approach.

3. Fishers deeply distrust management

Key Findings

While a certain level of distrust between regulators and those they regulate is expected, the lack of trust expressed by study participants was profound. The starkest example of this is less than 7% of the for hire sector and 15% of the commercial sector trusting regulators to “make the right decision”. The highest level of trust is shown among recreational fishers, but even here only 25% of recreational fishers trust management. With the exception of recreational fishers, these trust levels are lower than the 22% of Americans who trust the Federal government to do what is right (Pew Research 2024). However, our analysis of fishers’ world views (particularly among recreational fishers), shows that they hold beliefs that align with participating in citizen science.

Recommendations for citizen science

When considering a citizen science project, this level of distrust is concerning. Depending on the nature of the project, citizen science could ask participants to provide data which could be used against them. If levels of trust in the management institution is low, there may be great hesitancy to participate.

Approaching those which the highest levels of trust (recreational fishers) may be more successful than other sectors. However, levels of trust still remain lower than for other groups. This means there is a burden of proof on the citizen science project to be transparent with potential participants about the purpose of the research and the potential positive and negative implications of sharing data. Given the notably low levels of trust commercial and for hire fishers have with Federal regulators, these communities would not be the best to approach initially.

Another approach could be to have a neutral third party (such as a university or Sea Grant program) design and administer a citizen science program that is partially or fully funded by SAFMC, with complete transparency on the part of the project administrator about the relationship with SAFMC and how the data would be used. Regardless of sector, and project administrator, citizen science project designers should also be aware of the risk of further undermining trust between SAFMC and fishers if fishers participate in a citizen science project which is then perceived to be used "against" them (e.g., results in a cut to catch quota).

Recommendations for management

The lack of trust expressed by participants in this research should be deeply concerning to managers as it is very difficult for any institution to maintain legitimacy with low levels of trust. Managers may wish to consider long-term strategies for rebuilding trust among their stakeholders.

4. Fishers are sceptical of the science used by management

Key findings:

Closely intertwined with distrust of management, fishers also expressed scepticism of the science that management decisions are based on. When asked whether they "trust the science that regulators use to make their decisions," only 20% of for hire fishers, 31% of commercial fishers, and 41% of recreational fishers agreed. There is a fundamental disconnect between the regular, often daily, observations of the fishers who are on the water and the information that they are told as part of the management process. This dissonance influences fisher confidence in the validity and objectivity of the "best scientific information available" on which managers are required to base their decisions.

Recommendations for citizen science

This lack of trust in the science behind management is both a barrier to and opportunity for citizen science. If presented as an opportunity for fishers to get credible data that they gather in front of decision makers, fishers may be willing to participate. However, any such program would need to be genuinely transparent and collaborative. It would also need to be carefully considered so that fishers' interests are not put at risk.

Recommendations for management

The lack of trust in science expressed by participants partially explains the low levels of trust in management. It is likely that fishers are more inclined to trust the validity of science that they participate in developing, however, this is not guaranteed if they do not understand how it is used in the stock assessment process. Educational efforts to explain and break down how science has to be used in management could potentially help with this issue. In addition, carefully designed science communications outreach could help rebuild trust in science (and management) in the long term.

5. Federal fisheries management is a "black box"

Key findings

While those regularly engaged with Federal fisheries management understand the various parties, to many, fisheries management is a complex mess. Beyond the alphabet soup of agencies and committees (NOAA, NMFS, SAFMC, APs, SSC, SEDAR, MRIP, FLFWC, GADNR, SCDNR, NCDMF, SEFSC, SERO etc) the management process is intricate and difficult to navigate. Furthermore, because there is a fundamental disconnect between the ways that fisheries management operates, and peoples' understanding of the process and the agencies, frustration with one agency potentially disrupts their perceptions of and participation with all agencies

Recommendations for citizen science

A well-designed citizen science program could help address this, but cannot do it alone. A successful program will consider the specific goals of any intended research project, and commence with clear and informative explanations of the agencies at play in the project, as well as how the data can, and cannot, be used. It will be important to manage expectations about the potential for change.

Recommendations for management

There is need for more appropriate, more tailored educational outreach to the communities, beyond emails and public postings on websites or social media. Communication materials designed with the fisher audience in mind could include printed or electronic infographics, short videos (1-2 minutes at the very most), and brief but informative written materials mailed to

permit-holder's homes. Working with and through existing partners such as tackle shops, angler clubs, Sea Grants, and state agencies is a wise route, as many don't know what SAFMC is, or how it fits into the management landscape in a way that is relevant to their own lives.

6. Power dynamics mean this is not traditional citizen science

Key findings

In the traditional citizen science model, participants are volunteers motivated to participate by their intrinsic values (e.g., they love birdwatching, they think it's interesting to look at historic photographs, it provides a sense of accomplishment and contribution to a greater cause). Another characteristic of the traditional volunteer relationship upon which citizen science is built is that volunteers are not dependent on the entity organizing the project: Indeed, the citizen science project is dependent on the volunteer.

However, a fisher citizen science project would have a fundamentally different power dynamic. Fishers are regulated by the organization asking them to voluntarily provide data which will be used in regulation that affects their own lives. Particularly in a setting rife with distrust, this creates the risk of fishers feeling pressured to participate in data gathering efforts. Furthermore, depending on the nature of the project, citizen science could ask participants to provide data which could later be used against their immediate interests (e.g., resulting in area closures).

Recommendations for citizen science

Designers and managers of any citizen science project should be accurately aware of this power dynamic and work to mitigate it. At the most basic level, it may be useful to not think of any program as "citizen science" and instead regard it as something related but different, such as "fisher informed data collection" In addition, practical project design choices could help mitigate risk. This includes: selecting projects that have no risk of harming fishers' interests; being transparent about how data will be used; identifying potentially negative consequences during recruitment.

Recommendations for management

The potential benefits of citizen science projects in rebuilding the relationship between management and fishers is well described above. Managers should also consider the potential negative consequences if data gathered through citizen science ends up being "used against" them. This could result in a situation that further undermines fishers' trust in management.

7. “Pro-bono services” from commercial and for hire fishers

Key Findings

Beyond the issue of power dynamics, there are additional challenges to the traditional citizen science model among commercial and for hire fishers. While the citizen science volunteer model is a logical fit for recreational fishers (who are engaged in a hobby), it is problematic for fishers who make their living from fishing. Commercial and for hire fishers have invested financial capital into their businesses to engage in the industry, and time and energy to gain knowledge and build expertise in fishing. They are experienced professionals in their chosen careers. Rather than thinking of these sectors as volunteers, a more accurate model is that a citizen science program is asking them to provide “pro-bono” services, like a lawyer taking on an indigent client or an accountant providing services to a non-profit.

Recommendations for citizen science

The dynamic described above is a reason to prioritize citizen science projects with recreational fishers over other sectors. However, it does not mean work with commercial and for hire sectors is impossible. It may require a different approach that acknowledges and respects these fishers as professionals whose time and knowledge is valuable. Any SAFMC data project would be requesting their input and expertise as part of the fisher’s chosen profession, not just as part of hobby. Approaching commercial and for hire fishers with genuine respect for their experience and knowledge would be a pre-requisite for any aspiration of building a collaborative relationship.

While the traditional citizen science model of thinking about volunteers does not fit well with commercial and for hire fishers, there are other models that may be useful. In Maine and New Hampshire, lobstermen are working with universities to “crowdsource” plotter data in each state. Further afield, since 1995, the New Zealand Rock Lobster Industry Council has both funded and received government funding for stock monitoring and other research projects that are now integrated into the stock assessment process. This process has increased fishers’ confidence in data collection and stock assessment results. While there are specific characteristics of lobster fishing that make them more amenable to these projects, such activities may still be possible in Federally regulated fisheries.

Recommendations for management

Recognition of the professional nature of the commercial and for hire fishers in the region could shift the perspectives on the information that these stakeholders bring to the management process. When possible, management incorporation of fisher perspectives, and respect for their knowledgeable input, could improve both the best scientific information available and fisher trust in the management process.

8. Recreational fishers as partners for citizen science

Key findings

Recreational fishers would be a logical first partner for a fisheries citizen science program. First, they do not have the added complexity described for professional fishers such as commercial and for hire fishers described above. In addition, they have the highest levels of trust in Federal fisheries management among the three sectors. Finally, when asked about various citizen science projects, the recreational sector was consistently the most interested in participating. The most appealing programs (all with 100% of recreational participants expressing interest) were: reporting shark depredation, collecting fin clips and recording catch data.

Recommendations for citizen science

Designing a citizen science program aimed at recreational fishers is logical for the reasons described above. In addition, starting with the sector most interested in participating could spur interest in other sectors. Once commercial and for hire fishers have the opportunity to observe the working of a citizen science project in the recreational sector, and witness how that data is used in stock assessment and by management, they may become more willing to participate themselves.

Recommendations for management

From a broader fisheries management perspective, recreational fishers are a logical choice for a first citizen science project due to the relative lack of data collected on the sector. Without reporting requirements, there are less data available for the recreational sector compared to others. A well-designed citizen science program could be used to supplement existing Marine Recreational Information Program (MRIP) data.

9. What a well-designed citizen science project would look like

Key findings

This research project was commissioned by SAFMC to identify the opportunities and barriers to fisher participation in citizen science, and make recommendations for how to design a program based on these observations. This report provides detailed analysis showing that a citizen science program for fishers could work, but it would need to be first targeted to recreational fishers, collaborative and transparent in its design, and be very careful in selection of project and use of data to address the significant trust issues that federal fisheries management is facing. A successful citizen science program has the potential to increase fisher trust in management, and rebuild collaborative fisher-management interactions.

Recommendations for citizen science

Our research illuminated some additional design elements that should be considered when creating a citizen science program. Any program should be:

Genuinely collaborative

The project should be developed in cooperation with fishers, responding to fisher interest, and reflective of their expertise on the process and how to carry out recruitment and further engagement. The entire project, from brainstorming to the actual data collection on vessels or at shore should be vetted by fishers to ensure it is realistic and reasonable.

Relevant

The topic of the project should respond to fisher concerns, and be perceived by them as being necessary to improve a problem. Scientist-originated topics of research should be critically and honestly evaluated by a diverse group of fishers before attempting to implement a project. Project foci should significantly address pressing needs that are relevant to their professions.

Simple

The process should be clearly explained with fisher questions and concerns addressed completely. It should require minimal effort, minimal use of materials, and minimal time investment. Asking more may be perceived as disrespectful or dismissive of professional pressures and time commitments.

Non-duplicative

The project should not replicate information or data already being gathered in different ways. If information is already being reported in trip tickets or via other required means, it should not be also gathered in a citizen science project. If there is a reason that the duplicate info MUST be included in the citizen science project, great effort should be made to clearly explain why this repetition is necessary.

Culturally appropriate

Projects should be appropriate to the region, the geographic segment, and the sector. Care should be taken to ensure that the topics are pertinent to the potential participants, and the data gathered can address a problem applicable to each population. Issues of top priority for fishers in the Keys may or may not be of interest to fishers in the Carolinas, and trying to craft "one size fits all" projects may be fruitless. Data that fishers are asked to gather should not pose moral issues for them, for example, asking for GPS data related to fishing activity is a fraught topic and can reduce confidence that citizen science is unbiased.

Carefully selected initial projects

Potential citizen science projects in the region will be most successful if they meet all the above criteria, as well as being thoughtful and deliberate about which projects and populations to work with first. Recreational fishers in Florida had the highest rates of interest in potential participation, and may be the best "first try" group to collaborate with. For hire captains that are

open to clientele involvement (across the geographic segments) may prove to be a second potential pool of collaborators. The structure and success of the first few projects, and the fisher relationships built during those projects, will be key to future engagement with projects across the region.

Recommendations for management

Citizen science has the potential to be a valuable tool for Council. Perhaps the more direct use is filling data gaps, such as providing information to supplement MRIP. However, longer term, it could possibly be part of the solution to more fundamental challenges illuminated by this report, such as the lack of trust in management, the lack of trust in the science that management uses, and opening the "black box" of Federal fisheries management. While complex and potentially challenging to management's traditional structures, a co-developed and transparent citizen science program for fishers could be both a valuable tool and a change agent. In this era of rapid environmental, political, and economic shifts, a genuinely collaborative working relationship, established in successful citizen science, could be a transformative force in effective natural resource management.

Appendix 1: Supplementary analysis of fishers' attitudes by region

Fishers' participation in management activities by region

	Carolinas	Georgia/ N. Florida	Space Coast	Keys
	Percent (number)	Percent (number)	Percent (number)	Percent (number)
Informally discuss				
Sometimes do this	44.44% (4)	36.36% (4)	18.18% (2)	11.11% (1)
Usually do this	55.56% (5)	63.64% (7)	81.82% (9)	88.89% (8)
Read materials provided by Federal agencies				
Never do this	0.00%	9.09% (1)	0.00%	11.11% (1)
Sometimes do this	44.44% (4)	36.36% (4)	45.45% (5)	55.56% (5)
Usually do this	55.56% (5)	54.55% (6)	54.55% (6)	33.33% (3)
Attend fishing related meetings held by government				
Never do this	44.44% (4)	54.55% (6)	45.45% (5)	44.44% (4)
Sometimes do this	55.56% (5)	27.27% (3)	36.36% (4)	22.22% (2)
Usually do this	0.00%	18.18% (2)	18.18% (2)	33.33% (3)
Attend fishing related meetings held by other groups				
N/A	11.11% (1)	9.09% (1)	0.00%	0.00%
Never do this	33.33% (3)	27.27% (3)	27.27% (3)	11.11% (1)
Sometimes do this	22.22% (2)	27.27% (3)	36.36% (4)	66.67% (6)
Usually do this	33.33% (3)	36.36% (4)	36.36% (4)	22.22% (2)
Discuss on internet				
Never do this	33.33% (3)	63.64% (7)	63.64% (7)	66.67% (6)
Sometimes do this	33.33% (3)	18.18% (2)	18.18% (2)	22.22% (2)
Usually do this	33.33% (3)	18.18% (2)	18.18% (2)	11.11% (1)
Attend Federal meetings				
Never do this	66.67% (6)	54.55% (6)	45.45% (5)	66.67% (6)
Sometimes do this	33.33% (3)	27.27% (3)	54.55% (6)	33.33% (3)
Usually do this	0.00%	18.18% (2)	0.00%	0.00%

Speak at other meetings				
N/A	11.11% (1)	9.09% (1)	0.00%	0.00%
Never do this	44.44% (4)	27.27% (3)	27.27% (3)	44.44% (4)
Sometimes do this	22.22% (2)	36.36% (4)	36.36% (4)	44.44% (4)
Usually do this	22.22% (2)	27.27% (3)	36.36% (4)	11.11% (1)
Speak at Federal meetings				
Never do this	66.67% (6)	54.55% (6)	72.73% (8)	88.89% (8)
Sometimes do this	0.00% (0)	27.27% (3)	18.18% (2)	11.11% (1)
Usually do this	33.33% (3)	18.18% (2)	9.09% (1)	0.00%

Fishers' trust by region

	Carolinas	**Georgia/ N. Florida**	**Space Coast**	**Keys**
	Percent (Number)	Percent (Number)	Percent (Number)	Percent (Number)
People in general				
Can be TRUSTED	11.11% (1)	18.18% (2)	45.45% (5)	77.78% (7)
You can't be too CAREFUL	77.78% (7)	72.73% (8)	45.45% (5)	22.22% (2)
N/A	0.00% (0)	0.00% (0)	9.09% (1)	0.00% (0)
Refuse	11.11% (1)	9.09% (1)	0.00% (0)	0.00% (0)
Other people in your sector				
Can be TRUSTED	33.33% (3)	45.45% (5)	36.36% (4)	33.33% (3)
You can't be too CAREFUL	44.44% (4)	54.55% (6)	54.55% (6)	66.67% (6)
N/A	11.11% (1)	0.00% (0)	0.00% (0)	0.00% (0)
Refuse	11.11% (1)	0.00% (0)	9.09% (1)	0.00% (0)
State regulators				
Can be TRUSTED	33.33% (3)	45.45% (5)	36.36% (4)	33.33% (3)
You can't be too CAREFUL	44.44% (4)	54.55% (6)	63.64% (7)	66.67% (6)
N/A	22.22% (2)	0.00% (0)	0.00% (0)	0.00% (0)

Federal regulators				
Can be TRUSTED	33.33% (3)	18.18% (2)	18.18% (2)	33.33% (3)
You can't be too CAREFUL	55.56% (5)	81.82% (9)	81.82% (9)	66.67% (60
N/A	11.11% (1)	0.00% (0)	0.00% (0)	0.00% (0)
CCA				
Can be TRUSTED	33.33% (3)	45.45% (5)	9.09% (1)	55.56% (5)
You can't be too CAREFUL	55.56% (5)	54.55% (6)	63.64% (7)	22.22% (2)
N/A	11.11% (1)	0.00% (0)	9.09% (1)	22.22% (2)
Refuse	0.00%	0.00% (0)	18.18% (2)	0.00% (0)
Environmentalist				
Can be TRUSTED	22.22% (2)	27.27% (3)	18.18% (2)	22.22% (2)
You can't be too CAREFUL	66.67%	72.73% (8)	81.82% (9)	77.78% (7)
N/A	11.11% (1)	0.00% (0)	0.00% (0)	0.00% (0)

Fishers in the Carolinas and Georgia/North Florida showed notably less generalized trust than fishers in other segments. However, curiously, this lower generalized trust did not carry through to markedly lower levels of trust in regulators and other stakeholders by segment.

Fishers' World view on fisheries management by region

	Carolinas	**Georgia/ N. Florida**	**Space Coast**	**Keys**
	Percent (Number)	Percent (Number)	Percent (Number)	Percent (Number)
___ Fishers have a voice in fisheries management				
Agree	33.33% (3)	45.45% (5)	27.27% (3)	11.11% (1)
Disagree	66.67% (6)	54.55% (6)	63.64% (7)	88.89% (8)
N/A	0.00% (0)	0.00% (0)	9.09% (1)	0.00%

Feel welcome in public meetings				
Agree	66.67% (6)	100.00% (11)	81.82% (9)	77.78% (7)
Disagree	33.33% (3)	0.00% (0)	18.18% (2)	22.22% (2)
Trust regulators to make right decisions about fisheries management				
Agree	22.22% (2)	9.09% (1)	9.09% (1)	22.22% (2)
Disagree	77.78% (7)	90.91% (10)	90.91% (10)	77.78% (7)
Trust science regulators use				
Agree	22.22% (2)	27.27% (3)	27.27% (3)	44.44% (4)
Disagree	77.78% (7)	72.73% (8)	72.73% (8)	55.56% (5)
Believe information presented by fisheries managers				
Agree	22.22% (2)	36.36% (4)	45.45% (5)	55.56% (5)
Disagree	66.67% (6)	63.64% (7)	54.55% (6)	44.44% (4)
Refuse	11.11% (1)	0.00% (0)	0.00% (0)	0.00% (0)
People in charge of fisheries managers are fair to everyone				
Agree	33.33% (3)	27.27% (3)	27.27% (3)	11.11% (1)
Disagree	66.67% (6)	72.73% (8)	72.73% (8)	77.78% (7)
N/A	0.00%	0.00% (0)	0.00% (0)	11.11% (1)
Opinions of ____ fishers are taken seriously				
Agree	33.33% (3)	36.36% (4)	36.36% (4)	33.33% (3)
Disagree	66.67% (6)	63.64% (7)	63.64% (7)	66.67% (6)
_____ fishers have a responsibility to participate in fisheries management				
Agree	88.89% (8)	100.00% (11)	100.00% (11)	77.78% (7)
Disagree	11.11% (1)	0.00% (0)	0.00% (0)	22.22% (2)
_____ fishers should be willing to share info beyond that required by law.				
Agree	55.56% (5)	63.64% (7)	72.73% (8)	66.67% (6)
Disagree	44.44% (4)	36.36% (4)	27.27% (3)	33.33% (3)

Fisheries regulations help preserve my fishery				
Agree	66.67% (6)	81.82% (9)	72.73% (8)	77.78% (7)
Disagree	33.33% (3)	18.18% (2)	27.27% (3)	22.22% (2)
I work hard to make sure my actions do not harm my fishery				
Agree	100.00%	100.00% (11)	90.91% (10)	100.00% (0)
Disagree	0.00% (0)	0.00% (0)	9.09% (1)	0.00% (0)
The ocean is large and there is no way we can overfish it.				
Agree	0.00% (0)	18.18% (2)	0.00% (0)	11.11% (1)
Disagree	100.00% (9)	81.82% (9)	100.00% (11)	88.89% (8)
The environment is important to me				
Agree	100.00% (0)	100.00% (11)	100.00% (11)	100.00% (9)
Fishing regulations threaten my livelihood/hobby				
Agree	44.44% (4)	63.64% (7)	72.73% (8)	44.44% (4)
Disagree	55.56% (5)	36.36% (4)	27.27% (3)	55.56% (5)
I feel a strong connection to other fishers like me				
Agree	88.89% (8)	90.91% (10)	81.82% (9)	100.00% (9)
Disagree	11.11% (1)	9.09% (1)	9.09% (1)	0.00% (0)
Refuse	0.00% (0)	0.00% (0)	9.09% (1)	0.00% (0)

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