



Knowledge, Attitudes, and Perceptions: Gray's Reef National Marine Sanctuary



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Cover photo: Gray's Reef National Marine Sanctuary protects a natural live-bottom reef that attracts more than 200 species of fish, including this sheepshead. Photo: Greg McFall/NOAA



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Because of considerable differences in settings, resources, and threats, each national marine sanctuary has a tailored management plan. Conservation, education, research, monitoring, and enforcement programs vary accordingly. The integration of these programs is fundamental to marine protected area management. The National Marine Sanctuaries Conservation Series reflects and supports this integration by providing a forum for publication and discussion of the complex issues currently facing the National Marine Sanctuary System. Topics of published reports vary substantially and may include descriptions of educational programs, discussions on resource management issues, and results of scientific research and monitoring projects. The series facilitates integration of natural sciences, socioeconomic and cultural sciences, education, and policy development to accomplish the diverse needs of NOAA's resource protection mandate. All publications are available on the [Office of National Marine Sanctuaries website](#).



Report Availability

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Executive Summary

This study investigated the knowledge, attitudes, and perceptions of saltwater recreational anglers that use Gray's Reef National Marine Sanctuary (GRNMS) and surrounding areas. It also provides information on sociodemographic characteristics, activity participation, and use of coastal and ocean waters off Georgia, both inside and outside GRNMS. The surveys collected data on informational sources about GRNMS, anglers' trust of those sources, familiarity with GRNMS rules and regulations, and attitudes about selected management strategies for coastal and ocean resources both inside and outside GRNMS. For anglers inside GRNMS, perceptions of resource conditions were also assessed. The results of this study were also compared with data collected in 2010.

The survey, conducted in 2020, involved 367 Georgia residents who engaged in saltwater recreational fishing during 2019 in Georgia's coastal and ocean waters. The findings revealed that, in general, recreational anglers were familiar with GRNMS and supportive of the protection of ocean and coastal resources in and around Georgia.

Key findings from the knowledge, attitudes, and perceptions survey included:

1. Recreational anglers in Georgia who responded to the survey were ethnically and racially diverse; however, minorities were underrepresented as GRNMS users.
2. Recreational anglers were highly involved in leisure activities in ocean and coastal areas both in and around Georgia and inside GRNMS. These included scuba diving, sailing, and whale watching. Additionally:
 - Anglers engaged in some activities (such as beach combing, kayaking, watercraft) that do not take place in GRNMS.
 - The most influential factors considered when deciding to go to GRNMS were sea conditions, weather, prevalence of fish species, and seasonal patterns.
3. GRNMS is extremely important to recreational anglers and provides other socioeconomic benefits to the local economies.
 - Seafood availability, support for recreational activities, and education and research were the top ecosystem services valued by recreational anglers.
 - Compared to 2010, the same ecosystem services remained important in 2020.
4. About 55.6% of the anglers surveyed in the GRNMS were somewhat familiar with the sanctuary's rules and regulations, and 24.4% were very familiar.
 - Nearly 80% of anglers who did not use GRNMS were not familiar with GRNMS regulations.
5. The most trusted information sources for recreational anglers in Georgia were the Georgia Department of Natural Resources (GADNR), National Oceanic and Atmospheric Administration (NOAA), and GRNMS websites.
 - Recreational anglers' preferred ways to receive information included websites, email listservs, and direct email from GRNMS staff.
6. Overall, recreational anglers perceived that the condition of resources in GRNMS improved since designation of the sanctuary in 1981. Specifically, bottom fish populations, live-bottom habitat, and diversity of fish were the top qualities perceived to be getting better.

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7. Pollution, coral health, and marine animal health were the top concerns of recreational anglers inside GRNMS.
 - Pollution, habitat loss from development, and marine animals were the top concerns of recreational anglers outside GRNMS.
 - Recreational anglers had many concerns related to GRNMS; 12 of the top 15 concerns were significantly different between anglers inside (users) and anglers outside (non-users) GRNMS.
 8. Recreational anglers were supportive of the protection of ocean and coastal resources in and around Georgia.
 - The level of support by anglers was significantly different compared to 2010; in 2020, anglers strongly supported the protection of ocean and coastal resources in and around Georgia, while in 2010, anglers were more neutral.

Key Words

saltwater recreational angler, Gray's Reef National Marine Sanctuary, ocean health, ecosystem services, sociodemographics, fishing

Chapter 1: Introduction

Gray's Reef National Marine Sanctuary (GRNMS) is one of the largest nearshore "live-bottom" reefs in the southeastern United States (GRNMS, 2023). The sanctuary is located off the coast of Georgia, 19 miles east of Sapelo Island (Figure 1). It encompasses 22 square miles of live-bottom and sandy bottom habitat, as well as the overlying water column. The sanctuary is popular with recreational anglers, boaters, and more experienced divers.

Knowledge, attitudes, and perceptions studies tell us what specific groups of individuals know and feel about certain topics, as well as their associated actions. Knowledge, attitudes, and perceptions studies can be used to gauge a community's public knowledge and perception of, for example, marine habitat and ecosystem services, as well as the public's current actions and willingness to support these outcomes. Thus, the knowledge, attitudes, and perceptions framework is a popular for conservation and management studies.

Knowledge, attitudes, and perceptions studies have been applied to ocean and coastal areas, including marine protected areas (MPAs) and marine reserves globally and in the United States. A literature review is summarized in Appendix A. As a brief example, a study in the Florida Keys showed that different stakeholder groups (anglers, dive operators, and environmental groups) had different perceptions of engagement in the MPA designation process, specifically for a "harvest refugia" or fishing reserve approach (Suman et al., 1999). Anglers felt "highly alienated" from designation and indicated negative attitudes, such as "anger and powerlessness," and felt intentionally excluded from the MPA process.

Additionally, Silva and Lopes (2015) reported that perceptions of ocean conservation and management changes differed by age and fishing method among anglers. Younger anglers and those "who use selective fishing gear"¹ were less likely to have favorable perceptions of marine conservation, but younger anglers did tend to indicate a higher level of support for MPA designation. Anglers who were nonselective in gear choice and those who engaged in part-time work tended to be more adaptable to changes in ocean management.s

In 2010, a baseline study of recreational anglers at GRNMS was conducted to assess knowledge, attitudes, and perceptions about sanctuary management strategies and regulations (Leeworthy, 2013). The study provided information on sociodemographic profiles, activity participation, and use of coastal and ocean waters off the Georgia coast both inside and outside GRNMS. Both users and non-users of sanctuaries may change their attitudes over time as they experience effects of regulations, such as implementation of no-take marine reserves or research only areas. Thus, this survey of GRNMS users and non-users was replicated approximately 10 years later in

¹ Fishers may use selective fishing gear to be more effective in gathering target species without directly harming other species. In contrast, fishers may use nonselective gears that are not discriminant among target species (e.g., trawl net), which may cause more environmental impacts than selective fishing gears (Silva & Lopes, 2015).

2020 to understand how knowledge, attitudes, and perceptions may or may not have changed over time.

One decade after the initial study, West Virginia University used a NOAA survey that was approved by the Office of Management and Budget to assess knowledge, attitudes, and perceptions among Georgia anglers. The purpose of this survey was to help GRNMS managers understand how the public feels toward ocean and coastal resources and management off the Georgia coast and in the sanctuary. The results will support GRNMS management and inform partners.

This study targeted recreational anglers, with a focus on participation in various activities and the factors that determined the choice to use GRNMS. Results include sources of information utilized by users, level of trust in the sources of information used, perceptions of resource conditions in GRNMS, concerns about the health of coastal and ocean areas (inside and outside GRNMS), support for protection of coastal and ocean resources off the Georgia coast (inside and outside GRNMS), ways users value ocean and coastal resources/the marine environment, actions that users would take to ensure the sustainability of coastal and ocean resources, and support for selected policy/management strategies for coastal and ocean resources off the Georgia coast.

The study aims to determine the knowledge, attitudes, and perceptions of saltwater recreational anglers about ocean and coastal resources protection and management, the status and condition of resources and pressures in GRNMS, and marine-based uses of ocean and coastal areas in and around the sanctuary.

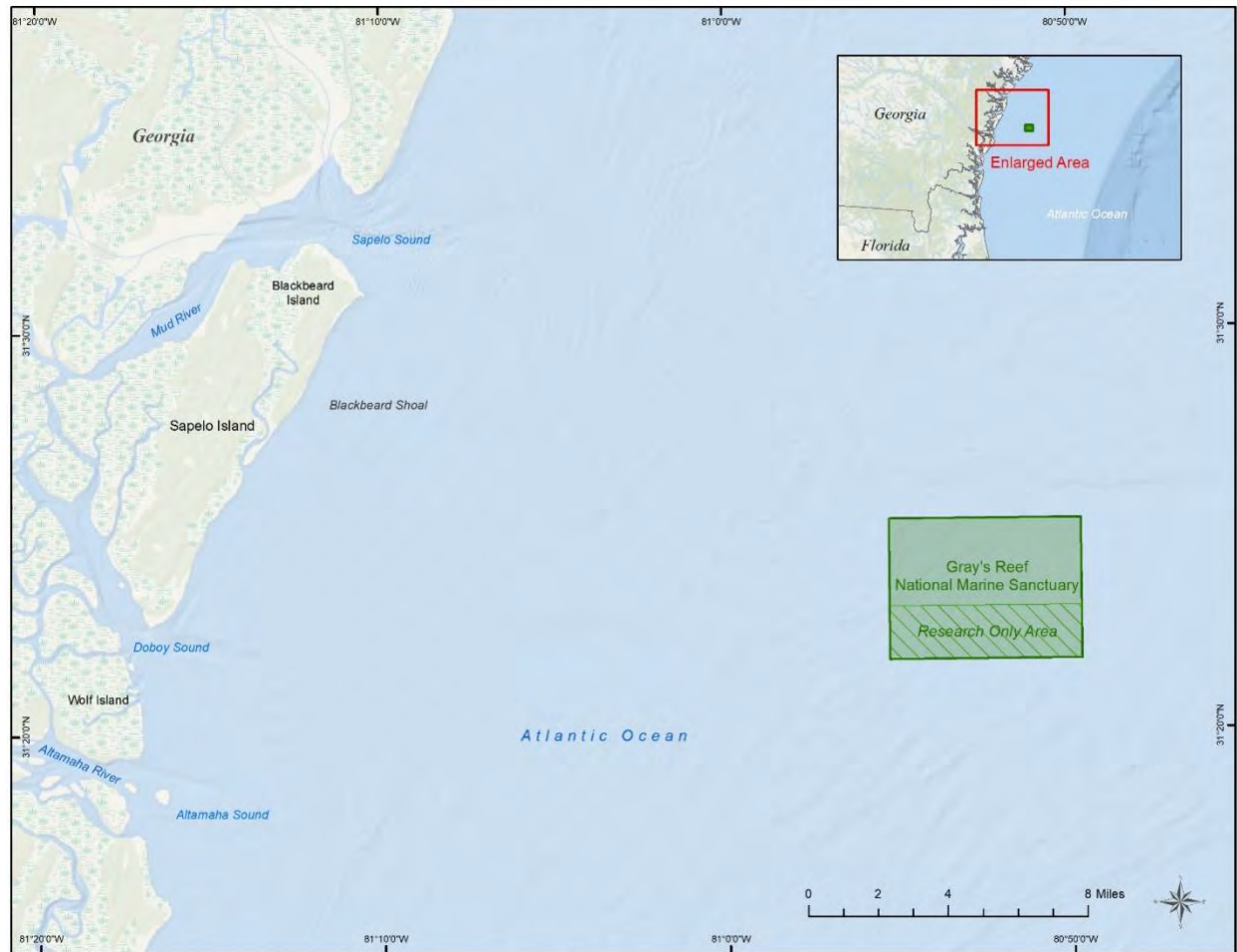


Figure 1. Location of GRNMS. Image: Tony Reyer/NOAA

Chapter 2: Data and Methods

In August–November 2020, West Virginia University researchers conducted an online survey of saltwater recreational anglers who use GRNMS (users) and those who fish outside GRNMS (non-users). The recreational anglers surveyed were those who held a saltwater information program permit in the state of Georgia. This is free permit that allows Georgia fishing license holders to fish in saltwater. Therefore, people surveyed may have lived in other states (South Carolina, Florida, etc.) but held a Georgia saltwater information program permit. GADNR (2023) provides additional information on the permit. Contact information for permit holders was obtained by West Virginia University through the GADNR angler license database.

The Dillman email sampling method (Dillman, 2000; Dillman et al., 2014) was used. The survey instrument was sent out, and if a response was not returned within two weeks, an email reminder was sent. If a completed survey was not received after an additional two weeks, a full survey package was sent by email. Permit holders were surveyed in 2020 but were asked about their activity levels and perceptions of the last “normal” year before the onset of the COVID-19 pandemic (in 2020). The data and results thus represent levels of activity and perceptions in 2019.

Separate surveys of users and non-users of GRNMS were conducted. The survey instrument was structured with seven sections and the following information was collected from each individual (Appendix B):

1. Socioeconomic and demographic information
2. Human uses in GRNMS and ocean and coastal areas in Georgia
3. Primary recreation activity
4. Value of ecosystem services
5. Sources of information on GRNMS and ocean and coastal resources
6. Perceptions on the status and condition of resources in GRNMS
7. Concern and support for ocean health and costal resources

Out of the 624 respondents, 367 completed the survey for a total response sample size of 367 (58.8% response rate). A screening question determined whether the respondent was a user or non-user of GRNMS. The respondent was asked if they visited or used GRNMS in 2019. Forty-nine respondents (13.3%) said yes, they visited GRNMS in 2019. This subset of respondents was considered GRNMS users. The majority, 318 respondents (86.7%), indicated that they did not visit the sanctuary in 2019. This group was considered GRNMS non-users.

Throughout this report, recreational anglers inside GRNMS refer to users; recreational anglers outside GRNMS refer to non-users.

Statistical Tests

T-tests were used to compare user and non-user responses. For responses that relied on 5-point Likert scales or continuous variables such as person-days or age of respondents, t-tests compared sample means. Statistical tests were conducted at a significance level of $\alpha = 0.05$.

The responses from each Likert scale survey question were summarized. The highest two responses of the scale were combined to create a single percentage, representing the strongest sentiment about the statement (also referred to as a satisfaction measure). The same approach was used to summarize the lowest two responses, which represent the weakest sentiment about the statement.

Responses from the 2020 survey of Georgia saltwater recreational fishers were compared to those from 2010. In the 2010 study (Leeworthy, 2013), users were identified based on GADNR records of vessels that were randomly boarded or observed within GRNMS. The name and address of the owner/operator was obtained by GADNR staff for boarded vessels. A list of 249 names and addresses and/or boat registration numbers was obtained. Publicly available boat registration data were used to obtain names and addresses corresponding to vessels observed in the sanctuary. The list of names and addresses corresponding to vessels boarded or observed in GRNMS was used to distribute the 2010 survey. There were 249 names and addresses, of which 94 were undeliverable, resulting in 155 net eligible respondents. Of these respondents, 79 (50.97%) responded to the survey.

Chapter 3: Sociodemographic Characteristics

Sociodemographic characteristics generated by the survey included gender, age, income, education, and racial distribution. The majority of anglers inside GRNMS (users) were male (81.0%) and White (95.0%). The majority of anglers outside GRNMS (non-users) were also male (84.0%) and White (90.3%; Figure 2, Figure 3).

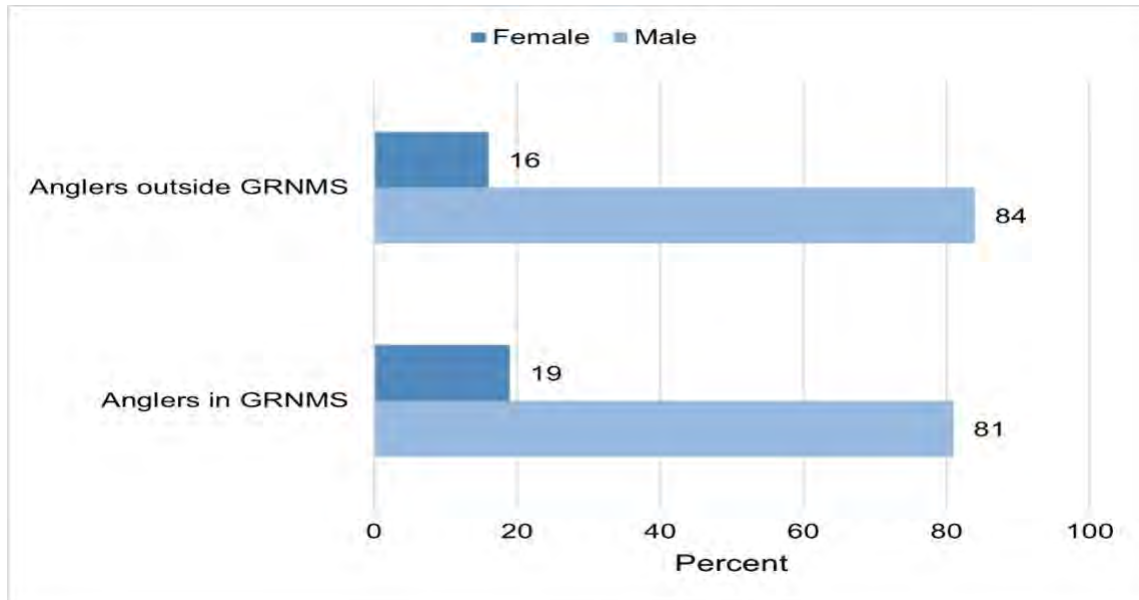


Figure 2. Gender distribution of saltwater recreational anglers surveyed.

Of the anglers inside GRNMS (users) surveyed, 5.0% of respondents were Black or African American and 95.0% were white or Caucasian (Figure 3). Only 4.7% of users identified as Hispanic or Latino (Table 1). For anglers outside GRNMS (non-users), 4.0% were Black or African American, 2.5% were American Indian or Alaska Native, 2.5% were Asian, and 0.6% were Native Hawaiian or Pacific Islander, and the remaining 90.3% were White. Only 1.6% of non-users identified as Hispanic or Latino.

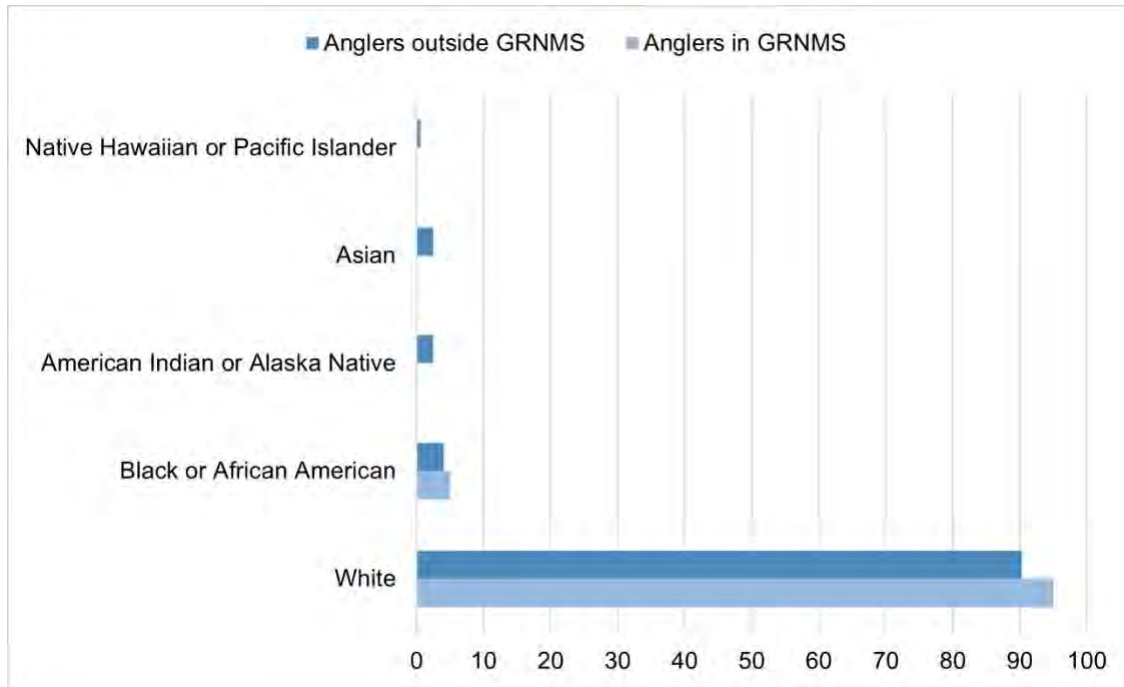


Figure 3. Racial distribution of saltwater recreational anglers surveyed.

Table 1. Ethnicity of saltwater recreational anglers surveyed.

Are you Hispanic or Latino?	Anglers inside GRNMS	Anglers outside GRNMS
Yes	4.7%	1.6%
No	95.3%	98.4%

The average age of anglers inside GRNMS (users) was 57 years, with a median birth year of 1964. The average age of anglers outside GRNMS (non-users) was 58 years, with a mean year of birth of 1963.

A majority (86%) of anglers inside GRNMS (users) surveyed had at least “some college” education or more (Figure 4), and nearly one-third (31.0%) had annual household incomes of \$150,000 or more (Figure 5). For anglers outside GRNMS (non-users), a majority (87%) had at least “some college” education or more, and roughly a quarter (25.5%) had annual household incomes of \$150,000 or more.

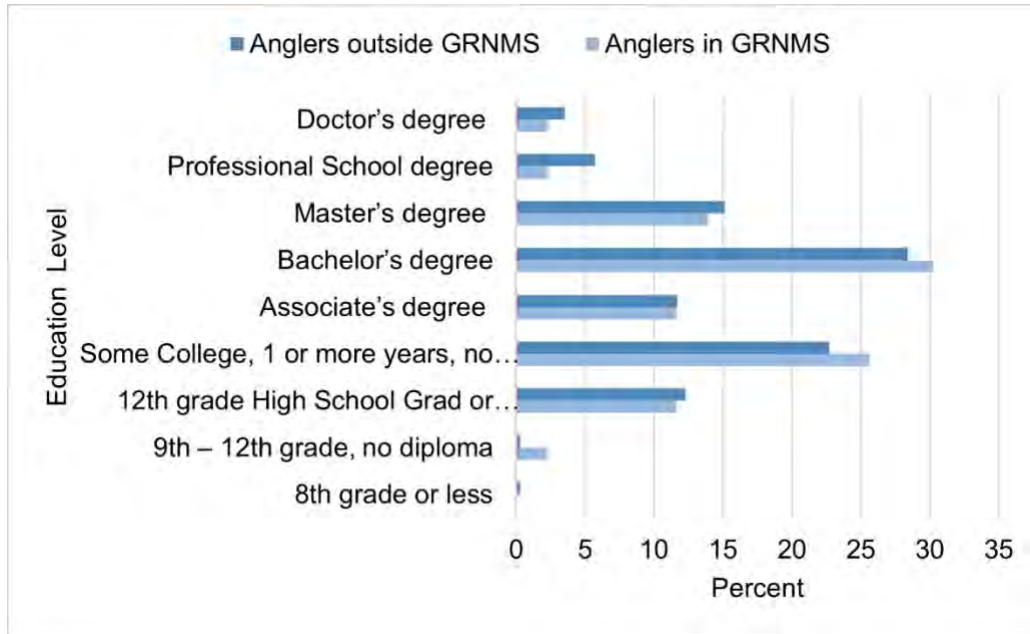


Figure 4. Education level of saltwater recreational anglers surveyed.

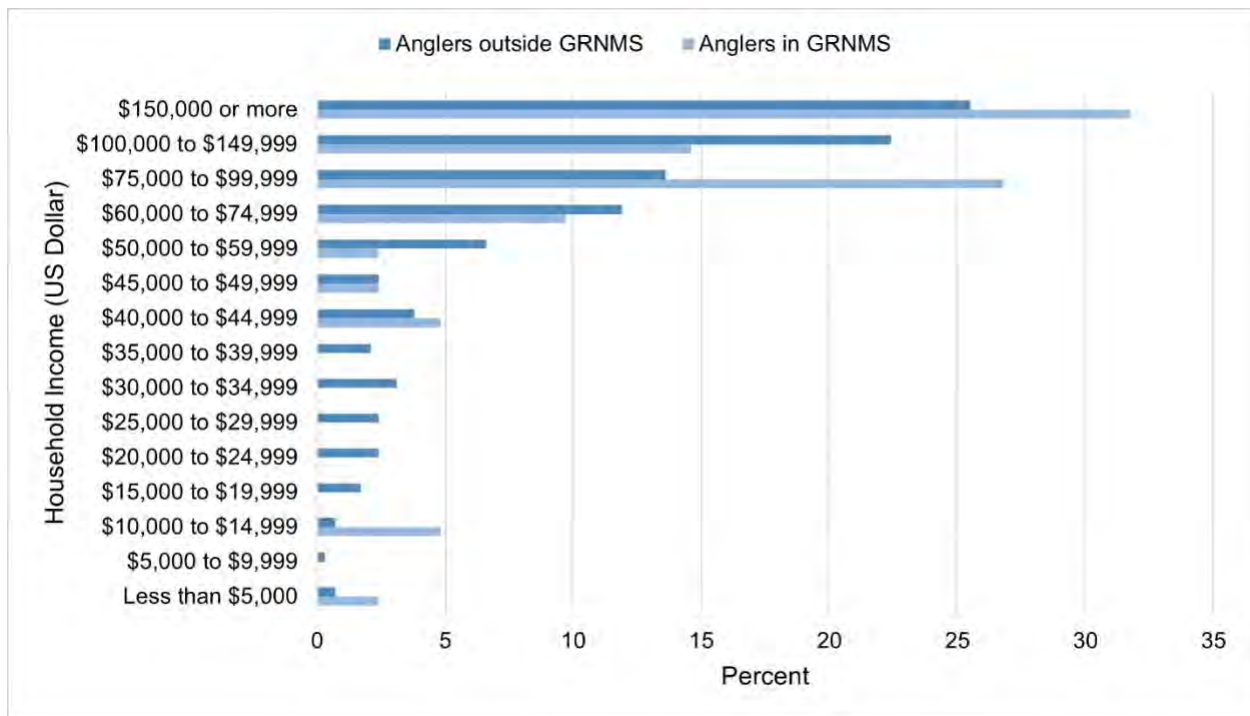


Figure 5. Household income of recreational anglers surveyed.

Most respondents lived in households with no children (Figure 6). For anglers inside GRNMS (users), the mean number of people age 18 or older living in the households was 2.0 and the mean number of people under age 18 living in households was 1.0. For anglers outside GRNMS (non-users), the mean number of people age 18 or older living in households was 2.2 and the mean number of people under age 18 living in households was 1.0.

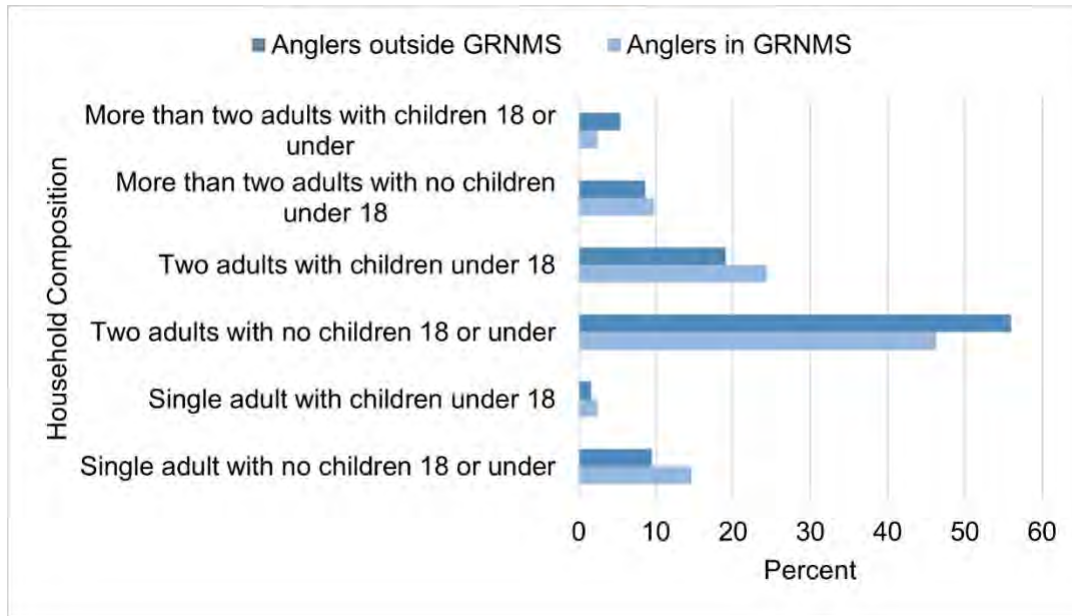


Figure 6. Household composition of saltwater recreational anglers surveyed.

Anglers inside GRNMS (users) had higher rates of boat ownership compared to anglers outside GRNMS (non-users) (Figure 7). Users, on average, also had larger boats. Over three-quarters of users (78.0%) owned a boat with an average length of 23.7 feet. Over half of non-users (53.9%) owned a boat with an average length of 18.4 feet.

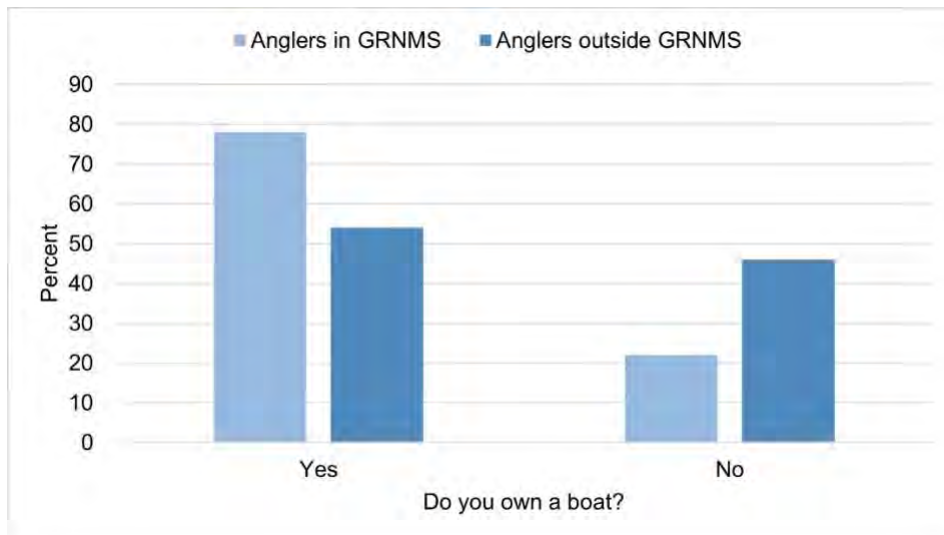


Figure 7. Boat ownership among saltwater recreational anglers surveyed.

Anglers inside GRNMS (users) and anglers outside GRNMS (non-users) were members of fishing groups, environmental clubs, or marine-related organizations. When anglers inside GRNMS were asked if they are part of any group or club in the area, almost half (47%) were members of a fishing group or club/organization (Figure 8). Over one-third (41%) of anglers outside GRNMS were members of a fishing group or club/organization.

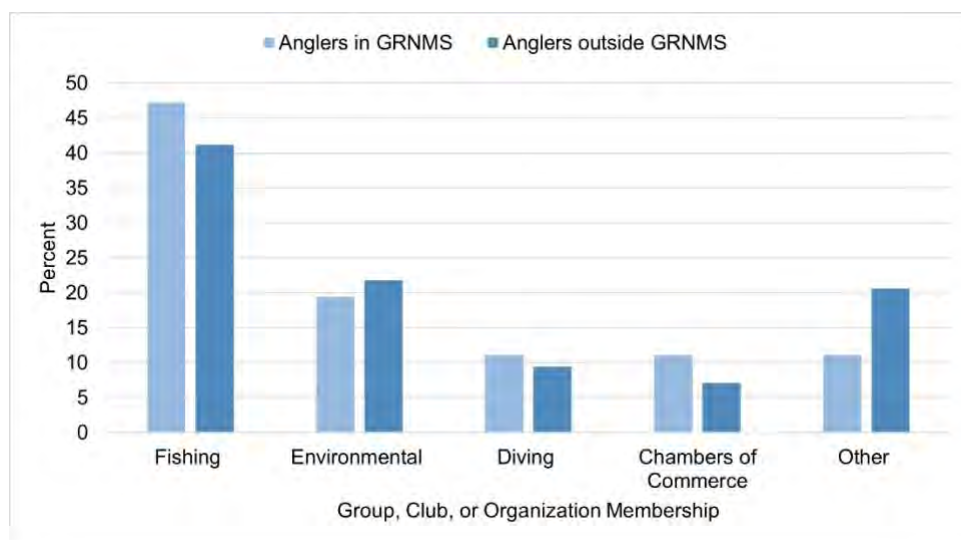


Figure 8. Organization membership of saltwater recreational anglers surveyed.

When anglers inside GRNMS (users) were asked about their employment status, 68% reported working a full-time job (Figure 9). Among anglers outside GRNMS (non-users), 56% reported working a full-time job.

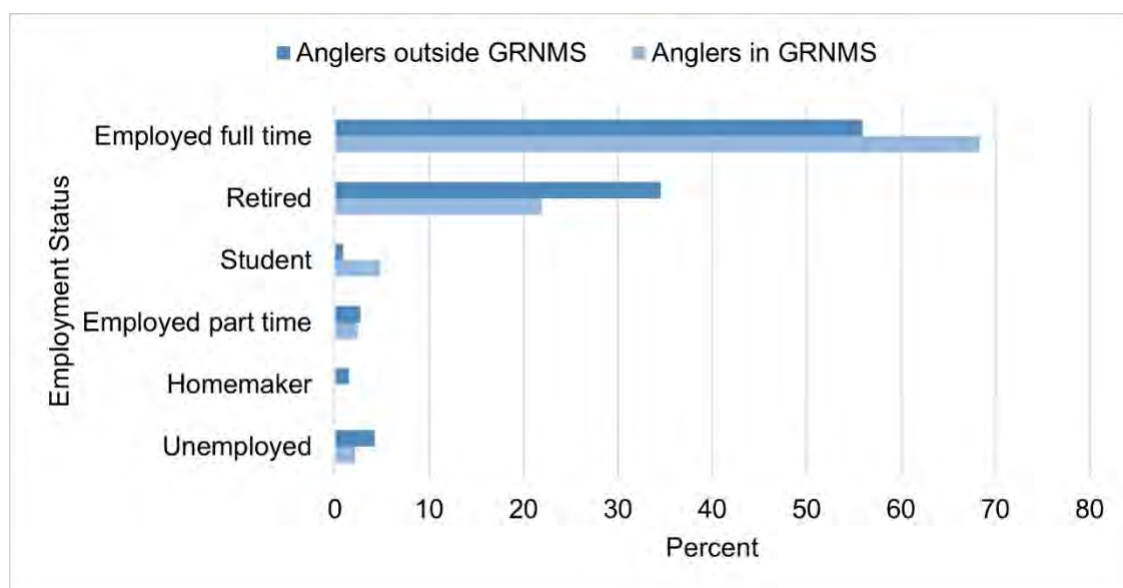


Figure 9. Employment status of saltwater recreational anglers surveyed.

Chapter 4: Results

Recreational Activities

Recreational Anglers Inside GRNMS (Users)

Anglers inside GRNMS (users) reported activities within Georgia and federal waters off the coast of Georgia (outside GRNMS). In a typical year, respondents reported spending 66.7% of their ocean recreation time “scuba diving (taking things such as coral for souvenir)” outside GRNMS. Inside GRNMS, a little more than a half (54.5%) of all users reported “scuba diving (don’t take anything—scuba divers don’t touch anything underwater and don’t take anything with them that they shouldn’t)” as their primary activity (Figure 10).

Spearfishing with powerheads is not a main/primary recreational activity. Although spearfishing has been prohibited in GRNMS since March 2010, seven individuals reported spearfishing in Georgia and inside GRNMS. Although this could indicate a lack of knowledge of or compliance with GRNMS regulations, it may also result from respondents believing that they were in GRNMS when they were not.

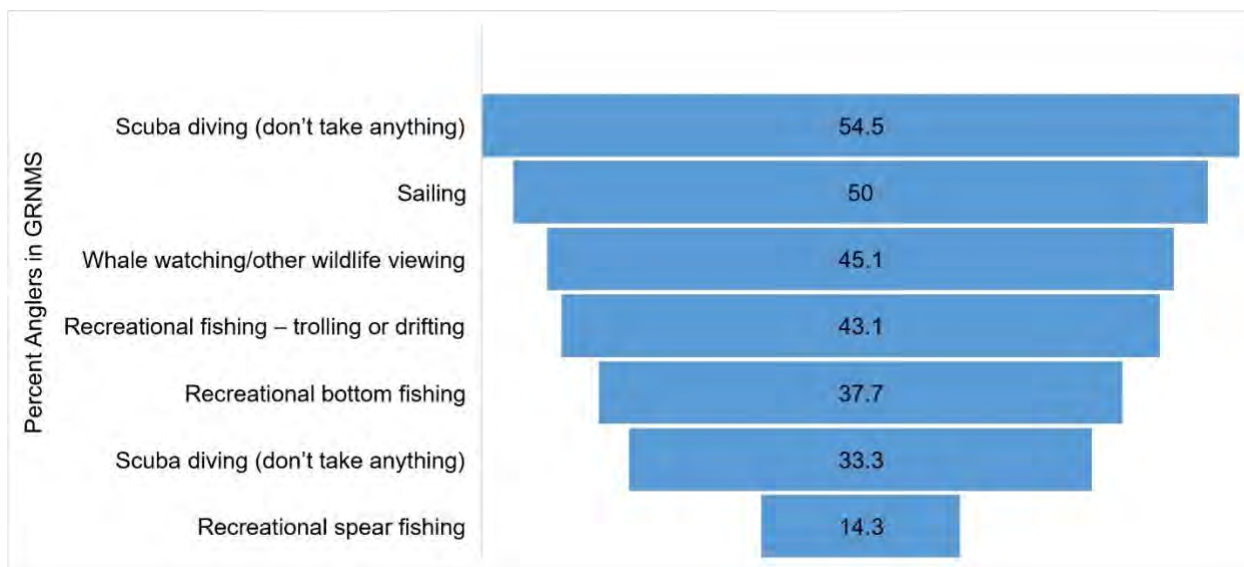


Figure 10. Percent of anglers inside GRNMS (n = 49) that engaged in selected recreational activities.

Anglers inside GRNMS (users) were asked to select activities that they may do in coastal Georgia and other areas but did not take place in GRNMS. Beach activities were the item that the respondents selected the most (97.6%; Figure 11).

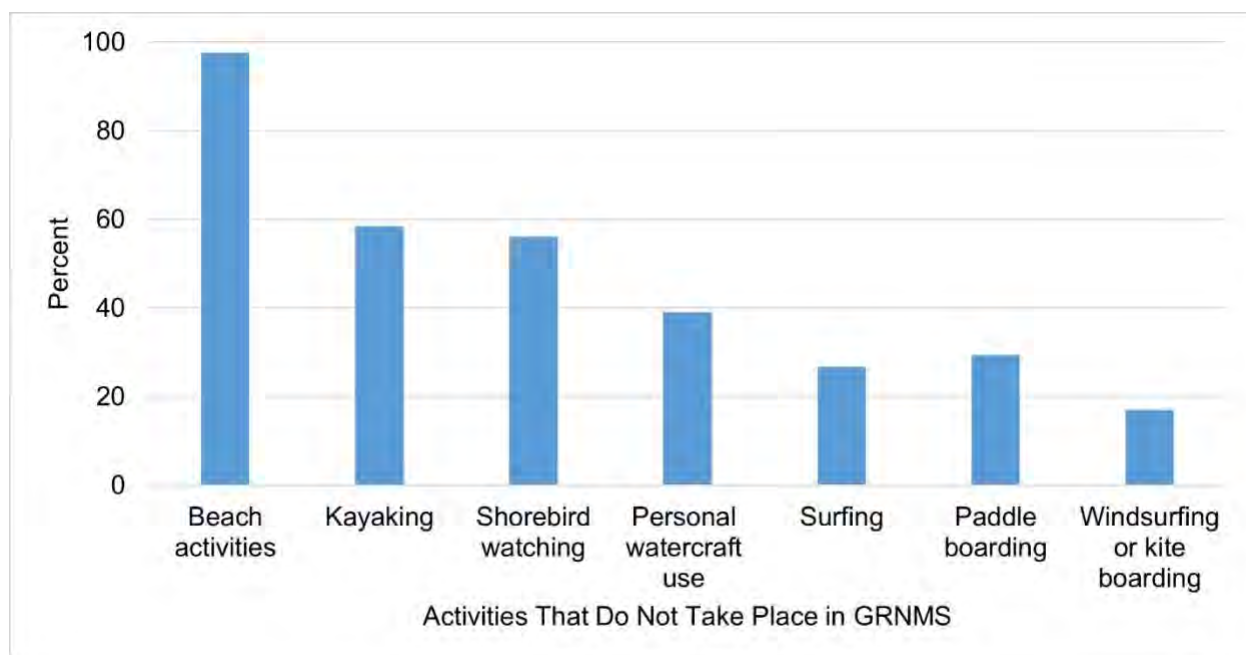


Figure 11. Activities in which recreational anglers engage that do not occur in GRNMS.

Users reported engaging in bottom fishing for an average of 26.6 days in Georgia, 13.4 of which were inside GRNMS (Table 2). Recreational fishing (trolling/drifted) occurred for an average of 15.7 days in Georgia and 4.5 days in GRNMS.

Table 2. Recreational activities of anglers inside GRNMS and days per activity.

Recreational Activity	Days in Georgia (mean)	Days inside GRNMS (mean)
Recreational bottom fishing	26.6	13.4
Recreational fishing—trolling or drifting in mid or top water	15.7	4.5
Whale watching or other wildlife viewing activities	2.9	0.5
Kayaking	2.8	0.1
Scuba diving	1.8	1.4
Paddle boarding	1.2	0.0
Recreational spearfishing	0.8	0.1

Respondents were asked about the type of boat they used to engage in recreational activities in GRNMS in 2019. Respondents engaged in recreational bottom fishing with a private boat for an average of about 19 days (Table 3). When users recreated in private boats, there were usually three people in their group (mean = 3.2).

Respondents were asked if they participated in fishing tournaments in GRNMS. The majority of respondents (86.4%) did not participate in fishing tournaments in GRNMS.

Table 3. Number of days spent engaging in recreational activities by boat type among anglers inside GRNMS.

Recreational Activities	Days—Private Boat (mean)	Days—Charter Boat (mean)
Recreational bottom fishing	18.8	0.5
Recreational fishing—trolling or drifting in mid or top water	7.9	0.8
Scuba diving (taking things)	2.3	0.1
Whale watching or other wildlife viewing activities	2.3	0.1
Recreational spearfishing	0.5	0

The top five factors that influenced a fisher's decision to go to GRNMS for recreation were sea conditions (75.0%), weather (69.0%), fish species preference (65.0), seasonal patterns (60.0%), and distance to GRNMS (60.0%; Table 4). "Better diving for things to see" did not influence the decision to go to GRNMS for nearly three-quarters (71.8%) of respondents. This is most likely because the sample was composed of Georgia saltwater fishing permit holders.

Table 4. Users' responses to whether they considered the following set of factors in their decision to go to GRNMS.

Factors	Yes (%)	Somewhat (%)	Not At All (%)
Sea conditions	75.0	15.0	10.0
Weather	69.0	23.8	7.1
Fish species preference	65.0	27.5	7.5
Seasonal patterns	60.0	32.5	7.5
Distance to GRNMS	60.0	15.0	25.0
Boat captain's choice	55.6	11.1	33.3
Better fishing	53.6	31.7	14.6
Time of day	27.5	50.0	22.5
Word of mouth/radio talk	25.7	37.1	37.1
Better diving for things to see	12.5	15.6	71.8

Respondents were asked, "Of the recreation activities listed, which one of these is your main or primary activity in the ocean and coastal areas of Georgia, including GRNMS?" Nearly one-third of users (31.0%) reported beach activities as their primary activity in the ocean and coastal areas of Georgia including GRNMS (Figure 12). Recreational fishing—trolling or drifting in mid or top water (33.3%) and recreational bottom fishing (26.1%) were also top selections among GRNMS users.

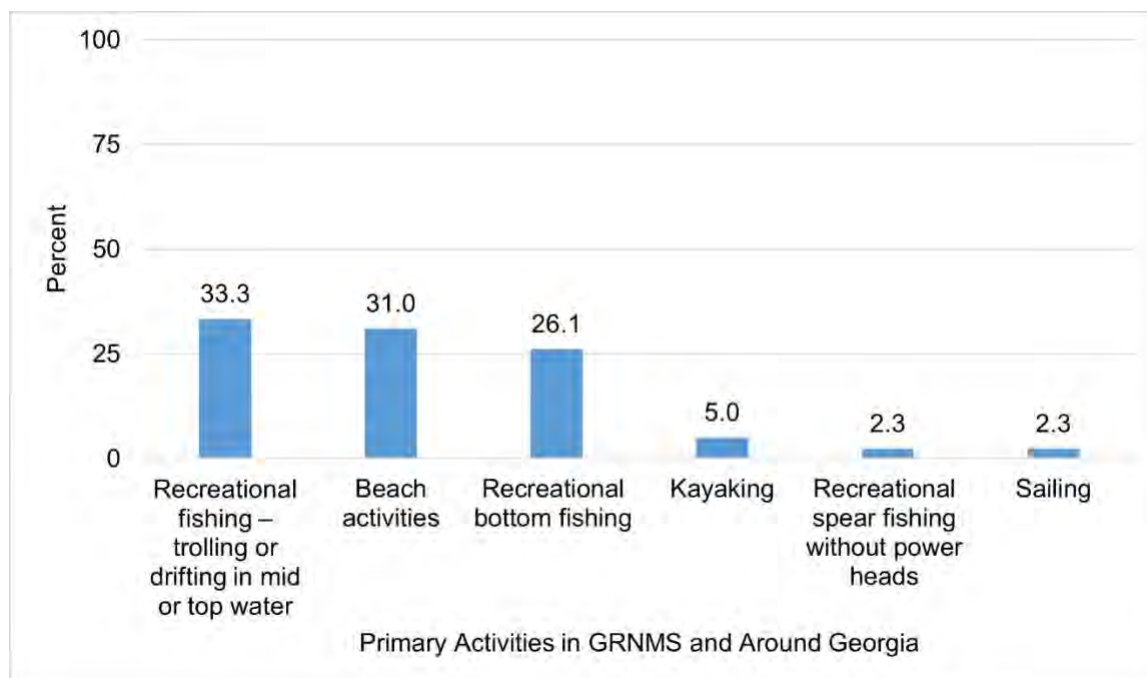


Figure 12. Recreational anglers' primary activities in GRNMS and waters off Georgia.

Slightly more than half of users (52.3%) described themselves as comfortable with their primary activity. These users had a good understanding of what they can do and how to do it. They are considered knowledgeable experts in their primary activity and encourage, teach, and enhance opportunities for others who are interested in the activity. About 38.1% had moderate specialization and were becoming more familiar and comfortable with the activity. Less than 10% had low specialization with some understanding of the activity and were still in the process of learning about the sport. Only 2.3% were not specialized and reported having little understanding of the activity and often being unsure about how to do certain things.

Slightly more than half of users (52.3%) reported having close relationships with others who practice the same activity. Their friendships often revolve around the activity. Close to 30% described their relationships with others who do the same activity as familiarity. Less than 15% of respondents had very limited relationships (knowing others by sight and talking sometimes, but not knowing their names). A small proportion of respondents (4.7%) did not have any established relationships with other people who engage in similar activities.

Users were asked about their commitment to their activity of choice, and 40.4% stated that it was very strong, and that they were totally committed to the activity. Further, they stated that they would encourage others to participate in the sport and seek to ensure the activity continues in the future. More than a third (35.7%) of the recreational anglers had a fairly strong commitment and will likely continue the activity for a long time. About 21.4% were moderately committed and will continue the activity as it is entertaining and provides the benefits they want. The remaining 2.3% had very little connection to the activity and may not participate in the sport in the future.

The top three sources from which GRNMS users gathered information about their primary recreation activity were (1) talking with others who participate in the activity, (2) magazines, and

(3) government agency publications (Table 5). Over one-third of users (37.2%) reported talking with others who participate in the activity for current information about their primary activity. The information sources that were used least were radio, internet, and social media.

Table 5. Information sources about primary recreation activity and level of use by GRNMS users.

Information Source	A Lot of Use (5)	Moderate Use (4)	A Little Use (3)	Almost No Use (2)	No Use (1)	Mean
Talking with others who participate in the activity	37.2%	34.9%	16.2%	7.0%	4.6%	3.9
Magazines	12.5%	12.5%	20.0%	10.0%	45.0%	3.9
Government agency publications	14.6%	21.9%	36.6%	7.3%	19.5%	3.0
Conservation organization publications	2.5%	17.5%	30.0%	22.5%	27.5%	2.4
Newspapers	0.0%	19.5%	24.3%	14.6%	41.4%	2.2
Diving shops/companies	2.5%	17.5%	20.0%	22.5%	37.5%	2.1
Club meetings/newsletters	2.5%	5.0%	2.5%	25.0%	42.5%	2.0
Television	5.0%	7.5%	15.0%	22.5%	50.0%	1.9
Radio	0.0%	2.5%	15.4%	23.1%	59.0%	1.5
Internet	2.5%	10.0%	7.5%	10.0%	70.0%	1.5
Social media	0.0%	2.5%	12.8%	20.5%	64.1%	1.5

The top three reasons that users of GRNMS engaged in their primary activity were for relaxation, to experience natural surroundings, and to be outdoors (Table 6). These three reasons were rated as extremely/very important.

Table 6. Users of GRNMS reasons for engaging in primary recreational activities.

Reason for Primary Recreational Activity	Extremely Important (5)	Very Important (4)	Moderately Important (3)	Slightly Important (2)	Not at All Important (1)	Mean
For relaxation	55.8%	41.9%	2.3%	0.0%	0.0%	4.5
To experience natural surroundings	67.4%	26.0%	4.6%	2.0%	0.0%	4.5
To be outdoors	62.8%	25.6%	9.3%	2.3%	0.0%	4.4
To be close to the water	58.1%	27.9%	11.6%	2.3%	0.0%	4.3
For family recreation	50.0%	31.8%	11.4%	0.0%	6.8%	4.1
To experience new and different things	44.2%	34.9%	13.9%	0.7%	0.0%	4.1
To be with friends	45.4%	29.5%	20.6%	4.5%	0.0%	4.1
To get away from the demands of other people	48.8%	27.9%	9.3%	4.6%	9.3%	4.0
To get away from the regular routine	48.8%	27.9%	11.6%	7.0%	4.6%	4.0
To experience adventure and excitement	48.8%	25.8%	11.5%	11.6%	2.3%	4.0
To develop my skills	30.2%	27.9%	25.5%	9.3%	7.0%	3.6
To catch food to eat	32.0%	16.0%	20.4%	18.0%	14.0%	3.2

Recreational Anglers Outside GRNMS (Non-users)

Several questions were asked to understand the activities in which non-users of GRNMS engage. Non-users were more likely to spend their time doing beach activities (75.7%), recreational bottom fishing (68.2%), and recreational fishing using troll/drift (56.3%; Figure 13). Non-users were less likely to participate in windsurfing or kiteboarding in and around Georgia. Other recreational activities were reported by 13.2% of the anglers surveyed. These other activities included surfing, scuba diving (taking things), windsurfing, and kiteboarding.

For recreational anglers outside GRNMS (non-users), 5 and 11 individuals reported spearfishing with powerheads and without powerheads, respectively.

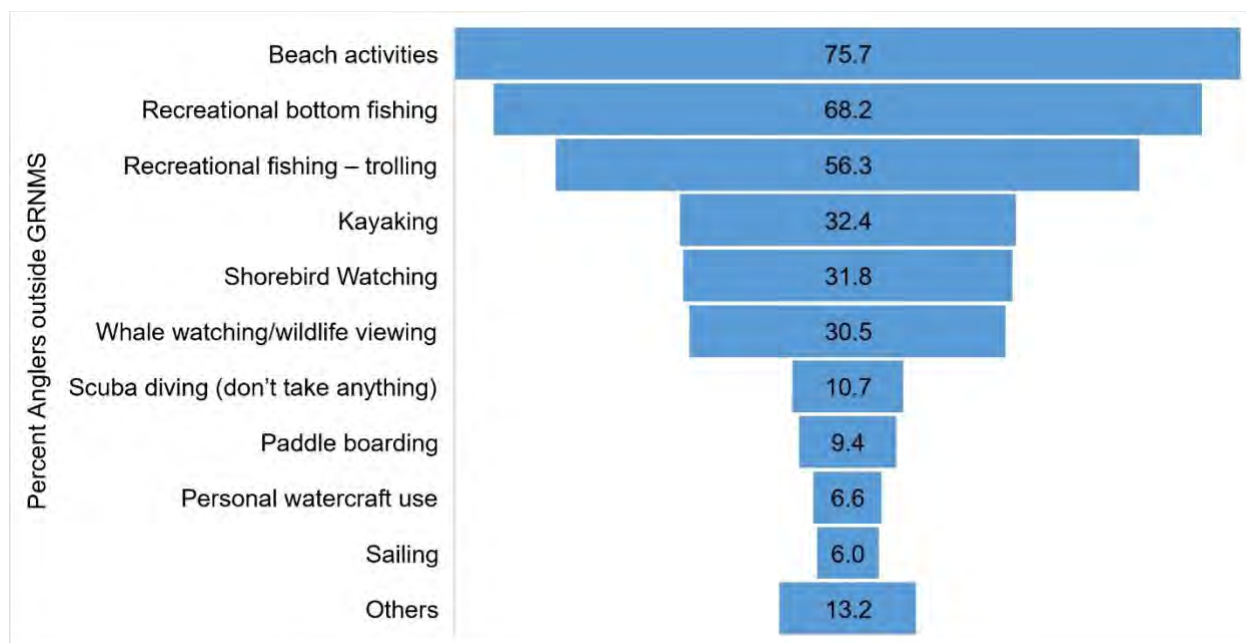


Figure 13. Percent of anglers outside GRNMS (non-users) that engaged in selected recreational activities (n = 318).

Non-users reported spending an average of seven days bottom fishing (mean = 6.8) in Georgia in 2019 (Table 7). Other activities that involved one day annually are scuba diving (don't take anything) and scuba diving (taking things).

Table 7. Number of days engaged in recreational activities outside GRNMS.

Activities	Days Outside GRNMS (mean)
Recreational bottom fishing	6.8
Recreational fishing—trolling or drifting in mid or top water	6.0
Kayaking	5.8
Whale watching or other wildlife viewing activities	3.7
Paddleboarding	1.5
Other	1.0

Important Ecosystem Services

Users were asked to rate ecosystem services provided by ocean and coastal resources in Georgia that they valued most and least. The top four highest-value ecosystem services for GRNMS users were support for recreation activities, support for scientific research, support for education, and seafood purchased at local stores/restaurants (Table 8). Supply of oil/gas and mineral resources were the lowest-value ecosystem services.

Table 8. Ecosystem services important to GRNMS users.

Ecosystem Services	Extremely High Value (5)	High Value (4)	Neither High nor Low Value (3)	Low Value (2)	No Value (1)	Mean
Support for recreation activities	37.2%	34.9%	20.9%	2.3%	4.6%	3.9
Seafood purchased at local stores and restaurants	30.2%	46.5%	16.3%	2.3%	4.6%	3.9
Support for education	34.1%	34.1%	22.7%	4.5%	4.5%	3.8
Support for scientific research	34.9%	30.2%	25.6%	4.6%	4.6%	3.7
Protection of resources even though I never intend to visit or directly use them	17.1%	31.7%	31.7%	9.8%	7.3%	3.3
Seafood purchased at non-local stores and restaurants	11.9%	16.7%	33.3%	19.0%	19.0%	2.9
Supply of alternative energy (wind, wave, tidal)	14.3%	14.3%	33.3%	23.8%	14.3%	2.8
Supply of pharmaceutical products through mining or harvest of resources	9.5%	14.3%	35.7%	23.8%	16.7%	2.8
Supply of oil and gas	7.1%	14.3%	26.2%	23.8%	28.6%	2.5
Supply of mineral resources through mining	7.1%	9.5%	30.9%	28.6%	23.8%	2.4

Non-users of GRNMS were also asked to rate services that they valued most and least. The highest-valued ecosystem services provided by ocean and coastal resources in Georgia were seafood purchased at local stores/restaurants, support for education, support for recreation activities, and support for scientific research (Table 9). Similar to GRNMS users, non-users valued supply of oil/gas and mineral resources lowest.

Table 9. Ecosystem services important to GRNMS non-users.

Ecosystem Services	Extremely High Value (5)	High Value (4)	Neither High nor Low Value (3)	Low Value (2)	No Value (1)	Mean
Seafood purchased at local stores and restaurants	48.6%	38.3%	8.9%	2.6%	1.6%	4.3
Support for education	42.6%	39.1%	15.4%	2.2%	0.6%	4.2
Support for recreation activities	42.1%	36.9%	17.5%	1.9%	1.6%	4.1
Support for scientific research	39.1%	35.9%	22.4%	1.9%	0.6%	4.1
Protection of resources even though I never intend to visit or directly use them	41.7%	33.7%	21.0%	2.3%	1.3%	4.1
Seafood purchased at non-local stores and restaurants	15.3%	26.3%	36.7%	14.9%	6.8%	3.3

Ecosystem Services	Extremely High Value (5)	High Value (4)	Neither High nor Low Value (3)	Low Value (2)	No Value (1)	Mean
Supply of alternative energy (wind, wave, tidal)	12.5%	29.8%	32.4%	16.7%	8.6%	3.2
Supply of pharmaceutical products through mining or harvest of resources	7.0%	23.4%	43.6%	17.3%	8.6%	3.0
Supply of oil and gas	7.1%	20.6%	36.7%	24.8%	10.6%	2.9
Supply of mineral resources through mining	6.1%	11.6%	42.3%	29.3%	10.6%	2.7

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Awareness of Sanctuary Regulations

About 55.6% of anglers inside GRNMS (users) surveyed were somewhat familiar with sanctuary regulations, and 24.4% were very familiar (Figure 14). In contrast, 78.3% of anglers outside GRNMS (non-users) were not familiar with sanctuary regulations.

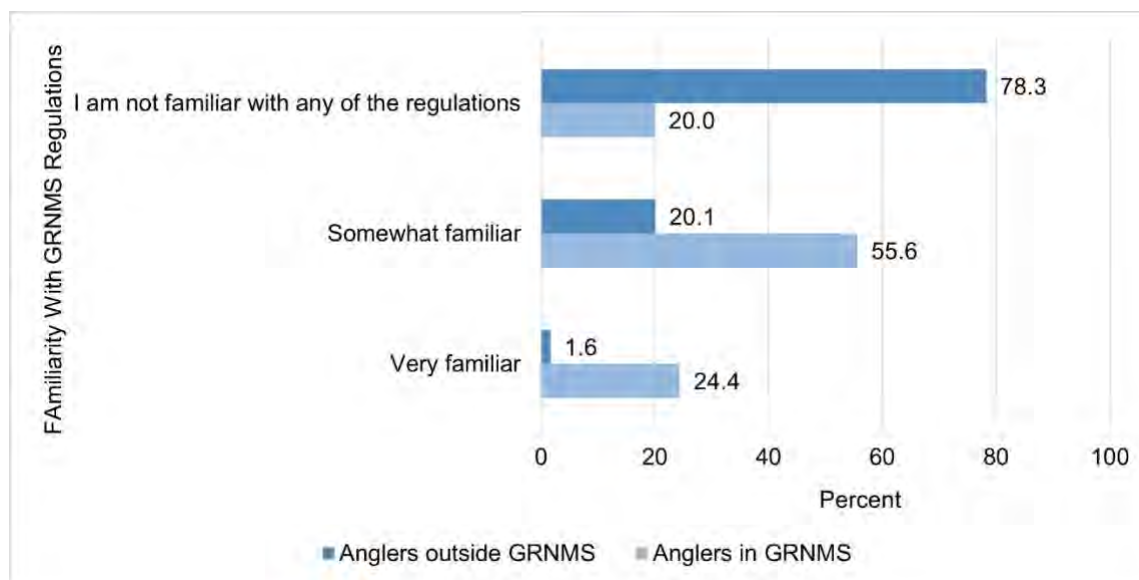


Figure 14. Familiarity with sanctuary regulations.

When asked, only 12% of all recreational anglers surveyed correctly responded that NOAA is the agency that manages national marine sanctuaries. Just 11% of respondents correctly stated that NOAA is the agency that sets policy/management for ocean areas/federal waters of Georgia. A greater proportion of recreational anglers surveyed (38%) responded that GADNR is the agency responsible for policy/management for coastal areas/state waters in Georgia. GADNR has statewide responsibilities for the management and conservation of Georgia's natural and cultural resources. The Coastal Resources Division has primary responsibility for managing Georgia's marshes, beaches, and marine fishery resources. The Coastal Resources Division administers permitting programs under the Coastal Marshlands Protection Act and Shore Protection Act; issues revocable licenses for use of state-owned water bottoms; monitors coastal

water quality; and manages shellfish harvest areas. The Coastal Resources Division conducts research; management and development activities associated with recreational and commercial fishery resources; represents Georgia on regional marine fishery boards and commissions; and builds boat ramps, artificial reefs, and fishing piers.

Information Sources

Respondents were asked what information sources they used and their level of trust in those information sources. GADNR was the most commonly trusted source among users (59.4%) and non-users (80.8%). Only 20.5% of users and 23.6% of non-users trusted internet sources. Other trusted sources of information were: NOAA Fisheries (users: 58.9%, non-users: 60.1%), the GRNMS website (users: 57.5%, non-users: 46.2%), and GRNMS staff (users: 53.8%, non-users: 43.4%).

Respondents were also asked to answer the level of trust in each information source. Almost one-third (28.5%) of users completely trusted GADNR and only 7.7% completely trusted internet sources (Table 10).

Users' trust of the GRNMS Twitter feed, GRNMS Facebook page, television, scuba diving magazines/newsletters, National Coalition for Marine Conservation, and South Atlantic Fishery Management Council was relatively low, while non-users were generally more neutral on these sources. Level of trust differed significantly between users and non-users for a number of information sources (Table 10).

Table 10. Trust of information sources among recreational anglers inside GRNMS (users) and outside GRNMS (non-users). The "Others" category included area anglers, events, local anglers, bait shop employees, charter anglers, anglers, Ducks Unlimited, and seafood business newsletters. **Bolded text** and asterisks (*) denote sources of information for which the mean level of trust was significantly different between users and non-users.

Sources of Information	Group	1 No Trust at All (%)	2 Very Little Trust (%)	3 Neutral (%)	4 Trust Very Much (%)	5 Completely Trust (%)	Mean
Gray's Reef National Marine Sanctuary Advisory Council	User	8.1	8.1	35.2	32.4	16.2	3.3
	Non-user	2.7	2.2	49.8	27.3	18.0	2.7
Gray's Reef National Marine Sanctuary staff	User	5.1	10.2	30.9	33.3	20.5	3.5
	Non-user	2.8	2.9	50.9	26.8	16.6	2.4
Gray's Reef National Marine Sanctuary website	User	5.0	7.5	30.0	37.5	20.0	3.6
	Non-user	2.7	2.7	48.4	28.3	17.9	3.5
Gray's Reef National Marine Sanctuary Foundation	User	2.9	1.7	52.9	22.7	19.8	3.3
	Non-user	2.9	1.7	52.9	22.7	19.8	3.5
NOAA's National Marine Fisheries Service	User	10.2	10.2	20.5	35.9	23.0	3.3
	Non-user	2.3	3.3	34.3	38.0	22.1	3.7
Atlantic States Marine Fisheries Commission*	User	12.1	21.2	30.3	18.1	18.1	3.5
	Non-user	2.7	1.1	51.4	31.1	13.7	3.0
South Atlantic Fishery Management Council*	User	26.4	11.7	29.6	20.6	11.7	3.1
	Non-user	3.3	4.4	49.6	29.4	13.3	3.4
Georgia Department of	User	0.0	11.9	28.7	30.9	28.5	2.7

Sources of Information	Group	1 No Trust at All (%)	2 Very Little Trust (%)	3 Neutral (%)	4 Trust Very Much (%)	5 Completely Trust (%)	Mean
Natural Resources*	Non-user	1.1	2.5	15.6	43.8	37.0	4.1
Georgia Sea Grant	User	12.9	9.6	51.7	12.9	12.9	3.8
	Non-user	3.7	3.0	60.4	20.1	12.8	3.3
Coastal Conservation Association of Georgia	User	11.4	8.6	37.1	22.9	20.0	3.0
	Non-user	4.3	4.8	47.3	25.3	18.3	3.5
Recreational Fishing Alliance	User	6.2	3.1	43.8	21.9	25.0	3.3
	Non-user	1.7	1.7	50.9	32.2	13.5	3.5
American Sportfishing Association	User	3.1	3.1	50.1	25.0	18.7	3.6
	Non-user	2.2	2.2	45.1	36.1	14.4	3.5
National Coalition for Marine Conservation	User	15.1	12.1	45.6	15.1	12.1	3.6
	Non-user	2.4	4.2	53.3	26.9	13.2	3.4
International Game and Fish Association	User	5.8	5.8	38.4	29.4	20.6	3.0
	Non-user	2.2	2.2	44.3	33.1	18.2	3.6
Southern Kingfish Association	User	5.9	5.9	41.2	23.5	23.5	3.6
	Non-user	1.9	0.6	65.3	22.1	10.1	3.4
Fishing magazines/newsletters	User	5.1	7.7	46.2	23.1	17.9	3.6
	Non-user	1.3	3.4	47.1	34.8	13.4	3.5
Scuba diving magazines/newsletters*	User	12.9	9.7	58.0	9.7	9.7	3.4
	Non-user	3.5	5.3	59.9	24.8	6.5	2.8
Newspapers	User	26.3	10.5	44.8	7.9	10.5	2.8
	Non-user	9.8	19.1	45.3	18.7	7.1	2.9
Radio	User	11.1	19.4	50.1	8.3	11.1	2.6
	Non-user	7.8	16.9	50.6	17.3	7.4	3.0
Television*	User	21.6	21.6	43.3	5.4	8.1	2.9
	Non-user	9.6	20.0	44.7	18.5	7.2	2.5
Internet	User	7.7	17.9	53.9	12.8	7.7	2.5
	Non-user	6.7	15.8	53.9	16.2	7.4	3.0
Gray's Reef National Marine Sanctuary Facebook page*	User	18.1	12.1	45.6	12.1	12.1	2.8
	Non-user	2.4	4.2	54.6	26.7	12.1	3.4
Gray's Reef National Marine Sanctuary Twitter feed*	User	20.7	17.2	48.4	3.4	10.3	2.5
	Non-user	5.7	5.7	63.6	17.9	7.1	3.1
Word of mouth	User	2.9	20.0	51.5	17.1	8.5	2.8
	Non-user	6.5	10.3	53.0	22.4	7.8	3.1
Other social media (YouTube, Flickr, Instagram, etc.)	User	7.1	14.2	57.4	14.2	7.1	3.0
	Non-user	6.8	1.7	72.9	11.8	6.8	3.2

Nearly one-third (32.1%) of users and over one-third (36.4%) of non-users reported that the sanctuary website was their preferred method for receiving information about GRNMS (Table 11). Telephone calls from staff was the least preferred method of receiving information about GRNMS.

Table 11. Preferred method of receiving information about GRNMS.

How would you like to receive information from Gray's Reef National Marine Sanctuary?	Anglers inside GRNMS (%)	Anglers outside GRNMS (%)
Website	32.1	36.4
Email listserv	21.4	20.6
Email from staff	18.3	18.3
Newsletter delivered by U.S. Postal Service	16.0	13.6
Social media (Twitter, Facebook, YouTube, etc.).	9.2	10.7
Telephone call from staff	2.3	0.4

Perceived Condition of Sanctuary Resources

Recreational anglers inside GRNMS (users) were asked about changes in the condition of resources and pressures since designation of the sanctuary in 1981. Overall, GRNMS users felt that the condition of sanctuary resources was getting somewhat better. Live bottom habitat, bottom fish populations, and diversity of fish were among GRNMS resources reported as getting somewhat better (Table 12).

At the time of the last GRNMS condition report (ONMS, 2008), sanctuary resources were generally in fair condition. None of the resources were considered to be in poor condition.

Table 12. User perceptions of resource condition in GRNMS.

GRNMS Resources	Getting a Lot Better (1)	Getting Somewhat Better (2)	No Change (3)	Getting Somewhat Worse (4)	Getting a Lot Worse (5)	Mean
Live bottom habitat	18.9%	16.2%	32.4%	29.7%	2.7%	2.7
Bottom fish populations	15.3%	25.6%	25.6%	20.5%	12.8%	2.8
Diversity (number of species) of fish	18.9%	16.2%	35.1%	18.9%	10.8%	2.8
Other bottom habitat	16.6%	13.9%	38.9%	16.7%	13.9%	2.8
Pelagic fish populations	10.0%	25.0%	35.0%	20.0%	10.0%	2.8
Abundance of other sea life	13.5%	18.9%	45.9%	10.8%	10.8%	2.8
Diversity (number of species) of other sea life	14.7%	14.7%	38.2%	23.5%	8.8%	3.0
Water quality	10.5%	15.8%	39.4%	26.3%	7.9%	3.0

In terms of pressures on GRNMS resources, ocean acidification (48.1%), invasive species (such as lionfish; 42.0%), and climate change (28.6%) were perceived to be “getting somewhat worse” by GRNMS users (Table 13). As of 2008, the status of non-indigenous species such as lionfish was rated good/fair with a worsening trend (ONMS, 2008).

Table 13. Perceptions of pressures on GRNMS.

Pressures	Getting a Lot Better (1)	Getting Somewhat Better (2)	No Change (3)	Getting Somewhat Worse (4)	Getting a Lot Worse (5)	Mean
Invasive species (such as lionfish)	3.0%	3.0%	36.2%	42.0%	15.0%	3.7
Marine debris (plastics, other trash)	10.8%	13.5%	24.3%	24.3%	27.0%	3.5
Ocean acidification (pH level harms shellfish and coral)	11.1%	0.0%	33.3%	48.1%	7.4%	3.3
Sea-based pollution (discharges from boats)	9.3%	15.6%	34.3%	25.0%	15.6%	3.2
Climate change	5.7%	0.0%	60.0%	28.6%	5.7%	3.2
Underwater noise from human activities	12.9%	0.0%	58.0%	25.8%	3.2%	3.0

Concern About Health of Ocean and Coastal Areas

Concerns Inside GRNMS

GRNMS users were asked how concerned they were about the health of the ocean inside GRNMS. Users' top three concerns were pollution (contaminants such as mercury, polychlorinated biphenyls, sewage, pesticides; 48.8%), marine animal health (36.6%), and health of coral reefs or other live bottom habitats (34.1%; Table 14). About one-quarter of users (24.4%) had no concern at all for climate change and sea level rise. Over one-third of users (41.5%) were neutral regarding their concerns about climate change. When users were asked about ocean acidification, 14.6% reported that they were not concerned at all.

Non-users were asked how concerned they were about ocean health inside GRNMS. Similar to users, the top three concerns of non-users were pollution (57.4%), marine animal health (44.4%), and health of coral reefs or other live bottom habitats (41.4%). There were significant differences in level of concern between users and non-users for all ocean health issues inside GRNMS except for energy production (oil and gas), alternative energy production, and mining of minerals (including sand).

Table 14. Level of concern about ocean health inside GRNMS by users and non-users. **Bolded text** and asterisks (*) denote statistically significant differences in mean level of concern between users and non-users.

Ocean Health Issue Inside GRNMS	Group	Extremely Concerned (5)	Somewhat Concerned (4)	Neutral (3)	Not Very Concerned (2)	No Concern at All (1)	Mean
Ocean acidification*	User	9.8%	39.0%	19.5%	17.1%	14.6%	3.0
	Non-user	23.5%	37.7%	27.8%	4.3%	6.8%	3.7
Climate change*	User	7.3%	17.1%	41.5%	9.8%	24.4%	2.6
	Non-user	24.7%	20.4%	29.0%	11.4%	14.5%	3.3
Sea level rise*	User	7.3%	14.6%	39.0%	14.6%	24.4%	2.6
	Non-user	19.8%	24.7%	30.2%	12.7%	12.7%	3.3
Over fishing*	User	29.3%	24.4%	17.1%	14.6%	14.6%	3.4
	Non-user	38.3%	34.6%	16.7%	5.2%	5.2%	4.0
Coral health/other live bottom habitat*	User	34.1%	31.7%	19.5%	4.9%	9.8%	3.7
	Non-user	41.4%	34.0%	19.4%	2.2%	3.1%	4.1
Marine animal's health*	User	36.6%	26.8%	17.1%	7.3%	12.2%	3.7
	Non-user	44.4%	31.5%	19.4%	1.9%	2.8%	4.1
Shipping (marine transportation)*	User	14.6%	19.5%	34.1%	9.8%	22.0%	2.9
	Non-user	20.7%	30.9%	35.1%	8.0%	5.2%	3.6
Dredging/offshore dredge disposal*	User	26.8%	22.0%	29.3%	9.8%	12.2%	3.4
	Non-user	29.3%	33.6%	26.5%	6.2%	4.3%	3.8
Beach re-nourishment*	User	19.5%	22.0%	22.0%	14.6%	22.0%	3.0
	Non-user	22.2%	30.9%	29.9%	9.6%	7.4%	3.5
Energy production (oil & gas)	User	19.5%	26.8%	26.8%	14.6%	12.2%	3.2
	Non-user	25.0%	26.2%	30.9%	9.9%	8.0%	3.5
Alternative energy production	User	17.1%	22.0%	29.3%	12.2%	19.5%	3.0
	Non-user	21.3%	23.1%	35.2%	9.3%	11.1%	3.4
Mining of minerals (including sand)	User	34.1%	14.6%	29.3%	9.8%	12.2%	3.5
	Non-user	29.0%	24.7%	31.8%	7.4%	7.1%	3.6
Habitat loss from coastal development*	User	34.1%	14.6%	24.4%	14.6%	12.2%	3.4
	Non-user	41.4%	27.8%	20.7%	4.3%	5.9%	4.0

Ocean Health Issue Inside GRNMS	Group	Extremely Concerned (5)	Somewhat Concerned (4)	Neutral (3)	Not Very Concerned (2)	No Concern at All (1)	Mean
Pollution*	User	48.8%	19.5%	19.5%	4.9%	7.3%	4.0
	Non-user	57.4%	22.8%	13.6%	2.8%	3.4%	4.3
Noise from human activities*	User	12.2%	26.8%	24.4%	14.6%	22.0%	2.9
	Non-user	16.0%	28.4%	36.7%	8.3%	10.5%	3.3

Concerns Outside GRNMS

Users were asked about their level of concern about the health of Georgia ocean and coastal areas outside GRNMS. The top three ocean health issues that users were extremely concerned about were pollution (65.9%), marine animal health (41.5%), and habitat loss from coastal development (39.0%; Table 15). When users were asked about climate change, 22.0% were not concerned at all and 36.6% were neutral.

Non-users were also asked about their level of concern about the health of Georgia ocean and coastal areas outside GRNMS. More than half of non-users (68.8%) were extremely concerned about pollution. Climate change was not a concern at all for 15.4% of non-users. Conversely, 27.1% reported that they were extremely concerned about climate change.

There were significant differences in the level of concern between users and non-users about aspects of ocean health outside GRNMS, including ocean acidification, sea level rise, overfishing, health of corals/other live bottom habitat, beach renourishment, habitat loss from coastal development, and noise from human activities.

Table 15. Level of concern about ocean health outside GRNMS by users and non-users. **Bolded text** and asterisks (*) denote statistically significant differences in mean level of concern between users and non-users.

Ocean/Coastal Health Issue Outside GRNMS	Group	Extremely Concerned (5)	Somewhat Concerned (4)	Neutral (3)	Not Very Concerned (2)	No Concern at All (1)	Mean
Ocean acidification*	User	26.8%	24.4%	29.3%	7.3%	12.2%	3.5
	Non-user	29.6%	40.7%	21.3%	4.3%	4.0%	3.8
Climate change	User	12.2%	24.4%	36.6%	4.9%	22.0%	3.0
	Non-user	27.1%	23.5%	20.1%	13.9%	15.4%	3.3
Sea level rise*	User	9.1%	27.3%	29.5%	17.1%	17.1%	2.9
	Non-user	23.0%	31.2%	19.8%	13.0%	13.0%	3.4
Over fishing*	User	36.6%	29.3%	7.3%	12.2%	14.6%	3.6
	Non-user	43.2%	39.5%	9.6%	4.3%	3.4%	4.1
Coral health/other live bottom habitat*	User	34.1%	41.5%	12.2%	7.3%	4.9%	3.9
	Non-user	47.2%	37.3%	10.2%	3.1%	2.2%	4.2
Marine animal's health	User	41.5%	31.7%	17.1%	7.3%	2.4%	4.0
	Non-user	48.6%	38.0%	9.3%	1.9%	2.2%	4.3

Ocean/Coastal Health Issue Outside GRNMS	Group	Extremely Concerned (5)	Somewhat Concerned (4)	Neutral (3)	Not Very Concerned (2)	No Concern at All (1)	Mean
Shipping (marine transportation)	User	17.1%	29.3%	31.7%	12.2%	9.8%	3.3
	Non-user	16.3%	35.5%	35.5%	9.6%	3.1%	3.5
Dredging/offshore dredge disposal	User	28.7%	26.8%	25.0%	9.8%	9.8%	3.5
	Non-user	28.9%	38.0%	24.4%	6.2%	2.5%	3.8
Beach renourishment*	User	16.0%	31.9%	29.5%	12.8%	9.8%	3.3
	Non-user	25.6%	38.3%	25.3%	7.4%	3.4%	3.8
Energy production (oil & gas)	User	19.5%	24.4%	24.4%	17.1%	14.6%	3.1
	Non-user	27.2%	26.2%	29.0%	11.1%	6.5%	3.5
Alternative energy production	User	19.5%	17.1%	29.3%	19.5%	14.6%	3.0
	Non-user	22.2%	25.9%	27.5%	15.4%	9.0%	3.3
Mining of minerals (including sand)	User	26.8%	14.6%	36.6%	9.8%	12.2%	3.3
	Non-user	25.9%	31.5%	25.6%	11.4%	5.6%	3.6
Habitat loss from coastal development*	User	39.0%	26.8%	9.8%	17.1%	7.3%	3.7
	Non-user	53.1%	34.9%	5.2%	4.6%	2.2%	4.3
Pollution	User	65.9%	12.2%	14.6%	2.4%	4.9%	4.3
	Non-user	68.8%	24.7%	3.1%	2.2%	1.2%	4.6
Noise from human activities*	User	12.2%	24.4%	24.4%	14.6%	24.4%	2.8
	Non-user	16.7%	35.5%	29.9%	10.8%	7.1%	3.4

Support for the Sanctuary

Protection of Ocean and Coastal Resources

Both users and non-users were supportive of ocean resource protection in and around Georgia outside GRNMS (Table 16). Non-users expressed stronger support for protection outside GRNMS.

Table 16. Comparison of users and non-users on support for ocean resource protection. **Bolded text** and asterisks (*) denote statistically significant differences in mean level of concern between users and non-users.

Support for Protection of Coastal and Ocean Resources	Group	Strongly Support (5)	Somewhat Support (4)	Neither support nor against (3)	Somewhat Against (2)	No Support at All (1)	Mean
Protection inside GRNMS	User	58.5%	22.0%	7.3%	9.8%	2.4%	4.2
	Non-user	58.3%	25.9%	12.2%	1.2%	2.5%	4.4
Protection outside GRNMS*	User	36.6%	36.6%	14.2%	4.9%	7.3%	3.9
	Non-user	52.5%	31.8%	11.3%	1.9%	2.5%	4.3

Marine Zoning

Anglers inside GRNMS (64.4%) and anglers outside GRNMS (69.3%) were supportive of the use of marine zoning in the ocean and coastal areas off of Georgia (Figure 15).

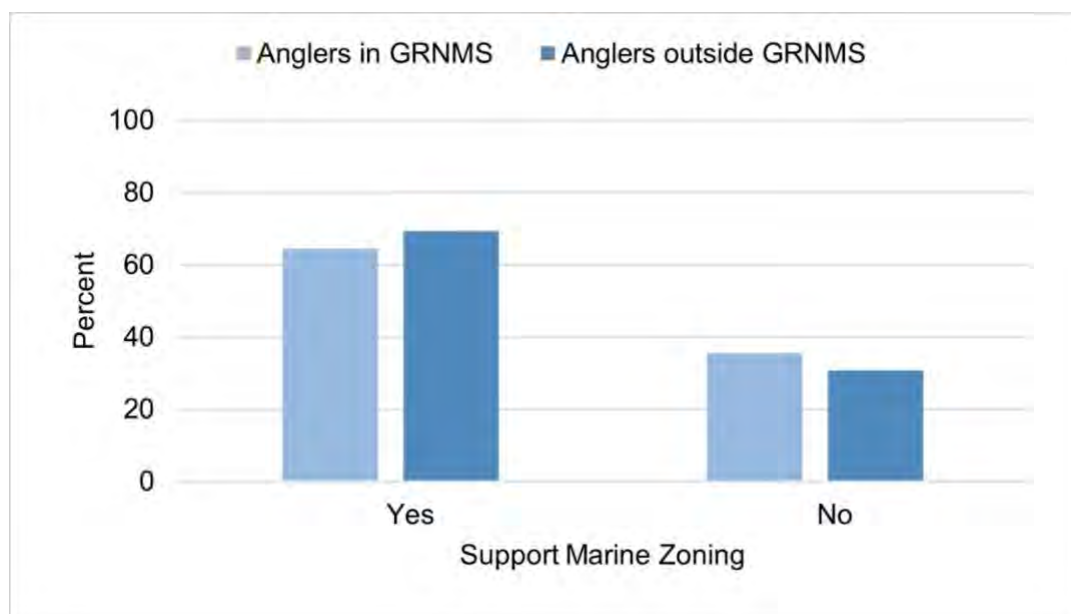


Figure 15. Support for marine zoning in areas off the coast of Georgia among GRNMS users and non-users.

Actions to Undertake for Sustainable Use

On a scale of 1 to 5, with 1 corresponding to “would not do” and 5 corresponding to “would do the maximum,” anglers were asked about the extent to which they would undertake activities or actions to ensure that ocean and coastal resources are used sustainability and remain available for future generations to enjoy. Nine activities or actions were included in the survey.

On the topic of recycling, over one-third of users (34.9%) and non-users (35.3%) would do the maximum to protect ocean and coastal resources (Table 17). Fewer users (23.8%) and non-users (16.7%) would do the maximum in terms of using less energy.

Nearly one-third of users (32.6%) and one-quarter of non-users (25.0%) would not pay higher taxes for resource protection, nor would many users (46.5%) and non-users (52.5%) donate to groups representing diving interests.

Table 17. Actions or activities to undertake for sustainable use of ocean resources.

Activity or Action	Group	Would Do the Maximum (5)	Would Do a Lot (4)	Neutral (3)	Would Do Very Little (2)	Would Not Do (1)	Mean
Volunteer time	User	4.6%	20.9%	41.9%	25.6%	7.0%	2.8
	Non-user	3.5%	8.6%	51.9%	22.1%	13.8%	2.7
Pay higher taxes for resource protection and restoration	User	2.3%	13.9%	30.2%	20.9%	32.6%	2.1
	Non-user	3%	7%	42%	23%	25%	2.4
Pay higher prices for goods and services due to costs to businesses in complying with regulations that protect ocean & coastal resources or require restoration of areas damaged	User	2%	21%	33%	19%	26%	2.4
	Non-user	4%	14%	48%	19%	15%	2.7
Pay user fees like fishing licenses or diving access fees or additional boat registration fees	User	7%	16%	42%	14%	21%	2.6
	Non-user	13%	28%	37%	11%	10%	3.2
Donate to groups representing recreational fishing interests	User	4.6%	18.6%	34.9%	16.3%	25.6%	2.6
	Non-user	0.6%	12.8%	40.7%	28.5%	17.3%	2.5
Donate to groups representing diving interests	User	2.3%	7.0%	20.9%	23.3%	46.5%	1.9
	Non-user	0.7%	4.9%	17.5%	24.4%	52.5%	1.8
Recycle	User	34.9%	30.2%	23.3%	0.0%	11.6%	3.7
	Non-user	35.3%	31.2%	24.8%	6.4%	2.2%	3.9
Use less energy	User	23.8%	21.4%	33.3%	11.9%	9.5%	3.3
	Non-user	16.7%	28.3%	35.7%	13.5%	5.8%	3.4
Avoid/boycott certain seafood products	User	18.6%	13.9%	27.9%	11.6%	27.9%	2.7
	Non-user	15.4%	16.7%	27.5%	17.3%	23.1%	2.8
Other	User	0.0%	28.6%	14.3%	0.0%	57.1%	2.1
	Non-user	21.0%	0.0%	18.4%	5.3%	55.3%	2.3

Chapter 5: 2010 and 2020 Comparison

The present study of GRNMS users and non-users replicated a 2010 baseline study (Leeworthy, 2013) to understand how knowledge, attitudes, and perceptions change over time. Leeworthy (2013) specifically assessed knowledge, attitudes, and perceptions of management strategies and regulations among users and non-users of the sanctuary. Although methods in the two studies differed (see Chapter 2), particularly regarding how respondents were identified and contacted, the following section compares results between the two studies where possible.

Sociodemographic Characteristics

In 2010, about 60% of recreational anglers inside GRNMS were aged 50–64 years, while in 2020, the average age of GRNMS users was 57 years (Table 18). In 2010, 100% of recreational anglers surveyed were white males, while in 2020, about 81% of users surveyed were male and 95% were white. Differences in sociodemographic characteristics between 2010 and 2020 were not tested statistically due to differences in sampling methodology.

Table 18. Comparison of demographic characteristics of users of GRNMS, 2010 and 2020.

Sociodemographics	Group	Users of GRNMS in 2010	Users of GRNMS in 2020
Age	All	About 60 % in 50–64 age range	Average age = 57 years
Sex	Male	100.0%	81.0%
	Female	0.0%	19.0%
Race	White	100.0%	95.0%
	Black or African American	0.0%	5.0%

At least 25% of users had some college education or at least a year in college in both 2010 and 2020 (Figure 16). Compared to 2010, there were more users with a bachelor's or master's degree in 2020.

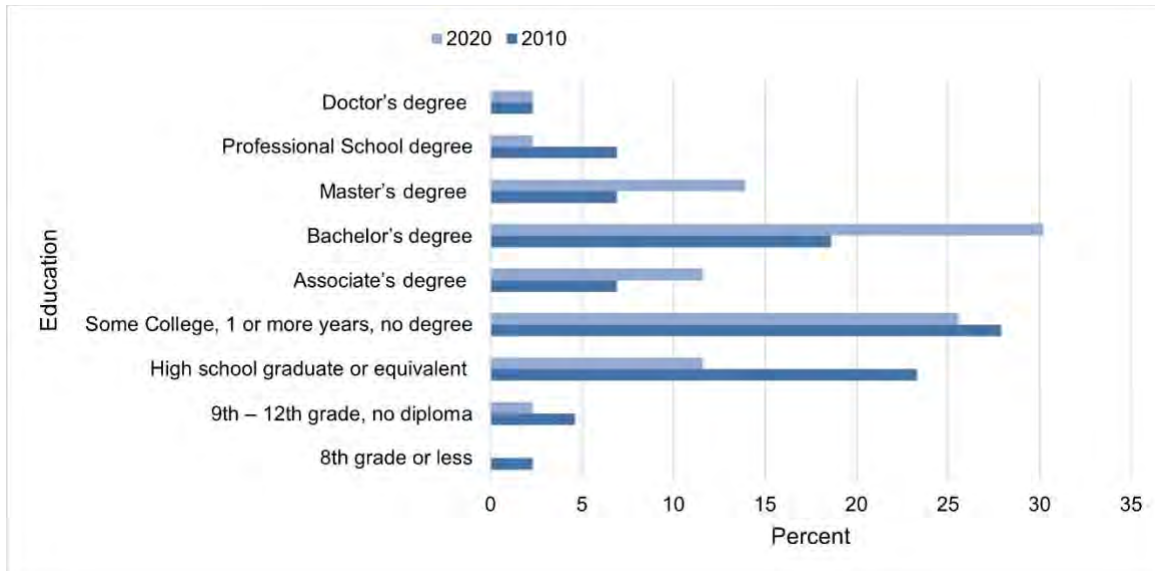


Figure 16. Comparison of educational attainment of users in GRNMS.

In 2010 and 2020, at least a quarter of users in GRNMS had household incomes of \$75,000 or higher (Figure 17). This correlates with employment status, as close to 70% of users in GRNMS were employed full-time in both years (Figure 18). Less than 3% recreational anglers who used GRNMS were unemployed in either year. This is not unexpected given the costs associated with using GRNMS compared to onshore or nearshore locations. GRNMS is an offshore site, and reaching it requires relatively larger boats and additional gas.

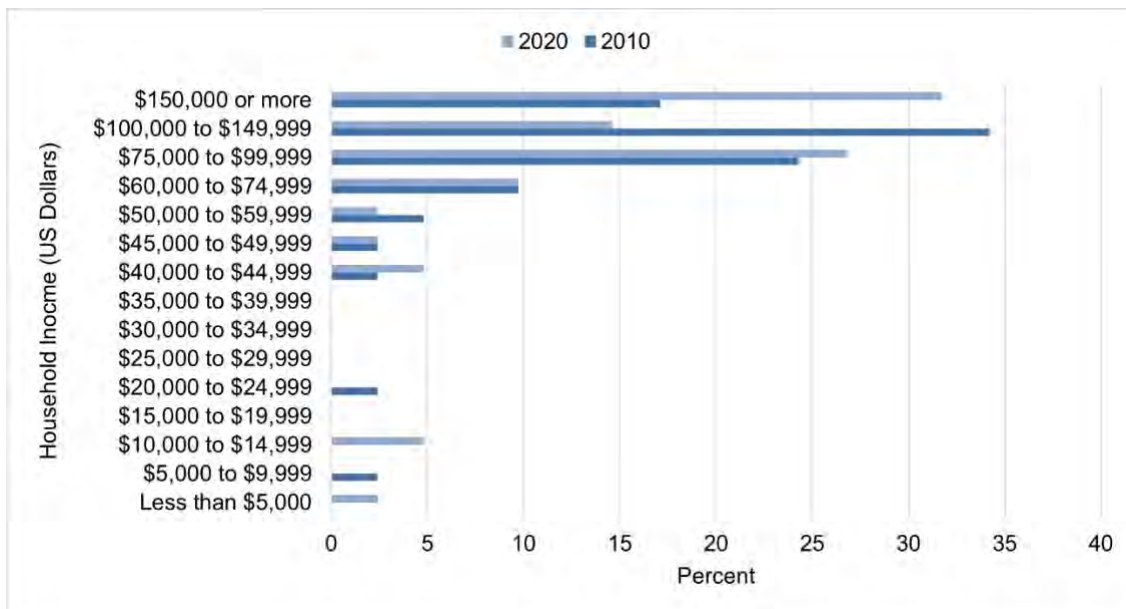


Figure 17. Comparison of annual household income of users in GRNMS.

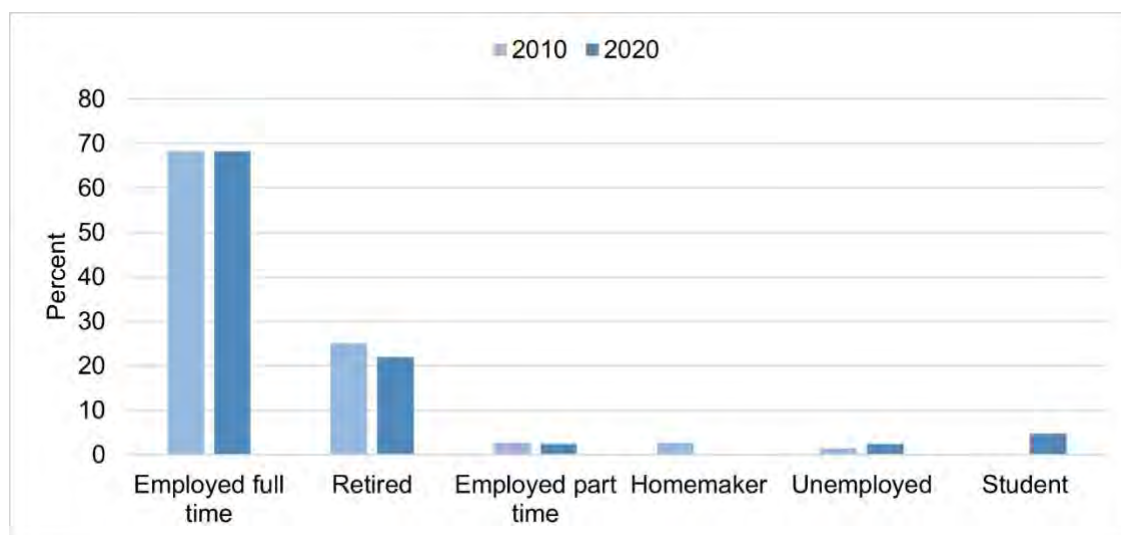


Figure 18. Comparison of employment status of users surveyed in GRNMS.

Household composition (people living in the household at the time of the survey) was similar among GRNMS users in 2010 and 2020, with most households composed of two adults and no children under 18. In 2010, almost all (98%) users surveyed were boat owners compared to 78% in 2020 (Table 19). For both years, membership in a fishing group, club, or organization was popular for users inside GRNMS.

Table 19. Comparison of demographic characteristics of users in GRNMS, 2010 and 2020.

Demographic Characteristic	Response	Users in GRNMS in 2010	Users in GRNMS in 2020
Household composition	Single adult with no children 18 or under	2.3%	14.6%
Household composition	Single adult with children under 18	0.0%	2.4%
Household composition	Two adults with no children 18 or under	65.2%	46.3%
Household composition	Two adults with children under 18	13.9%	24.4%
Household composition	More than two adults with no children under 18	9.3%	9.8%
Household composition	More than two adults with children 18 or under	9.3%	2.4%
Boat ownership	Yes	98.0%	78.0%
Boat ownership	No	2.0%	22.0%
Average boat length (feet)	N/A	24.1	23.7
Membership in groups, clubs, or organization	Fishing	54.6%	47.2%
Membership in groups, clubs, or organization	Environmental	6.8%	19.4%
Membership in groups, clubs, or organization	Diving	2.3%	11.1%
Membership in groups, clubs, or organization	Chambers of Commerce	13.6%	11.1%

Recreation Activities of Users of GRNMS

There were no statistically significant differences in the reasons for engaging in primary recreational activities. The top five reasons for engaging in recreation activities were consistent between 2010 to 2020. These reasons included being close to the water, being outdoors, being with friends, relaxation, and experiencing natural surroundings (Table 20).

Table 20. Responses to the following question among GRNMS users in 2010 and 2020: “On a scale of 1 to 5, where 1 means Not at All Important and 5 means Extremely Important, how important are these reasons for your primary recreational activity?” Responses marked with (‡) were new to the 2020 survey and were not included in the 2010 survey.

Response	2010 Mean	2020 Mean
To be close to the water	4.6	4.4
To be outdoors	4.4	4.5
To be with friends	4.4	4.1
For relaxation	4.3	4.6
To experience natural surroundings	4.3	4.6
For family recreation	4.3	4.2
To experience adventure and excitement	4.3	4.1
To get away from the regular routine	3.9	4.1
To experience new and different things	3.8	4.2
To get away from the demands of other people	3.8	4.0
To develop my skills	3.8	3.7
To catch food to eat [‡]	—	3.2

Ecosystem Services

The top ecosystem services that were important to GRNMS users surveyed in 2010 and 2020 were support for recreation activities, education, seafood purchased at local stores and restaurants, and scientific research. There were statistically significant differences between 2010 and 2020 users in the level of value for supply of oil and gas and seafood purchased at non-local stores and restaurants (Table 21). Overall respondents in 2020 value the supply of oil and gas less than in 2010 and valued seafood purchased as non-local stores more in 2020 than 2010.

Table 21. Responses to the following question among GRNMS users in 2010 and 2020: “On a scale of 1 to 5, where 1 means No Value and 5 means Extremely High Value, to what extent do you value each good or service?” **Bolded text** and asterisks (*) denote statistically significant differences in mean level of value between users in 2010 and 2020.

Response	2010 Mean	2020 Mean
Support for recreation activities	4.2	4.0
Support for education	3.7	3.8
Seafood purchased at <u>local</u> stores and restaurants	3.4	3.9
Support for scientific research	3.4	3.8
Protection of resources even though I never intend to visit or directly use them	3.3	3.3
Supply of oil and gas*	3.2	2.5
Supply of alternative energy (wind, wave, tidal)	3.0	2.8
Supply of pharmaceutical products through mining or harvest of resources	2.7	2.8

Response	2010 Mean	2020 Mean
Seafood purchased at <u>non-local</u> stores and restaurants*	2.4	2.9
Supply of mineral resources through mining	2.3	2.4

Information Sources About the Sanctuary

GRNMS users in 2010 and 2020 had similar opinions regarding information sources. Users' trust in five information sources was significantly different between 2010 and 2020: Georgia Department of Natural Resources, Coastal Conservation Association of Georgia, International Game and Fish Association, internet, and scuba diving magazines/newsletters (Table 22).

Table 22. Responses to the following question among GRNMS users in 2010 and 2020: "On a scale of 1 to 5, where 1 means No Trust at All and 5 means Completely Trust, to what extent do you trust each source of information?" **Bolded text** and asterisks (*) denote statistically significant differences in mean level of value between users in 2010 and 2020. The "Others" category included area anglers, events, local anglers, bait shop employees, charter anglers, anglers, Ducks Unlimited, and seafood business newsletters. Categories marked with (†) were new to the 2020 survey and were not included in the 2010 survey.

Response	2010 Mean	2020 Mean
Fishing magazines/newsletters	3.7	3.6
Recreational Fishing Alliance	3.9	3.3
Georgia Department of Natural Resources*	3.6	2.7
Georgia Sea Grant	4.0	3.8
Coastal Conservation Association of Georgia*	4.0	3.0
National Coalition for Marine Conservation	3.8	3.6
American Sportfishing Association	4.1	3.6
International Game and Fish Association*	3.9	3.0
Southern Kingfish Association	4.0	3.6
Gray's Reef National Marine Sanctuary staff	3.6	3.5
South Atlantic Fishery Management Council	2.9	3.1
Others	3.5	3.2
Internet*	3.3	2.5
Gray's Reef National Marine Sanctuary Advisory Council	3.4	3.3
Radio	3.3	2.6
Word of mouth	3.3	2.8
Newspapers	3.2	2.8
Television	3.3	2.9
Scuba diving magazines/newsletters*	4.1	3.4
Gray's Reef National Marine Sanctuary website	3.1	3.6
NOAA's National Marine Fisheries Service	2.9	3.3
Atlantic States Marine Fisheries Commission	2.9	3.5
Gray's Reef National Marine Sanctuary Foundation†	-	3.3
Gray's Reef National Marine Sanctuary Facebook page†	-	2.8
Gray's Reef National Marine Sanctuary Twitter feed†	-	2.5

Perceived Condition of the Sanctuary

Users' perceptions of the status of sanctuary resources were generally consistent between users in 2010 and 2020. However, perceptions of invasive species (such as lionfish) improved over time; users in 2010 perceived that invasive species were "getting a lot worse," while those in 2020 perceived that they were "getting somewhat worse" (Table 23).

Table 23. Responses to the following question among GRNMS users in 2010 and 2020: "On a scale of 1 to 5, where 1 means Getting a Lot Better and 5 means Getting a Lot Worse, how has the status/condition of the following resources been changing since the designation of GRNMS (1981)?" **Bolded text** and asterisks (*) denote statistically significant differences in mean level of value between users in 2010 and 2020. Categories marked with (‡) were new to the 2020 survey and were not included in the 2010 survey.

Response	2010 Mean	2020 Mean
Invasive species (such as lionfish)*	4.6	3.7
Marine debris (plastics, other trash)	3.4	3.5
Water quality	3.3	3.0
Sea based pollution (discharges from boats)	3.2	3.3
Other bottom habitat	3.1	2.9
Live bottom habitat	3.1	2.8
Other Sea life (diversity or number of species)	3.1	3.0
Other Sea life (abundance)	3.0	2.8
Fish populations (diversity or number of species)	2.9	2.8
Fish populations (pelagic)	2.9	2.9
Fish populations (bottom fish)	2.9	2.9
Ocean acidification (pH level harms shellfish and coral)‡	-	3.3
Climate change‡	-	3.2
Underwater noise from human activities‡	-	3.0

Concern About Sanctuary and Ocean Health

Users' concerns regarding ocean health inside GRNMS did not differ between 2010 and 2020. The top five concerns were: pollution, coral health/other live bottom habitat, habitat loss from coastal development, marine animal health, and dredging (Table 24).

Table 24. Responses to the following question among GRNMS users in 2010 and 2020: "On a scale of 1 to 5, where 1 means No Concern at All and 5 means Extremely Concerned, to what extent are you concerned about the health of ocean areas inside GRNMS?"

Response	2010 Mean	2020 Mean
Pollution	4.3	4.0
Coral health/other live bottom habitat	3.9	3.8
Habitat loss from coastal development	3.7	3.5
Marine animal health	3.6	3.7
Dredging/offshore dredge disposal	3.6	3.5
Mining of minerals (including sand)	3.3	3.5
Ocean acidification	3.3	3.1
Beach renourishment	3.1	3.1

Response	2010 Mean	2020 Mean
Shipping	3.1	3.0
Overfishing	3.1	3.4
Energy production (oil and gas)	2.9	3.3
Climate change	2.8	2.7
Alternative energy production	2.7	3.1
Sea level rise	2.6	2.7

Users' concerns regarding ocean health outside GRNMS also did not differ between 2010 and 2020. The top five concerns regarding ocean areas outside GRNMS were the same as those inside GRNMS: pollution, coral health/other live bottom habitat, habitat loss from coastal development, marine animal health, and dredging (Table 25).

Table 25. Responses to the following question among GRNMS users in 2010 and 2020: "On a scale of 1 to 5, where 1 means No Concern at All and 5 means Extremely Concerned, to what extent are you concerned about the health of ocean and coastal areas around Georgia outside GRNMS?"

Response	2010 Mean	2020 Mean
Pollution	4.3	4.3
Coral health/other live bottom habitat	3.9	4.0
Habitat loss from coastal development	3.9	3.8
Marine animal health	3.7	4.1
Dredging/offshore dredge disposal	3.4	3.5
Overfishing	3.3	3.6
Mining of minerals (including sand)	3.3	3.4
Ocean acidification	3.2	3.5
Beach renourishment	3.1	3.3
Shipping	3.0	3.3
Energy production (oil and gas)	2.8	3.2
Climate change	2.7	3.0
Sea level rise	2.7	2.9
Alternative energy production	2.7	3.1

Support for the Sanctuary

GRNMS users' support for protection of ocean resources both inside and outside the sanctuary differed between 2010 and 2020 GRNMS (Table 26). In 2020, there was higher support among anglers for the protection of marine resources both inside and outside of GRNMS.

Table 26. Responses to the following question among GRNMS users in 2010 and 2020: “On a scale from 1 to 5, where 1 means No Support at All and 5 means Strongly Support, to what extent do you support the protection of ocean and coastal resources in and around Georgia?” **Outside GRNMS?** and asterisks (*) denote statistically significant differences in mean level of value between users in 2010 and 2020.

Response	2010 Mean	2020 Mean
Outside GRNMS? *	3.3	3.9
Inside GRNMS? *	3.5	4.2

When 2010 and 2020 responses were compared, there were no significant differences in the actions or activities anglers would be willing to undertake to sustain resources for future generations. The top five actions in both years were recycling, using less energy, donating to groups representing recreational fishing interests, avoiding/boycotting certain seafood products, and volunteering time (Table 27).

Table 27. Responses to the following question among GRNMS users in 2010 and 2020: “On a scale of 1 to 5, where 1 means Would Not Do and 5 means Would Do the Maximum, to what extent would you undertake the activities or actions to ensure that ocean & coastal resources are used sustainability an available for future generations to enjoy?”.

Response	2010 Mean	2020 Mean
Recycle	3.6	3.7
Use less energy	3.2	3.3
Donate to groups representing recreational fishing interests	3.0	2.6
Avoid/boycott certain seafood products	2.9	2.8
Volunteer time	2.8	2.8
Pay user fees like fishing licenses or diving access fees or additional boat registration fees	2.4	2.6
Donate to groups representing diving interests	2.1	1.9
Pay higher prices for goods and services due to costs to businesses in complying with regulations that protect ocean and coastal resources or require restoration of areas damaged	2.0	2.4
Pay higher taxes for resource protection and restoration	1.9	2.2

Chapter 6: Management Implications

Saltwater recreational fishing is an important sector of the U.S. economy. The economic impacts from recreational fishing activities supported 594,734 jobs and generated about \$98 billion in sales across the U.S. in 2020 (National Marine Fisheries Service, 2022). In Georgia, the recreational fishing industry generated 2,922 jobs and \$256 million in sales (National Marine Fisheries Service, 2023). About \$123 million of ocean recreation spending can be attributed to GRNMS, contributing 1702 total jobs and \$159 million in sales (Gazal et al., 2023). Another economic survey estimated total individual spending for a single typical trip to GRNMS. Visitors spent an average of \$156.60 for a fishing trip and \$84.60 for a general boating trip (Burns et al., 2022).

This study examined knowledge, attitudes, and perceptions of factors relevant for sanctuary management among users and non-users of GRNMS. These results will help to inform sanctuary managers and partners about public opinions regarding ocean and coastal resources and management of Georgia waters, including GRNMS. These results can inform outreach strategies to better protect sanctuary resources to ensure continued provision of ecosystem services within GRNMS.

Various ecosystem services are considered in sanctuary condition reports. Sanctuary condition reports are used by NOAA to assess the condition and trends of national marine sanctuary resources and ecosystem services. These reports provide a summary of resources in NOAA's sanctuaries, analyze the status and trends of ecosystem services, and ultimately serves as a tool to determine if the sanctuaries are achieving their resource protection and improvement goals.

Condition reports include information on the status and trends of water quality, habitat, living resources, and maritime heritage resources, and the human activities that affect them. The results of this study inform the status and trends for cultural ecosystem services, specifically the recreational ecosystem services. ONMS (2022) defines ecosystem services as the benefits people obtain from nature through use, consumption, enjoyment, and/or simply knowing these resources exist (non-use). Cultural (non-material benefits) ecosystem services include:

1. Consumptive recreation — Recreational activities that result in the removal of or harm to natural or cultural resources
2. Non-consumptive recreation — Recreational activities that do not result in intentional removal of or harm to natural or cultural resources
3. Science — The capacity to acquire and contribute information and knowledge
4. Education — The capacity to acquire and provide intellectual enrichment
5. Heritage — Recognition of historical and heritage legacy and cultural practices
6. Sense of place — Aesthetic attraction, spiritual significance, and location identity

GRNMS will revise its management plan in coming years, and will rely on public input and recommendations from partners, stakeholders, and the Sanctuary Advisory Council to help shape future management activities. The GRNMS management plan is designed to protect sanctuary resources via measures including regulations, enforcement, and permitting. The results of this study will support effective management of GRNMS by:

- Facilitating the inclusion of cultural ecosystem services (for example, consumptive/non-consumptive recreation) experienced by saltwater recreational anglers in a forthcoming update of the GRNMS condition report;
- Informing GRNMS education and outreach efforts targeted toward saltwater recreational anglers; and
- Identifying management actions that address recreational anglers' concerns regarding GRNMS.

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Appendix A: Literature Review

Several studies on knowledge, attitudes, and perceptions about MPAs in different countries are summarized in Table A.1. The populations surveyed in these studies included household residents near coastal areas, commercial fishers, tourists, recreational divers, researchers, and government staff. Key findings included low levels of marine protected area awareness, differences in perceptions among stakeholder groups, differences in perceptions based on demographics, and support for ocean protection and conservation.

In 1995 and 1996, personal interviews were conducted with commercial fishers and dive operators in the Florida Keys, and members of environmental groups were surveyed by mail. Different stakeholder groups indicated different perceptions of engagement in the MPA designation process, specifically for a “harvest refugia” or fishing reserve approach (Suman et al., 1999). Anglers felt “highly alienated” from designation and indicated negative attitudes such as “anger and powerlessness,” feeling intentionally excluded from the MPA process. Dive operators “demonstrated the highest levels of participation in the designation process,” although they did indicate some concerns that the regulations within the MPA would restrict their diving activities in unforeseen or unfavorable ways. Respondents who belonged to environmental groups indicated the highest level of support for a reserve within Florida Keys National Marine Sanctuary.

In 2003, data were collected by means of questionnaires administered through personal interviews during the high tourist season in Torre Guaceto, Italy. MPA awareness was largely explained by education level (Petrosillo et al., 2007). In addition, many respondents who were not aware of the MPA were from nearby towns. The study demonstrated the dependence of tourists’ awareness from the place of residence, and that is going to reflect on management of MPA tourism, in particular, as to environmental education activities.

In 2010 and 2011, a survey was conducted to assess perceptions of the local adult population in Corvo Island, Portugal. Participants recognized the value of the marine environment and strategies to promote the sustainable use of marine resources (Abecasis et al., 2013). Many respondents perceived a decline in species’ populations, loss of biodiversity, notable changes in the marine environment over time, and awareness of the vulnerability of marine environments and species. Most respondents were supportive of ocean conservation and MPAs.

Face-to-face surveys were administered in 2011–2012 with fishers and tourists at the Wildlife Refuge of Ilha dos Lobos, off the southern coast of Brazil. Engel et al. (2014) concluded that stakeholder groups had different perceptions of protected areas. “Non-direct” stakeholders (or non-users, in our terms) had more positive perceptions of protected areas and species within the protected area, while “direct” stakeholders like anglers had a less favorable view of the protected area because they viewed it as an impediment to fishing.

One hundred fishers in three MPAs in northeastern Brazil were interviewed between 2010 and 2011. Perception of ocean conservation and management changes differed by age and fishing method (Silva & Lopes, 2015). Younger fishers who used selective fishing gear were less likely to have favorable perceptions of marine conservation. Fishers with nonselective gear and those who engaged in part-time rather than full-time work tended to indicate a higher degree of

adaptability toward changes in ocean management. The authors recommended a more stratified approach to develop fisheries management measures that should consider the type of gear fishers use, their degree of dependence on fishing resources, and their age in order to minimize conflicts and increase compliance.

In 2012, a phone survey was administered to 500 household residents in the U.S. territories of Guam and the Commonwealth of the Marianas Islands. Kotowicz et al. (2017) concluded the public was not highly aware of the marine monument before taking the survey, but residents of the area supported the creation and designation of the monument as a protected area. Few residents felt they or their community would be personally affected by the existence of the monument, but this differed based on whether the household engaged in fishing or not. Stakeholder groups (users) therefore had different perceptions of MPAs compared to the public at large, and this may be used to inform management and outreach strategies.

In-person and online surveys were conducted in 2015 and 2016 for stakeholder groups (e.g., recreational shoreline user, recreational ocean/boat user, commercial fisher, tourism operator, utilities, shipping and transport, scientific research, government/ management) in Bermuda. According to Lester et al. (2017), stakeholder groups generally tended to support marine spatial planning and ocean zoning but disagreed on specific decisions and management strategies. Commercial fishers tended to be less likely than other stakeholders (except recreational fishers) to support increased regulations. In general, though, public perception of and support for ocean regulations and new management strategies is relatively favorable.

In 2015, an online survey of residents of Australia's South-east Marine Region (Victoria and Tasmania) was conducted. Burton et al. (2018) concluded that knowledge and awareness about the South-east Commonwealth Marine Reserves was relatively low. Of the 86 respondents who had heard of the South-east Commonwealth Marine Reserve, they indicated that the Department of Environment website, newspaper articles, radio news, and conversation with friends and family as primary sources of information.

Firsthand information was collected from 77 fishers, 39 authorities, and 41 middlemen/traders in the Andaman Islands, India between 2014 and 2016. According to Patankar (2019), awareness about protected marine species differed by stakeholder group, and was highest among authorities (80%), followed by traders/middlemen (63%), and anglers (59%). Awareness also tended to vary by respondent demographics, most notably by years of fishing experience, occupation, annual income, and age. There was limited awareness across all groups about which governmental entity is in charge of management of these species and implementation of rules, regulations, and laws.

A telephone survey was conducted in 2016–2017. Manson et al. (2021) concluded most residents of Oregon, USA were not very familiar with the state's system of marine reserves, but familiarity with the system had little to no effect on the public's support for the system. Public support was relatively high for respondents who were "concerned with the ecological integrity" of the ocean. Support was lower for people who lived along the coast or those who had favorable attitudes about commercial fisheries.

Table A.1. Summary findings from existing literature on knowledge, attitudes, and perceptions of MPAs.

Publication Title	Location of MPA	Low Levels of Awareness	Support for Ocean Protection and Conservation	Differences in Perceptions Among Stakeholder Groups	Differences Based on Demographics	Author
Perceptions and attitudes regarding marine reserves: A comparison of stakeholder groups in the Florida Keys National Marine Sanctuary	Florida Keys, USA		✓	✓		Suman et al., 1999
Tourist perception of recreational environment and management in a marine protected area	Torre Guaceto, Italy	✓			✓	Petrosillo et al., 2007
Implications of community and stakeholder perceptions of the marine environment and its conservation for MPA management in a small Azorean island	Corvo Island, Portugal		✓		✓	Abecasis et al., 2013
Perceptions and attitudes of stakeholders towards the wildlife refuge of Ilha dos Lobos, a marine protected area in Brazil	Rio Grande do Sul, Brazil			✓		Engel et al., 2014
Each fisherman is different: Taking the environmental perception of small-scale anglers into account to manage MPAs			✓		✓	Silva & Lopes, 2015
Exploring public knowledge, attitudes, and perceptions of the Marianas Trench Marine National Monument	U.S. territories of Guam and Commonwealth of the Marianas Islands	✓	✓	✓		Kotowicz et al., 2017
Exploring stakeholder perceptions of marine management in Bermuda	Bermuda		✓	✓		Lester et al., 2017
The South-east Commonwealth Marine Reserves Network—Public knowledge, perceptions, and values survey	Southeast Australia	✓				Burton et al., 2018

Publication Title	Location of MPA	Low Levels of Awareness	Support for Ocean Protection and Conservation	Differences in Perceptions Among Stakeholder Groups	Differences Based on Demographics	Author
Attitude, perception, and awareness of stakeholders towards the protected marine species in the Andaman Islands	Andaman Islands, India			✓	✓	Patankar, 2019
Public perceptions of ocean health and marine protection: Drivers of support for Oregon's marine reserves	Oregon, USA	✓	✓	✓		Manson et al., 2021

Appendix B: Survey Instrument²

Gray's Reef National Marine Sanctuary Knowledge, Attitudes, and Perceptions Survey

Managers of Gray's Reef National Marine Sanctuary (GRNMS) would like to know how you feel about ocean and coastal resources management off the Georgia coast and in GRNMS. More specifically, GRNMS managers would like to know about your uses of these ocean and coastal resources and your opinions about management and other activities. All questions and answers are optional, confidential, and voluntary. Public reporting burden for this collection of information is estimated to average about one half hour per response. (Reference OMB Control Number 0648- 0625, Expiration Date: 12/31/2020)

Definition: Ocean areas include the Atlantic Ocean and coastal areas include inland bays, estuaries, and tidally influenced portions of rivers where fresh and saltwater mix. See the map below of Coastal and Ocean Georgia & GRNMS.

0. Since the start of 2019, have you visited or used Gray's Reef National Marine Sanctuary (GRNMS)? _____ Yes _____ No

Section 1 – Opinions About Ocean & Coastal Resources Protection and Management

1. On a scale of 1 to 5, where 1 means *No Concern at All* and 5 means *Extremely Concerned*, to what extent are you concerned about the health of ocean & coastal areas around Georgia outside the Gray's Reef National Marine Sanctuary (GRNMS)?
2. On a scale of 1 to 5, where 1 means *No Concern at All* and 5 means *Extremely Concerned*, to what extent are you concerned about the health of ocean & coastal areas around Georgia inside the Gray's Reef National Marine Sanctuary (GRNMS)?
3. On a scale from 1 to 5, where 1 means *No Support at All* and 5 means *Strongly Support*, to what extent do you support the protection of ocean & coastal resources in and around Georgia outside GRNMS?
4. On a scale from 1 to 5, where 1 means *No Support at All* and 5 means *Strongly Support*, to what extent do you support the protection of ocean & coastal resources in and around Georgia inside GRNMS?
5. Do you support the use of marine zoning in ocean & coastal areas off the coast of Georgia?
_____ Yes _____ No

² The survey in this appendix is reproduced exactly as it was presented to respondents and has not been copy edited for the purposes of this report.

Section 2 – Sources of Information on Ocean & Coastal Resources and GRNMS

In this section, we want to learn what are the best ways GRNMS can communicate with you by understanding the sources of information which you use, and which sources of information you trust.

6. Sources of Information Used **(Please check all sources you use).**

Sources of Information	
Gray's Reef National Marine Sanctuary Advisory Council	
Gray's Reef National Marine Sanctuary Staff	
Gray's Reef National Marine Sanctuary Web site	
Gray's Reef National Marine Sanctuary Foundation	
NOAA's National Marine Fisheries Service	
Atlantic States Marine Fisheries Commission	
South Atlantic Fishery Management Council	
Georgia Department of Natural Resources	
Georgia Sea Grant	
Coastal Conservation Association (CCA) of Georgia	
Recreational Fishing Alliance (RFA)	
American Sportfishing Association (ASA)	
National Coalition for Marine Conservation	
International Game and Fish Association (IGFA)	
Southern Kingfish Association (SKA)	
Fishing Magazines/Newsletters	
SCUBA diving magazines/Newsletters	
Newspapers	
Radio	
Television	
Internet	
Gray's Reef National Marine Sanctuary Facebook Page	

Sources of Information	
Gray's Reef National Marine Sanctuary Twitter Feed	
Other Social Media (You Tube, Flickr, Instagram, etc.)	
Word of Mouth	
Others (please specify, include people like a marina manager, other anglers or divers, local community leader, family member, friend, etc.)	

7. For the sources of information, you said you used in the previous question, on a scale of 1 to 5, where 1 means No Trust at All and 5 means Completely Trust, to what extent do you trust each source of information?

Items	1- No Trust at All	2- Very Little Trust	3- Neutral	4- Trust Very Much	5- Completely Trust
Gray's Reef National Marine Sanctuary Advisory Council					
Gray's Reef National Marine Sanctuary Staff					
Gray's Reef National Marine Sanctuary Website					
Gray's Reef National Marine Sanctuary Foundation					
NOAA's National Marine Fisheries Service					
Atlantic States Marine Fisheries Commission					
South Atlantic Fishery Management Council					
Georgia Department of Natural Resources					
Georgia Sea Grant					
Coastal Conservation Association (CCA) of Georgia					

Items	1- No Trust at All	2- Very Little Trust	3- Neutral	4- Trust Very Much	5- Completely Trust
Gray's Reef National Marine Sanctuary Advisory Council					
Gray's Reef National Marine Sanctuary Staff					
Gray's Reef National Marine Sanctuary Website					
Gray's Reef National Marine Sanctuary Foundation					
NOAA's National Marine Fisheries Service					
Atlantic States Marine Fisheries Commission					
South Atlantic Fishery Management Council					
Georgia Department of Natural Resources					
Georgia Sea Grant					
Recreational Fishing Alliance (RFA)					
American Sportfishing Association (ASA)					
National Coalition for Marine Conservation					
International Game and Fish Association (IGFA)					
Southern Kingfish Association (SKA)					
Fishing Magazines/Newsletters					

Items	1- No Trust at All	2- Very Little Trust	3- Neutral	4- Trust Very Much	5- Completely Trust
Gray's Reef National Marine Sanctuary Advisory Council					
Gray's Reef National Marine Sanctuary Staff					
Gray's Reef National Marine Sanctuary Website					
Gray's Reef National Marine Sanctuary Foundation					
NOAA's National Marine Fisheries Service					
Atlantic States Marine Fisheries Commission					
South Atlantic Fishery Management Council					
Georgia Department of Natural Resources					
Georgia Sea Grant					
SCUBA diving magazines/Newsletters					
Newspapers					
Radio					
Television					
Internet					
Gray's Reef National Marine Sanctuary Facebook Page					
Gray's Reef National Marine Sanctuary Twitter Feed					
Other Social Media (You					

Items	1- No Trust at All	2- Very Little Trust	3- Neutral	4- Trust Very Much	5- Completely Trust
Gray's Reef National Marine Sanctuary Advisory Council					
Gray's Reef National Marine Sanctuary Staff					
Gray's Reef National Marine Sanctuary Website					
Gray's Reef National Marine Sanctuary Foundation					
NOAA's National Marine Fisheries Service					
Atlantic States Marine Fisheries Commission					
South Atlantic Fishery Management Council					
Georgia Department of Natural Resources					
Georgia Sea Grant					
Tube, Flickr, Instagram, etc.)					
Word of Mouth					
Others (please specify)					

8. How do you like to receive information? (Please check all that apply).

Information from GRNMS	
Website	
E-mail list serve	
Newsletter delivered by U.S. Post Office	
Telephone call from Staff	
E-mail from Staff	
Social media (Twitter, Facebook, You Tube, etc.).	

9. To the best of your knowledge please name the agency who sets policy/management for each of the following:

- ☐ National Marine Sanctuaries
☐ Ocean areas of Georgia (Federal waters)
☐ Coastal areas in and around Georgia (State waters)

10. How would you rank your familiarity with the rules and regulations in place at GRNMS?

Familiarity	
Very Familiar	
Somewhat Familiar	
I am not familiar with any of the rules or regulations	

Section 3 – Status and Conditions of the Resources/Pressures’ in GRNMS (Note: For users of GRNMS only)

11. On a scale of 1 to 5, where 1 means Getting a lot Better and 5 means Getting a lot Worse, please rate how you think the status/condition of each of the following resources has been changing since implementation of the GRNMS (1981).

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Items	1- Getting a Lot Better	2- Getting Somewhat Better	3- Same	4- Getting Somewhat Worse	5- Getting a Lot worse
Live bottom habitat					
Other bottom habitat					
Fish populations (bottom fish)					
Fish populations (pelagic)					
Fish populations (diversity or number of species)					
Other Sea life (abundance)					
Other Sea life (diversity or number of species)					
Water quality					
Invasive species (such as lionfish)					
Marine debris (plastics, other trash)					
Sea based pollution (discharges from boats)					
Underwater human produced noise from human activities					
Ocean Acidification (ph. level harms shellfish and corals)					
Climate Change					

Section 4 – Activities in Ocean & Coastal Areas in and Around Georgia and in the GRNMS

12. Which activities do you do in ocean & coastal areas both in and around Georgia and inside GRNMS? Please check all that apply.

Activities	Georgia	GRNMS
Recreational bottom fishing		
Recreational fishing – trolling or drifting in mid or top water		
Recreational spear fishing with power heads		
Recreational spear fishing without power heads		
SCUBA diving (taking things)		
SCUBA diving (don't take anything)		
Whale watching or other wildlife viewing activities		
Sailing		

13. Please check all that apply for some activities that do not take place in GRNMS, but may take place in coastal Georgia in other areas.

Activities	Georgia
Beach Activities	
Surfing	
Windsurfing or Kite boarding	
Personal Watercraft Use (jet skis, wave runners, etc.)	
Shorebird Watching	
Kayaking	
Paddle Boarding	

14. For those activities you did in 2019, please provide how many days you did the activity in Georgia and how many of those days were in GRNMS. (If all your days were in GRNMS, then code all your days in Georgia and GRNMS). Count any part of a day as a whole day.

Activities	Days in Georgia	Days in GRNMS
Recreational bottom fishing		
Recreational fishing – trolling or drifting in mid or top water		
Recreational spear fishing with power heads		
Recreational spear fishing without power heads		
SCUBA diving (taking things)		
SCUBA diving (don't take anything)		
Whale watching or other wildlife viewing activities		
Kayaking		
Paddle Boarding		

15. For the days you did activities in GRNMS in 2019, please provide the number of days by each type of boat access.

Activities	Days Private Boat	Days Charter Boat
Recreational bottom fishing		
Recreational fishing – trolling or drifting in mid or top water		
Recreational spear fishing with power heads		
Recreational spear fishing without power heads		
SCUBA diving (taking things)		
SCUBA diving (don't take anything)		
Whale watching or other wildlife viewing activities		

16. When doing your activities from a private boat, how many other people are usually with you on the boat?

17. Do you participate in fishing tournaments in GRNMS?

_____ Yes _____ No _____ I do not fish

18. What factors influenced your choice of going to GRNMS to do your activities? For each factor select the appropriate answer.

Activities	Yes	Somewhat	Not At All
Weather			
Fish species preference			
Time of Day			
Seasonal patterns			
Word of mouth/radio talk			
Boat Captain's choice			
Sea conditions			
Distance to GRNMS			
Better fishing			
Better diving for things to see			

Section 5 – Activity Specialization

19. Of the list of activities listed in previous questions, which one of these is your main or primary activity in the ocean & coastal areas of Georgia, including GRNMS?

- _____ Recreational bottom fishing
- _____ Recreational fishing – trolling or drifting in mid or top water
- _____ Recreational spear fishing with power heads
- _____ Recreational spear fishing without power heads
- _____ SCUBA diving (taking things)
- _____ SCUBA diving (don't take anything)
- _____ Whale watching or other wildlife viewing activities
- _____ Sailing
- _____ Beach activities
- _____ Surfing
- _____ Windsurfing or kite boarding

- _____ Personal watercraft use (jet skis, wave runners, etc.)
- _____ Shorebird watching
- _____ Kayaking
- _____ Paddle boarding

20. During my main or primary activity, I can be best described as:

- a) having very little understanding of the activity. I am often unsure about how to do certain things when I go.
- b) having some understanding of the activity, but still in the process of learning more about the sport.
- c) I am becoming more familiar and comfortable with the activity.
- d) being comfortable with the sport. I have a good understanding of what I can do, and how to do it. A knowledgeable expert in the sport. I encourage, teach and enhance opportunities for others who are interested in the activity.

21. My relationships with others who do the activity are:

- a) not established. I really don't know any other people who do the activity.
- b) very limited. I know some others in the activity by sight and sometimes talk with them, but I don't know their names.
- c) one of familiarity. I know the names of others who do the activity, and often speak with them.
- d) close. I have personal and close relationships with others in the activity. These friendships often revolve around the activity.

22. My commitment to the activity is:

- a) very slight. I have very little connection to the activity. I may or may not continue to participate in the sport in the future.
- b) moderate. I will continue to do it as it is entertaining and provides the benefits I want.
- c) fairly strong. I have a sense of being a member of the activity, and it is likely that I will continue to do it for a long time.
- d) very strong. I am totally committed to the activity. I encourage other to participate in the sport and seek to ensure the activity continues in the future.

23. On a scale of 1 to 5, where 1 means No Use and 5 means A Lot of Use, to what extent do you make use of the following for current information about your primary activity?

Types of Information	1- No Use	2- Almost No Use	3- A Little Use	4- Moderate Use	5- A Lot of Use
Talking with others who participate in the activity					
Magazines					
Government agency publications					
Conservation organization publications					
Newspapers					
Diving shops/companies					
Club meetings/newsletters					
Television					
Radio					
Internet					
Social Media					

24. Below is a list of reasons why people engage in recreation activities. On a scale of 1 to 5, where 1 means Not at All Important and 5 means Extremely Important, how important is each of the reasons for your primary activity?

Reasons why people engage in recreation activities	1- Not at All Important	2- Slightly Important	3- Moderately Important	4- Very Important	5- Extremely Important
To be outdoors					
For family recreation					
To experience new and different things					
For relaxation					
To be close to the water					
To get away from the demands of other people					
To be with friends					
To develop my skills					
To get away from the regular routine					
To experience adventure and excitement					
To experience natural surroundings					
To catch food to eat					

Section 6 – Ways You Value Ocean & Coastal Resources/Marine Environment

In this section, we want to learn about the ways you value the many products and services that are derived from ocean & coastal resources and the things you would do to help ensure their sustainability for the future.

25. Below is a list of goods or services that people get from ocean & coastal resources. On a scale of 1 to 5, where 1 means No Value and 5 means Extremely High Value, to what extent do you value each good or service?

Goods/Services	1- No Value	2- Low Value	3- Medium Value	4- High Value	5- Extremely High Value
Support for recreation activities					
Seafood purchased at <u>local</u> stores and restaurants					
Seafood purchased at <u>non local</u> stores and restaurants					
Support for scientific research					
Support for education					
Supply of mineral resources through mining					
Supply of oil & gas					
Supply of alternative energy (wind, wave, tidal)					
Supply of pharmaceutical products through mining or harvest of resources					
Protection of resources even though I never intend to visit or directly use them					

26. On a scale of 1 to 5, where 1 means Would Not Do and 5 means Would Do the Maximum, to what extent would you undertake the activities or actions to ensure that ocean & coastal resources are used sustainability and available for future generations to enjoy?

Activities	1- Would Not Do	2- Would Do Very Little	3- Would Do Some	4- Would Do A Lot	5- Would Do The Maximum
Volunteer time					
Pay higher taxes for resource protection and restoration					
Pay higher prices for goods and services due to costs to businesses in complying with regulations that protect ocean & coastal resources or require restoration of areas damaged					
Pay user fees like fishing licenses or diving access fees or additional boat registration fees					
Donate to groups representing recreational fishing interests					
Donate to groups representing diving interests					
Recycle					
Use less energy					
Avoid/boycott certain seafood products					
Other (please specify)					

Section 7 – Information About Yourself

In this last section, we need information about you to help classify and analyze your responses to ensure the scientific validity of this information. Any information that can connect this information with you personally will

be protected and not given out to anyone.

27. What is your sex

_____Male _____Female

28. What year were you born? _____

29. Are you Hispanic or Latino?

_____Yes _____No

30. What is your race?

_____White
_____Black or African American
_____American Indian or Alaska Native
_____Asian
_____Native Hawaiian or Pacific Islander

31. How many people age 18 or older live in your household? _____

32. How many people under age 18 live in your household? _____

33. What type below best describes your household?

___Single adult with no children 18 or under
___Single adult with children under 18
___Two adults with no children 18 or under
___Two adults with children under 18
___More than two adults with no children under 18
___More than two adults with children 18 or under

34. What is your highest level of education completed?

___8th grade or less
___9th to 12th grade, no diploma
___12th grade High School Graduate or equivalent (GED or alternative credential)
___Some College, 1 or more years, no degree
___Associate's degree (for example: Associate in Arts (AA), Associate in Science (AS))

____ Bachelor's degree (for example: Bachelor of Arts (BA), Bachelor of Science (BS))

____ Master's degree (for example: MA, MS, Meng, Med, MSW, MBA)

____ Professional School degree (for example: MD, DDS, DVM, LLB, JD)

____ Doctor's degree (for example: PhD, EdD)

35. What is your employment status (Check all that apply)

____ Unemployed

____ Employed full time

____ Employed part time

____ Retired

____ Student

____ Homemaker

____ None of the above

36. Which category below best describes your annual household income before taxes in 2019?

____ Less than \$5,000

____ \$5,000 to \$9,999

____ \$10,000 to \$14,999

____ \$15,000 to \$19,999

____ \$20,000 to \$24,999

____ \$25,000 to \$29,999

____ \$30,000 to \$39,999

____ \$40,000 to \$44,999

____ \$45,000 to \$49,999

____ \$50,000 to \$59,999

____ \$60,000 to \$74,999

____ \$75,000 to \$99,999

____ \$100,000 to \$149,999

____ \$150,000 or more

37. Do you own a boat?

____ Yes ____ No

42. What is the length of your boat? _____

43. Do you have memberships in any groups or clubs?

- _____ Fishing groups, clubs or organizations
- _____ Diving groups, clubs or organizations
- _____ Environmental groups, clubs or organizations
- _____ Chamber of Commerce
- _____ Other (specify type)

44. What is your home ZIP/postal code? (If you live in more than one location, please put your primary location code) _____



NATIONAL MARINE
SANCTUARIES

AMERICA'S UNDERWATER TREASURES