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Survey of Scientists and Managers Working in the Region Covered by the South Atlantic Fishery Management Council

Draft report *(please bear with the formatting of figures and tables in this draft; these will be improved for the final report)*

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INTRODUCTION

This survey of fishery scientists and managers working in the South Atlantic region was designed to gather information on knowledge of, beliefs about, and attitudes toward fisheries data, fisheries management, and citizen science. The survey is part of a larger study that additionally seeks the same types of information from recreational and commercial fishermen also operating in the South Atlantic. The original intent of the study was to gather baseline data that could be used in the future to evaluate changes in knowledge, beliefs, and attitudes of scientists, managers, and fishermen as a result of participation in the South Atlantic Fishery Management Council (SAFMC) Citizen Science Program (CSP). As the study developed, its goals expanded to collect data useful in development and operation of the CSP.

An initial stage of the research conducted telephone and Zoom interviews with six scientists, six managers, and six fishermen (Bonney 2022). The interviews showed a high level of frustration with fisheries management and the state of the fishery resource among fishermen, as well as some skepticism about whether citizen science data would be respected and used by scientists and managers. As a result of these interviews, SAFMC staff felt that further information from fishermen would be highly useful in developing the CSP, and the SAFMC commissioned a new study to conduct many more fishermen interviews, both in-person and by telephone. That study has now been completed and is the subject of a separate report (Tookes, Yandle, and Fluech 2024).

The initial interviews with scientists and managers suggested that they were more optimistic than fishermen, both about the state of the South Atlantic fishery and the potential for citizen science to gather data useful for fisheries management. Considering the results, SAFMC staff felt that more information from scientists and managers also would be useful but thought that such information could be obtained readily—and inexpensively—from an online survey, in part because this audience is very familiar with the online environment. The SAFMC therefore commissioned a survey, which is the subject of this report.

METHODS

Survey development

The survey questions were developed by Rick Bonney. They were initially developed using results from the aforementioned interviews and then shared with the SAFMC's Citizen Science Operations Committee. Feedback from the Committee was used to refine the questions, which were then shared again with the Committee. After a second revision based on further Committee input, the questions were placed into a survey on the Qualtrics platform. The survey was then pretested with eight individuals including SAFMC staff and colleagues. The pretest resulted in a few more modifications and a final version of the survey (Appendix A).

A solicitation email was then developed, which included information about informed consent. The survey and solicitation were approved by the Cornell University Institutional Review Board (Cornell IRB 0010490).

Audience

Discussions among SAFMC staff and members of the SAFMC Citizen Science Operations Committee suggested that the best way to obtain names and email addresses from relevant scientists and managers would be to solicit them from senior staff at state agencies, NOAA, and the SAFMC. Emails explaining the study and requesting lists of relevant names were sent to key individuals at:

   * Florida Fish and Wildlife Commission
   * Georgia Department of Natural Resources
   * South Carolina Department of Natural Resources
   * North Carolina Division of Marine Fisheries
   * NOAA Southeast Regional Office
   * NOAA Southeast Fisheries Science Center

All of the individuals contacted at these agencies submitted lists of names and email addresses, which were compiled into a master list. To that list were added names of current members of the SAFMC and of the SAFMC's Science and Statistical Committee (SSC) and its Socio-Economic Panel (SEP). After removing duplicates, the master list included 154 names. These names are known only to members of the research team as required by the IRB approval.

Data Collection

Each individual on the list received an email solicitation that explained the study and urged them to complete it. Follow-up emails were sent to non-respondents about 7-10 days after

receipt of the first one. Second follow-ups were sent after another 7-10 days. The text of the emails was modified for each version to make them shorter and, hopefully, more compelling. After all individuals on the list had received one, two, or three emails, depending on whether they responded, discussion with SAFMC staff led to the decision to send a third follow-up to most of the remaining individuals, this one adopting a more "pleading" tone. Texts of the four solicitation emails are provided in Appendix B.

Four of the 154 names either opted out of the survey or were no longer employed in the Southeast fishing industry. According to the results displayed by Qualtrics, of the 150 remaining names, 83 individuals started the survey and 79 finished it, resulting in a survey completion rate of 95% and an overall response rate of 53%. However, examining the results, not all individuals answered all questions, and many of the more substantive questions were answered by only 72 individuals, reflecting a response rate of 48% for most questions. While this would be considered a good response rate by most researchers, it means that the numbers of individuals in certain categories is small, making cross-tab comparisons challenging. (Note that sending the third follow-up turned out to be a good decision, because it yielded 10 additional responses, more than 12 percent of the total.)

RESULTS

The 83 Individuals who chose to click on the link opened to the first question on the survey: "Welcome to this survey of fisheries scientists and managers working in the Southeast Atlantic. Details about the survey were included in the email that directed you to the survey. As a reminder, your participation is entirely voluntary. All responses will be summarized in aggregate, and your individual responses will be kept confidential. You can take a break from the survey at any time and come back to finish it later, but you need to use the same computer on which you started the survey for the results to be recorded properly. Do you consent to participate?"

All 79 individuals who "completed" the survey answered yes, or they would not have been able to see the remaining questions. The other 4 individuals also answered yes and began the survey but for reasons known only to themselves did not finish it. Survey results are compiled from the 79 individuals who "completed" the survey. (Note that some individuals skipped certain questions, or did not see certain questions based on their answers to previous questions, so the total responses for each question do not always equal 79.)

Demographics

Just over half of the respondents categorized themselves as a fisheries scientist (biologist, researcher, or assessment specialist). About 20% categorized themselves as a fisheries manager at the state, regional, or federal level. About 18% categorized themselves as both a fisheries scientist and a fisheries manager, while 9% (7 individuals) categorized themselves as "other," including a retired fisheries scientist, a charter boat captain, a recreational fisherman, a fisheries economist, a faculty member, and a social scientist.

Most of these "others" are likely individuals that came from the SAFMC membership or SSC lists. The respondents, then, are weighted fairly heavily toward scientists. These results are summarized in Figure 1.

Figure 1

Q2 - Which category best describes your role in the saltwater fisheries community?
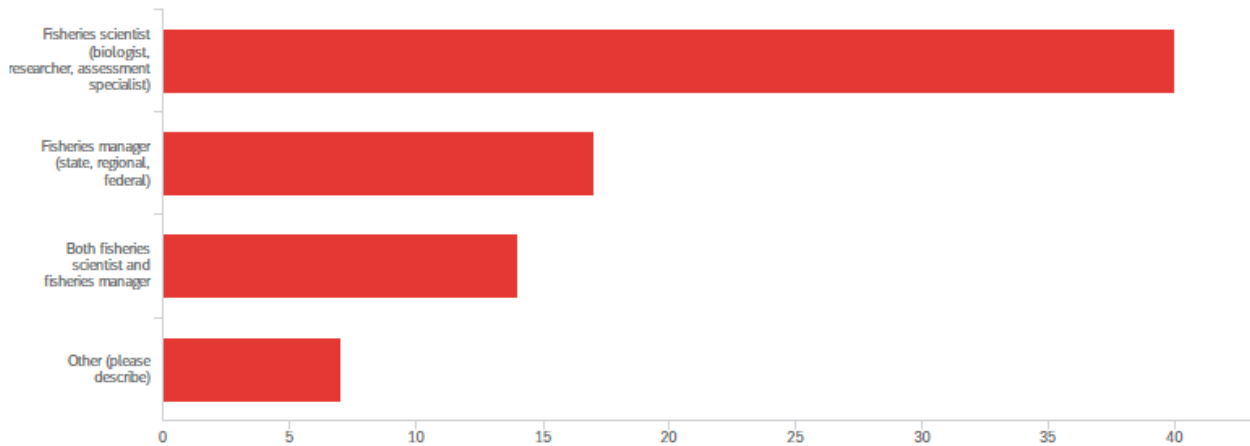
Considering their place of employment, respondents were weighted fairly equally between federal and state agencies, 36% and 38%, respectively, with only about 15% identifying as academics. None claimed to work at a non-governmental organization, but 8 answered "other." These likely include many of the same individuals who answered "other" to the previous question. Some were retired, but others worked in the fishery support industry. These results are summarized in Figure 2.
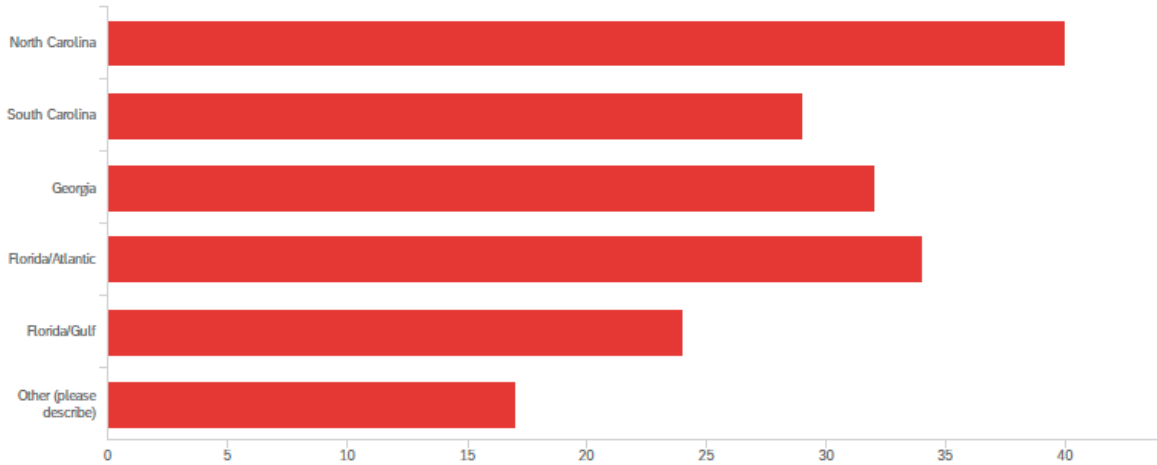
Figure 2

Q3 - What type of agency do you work for?
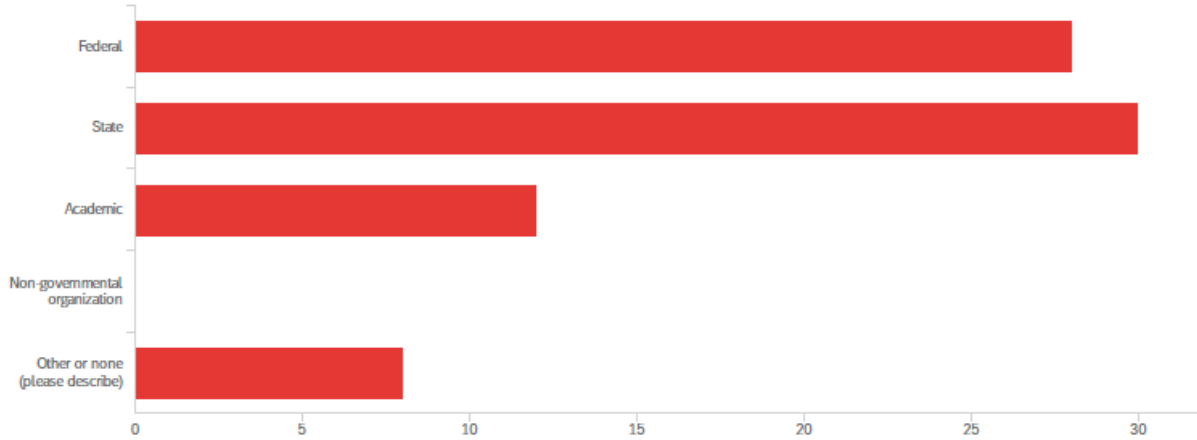
Respondents were distributed fairly evenly across the states represented by the SAFMC. Florida had the most respondents including those from both the Atlantic coast and the Gulf, but about the same numbers if you consider these very different regions separately. Note that a fair number of respondents (17) answered "other" (Figure 3). These included 10 individuals who work throughout most areas of the South Atlantic and seven individuals who work outside of the region.

Figure 3

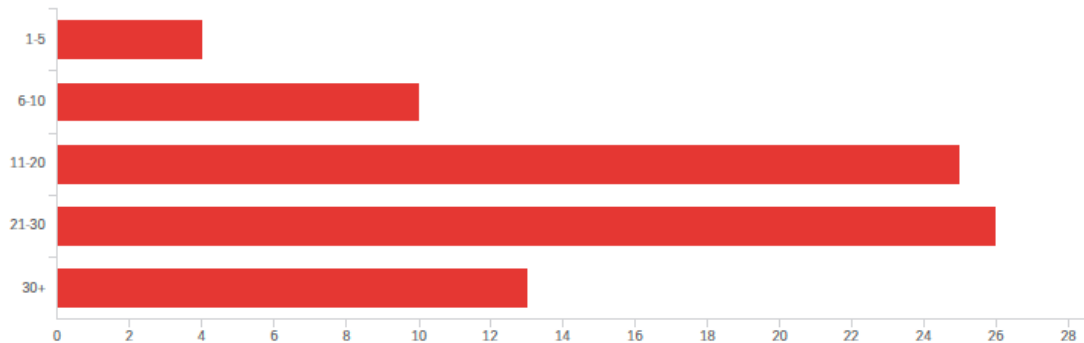Q4 - What state or states do you work in? (Check all that apply.)

Respondents were experienced in the field of fisheries science and management. Thirteen individuals had been working in the field for more than 30 years, while only 5 had been working fewer than 6 (Figure 4).

Figure 4

Q5 - How many cumulative years have you been working in fisheries science/management?

Question 6 asked if a respondent worked within a specific aspect of the South Atlantic fisheries (i.e., species assemblage, fishery dependent or fishery independent data collection, or policy type). This question was answered by 53 respondents, who represent a full spectrum of jobs related to fishery dependent and fishery independent research, fishery economics, stock assessment, and habitat research and enhancement. The full answers are provided in Appendix C.


INVOLVEMENT WITH THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

Respondents were heavily involved with the SAFMC. Only 9 had not been involved, while 69 had. When asked in what ways they were involved, most (50) had participated in or attended a SEDAR stock assessment workshop or webinar. Many (43) had attended a public meeting of the SAFMC, while 35 had served on a SAFMC advisory panel or scientific advisory committee (note that the answers are not mutually exclusive) (Figure 5).

Many respondents provided more specific answers. These are provided in Appendix D.

Figure 5

Q9 - In what way(s) have you been involved with or interacted with the SAFMC? (Please check all that apply.)
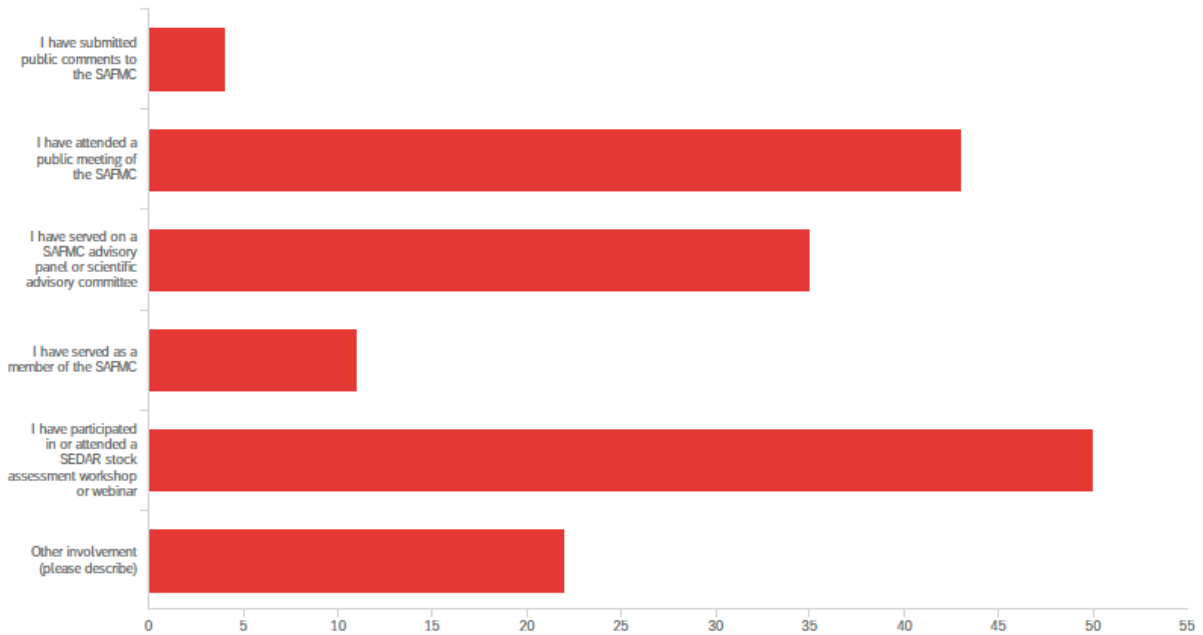
Those who stated that they had participated in SEDAR were asked in what way(s) they had done so. Many had been involved in multiple ways including collecting data, analyzing data, and making decisions with data (Figure 6). (The "other" category included only 3 responses for this question.)

Figure 6

Q10 - In what ways have you participated in SEDAR? (Check all categories that apply.)
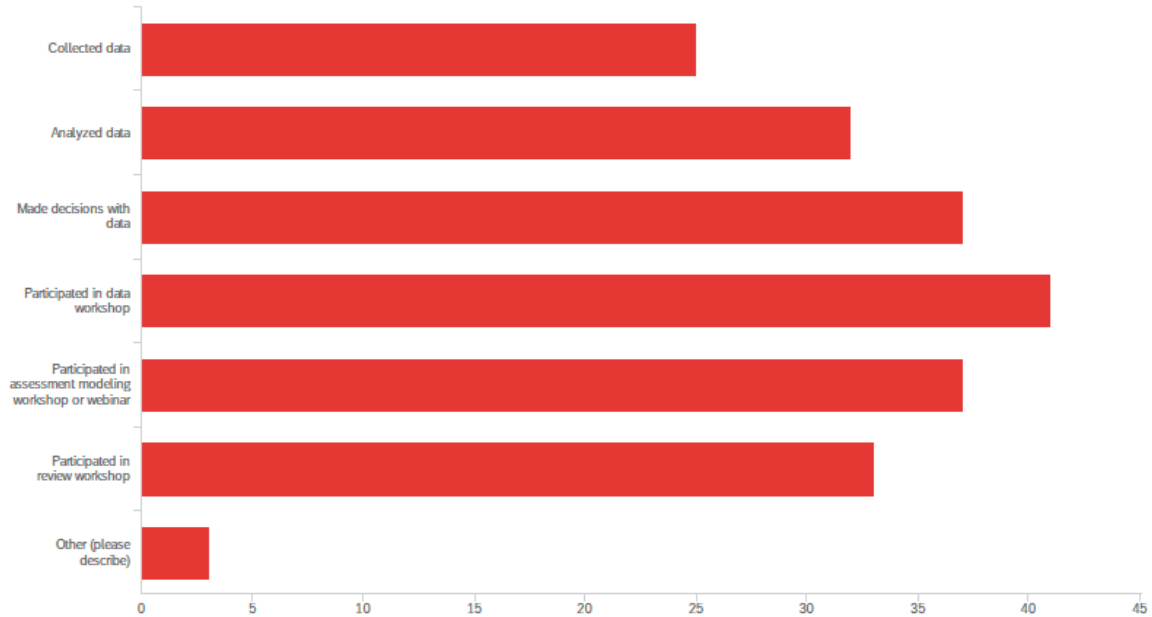
Question 11 asked participants how familiar they were with SEDAR. (Note that this question was asked of all respondents, even those who said that they had participated in SEDAR.) Respondents were quite familiar with SEDAR, with 51 saying that they were very or extremely familiar, and only 1 stating that they were not familiar at all (Figure 7).

Figure 7

Q11 - How familiar are you with SEDAR, the stock assessment process that the SAFMC uses to recommend fisheries management regulations to NOAA?
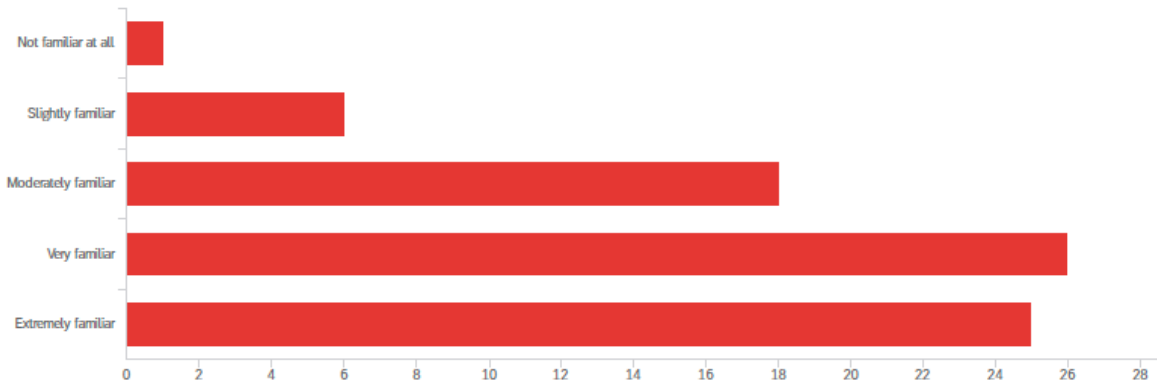
DATA SOURCES

In question 12, respondents were asked to indicate the sources of fisheries data used by the SAFMC to make recommendations for managing fisheries with which they were familiar. Many were familiar with most of the data sources. Surveys by scientists were familiar to the most (68) and data collected by vessel monitoring systems were familiar to the least (43), although that number is still 54% of the respondents. Citizen Science was known as a data source to 48 respondents (61%) (Figure 8).

Figure 8

Q12 - To make recommendations for managing fisheries, SAFMC requires reliable data about fish life histories, fishing effort, fish harvest, abundance information, and fisheries socioeconomics. Please indicate the sources of fisheries data used by the SAFMC with which you are familiar (check all that apply).
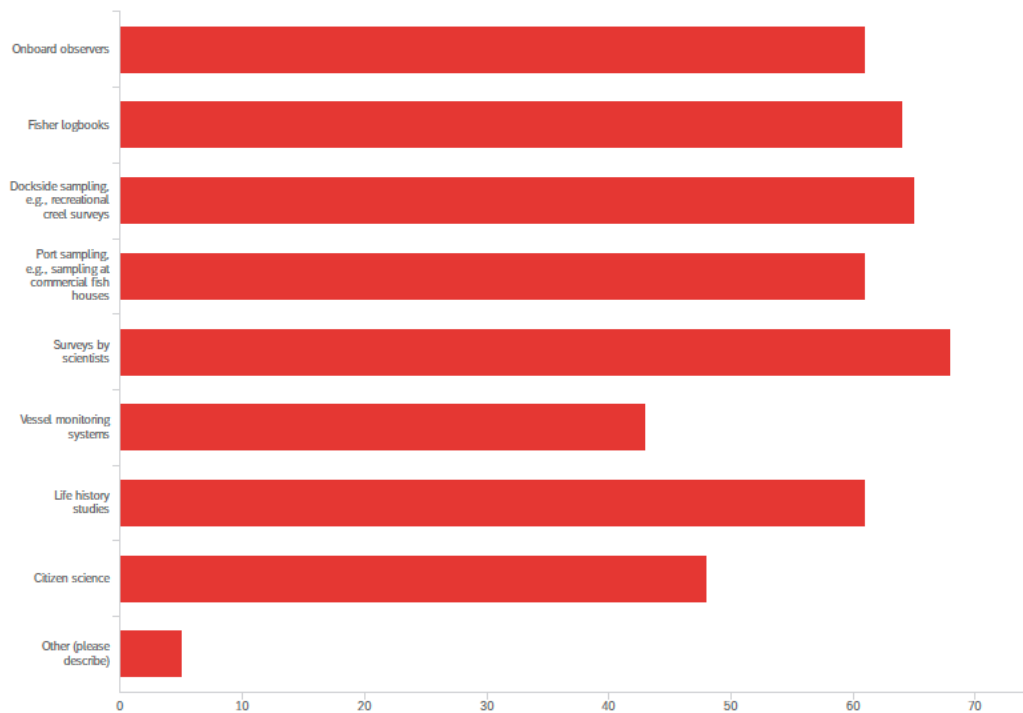
When asked whether respondents felt that the above sources of data, taken together, currently provide sufficient information on which to base management decisions, only 3 respondents said yes. One of these three stated "we could certainly benefit from more and better data, but for most species that we assess, the data and the analyses we conduct with them are sufficient to provide useful management advice." This is a minority view, however. Sixty two respondents (82%) said that data are sometimes sufficient, but that more data would be helpful for many species, and 11 respondents (15%) said that insufficient data are available for most species (Figure 9).

In addition, many useful comments were received for this question. These are provided in Appendix E.

Figure 9

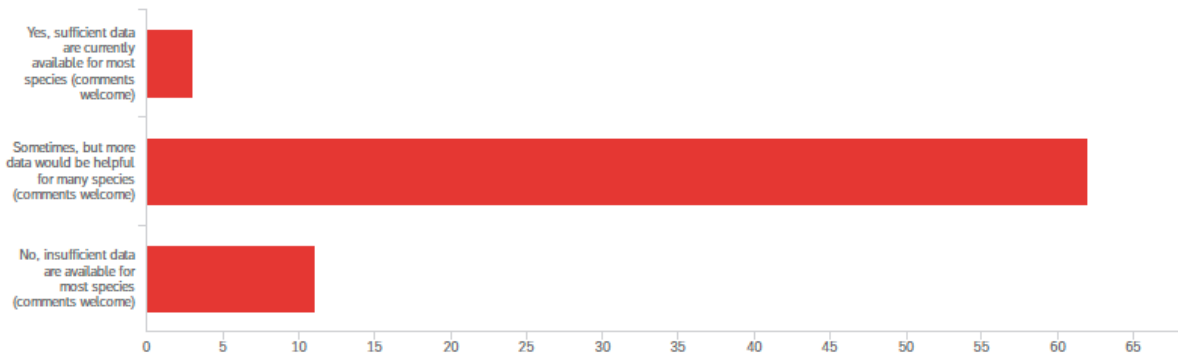Q13 - Do you feel that the above sources of data, taken together, currently provide sufficient information on which to base management recommendations?

Answers to this question suggest that more ways to collect data would be welcomed by these respondents, and the next question (14) was designed to understand the ways in which respondents thought that more data could best be collected taking into account cost and effort. Because respondents would be likely to check that all methods would be very helpful if given a traditional matrix-style question, instead, they were asked to rank each of eight options in order of most (1) to least (8) effective.

In one way of looking at these data, citizen science ranked highly in this exercise, as it was ranked as the most effective method (i.e., given a large number of "ones," bottom bar in chart) followed by surveys by scientists and onboard observers.

Figure 10

Q14 - Fishery scientists and managers wish that unlimited resources were available to collect data to inform fisheries management. Knowing that is not possible, how do you think that more data could best be acquired? Please rank these options in order of most (1) to least (8) effective considering cost and effort:

■ Onboard observers
■ Fisher logbooks
■ Dockside sampling, e.g., recreational creel surveys
■ Port sampling, e.g., sampling at commercial fish houses
■ Surveys by scientists
■ Vessel monitoring studies
■ Life history studies
■ Citizen science
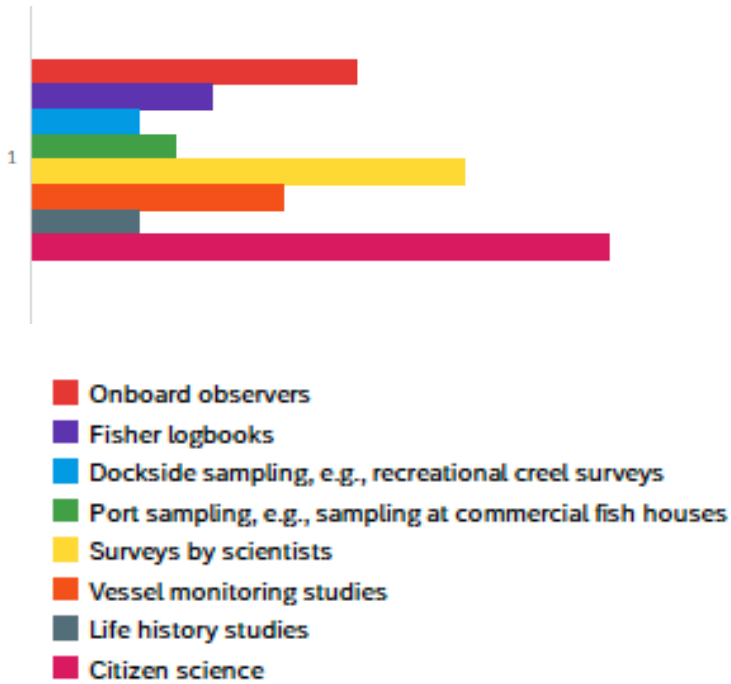
However, many respondents gave citizen science lower ratings. Here's the chart of data sources ranked 6, where citizen science (bottom bar) also is highest:
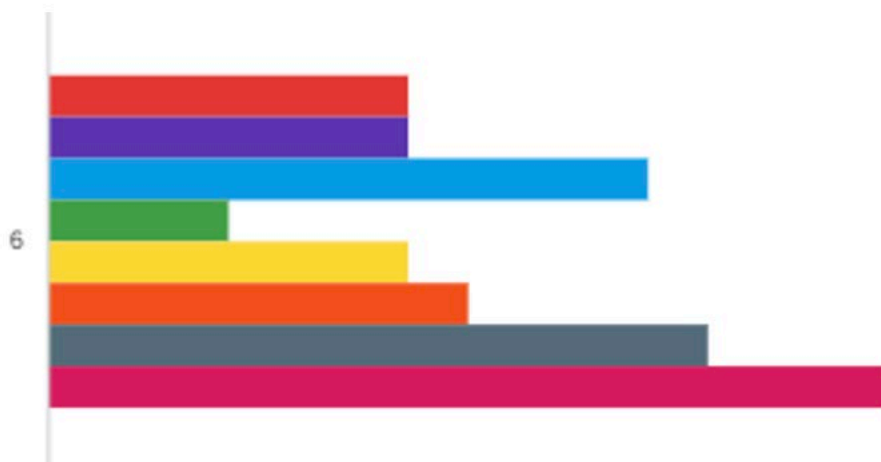
These results suggest that while many respondents thought that citizen science would be the most effective of these methods of gathering data, a large number did not.

Another way to visualize these results is by examining the means and standard deviations of the rankings (Table 1). Here the means represent the most "popular" data sources. Sources with lower means (closer to 1, top ranked) were thought to be more appropriate than data sources with higher means (closer to 8). Examining this table, citizen science still rates somewhat highly, but below port sampling and dockside sampling. One reason for this is the high standard deviation regarding the ranking of citizen science. That is, while many respondents rated it number 1, many others ranked it 6, 7, or 8.

Table 1.

	Mean	SD
Port sampling, e.g., sampling at commercial fish houses	4.32	1.87
Dockside sampling, e.g., recreational creel surveys `	4.33	1.81
Citizen science	**4.44**	**2.58**
Fisher logbooks	4.44	2.26
Surveys by scientists	4.54	2.48
Vessel monitoring studies	4.54	2.51
Onboard observers	4.77	2.43
Life history studies	4.86	2.05

An important finding here is the bifurcation of confidence afforded citizen science data. That is, many scientists and managers seem to feel that it is a valuable source worth pursuing, while many are less certain. Examining the data to see what characteristics of respondents may be correlated with their answers to this question would be a valuable next step in data analysis.

MANAGEMENT

The next section of the survey deals with issues surrounding fisheries management. In question 15, respondents were asked to rate their agreement from strongly agree (ranking 1) to strongly disagree (ranking 5) for 13 statements.

These statements are presented in descending order of agreement in Table 2. That is, the first statement, with a mean of 1.43, can be interpreted as a statement with which most respondents strongly or somewhat agree. The last statement, with a mean of 3.94, can be interpreted as one with which most respondents somewhat or strongly disagree. The actual data are shown in Figure 11.

Table 2

Statements that stand out with respondents mostly strongly or somewhat agreeing:

	Mean	SD
Fisheries managers use data to make management recommendations	1.43	0.64
Fishermen should have a voice in fishery management decisions	1.54	0.71
Fishermen have a responsibility to participate in fisheries management	1.58`	0.79
Fisheries managers consider the needs of fishermen when making management recommendations	1.63	0.59

Statements with which most respondents generally agree, but not quite as strongly:

	Mean	SD
Fishing regulations help to preserve the fishing industry	1.69	0.91
Managers make informed decisions about fisheries management	1.87	0.77
The science used by managers to make recommendations can be trusted	1.92	0.78

Statement with which many respondents either somewhat agree or neither agree nor disagree:

	Mean	SD
The opinions of fishermen are taken seriously	2.18	0.89

Statements with which many respondents neither agree nor disagree or somewhat disagree:

	Mean	SD
Scientists trust managers to use data to make management recommendations	2.51	1.08
Fishing industry associations have the best interests of fishermen at heart	2.81	0.94

Statements with which many respondents strongly disagree:

	Mean	SD
South Atlantic Fisheries are generally healthy	3.33	1.04
Fishermen trust scientists to collect data that are representative of their fisheries	3.88	0.87
Fishermen trust managers to make sensible fishing regulations	3.94	0.68

Figure 11

#	Field	Strongly agree		Somewhat agree		Neither agree nor disagree		Somewhat disagree		Strongly disagree		Total
1	Fisheries managers use data to make management recommendations	63.89%	46	30.56%	22	4.17%	3	1.39%	1	0.00%	0	72
2	Fisheries managers consider the needs of fishermen when making management recommendations	41.67%	30	55.56%	40	1.39%	1	1.39%	1	0.00%	0	72
3	Fishermen trust managers to make sensible fishing regulations	1.39%	1	1.39%	1	13.89%	10	68.06%	49	15.28%	11	72
4	Fishing industry associations have the best interests of fishermen at heart	6.94%	5	33.33%	24	33.33%	24	25.00%	18	1.39%	1	72
5	Fishermen should have a voice in fisheries management decisions	54.17%	39	40.28%	29	4.17%	3	0.00%	0	1.39%	1	72
6	Managers make informed decisions about fisheries management	30.99%	22	56.34%	40	7.04%	5	5.63%	4	0.00%	0	71
7	The science used by managers to make recommendations can be trusted	29.17%	21	55.56%	40	9.72%	7	5.56%	4	0.00%	0	72
8	The opinions of fishermen are taken seriously	22.22%	16	47.22%	34	20.83%	15	9.72%	7	0.00%	0	72
9	Fishermen have a responsibility to participate in fisheries management	56.94%	41	30.56%	22	11.11%	8	0.00%	0	1.39%	1	72
10	Fishing regulations help to preserve the fishing industry	54.17%	39	27.78%	20	13.89%	10	2.78%	2	1.39%	1	72
11	South Atlantic fisheries are generally healthy	1.39%	1	25.00%	18	26.39%	19	33.33%	24	13.89%	10	72
12	Fishermen trust scientists to collect data that are representative of their fisheries	1.39%	1	6.94%	5	15.28%	11	55.56%	40	20.83%	15	72
13	Scientists trust managers to use data to make management regulations.	15.28%	11	43.06%	31	22.22%	16	13.89%	10	5.56%	4	72

CITIZEN SCIENCE

Answers to the next two questions, 17 and 18, showed that respondents were either very familiar (64%) or somewhat familiar (36%) with citizen science, and that 69% had participated in citizen science or used citizen science data.

Figure 12

Q17 - One method of data collection mentioned in an earlier question is citizen science, which refers to projects for which non-scientists collect and submit data about the natural world. In the past, several citizen science projects have involved fishermen, such as fish-tagging projects, genetics projects for which fishermen collect fin clips, and projects where fishermen log information on their catches in a mobile app. How familiar are you with the concept of citizen science?

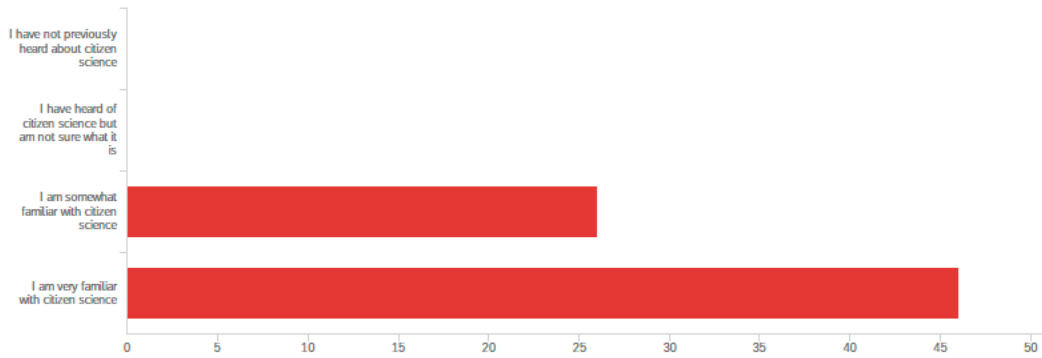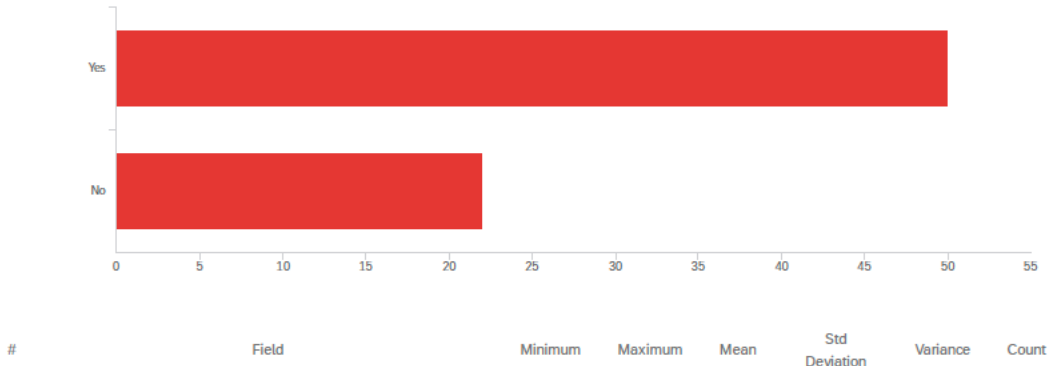
Figure 13

Q18 - Have you participated in citizen science or used citizen science data?

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count

Of those who have participated in citizen science, participation took many forms (Figure 14).

Figure 14

Q19 - In what ways have you participated in citizen science? (Check all that apply.)
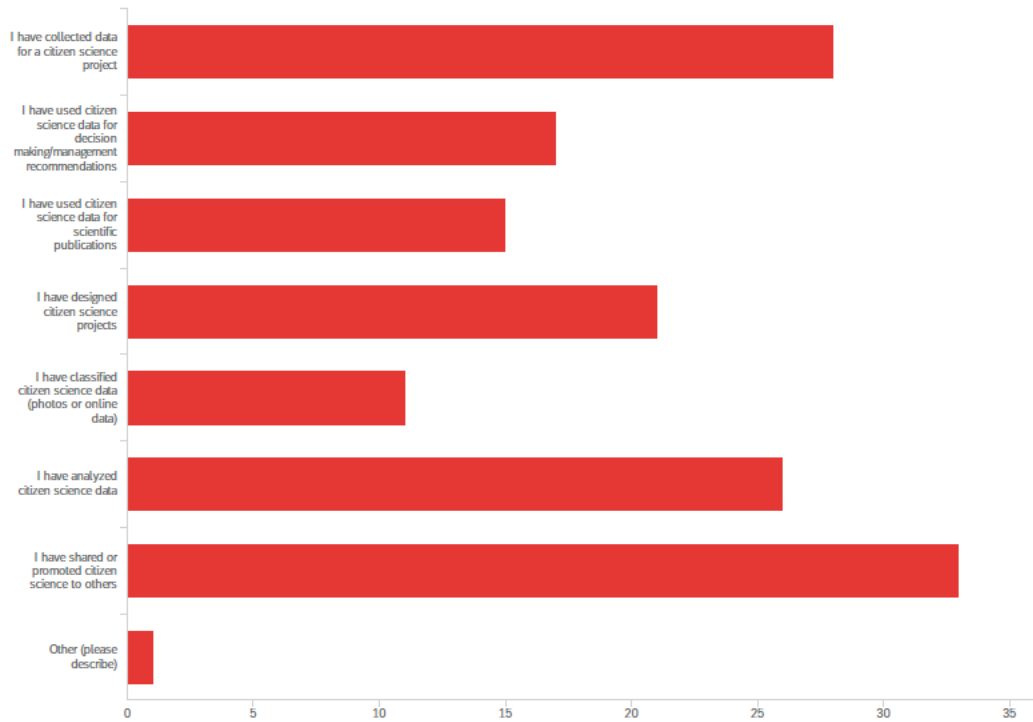
Encouragingly, all 72 respondents said that citizen science could be a useful tool for collecting data, with 39 (54%) stating that it could be very or extremely useful (Figure 15). Note that this includes respondents who had ranked citizen science father down the list.

Figure 15

Q20 - Assuming that citizen science projects are professionally developed by
knowledgeable scientists, managers, and fishermen, do you think that citizen science can
be a useful tool for collecting data that could inform fisheries management?
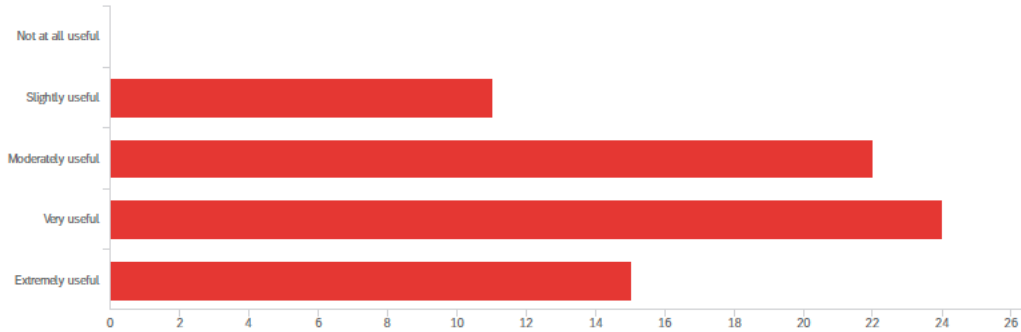
Respondents also were asked what concerns they have about citizen science, and they responded to all of the provided choices (Figure 16):

Figure 16

Q21 - What concerns do you have about citizen science? (Please check all that apply.)

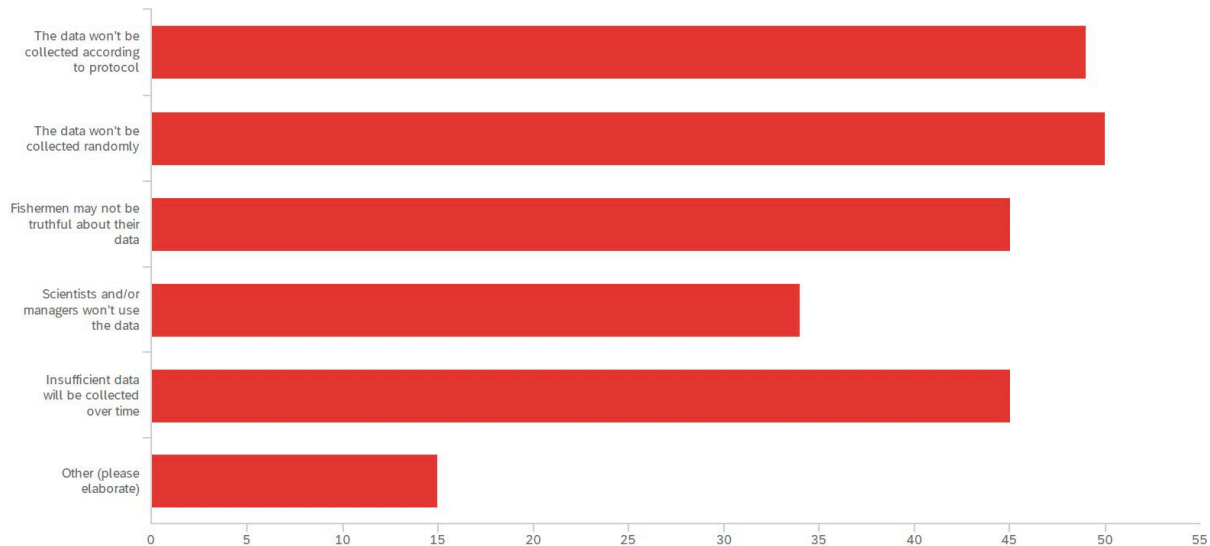Fifteen respondents added a comment, and while some of them are restatements or elaborations of the above, many are important to consider:

* Data will be misused or interpreted incorrectly
* Scientists won't use the data if it cannot be shown that the samples are representative
* Because data are not collected with a sampling design they can be difficult to analyze and use
* May lack statistical design requirements that will stand up to the scientific review process needed for stock assessments and management
* Perceptions replacing observations as data
* Data collection may not be well-matched to the scientific gap or data need
* Data will not be consistently provided
* Long-term data cannot be relied upon because people drop off involvement over time
* Citizen science data will be over-valued by certain groups who will insist that they should be weighted more heavily in management decisions than data collected by government surveys
* Bias in s sampling due to selective reporting and non-reporting issues
* Citizens will lose interest in the project and participants will dwindle over time
* Bias

* Avidity bias. Only avid anglers will participate
* No QAQC
* My concerns have to do with projects that are not designed by and/or closely monitored by scientists.

Considering this last response—and several of the others—note that the preceding question said "Assuming that projects are professionally developed by knowledgeable scientists, managers, and fishermen ..." Perhaps this statement should have been repeated for this question. However, the 15 provided comments are insights into the ways that scientists/managers think about citizen science. They show that one big job for the SAFMC citizen science program is to build credibility by demonstrating that the projects are in fact carefully and scientifically designed.

Finally, question 22 asked respondents to rank the five topics that they thought would provide the most useful data to the Citizen Science Program. Discard information far outranked all other topics as a "one," followed by age sampling and genetic sampling (Figure 17).

Figure 17
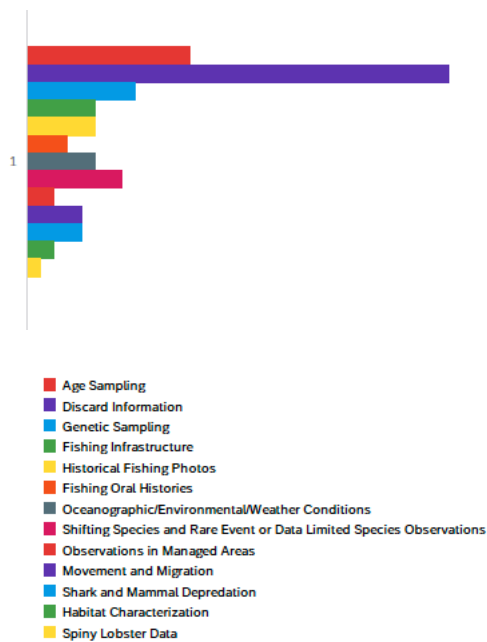
Discard information also ranks first looking at the means for each topic (recall that the lowest numbers are the highest ranked categories) (Table 3).

Table 3.

	Mean	SD
Discard information	2.18	1.49
Age sampling	2.63	1.41
Genetic sampling	2.85	1.65
Shark and mammal depredation	2.93	1.49
Shifting species/Rare event observations	3.20	1.51
Movement and migration	3.26	1.55
Oceanographic/Environmental weather conditions	3.42	1.35
Historical fishing photos	3.44	1.93
Fishing infrastructure	3.45	2.11
Observations in managed areas	3.71	2.45
Fishing oral histories	3.83	2.10
Habitat characterization	3.85	2.10
Spiny Lobster data	4.64	3.37

DISCUSSION

Using, managing, and maintaining the South Atlantic fishery requires a collaboration among fishermen, scientists, and managers. Developing, implementing, and maintaining a citizen science program that can gather data useful in fishery management requires the same collaboration. This study has examined scientists' and managers' knowledge, attitudes, and beliefs surrounding citizen science and the South Atlantic fishery. That is, it has looked at two thirds of a three-legged stool. A parallel study has examined the third leg.

Results of the study, which involved scientists and managers whose names were supplied by senior staff at several state and federal resource management agencies, have shown this group to include individuals who are highly experienced in their fields and have a wide variety of skills and knowledge about fisheries and fishery management. These are precisely the individuals who are needed to embrace a citizen science program if it is to be successful. For this reason, the attitudes and beliefs of this group should be taken very seriously and examined very carefully.

Fortunately for the future of citizen science in this region, the practice is generally supported by many or even most survey respondents. Many feel that citizen science is the most appropriate tool to use for gathering data on certain topics. At the same time, many respondents have concerns about citizen science that need to be understood and addressed for scientists and managers to embrace and use the data.

Many comments have to do with the rigor of program design. The SAFMC CSP has involved scientists and managers in designing its initial projects. However, scientists and managers could probably be more involved in ongoing project design. Also, more could be done to

advertise the fact that project design is accomplished through collaborations among scientists, managers, and fishermen to improve credibility of the CSP.

The large number of survey respondents who said that they would be willing to engage in further discussion on these topics could provide a pool of individuals willing to help. While some of these individuals are known to the CSP staff and already have been involved, many have not. As more projects get under way, reaching out to these individuals and incorporating them into project design could be an excellent strategy.

Several respondents were less supportive of citizen science. Some of these include individuals who stated that they would welcome further discussion, and they could be contacted to better understand their concerns. One way would be to hold a meeting, which could be done online, to explore and address these concerns. In addition, ascertaining any patterns in categories of respondents who are and who are not supportive of citizen science would be a useful exercise.

Concerning the perceived appropriateness of various topics for inclusion in the CSP, rankings by fishermen interviewed in the sister study should be compared to rankings made by the scientists and managers to see what overlaps exist. Those topics with high overlaps are likely prime categories for new and ongoing citizen science efforts. Also, many comments about the need for citizen science are included in Appendix E, and these should be examined along with the topic rankings.

Finally, this survey was originally conceived as a method to collect baseline information on fishery scientists and managers' knowledge, attitudes, and trust levels about citizen science that could be used to discern future changes in this information as the SAFMC Citizen Science Program grows and matures. The data should thus be preserved for future comparative analysis. Changes in the answers to these questions, say five years down the road, could provide insight into the overall success of the program. In particular, many comments were received about the state of the resource and about trust among those involved in the fishery. For example, scientists and managers believe that fishermen do not trust scientists to collect data that are representative of their fisheries, and that fishermen do not trust managers to make sensible fishing regulations. While expecting a citizen science program to help turn these attitudes around may be asking a lot, deliberately involving all three legs of the stool in project design and implementation could help, and future research may be able to tease out the role of citizen science in any changes that do occur.

Appendices

Appendix A: Scientist/Manager Survey final
Appendix B: Solicitation emails
Appendix C: full answers to question 6
Appendix D: role in fishery
Appendix E: need for data

Introduction

Welcome to this survey of fisheries scientists and managers working in the Southeast Atlantic. Details about the survey were included in the email that directed you to the survey. As a reminder, your participation is entirely voluntary. All responses will be summarized in aggregate, and your individual responses will be kept confidential. You can take a break from the survey at any time and come back to finish it later, but you need to use the same computer on which you started the survey for the results to be recorded properly.

Do you consent to participate?

○ Yes

○ No

Which category best describes your role in the saltwater fisheries community?

○ Fisheries scientist (biologist, researcher, assessment specialist)

○ Fisheries manager (state, regional, federal)

○ Both fisheries scientist and fisheries manager

○ Other (please describe)

[text box]

What type of agency do you work for?

○ Federal

○ State

○ Academic

○ Non-governmental organization

○ Other or none (please describe)

[text box]

What state or states do you work in? (Check all that apply.)

☐ North Carolina

☐ South Carolina

☐ Georgia

☐ Florida/Atlantic

☐ Florida/Gulf

☐ Other (please describe)

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How many cumulative years have you been working in fisheries science/management?

○ 1-5

○ 6-10

○ 11-20

○ 21-30

○ 30+

If you work within a specific area/aspect of south Atlantic fisheries (i.e., species assemblage, fishery dependent or fishery independent data collection, or policy type), please describe it briefly:

Involvement with the South Atlantic Fisheries Management Council (SAFMC)

INVOLVEMENT WITH THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL (SAFMC)

Have you been involved with or interacted with the SAFMC in the course of your work as a fisheries scientist or manager?

○ No, I have not been involved with or interacted with the SAFMC

○ Yes, I have been involved with or interacted with the SAFMC

In what way(s) have you been involved with or interacted with the SAFMC? (Please check all that apply.)

☐ I have submitted public comments to the SAFMC

☐ I have attended a public meeting of the SAFMC

☐ I have served on a SAFMC advisory panel or scientific advisory committee

☐ I have served as a member of the SAFMC

☐ I have participated in or attended a SEDAR stock assessment workshop or webinar

☐ Other involvement (please describe)

In what ways have you participated in SEDAR? (Check all categories that apply.)

☐ Collected data

☐ Analyzed data

☐ Made decisions with data

☐ Participated in data workshop

☐ Participated in assessment modeling workshop or webinar

☐ Participated in review workshop

☐ Other (please describe)

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How familiar are you with SEDAR, the stock assessment process that the SAFMC uses to recommend fisheries management regulations to NOAA?

○ Not familiar at all

○ Slightly familiar

○ Moderately familiar

○ Very familiar

○ Extremely familiar

To make recommendations for managing fisheries, SAFMC requires reliable data about fish life histories, fishing effort, fish harvest, abundance information, and fisheries socioeconomics. Please indicate the sources of fisheries data used by the SAFMC with which you are familiar (check all that apply).

☐ Onboard observers

☐ Fisher logbooks

☐ Dockside sampling, e.g., recreational creel surveys

☐ Port sampling, e.g., sampling at commercial fish houses

☐ Surveys by scientists

☐ Vessel monitoring systems

☐ Life history studies

☐ Citizen science

☐ Other (please describe)

Do you feel that the above sources of data, taken together, currently provide sufficient information on which to base management recommendations?

○ Yes, sufficient data are currently available for most species (comments welcome)

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○ Sometimes, but more data would be helpful for many species (comments welcome)

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○ No, insufficient data are available for most species (comments welcome)

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Fishery scientists and managers wish that unlimited resources were available to collect data to inform fisheries management. Knowing that is not possible, how do you think that more data could best be acquired? Please rank these options in order of most (1) to least (8) effective considering cost and effort:

	1	2	3	4	5	6	7	8
Onboard observers	○	○	○	○	○	○	○	○
Fisher logbooks	○	○	○	○	○	○	○	○
Dockside sampling, e.g., recreational creel surveys	○	○	○	○	○	○	○	○

	1	2	3	4	5	6	7	8
Port sampling, e.g., sampling at commercial fish houses	○	○	○	○	○	○	○	○
Surveys by scientists	○	○	○	○	○	○	○	○
Vessel monitoring studies	○	○	○	○	○	○	○	○
Life history studies	○	○	○	○	○	○	○	○
Citizen science	○	○	○	○	○	○	○	○

1 2 3 4 5 6 7 8

Please rate your agreement with the following statements:

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Fisheries managers use data to make management recommendations	○	○	○	○	○
Fisheries managers consider the needs of fishermen when making management recommendations	○	○	○	○	○
Fishermen trust managers to make sensible fishing regulations	○	○	○	○	○
Fishing industry associations have the best interests of fishermen at heart	○	○	○	○	○
Fishermen should have a voice in fisheries management decisions	○	○	○	○	○
Managers make informed decisions about fisheries management	○	○	○	○	○
The science used by managers to make recommendations can be trusted	○	○	○	○	○
The opinions of fishermen are taken seriously	○	○	○	○	○

Fishermen have a responsibility to participate in fisheries management	○	○	○	○	○
Fishing regulations help to preserve the fishing industry	○	○	○	○	○
South Atlantic fisheries are generally healthy	○	○	○	○	○
Fishermen trust scientists to collect data that are representative of their fisheries	○	○	○	○	○
Scientists trust managers to use data to make management regulations.	○	○	○	○	○

Citizen Science

CITIZEN SCIENCE

One method of data collection mentioned in an earlier question is citizen science, which refers to projects for which non-scientists collect and submit data about the natural world. In the past, several citizen science projects have involved fishermen, such as fish-tagging projects, genetics projects for which fishermen collect fin clips, and projects where fishermen log information on their catches in a mobile app. How familiar are you with the concept of citizen science?

○ I have not previously heard about citizen science

○ I have heard of citizen science but am not sure what it is

○ I am somewhat familiar with citizen science

○ I am very familiar with citizen science

Have you participated in citizen science or used citizen science data?

○ Yes

○ No

In what ways have you participated in citizen science? (Check all that apply.)

☐ I have collected data for a citizen science project

☐ I have used citizen science data for decision making/management recommendations

☐ I have used citizen science data for scientific publications

☐ I have designed citizen science projects

☐ I have classified citizen science data (photos or online data)

☐ I have analyzed citizen science data

☐ I have shared or promoted citizen science to others

☐ Other (please describe)

Assuming that citizen science projects are professionally developed by knowledgeable scientists, managers, and fishermen, do you think that citizen science can be a useful tool for collecting data that could inform fisheries management?

○ Not at all useful

○ Slightly useful

○ Moderately useful

○ Very useful

○ Extremely useful

What concerns do you have about citizen science? (Please check all that apply.)

☐ The data won't be collected according to protocol

☐ The data won't be collected randomly

☐ Fishermen may not be truthful about their data

☐ Scientists and/or managers won't use the data

☐ Insufficient data will be collected over time

☐ [   ] Other (please elaborate)

The SAFMC has created a list of topics for which citizen science data could be collected to inform fisheries management. Please rank the five topics that you think would

provide the most useful data to the SAFMC Citizen Science Program in order of most useful (1) to least useful (5). (If you would like more information about any of these topics before ranking them, please click here.)

	Age Sampling
	Discard Information
	Genetic Sampling
	Fishing Infrastructure
	Historical Fishing Photos
	Fishing Oral Histories
	Oceanographic/Environmental/Weather Conditions
	Shifting Species and Rare Event or Data Limited Species Observations
	Observations in Managed Areas
	Movement and Migration
	Shark and Mammal Depredation
	Habitat Characterization
	Spiny Lobster Data

Block 3

If you would be willing to be contacted with any follow-up questions, please provide your name and email address here.

Thank you for taking the time to complete this survey!

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APPENDIX B

Solicitation emails

Email # 1

Hello!

I, Rick Bonney, invite you to participate in a survey of fisheries scientists and managers working in the Southeast Atlantic. The goal of the survey is to collect baseline information on knowledge, attitudes, collaborations, engagement, and trust levels concerning fisheries management. The information will be used to inform the continuing design of the South Atlantic Fishery Management Council Citizen Science Program and also will aid in evaluating the program's impacts. The survey complements work to collect similar information from recreational and commercial fishermen.

Completing the survey should take about 15-20 minutes. Your participation is entirely voluntary, and your completion of the survey will indicate your consent to participate. All responses will be summarized in aggregate and your individual responses will be kept confidential. You can take a break from the survey at any time and come back to finish it later, but you need to use the same computer on which you started the survey for the results to be recorded properly. Your participation in this survey should present no greater risk than everyday use of the internet.

If you don't know me, I am director emeritus of the public engagement in science program at the Cornell Lab of Ornithology, and have been working as a consultant to the SAFMC for several years. Any questions about the survey should be directed to me (you can reply directly to this email) or to the Institutional Review Board at Cornell University (irbhp@research.mail.cornell.edu reference IRB0010490).

I hope that you will choose to participate!
Follow this link to the Survey:
${l://SurveyLink?d=Take the Survey}
Or copy and paste the URL below into your internet browser:
${l://SurveyURL}
Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Email #2

Hello!

You are receiving this email because you are a fisheries scientist or manager working in the

South Atlantic region whose knowledge of issues and data regarding fisheries are critical to the ongoing development of the South Atlantic Fishery Management Council's Citizen Science Program. I would really like to capture your knowledge and perspectives in a survey that should not take you long to complete, and that you might even find interesting! I have been provided with your name because you are known to have ideas and experience that would be truly helpful in guiding the Council's growing citizen science efforts.

Completing the survey should take about 15-20 minutes. Your participation is entirely voluntary, and your completion of the survey will indicate your consent to participate. All responses will be summarized in aggregate and your individual responses will be kept confidential. You can take a break from the survey at any time and come back to finish it later, but you need to use the same computer on which you started the survey for the results to be recorded properly. Your participation in this survey should present no greater risk than everyday use of the internet.

If you don't know me, I am Director Emeritus of the Public Engagement in Science Program at the Cornell Lab of Ornithology, and have been working as a consultant to the SAFMC for several years. Any questions about the survey should be directed to me (you can reply directly to this email) or to the Institutional Review Board at Cornell University (irbhp@research.mail.cornell.edu reference IRB0010490).

I hope that you will choose to participate!

Rick Bonney
Follow this link to the Survey:
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Or copy and paste the URL below into your internet browser:
${l://SurveyURL}
Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Email #3

I am sending you this request because your knowledge of issues and data regarding fisheries is critical to the ongoing development of the Southeast Atlantic Fishery Management Council's Citizen Science Program. I hope to capture your opinions in a survey that I hope you will find painless and interesting.

Completing the survey should take about 15-20 minutes. Your participation is entirely voluntary, and your completion of the survey will indicate your consent to participate. All responses will be summarized in aggregate and individual responses will be kept confidential. You can take a break from the survey at any time and come back to finish it later, but you need to use the same computer on which you started the survey for the

results to be recorded properly. Your participation in this survey should present no greater risk than everyday use of the internet.

For context, I have been working as a consultant to the SAFMC's Citizen Science Program for several years and am director emeritus of the public engagement in science program at the Cornell Lab of Ornithology. Any questions about the survey should be directed to me (you can reply directly to this email) or to the Institutional Review Board at Cornell University (irbhp@research.mail.cornell.edu reference IRB0010490).

I hope that you will choose to participate!

Rick Bonney
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${l://SurveyURL}
Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Email #4 (sample)

Good morning:

I know that I have sent you three emails asking for your input into the South Atlantic Fishery Management Council's citizen science program, and you may be tired of hearing from me. I'm writing one last time because we really need thoughts and opinions from as many fisheries scientists and managers as possible to make the Council's program as effective as possible. Our survey does not have a great response rate from NOAA Staff, so we really want to hear from a few more people. Can you help? Completing the survey should take just a few minutes, and I think that you will find it painless and interesting.

Of course, your participation is entirely voluntary, and your completion of the survey will indicate your consent to participate. All responses will be summarized in aggregate and individual responses will be kept confidential. You can take a break from the survey at any time and come back to finish it later, but you need to use the same computer on which you started the survey for the results to be recorded properly. Your participation in this survey should present no greater risk than everyday use of the internet.

In case you are wondering who I am, I have been working as a consultant to the SAFMC's Citizen Science Program for several years and am director emeritus of the public engagement in science program at the Cornell Lab of Ornithology. Any questions about the survey should be directed to me (you can reply directly to this email) or to the Institutional Review Board at Cornell University (irbhp@research.mail.cornell.edu reference

IRB0010490).

I hope that you will choose to participate!

Rick Bonney

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${l://SurveyLink?d=Take the Survey}
Or copy and paste the URL below into your internet browser:
${l://SurveyURL}
Follow the link to opt out of future emails:
${l://OptOutLink?d=Click here to unsubscribe}

Appendix C

Answers to Question 6: "If you work within a specific aspect of the South Atlantic fisheries (i.e., species assemblage, fishery dependent or fishery independent data collection, or policy type), please note. (Note: some answers have been edited to remove identifying characteristics.)

no
Stock assessment
All items relevant to fisheries management
Economics of recreational fishing
Broad fisheries work in south Atlantic from individual species ecology/fisheries to assemblages/ecosystem level. Fishery-independent and -dependent data.
Fisheries management / policy / regulation
Fishery independent data, trawl survey
Economics and social science research
fishery independent data and research
Fishery dependent data collection
Highly migratory species
fishery dependent data analyst for SEDAR
Fishery independent data collection; life history studies; stock assessments
species assemblages, climate change, food web models
Fishery Dependent data collection
cooperative research related to reef fisheries
Habitat
Fishery Dependent and Independent
Mainly fishery independent data collection and associated life history information for reef fish species found along the Atlantic waters off the southeastern US.
Fishery dependent data, outreach, regulations
Currently work with fishery-dependent data collection
stock assessment, management advice provision
fishery-independent surveys, regional coverage FL-NC, coastal and offshore species.

Habitat and fisheries

fishery independent surveys of reef-associated fishes in N. Atlantic ocean off southeast US

Fishery-independent data collection

Fishery dependent

Fisheries economics and general statistical methods

fishery dependent data collection

Angler surveys

Fishery analyses, electronic data collection, catch share programs, data governance

stock assessment

interstate and federal fishery management policy

stock assessment

Fishery-dependent data collection

stock assessment

Recreational Fisheries Statistics: Data Management, Survey Design, Automation

stock assessment

My work is primarily fisheries dependent working with recreational anglers, charter captains and commercial fishermen.

social science / human dimensions

Fishery independent data collection surveys

Stock Assessment

Fishery Independent data collection.

economics

Incidental take of ESA or MMPA listed species in fisheries

Habitat Mapping, Enhancement and Restoration

Aging, data storage and retention, protected resources, permitting

Fishery independent data, management/assessment

Currently working with dependent data, recreational anglers

I work in fishery dependent research [citizen science]

Fisheries Dependent monitoring

Marine fisheries research program; former member of the South Atlantic SSC.

Regulatory/Rule Making

Appendix D

Answers to Question 9: "In what ways have you been involved in the South Atlantic Fisheries Management Council?" (Note: some answers have been edited to remove identifying characteristics.)

presented to SAFMC in previous position

Co-lead on fishery management actions

SAFMC SSC member

I have worked with Council staff in the development of amendments.

current council member

Work on IPTs, presentations to Council and SAFMC Committees

presented information relevant to amendments

Working groups and SEDAR best practices

worked with council members on citizen science funding

Presented to the SAFMC on several occasions on various topics

I have worked with SAFMC staff on regional projects as well as during efforts such as MREP

I work directly with some SAFMC staff members

Citizen Science outreach events

I attend many council meetings representing SEFSC

Joint proposals

attended & presented at SSC meetings

Presented at Council meetings

Often provide data to SAFMC staff

Gave presentations to SAFMC.

Assisted planning port meetings

I have partnered on collaborative citizen science initiatives

Answered questions from SAFMC staff both directly and through our agency contact

Appendix E

Answers to question "Do you feel that existing sources of data, taken together, currently provide sufficient information on which to base management recommendations?

Sometimes, but more data would be helpful for many species (comments welcome) - Text

MRIP data often highlynuncertain. Often dockside commercial and rec smapling need to be enhanced, Bio sample collection and processing needs to be substantially enhanced includiing to reproductive biology
While more data would be helpful, what is available is best scientific information available
Most Southeast fisheries remain data poor despite our best efforts
More aging of catch. Important demographic rates (e.g. natural mortality) are often estimated and not measured empirically. Need for better recruitment indices.
Reef fish fisheries in the region have a large private recreational component. Uncertain estimates of effort greatly affect estimates of landed and discarded catch. Getting better estimates of landed and discarded catch is the number data issue in the region, including the Gulf of Mexico.
lack of coverage due to funding limitations can impact usability of fishery-dependent data.
Currently missing B2 length compositions and with the rise of catch-and-release fishing these represent a greater component of annual removals
We have no ichthyoplankton or zooplankton surveys in the southeast east coast to understand spawning locations. Need more ageing data and more data on predators
There is still a need for better recreational data, specifically effort and discard information
recreational effort and impact
More fisheries dependent data is needed.
I feel that we can always have more data to explore a variety of analytical and management methods
fishery independent indices (SADL, SEFIS) still remain limited in length of time series. No good indices exist for coastal migratory pelagics (Mackerel + cobia)
deep-water species coverage low; observer coverage low; recreational effort and reporting insufficient
recreational catch and effort are still insufficently captured with the survey instruments in use. Error is large which makes it difficult to calculate estimates of the populations or fisheries
Data are limited for some managed species
more data needed on fish recruitment and fishery discard rates by fishing sector
Life history - more samples of less common species would help, as both fishery dependent survey and Marmap have limitations in the size of fish collected. More juvenile studies would also help. Social and economic sciences offer valuable insight into trends but are not consistently used (or sometime not used at all). Recreational (private angler) data is still our weakest point and one of the largest harvesters of fish.

better recreational catch estimates are needed for most species in the region

Sometimes basic life history information (natural mortality (longevity), fecundity, maturity, hermaphroditism, movement/tagging) isn't available/adequate for some species. Age/length composition data by year and fleet can often be sparse. In many species, an adequate fishery independent indices of YOY and adult abundance is crucially needed (e.g. Spanish Mackerel). Accurate commercial discard information is needed.

Very species dependent. Some managed species we have almost no data for.

there are a LOT of snapper grouper species but not all are particularly important to the fishery

Recreational harvest for all species, and post-release mortality studies, impacts of local tournaments on smaller populations

Gaps are missing that need to be addressed by novel research and technology.

We can always use more data, just ask an assessment person

The large number of stocks being managed and the variety of life histories involved makes it very difficult (as likely cost prohibitive) to obtain adequate data for all stocks. Citizen science can be a big help.

No, insufficient data are available for most species (comments welcome) - Text

We lack fishery-independent indices of abundance that inform us on overall population trends. We also lack an understanding of the total removals from the fisheries due to high uncertainty in recreational effort, landings and discards.

MRIP/FES remains a very poor tool for collection of recreational data, especially for rare event species.

There is not enough observer coverage in the South Atlantic Reef Fishery or the South Atlantic shrimp fishery as compared to the GOM and HMS fisheries.

Not enough quantitative social science being conducted to answer questions related to recreational anglers

While there is some data streams from all the above identified sources, most of it very limited in temporal and spatial converage resulting in a high degree of uncertainty.

Majority of species managed by SAFMC are considered "rare event" species and not encountered frequently enough in current surveys to produce precise catch estimates. Best available data is used far too often for data that is in actuality "only available data".

The above works well for commercial, but not recreational.