

NOAA Technical Memorandum CRCP 39

**National Coral Reef Monitoring Program
Socioeconomic Monitoring Component**

Summary Findings for South Florida, 2019



NOAA Coral Reef Conservation Program
Silver Spring, MD
February 2021



United States
Department of Commerce

National Oceanic and
Atmospheric Administration

National Ocean Service

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M.E. Allen, C.S. Fleming, B.M. Zito, S.B. Gonyo, S.D. Regan, and E.K. Towle
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About this Document

The mission of the National Oceanic and Atmospheric Administration (NOAA) is to understand and predict changes in the Earth's environment and to conserve and manage coastal and oceanic marine resources and habitats to help meet our Nation's economic, social, and environmental needs. As a branch of NOAA, the National Ocean Service (NOS) conducts or sponsors research and monitoring programs to improve the scientific basis for conservation and management decisions. The NOS strives to make information about the purpose, methods, and results of its scientific studies widely available.

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Executive Summary

The Socioeconomic Component of the National Coral Reef Monitoring Program (NCRMP) collects socioeconomic data across all United States (US) coral reef territories and jurisdictions to inform human connections indicators. These indicators fall under broad categories of demographics of these populations, human use of coral reef resources, and knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal of this endeavor is to track relevant information regarding each jurisdiction's population, social and economic structure, societal interactions with coral reef resources, and the responses of local communities to coral management. These data are used to develop and update indicators that describe the state of each jurisdiction relative to other US jurisdictions. The National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) uses the information to protect coral reefs at local, regional, and national levels, as well as to inform continuing research and communication products. CRCP staff, along with educators and managers in the jurisdictions, use this information to monitor changes in coral reef dependent communities and jurisdictions, and ensure education programs are designed to achieve their goals.

This report presents primary data from the second monitoring cycle in South Florida (the first monitoring cycle was completed in 2014). The survey was conducted from April to August 2019, and results are representative of South Florida as a whole, as well as each of the South Florida counties adjacent to Florida's coral reef: Martin, Palm Beach, Broward, Miami-Dade, and Monroe Counties. The following are key highlights from the results:

- South Florida residents' top three activities continue to be beach recreation, swimming, and boating. The 2019 survey indicated a significant increase in residents' participation in fishing, snorkeling, island/sandbar recreation, and watersports in general compared to the 2014 survey.
- Coral reefs are important to South Florida's culture and tourism, and many rely on local reefs for seafood (particularly in Monroe County).
- Residents in 2019 were more familiar with marine resources and how their conditions are changing than residents were in 2014. Their general outlook was that resource conditions had become worse, and residents were particularly concerned about water quality, coral abundance, and climate change.
- Awareness of threats to coral reef ecosystems tended to be low among residents of Martin, Miami-Dade, Palm Beach, and Broward Counties.
- The majority of Monroe County residents were familiar with marine protected areas (MPAs). Residents of all counties generally supported the establishment of MPAs and agreed that MPAs protect coral reefs. However, there was less agreement on whether there should be more MPAs.
- Residents strongly supported more public education on sea level rise and climate change.
- Overall, residents were receptive to management strategies specific to improving water quality and restoring corals. This indicates that managers can more confidently suggest implementing those kinds of initiatives to support coral reef health. However, those initiatives may have differing impacts for different subgroups/stakeholders.

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List of Acronyms

CNMI	Commonwealth of the Northern Mariana Islands
CRCP	Coral Reef Conservation Program
CRPA	Florida Coral Reef Protection Act
FDEP	Florida Department of Environmental Protection
FKNMS	Florida Keys National Marine Sanctuary
FWC	Florida Fish and Wildlife Conservation Commission
GDP	Gross Domestic Product
MPA	Marine Protected Area
NCCOS	National Centers for Coastal Ocean Science
NCEI	National Center for Environmental Information
NCRMP	National Coral Reef Monitoring Program
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
OMB	Office of Management and Budget
SCTLD	Stony Coral Tissue Loss Disease
SCUBA	Self Contained Underwater Breathing Apparatus
US	United States

1. Introduction

Coral reefs are among the most valuable ecosystems on Earth, providing food, protection from storms, and recreational opportunities to adjacent coastal communities (e.g., Storlazzi et al. 2019). These assets are also tied to economic benefits including tourism, fishing, the aquarium trade and other ornamental resources, and biomedical products. When coral reefs are threatened by climate change, fishing impacts, and land-based sources of pollution, nearby human communities are also threatened. In 2013, the National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) created the National Coral Reef Monitoring Program (NCRMP) to establish an integrated and focused long-term monitoring program for all United States (US) coral reef ecosystems. Since 2014, the program has been conducting sustained observations of biological, climatic, and socioeconomic indicators in US states and territories where coral reefs are present. More information about all components of the NCRMP can be explored in "NOAA Coral Reef Conservation Program: National Coral Reef Monitoring Plan" (NOAA CRCP 2014).¹

The novel inclusion of a socioeconomic monitoring component to the NCRMP represents a progressive, interdisciplinary approach for the CRCP, which has recognized the need to integrate socioeconomic information with biophysical indicators relevant to the conservation of coral reef resources.

1.1 Socioeconomic component of NCRMP

The Socioeconomic Component of the NCRMP collects and monitors socioeconomic information, including human use of coral reef resources, knowledge, attitudes, and perceptions of coral reefs and coral reef management, and demographics of the populations living in coral reef areas. The overall goal of the socioeconomic monitoring component is to track relevant information regarding each jurisdiction's population, social and economic structure, the benefits of coral reefs and related habitats, the perceived impacts of society on coral reefs, and the impacts of coral management on communities. NOAA's CRCP uses the information to improve programs designed to protect coral reefs at local, regional, and national levels, as well as to inform continuing research and communication products. Survey indicators were developed in consultation with local stakeholders, partners, and other scientists. Composite indicators allow researchers to measure the complex two-way relationship between the environment and humans. Researchers are then able to track the various facets of this relationship over time by breaking down an intellectually complex and immeasurable concept into its various smaller and more measurable parts to improve communication and policy (Schirnding 2002).

¹ ftp://ftp.library.noaa.gov/noaa_documents/lib/CoRIS/CRCP/noaa_crmp_national_coral_reef_monitoring_plan_2014.pdf

In 2012, an indicator development workshop produced a suite of 13 socioeconomic indicators to track the relationship between coral reefs and coral reef adjacent communities (**Error! Reference source not found.**) (Lovelace and Dillard 2012).² Primary and secondary data streams inform the indicators for each of the seven inhabited US coral reef jurisdictions: South Florida, the US Virgin Islands, Puerto Rico, Hawai'i, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands (CNMI) (**Error! Reference source not found.**).

Table 1: Thirteen socioeconomic indicators for the NCRMP socioeconomic surveys.

	Indicators	Rationale
1	Participation in coral reef activities (including snorkeling, diving, fishing, harvesting)	Measuring participation in coral reef activities enhances understanding of the economic and recreational importance of coral reefs to local residents as well as the level of extractive and non-extractive pressures on reefs
2	Perceived resource condition	Assessment of perceived conditions is a complement to biophysical information and is key to evaluating differences in levels of support for various management strategies
3	Attitudes towards coral reef management strategies	Monitoring this information over time will be valuable to decision makers, as it will provide insight into possible changes in public perception concerning coral reef management strategies
4	Awareness and knowledge of coral reefs	Monitoring this information over time is key to tracking whether CRCP constituents understand threats to coral reefs and will help inform management strategies (and education/outreach efforts)
5	Human population trends (change) near coral reefs	Monitoring human population trends is important for understanding increasing pressure on coral reefs, as well as reef-adjacent populations
6	Economic impact of coral reef fishing to jurisdiction	Tracking the economic contributions of coral reefs can help justify funds allocated for coral reef protection
7	Economic impact of dive/snorkel tourism to jurisdiction	Tracking the economic contributions of coral reefs can help justify funds allocated for coral reef protection
8	Community well-being	Tracking changes in health, basic needs, and economic security enhances understanding of links between social conditions and coral reefs
9	Cultural importance of coral reefs	Measuring cultural importance improves understanding of traditional and cultural significance of coral reefs to jurisdictional residents, and whether this is changing over time
10	Participation in behaviors that may improve coral reef health (e.g., beach cleanups, sustainable seafood choices)	Measuring participation improves understanding of positive impacts to coral reefs as well as negative impacts
11	Physical Infrastructure	Assessment of coastal development footprint, physical access to coastal resources, and waste and water management infrastructure provides an understanding of human impact on the coast
12	Knowledge of coral reef rules and regulations	Tracking this information over time at the jurisdictional/national level will inform investment in education and outreach
13	Governance	Measurement of governance provides information on the current status of local institutions involved in coral reef conservation, number

²

https://data.nodc.noaa.gov/coris/library/NOAA/CRCP/project/626_Loper/Social_and_Economic_Indicators_for_Monitoring_the_U.S._Coral_Reef_Jurisdictions_Workshop_Report_2012.pdf.

		of functioning management strategies, and percent area of coral reefs under protection
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From 2014-2018, the NCRMP Socioeconomic team completed its first round of monitoring via a random sample of resident households in each jurisdiction (Gorstein et al. 2019a; Gorstein et al. 2019b; Gorstein et al. 2018a; Gorstein et al. 2018b; Gorstein et al. 2017; Gorstein et al. 2016; Levine et al. 2016). The survey instrument was composed of one consistent set of questions for all US coral reef jurisdictions, as well as a subset of jurisdiction-specific questions relevant to local management needs. NCRMP socioeconomic data are collected using a variety of modes as appropriate to the context in each jurisdiction with methodology that generally follows Dillman's Tailored Design Method (Dillman et al. 2009). For all jurisdictions, the aim is a representative sample of the population that meets a 95% confidence level with a minimum of a +/-5% margin of error. All survey questions are periodically approved for use by the Office of Management and Budget (OMB) under OMB#0648-0646. Surveys are planned to be repeated in each US coral reef jurisdiction approximately once every five to seven years, and the second round of monitoring began in 2019.

Table 2: Geographic scope of current NCRMP Socioeconomic Monitoring

Location	Inhabited Islands/Counties
American Samoa	Islands of Tutuila, Ta'u, Olosega, Ofu, Aunu'u
Florida	Martin, Palm Beach, Broward, Miami-Dade, and Monroe Counties
Hawai'i	Islands of Kauai, Maui, Moloka'i, O'ahu, Hawai'i, Lana'i
Puerto Rico	Islands of Puerto Rico, Vieques, and Culebra
Commonwealth of the Northern Mariana Islands	Islands of Saipan, Tinian, and Rota
Guam	Entire island of Guam
US Virgin Islands	Islands of St. Croix, St. Thomas, and St. John

Following the first round of monitoring (2014-2018), the NCRMP Socioeconomic team coordinated a series of expert panels and workshops to determine how each of the 13 socioeconomic indicators would be measured using primary data collected through the NCRMP resident surveys and existing secondary data. In 2019, the team published an indicator development report (Abt Associates, Inc. 2019) that presented guiding methodology for each monitoring cycle's indicator score development, as well as the calculated indicator scores for the first round of monitoring. Following the completion of each monitoring cycle, the 13 socioeconomic indicator scores will be recalculated using the 2019 foundational methodology. Tracking indicator scores over time will allow CRCP to monitor trends in human connections to US coral reef ecosystems.

More information on indicator development, secondary data, as well as summary findings and methods can be found at the project website:

www.coris.noaa.gov/monitoring/socioeconomic.html.

1.2 Purpose of this report

This technical memorandum presents the findings from the second South Florida NCRMP socioeconomic primary data collection, which inform the following indicators:

- Participation in coral reef activities (including snorkeling, diving, fishing, harvesting)
- Cultural importance of coral reefs
- Perceived resource condition
- Awareness and knowledge of coral reefs
- Attitudes towards coral reef management strategies
- Awareness of coral reef rules and regulations
- Participation in behaviors that may improve coral health

While additional secondary data collection efforts will support the remaining six indicators (Human population change near coral reefs, Community well-being, Physical infrastructure, Economic impact of coral reef fishing to jurisdiction, Economic impact of dive/snorkel tourism to jurisdiction, and Governance), the present report focuses solely on data collected through the South Florida NCRMP survey. As demonstrated in Abt Associates, Inc. (2019), the data presented in this report as well as additional secondary data will be synthesized and published at the completion of the current monitoring cycle.

This report is organized into five remaining sections. Section 2 briefly describes the current jurisdiction (South Florida), Section 3 details the methodology used in data collection and analysis, Section 4 provides descriptive statistics for the current (2019) round of monitoring, and Section 5 provides trend analysis between the first (2014) and second (2019) rounds of monitoring. Section 6 provides discussion and ideas for future monitoring.

2. Jurisdiction Description

The South Florida region encompasses five of the southernmost counties in the contiguous US: Martin, Palm Beach, Broward, Miami-Dade, and Monroe (Figure 1). This region includes the Florida Keys, which extend south of the 25th parallel north, in Monroe County. The topography of this coastal region, combined with warm water temperatures influenced by the Gulf Stream Current, provide ample habitat for coral growth (Andrews et al. 2005, University of Miami 2013). The Florida Reef Tract (also known as Florida's coral reef) is the only nearshore coral habitat in the contiguous US, and extends approximately 360 miles from the St. Lucie Inlet (Martin County) to Dry Tortugas National Park, west of the Florida Keys (Monroe County) (FDEP 2020a). These reefs are home to over 45 species of stony corals, 35 species of octocorals, and 70 species of marine sponges (FDEP 2020a).

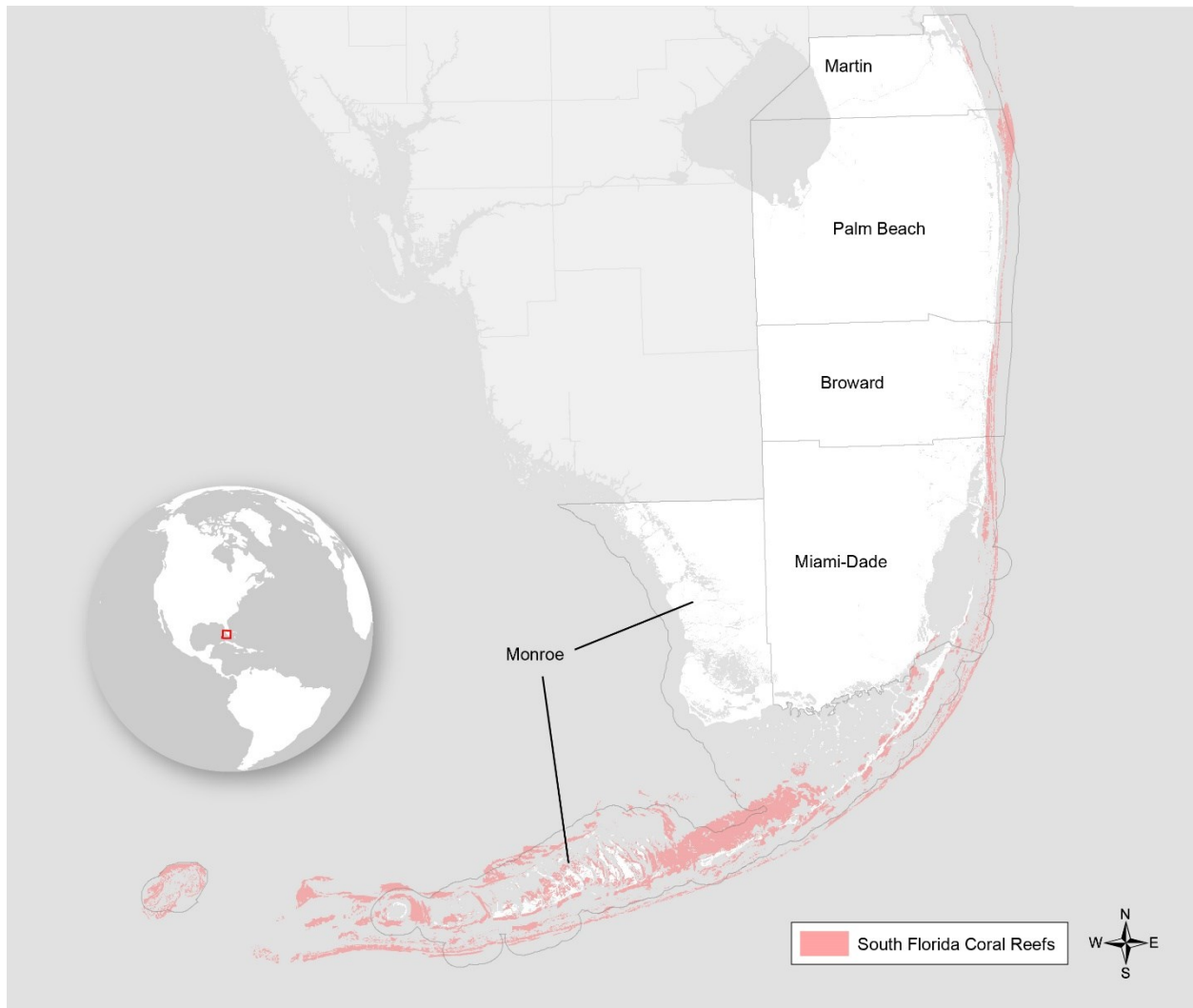


Figure 1: Map of South Florida in relation to total coral cover

Of the sixty-seven counties in Florida, nearly one third (6.3 million) of the state’s population (21.3 million) resides in the five study area counties, with the three most populous counties statewide being Miami-Dade (2.7 million), Broward (1.9 million), and Palm Beach (1.4 million) (US Census Bureau 2018). In recent years, South Florida has become the eighth most populous metropolitan area in the US, and the coastal marine habitats of this region are considered an “urban ecosystem” (Lirman et al. 2019). The Hispanic/Latino population represents nearly half (2.8 million) of the 6.3 million residents in South Florida’s counties (US Census Bureau 2018). In Miami-Dade County alone, 68% (1.8 million) of the population is of a Hispanic/Latino ethnicity, and has the nation’s largest populations of Cubans, Colombians, Hondurans, and Peruvians (US Census Bureau 2010; Motel and Patten 2012). While English is the predominant language, Spanish is used extensively in certain enclaves throughout South Florida, most notably

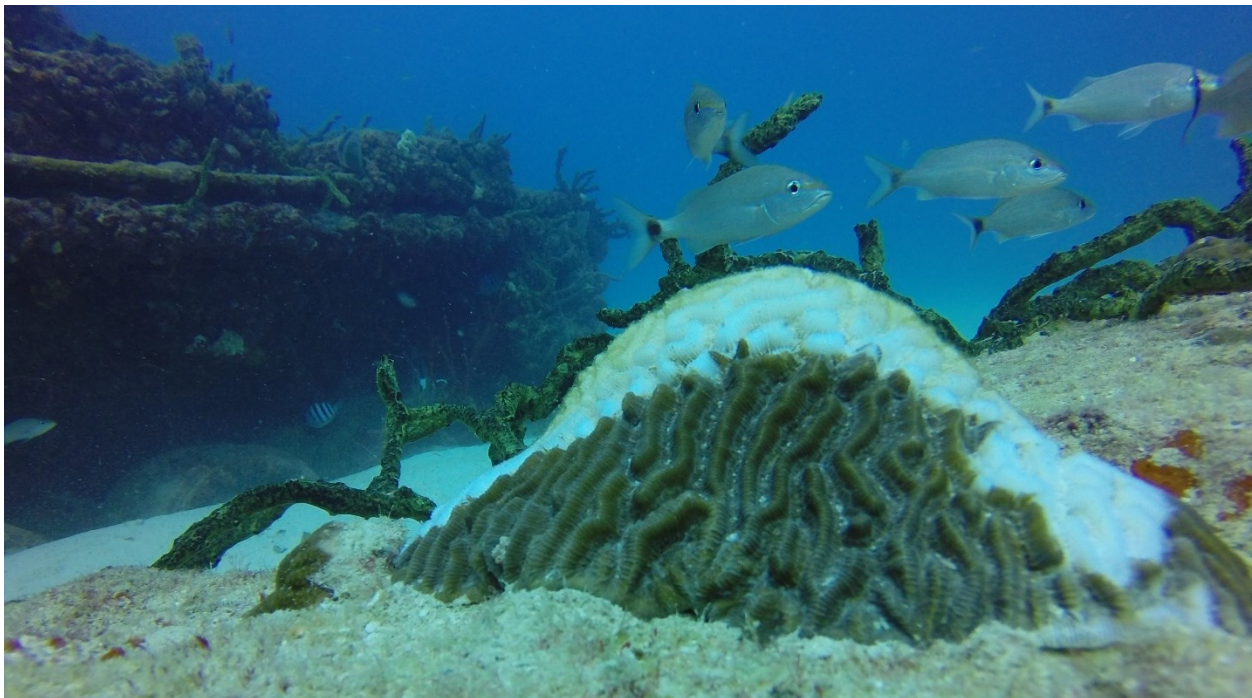
in Miami-Dade County where 66% (1.8 million) of the population speaks Spanish at home (US Census Bureau 2018).

While the majority of South Florida is comprised of wetlands and open water, 12% of this region's land cover is classified as urban or built-up land (C-CAP 2016). Miami-Dade and Palm Beach Counties are the most highly urbanized areas in South Florida accounting for 64% of South Florida's developed land. Additionally, one-third of Palm Beach and Martin Counties is comprised of agricultural land. Many of the region's corals are within 1.5 km of South Florida's urbanized and cultivated coast (Collier et al. 2008), putting the residents in close proximity to these natural features.

In 1990, the Florida Keys National Marine Sanctuary (FKNMS) was established in response to the declining health of Florida's coral reef habitat. The area now covers roughly 10,000 square kilometers in which certain human activities and stressors are prohibited (FKNMS 2020b, Lirman 2019). Other protected areas along Florida's reef include the Tortugas Ecological Reserve and Biscayne National Park. In 2009, the State of Florida enacted the Florida Coral Reef Protection Act (CRPA) as a measure to protect the vulnerable, yet ecologically and economically valuable reef ecosystem. The CRPA made it illegal to anchor on or damage coral reefs in Florida and gave the Florida Department of Environmental Protection (FDEP) the authority to fine those who do so (FDEP 2020c). In July 2018, the Southeast Florida Coral Reef Ecosystem Conservation Area, a portion of Florida's reef from the St. Lucie Inlet to the northern border of Biscayne National Park, was formally established by Florida House Bill 53 (HB 53 2018). While no state funding was linked to this bill, it represented further acknowledgement that Florida's reef is valuable and in need of protection.

Tourism and recreation are an integral part of the South Florida economy, contributing over \$9.4 billion in gross domestic product (GDP) in 2017 (NOAA 2020). High rates of tourism and recreation, coupled with high population density near the coast, bring even more humans in contact with Florida's coral reef ecosystems. This increases access to coral reef ecosystem services, but also introduces more opportunities for human-induced stressors to the reefs (e.g., boating and fishing impacts, water quality issues). Changes in precipitation can cause fluctuations in salinity concentrations, increased turbidity, and stormwater pollutant runoff throughout the Everglades watershed (Lirman et al. 2019). Tropical storms and hurricanes not only pose a threat to the coastal communities of South Florida, but can also damage coral reef habitat through increased sedimentation and breakage of reef colonies (Walker 2018). Recent preliminary studies assessing damage from Hurricane Irma in 2017 have shown that Florida's coral reef was minimally impacted, but even minor damage to this vulnerable ecosystem is of concern given declines in coral cover, abundance, and diversity over the past several decades (Lirman et al. 2019, Wachnicka et al. 2019, Walker 2018).

Under environmental stress, corals can undergo a bleaching response in which they expel the symbiotic algae that they depend on for food and energy. While in this bleached state, corals are weakened and more susceptible to disease, yet they are often capable of recovering if water conditions improve (FDEP 2020b). A bleaching event occurred in South Florida in 2014 and 2015, which coincided with the initial outbreak of the novel Stony Coral Tissue Loss Disease (SCTLD) in mid-northern portions of Florida's reef along Palm Beach, Broward, and Miami-Dade Counties (Muller et al. 2020). This highly contagious disease has now affected nearly all of Florida's reefs (and those in the Caribbean), and nearly half of Florida's 45 reef-building coral species (FDEP 2020a, FDEP 2020b, Muller et al. 2020, FKNMS 2020a). While it is possible for corals to recover from bleaching events under the right conditions, the SCTLD outbreak has resulted in high rates of mortality and devastated Florida's reef ecosystem. Recent surveys have shown that coral diversity has decreased in South Florida, and species that can tolerate a wider range of environmental conditions are now dominating the ecosystem (Walker 2018, Walton et al. 2018).



Signs of stony coral tissue loss disease (SCTLD) on Symmetrical Brain coral (*Pseudodiploria strigosa*). Photo: Florida Department of Environmental Protection

3. Methodology

A telephone survey of residents aged eighteen and older within Miami-Dade, Broward, Palm Beach, Martin, and Monroe Counties was conducted from April to August, 2019.³ Surveyed areas in relation to total coral cover are shown in Figure 1 (Section 2).

Telephone surveys were offered in both English and Spanish. Of the 16,275 individuals contacted, a total of 2,201 surveys were completed (402 landline interviews and 1,799 cell phone interviews), yielding an overall response rate of 13.5% (10.02% landline and 14.67% cell phone). Data were weighted to account for demographic characteristics within each of the five counties including age, gender, and Hispanic ethnicity, as well as population size. No names or personally identifiable information were collected during surveying. For more details on data collection and weighting protocols, please see Appendix A.

Data analysis of all monitoring cycles includes descriptive analyses (e.g., measures of central tendency, examination of distribution), as well as examinations of statistical relationships between variables (e.g., cross tabulations and mean comparisons).

4. Results: Summary Findings

Survey results are reported for each of the seven indicators reliant upon primary data. The survey instrument is included in Appendix B. Variables were grouped in some sections, but all data are publicly archived with the National Center for Environmental Information (NCEI), and the authors are happy to provide assistance upon request. Some sub-strata (county) comparisons of interest are discussed, and their corresponding data tables are found in Appendix C. All results were self-reported by survey respondents, and these data were later weighted to be representative of South Florida residents. Unless otherwise stated, all descriptions describe weighted data.

4.1 Sample demographics

Table 3 provides an overview of demographic variables for the weighted sample (survey respondents), as well as the target population for comparison where data were available. Results of the survey were weighted by age, gender, Hispanic ethnicity, and county so that within each county the data were representative of the demographic characteristics of the total population of that county. County of residence for survey respondents matched the population metrics, with 43.2% of respondents residing in Miami-Dade County, 29.8% residing in Broward County, 23.1% residing in Palm Beach County, 2.6% residing in Martin County, and 1.3% residing in Monroe County.

The sample was relatively split between males and females. The sample was predominantly white, and slightly skewed towards older, well-educated residents, with 58.8% having a

³ Survey respondents lived in South Florida at least three months per year.

Bachelor's or advanced degree. For ethnicity, 45.1% of respondents self-identified as Hispanic or Latino. There were fewer black/African Americans represented in the sample compared to the population, and respondents were 3.5 times more likely to self-identify their race as "other". The sample also had a much lower proportion of residents who had not yet graduated high school, compared to the population. The median household income reported by respondents was \$100,000-149,999.

Additionally, residential tenure of survey respondents was high, with most respondents having lived in South Florida for longer than 10 years (57.2%) or "all my life" (31.2%). A majority (93.0%) of survey respondents claimed not to have a marine-dependent occupation, but for those that did (7.0%), some of the more common occupations included marina or boat operations (13.2%), education (8.7%), and dive or snorkel operations (6.2%).

Table 3: Comparison of demographic variables for population and weighted sample (percent)

Demographic Variables (RR = Response rate percent)		Population	Weighted Sample
County of Residence (RR = 100)	Miami-Dade	43.2	43.2
	Broward	29.8	29.8
	Palm Beach	23.1	23.1
	Martin	2.6	2.6
	Monroe	1.3	1.3
Gender (RR = 98.2)	Female	52.0	51.9
Race (RR = 90.6)	White	73.1	67.9
	Black or African American	21.3	11.8
	Other	5.7	20.3
Ethnicity (RR = 95.1)	Hispanic	43.4	45.1
Age (RR = 92.1)	18-24	10.6	11.1
	25-34	16.7	16.7
	35-44	16.6	17.1
	45-54	18.3	17.9
	55-64	15.7	16.1
	65+	22.1	21.1
Education (RR = 94.2)	Less than high school (includes equivalency)	14.8	2.1
	High school graduate (includes equivalency)	27.3	13.7
	Some college, community college, or associate's degree	29.5	25.4
	Bachelor's degree or higher	28.4	58.8

4.2 Participation in coral reef activities

Participation levels in twelve marine-related activities varied among residents in South Florida (Figure 2), with most frequent participation in beach recreation (68.2%) and swimming or wading (65.8%). Residents engaged in these two activities “at least once a month” or more, with 19.2% and 14.6% participating four times a month or more in swimming or wading and beach recreation, respectively. Participation in SCUBA diving (12.9%) and free diving (12.5%) was generally low among South Floridians.

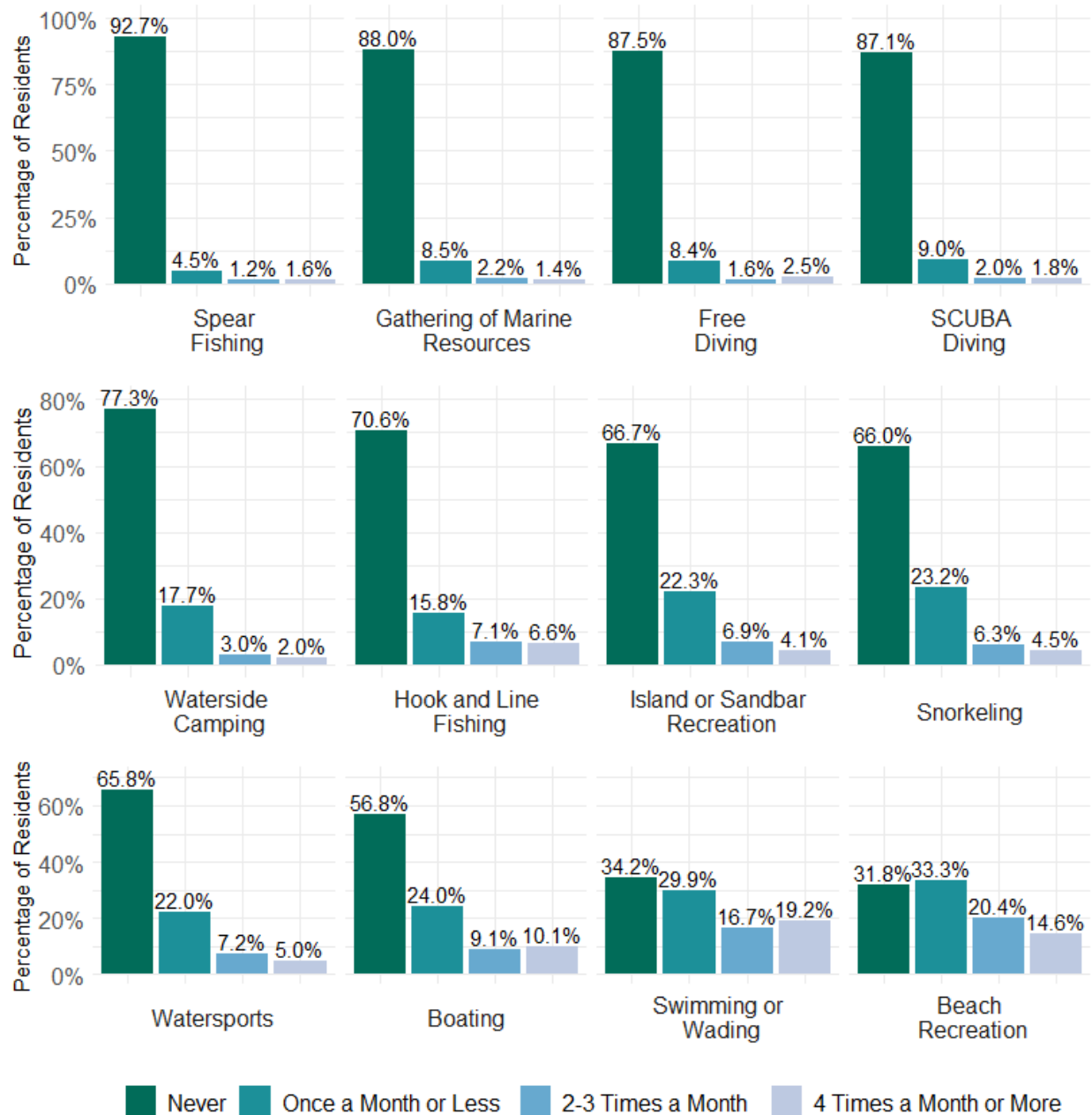


Figure 2: Frequency of participation in various reef activities

Activity participation also varied by county of residence. Monroe County residents more frequently participated in all activities compared to other counties, with greatest participation in swimming or wading (80.8%) and snorkeling (71.7%). Residents of the remaining four counties most frequently engaged in either beach recreation (65.6- 71.2%) or swimming or wading (64.4- 73.7%).

Hook and line fishing was an activity in which 30% of residents participated at least once a month; spear fishing (7.3%) and gathering of marine resources (12.1%) were the least common activities. Residents reported that the most common reason for fishing or gathering was for fun, and most residents never fished to sell their catch (Figure 3). Compared to other counties, residents of Monroe County (10.2%) and Martin County (11.1%) were most likely to fish to sell their catch. Monroe County residents were also most likely to fish to feed their family or household (87.4%) than are residents of any other county.



Anglers in the Florida Keys. Photo: Matt McIntosh, NOAA.

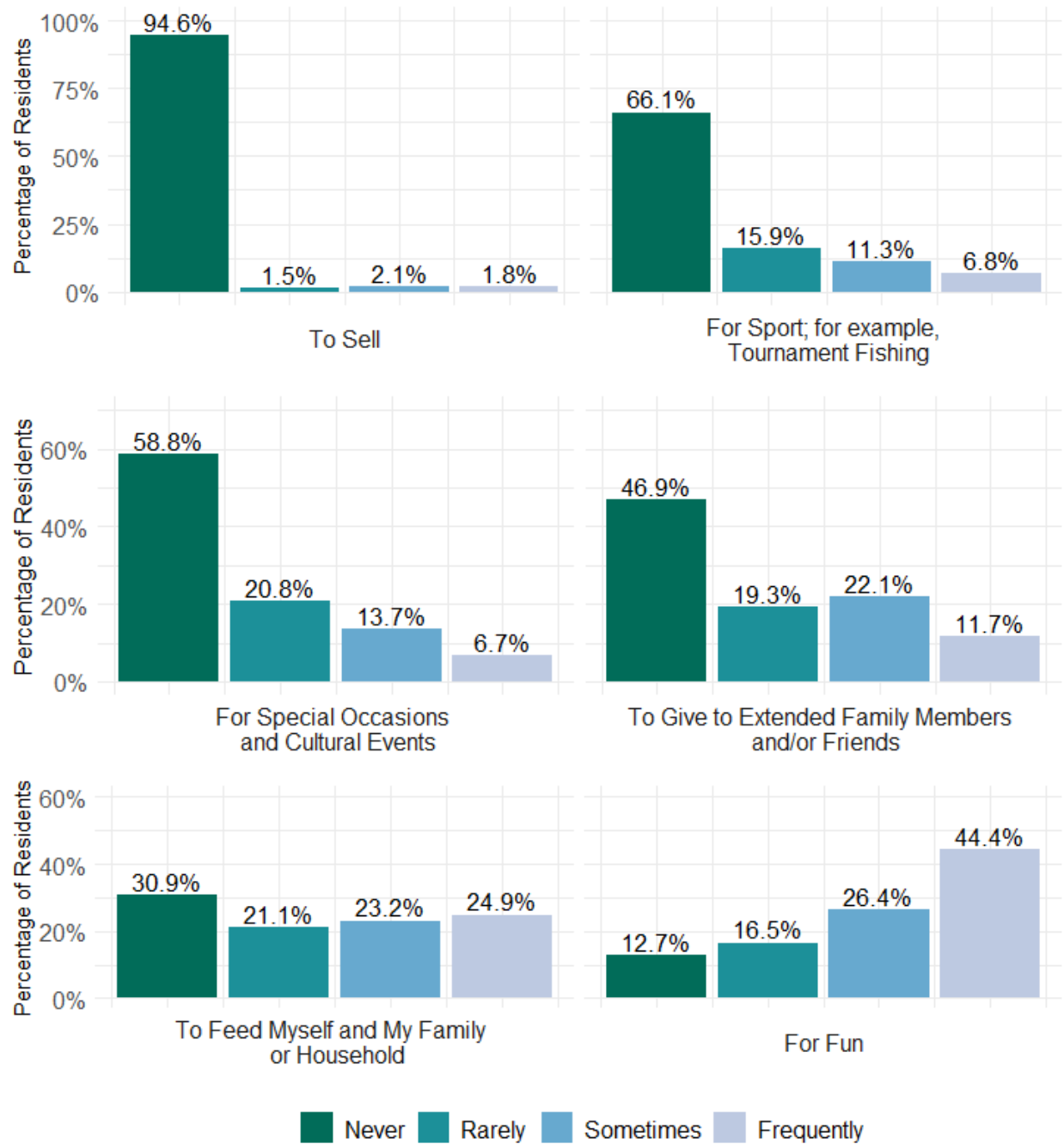


Figure 3: Frequency of fishing and gathering by reason

Residents who fished or gathered marine resources also provided the frequency at which they targeted seven different fisheries groups (Figure 4). The top two species groups that respondents frequently fished for and/or harvested were snappers or groupers (28.2%) and dolphin, wahoo, or tuna (21.4%). The majority of those who fished or gathered never targeted conch (91.1%) or parrotfish or surgeonfish (86.8%). Snappers or groupers (43.8%), lobsters (29.7%), and lionfish

(14.6%) were most frequently targeted by Monroe County residents, while dolphin fish, wahoo, or tuna had similar targeting frequencies throughout the counties (ranging from 16.8% by Broward residents and 19.3% by Miami-Dade residents to 30.0% by Monroe residents and 31.9% by Martin residents).

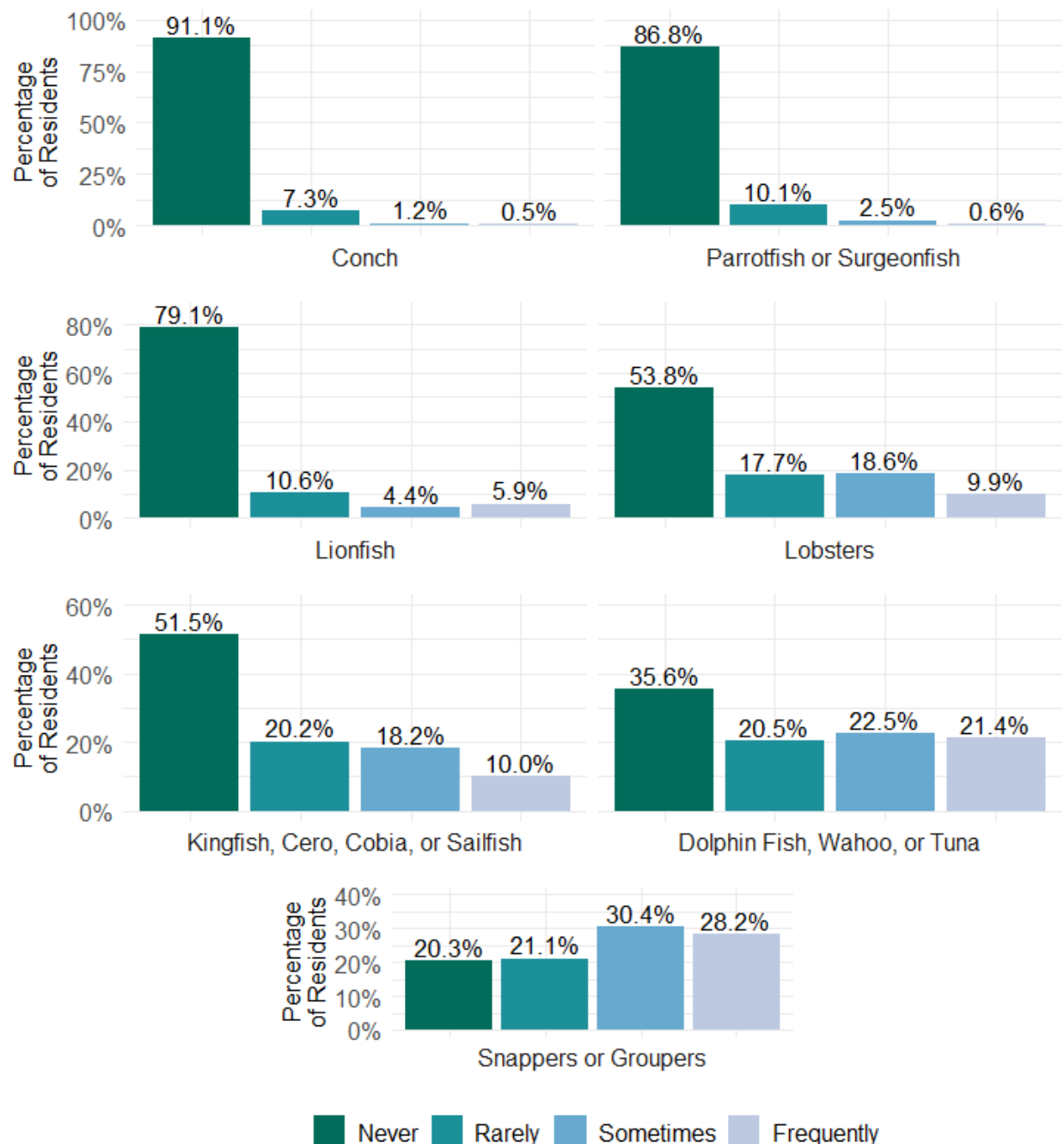


Figure 4: Frequency of fishing for certain fisheries species

4.3 Cultural importance of reefs and reef reliance

More than three quarters of South Florida residents believed that coral reefs were important or very important to their family’s cultural beliefs and practices (Figure 5). Monroe and Martin County residents were most likely to find these environments culturally important or very important (Monroe = 88.2%, Martin = 85.3%). Monroe and Martin County residents were also least likely to find these environments culturally unimportant or very unimportant (Monroe = 3.1%, Martin = 7.8%).

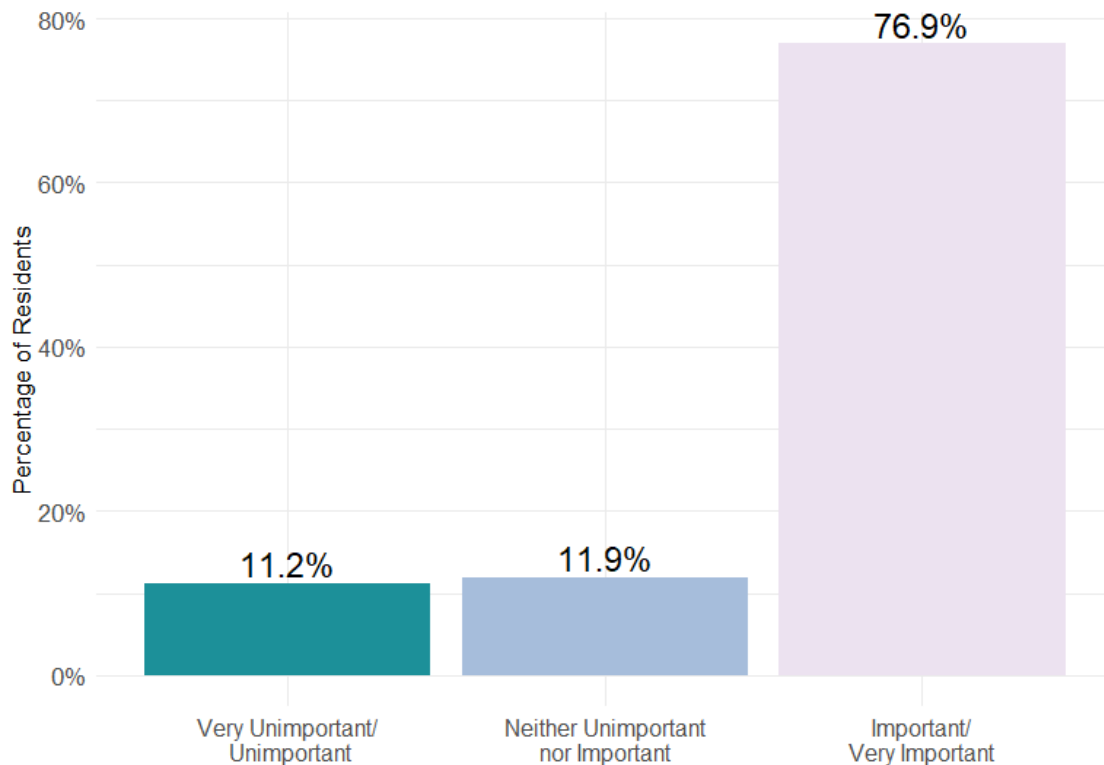


Figure 5: Cultural importance of coral reef environments

4.3.1 Seafood consumption

The large majority (97%) of respondents indicated that their family⁴ consumed seafood, and two-thirds consumed seafood at least once a week (Figure 6). Residents of Broward (4.5%) and Miami-Dade (3.6%) were most likely to eat seafood daily, and Monroe County residents (44.4%) were most likely to eat seafood a few times a week or more.

⁴ “Family” was defined as all persons living under the same roof.

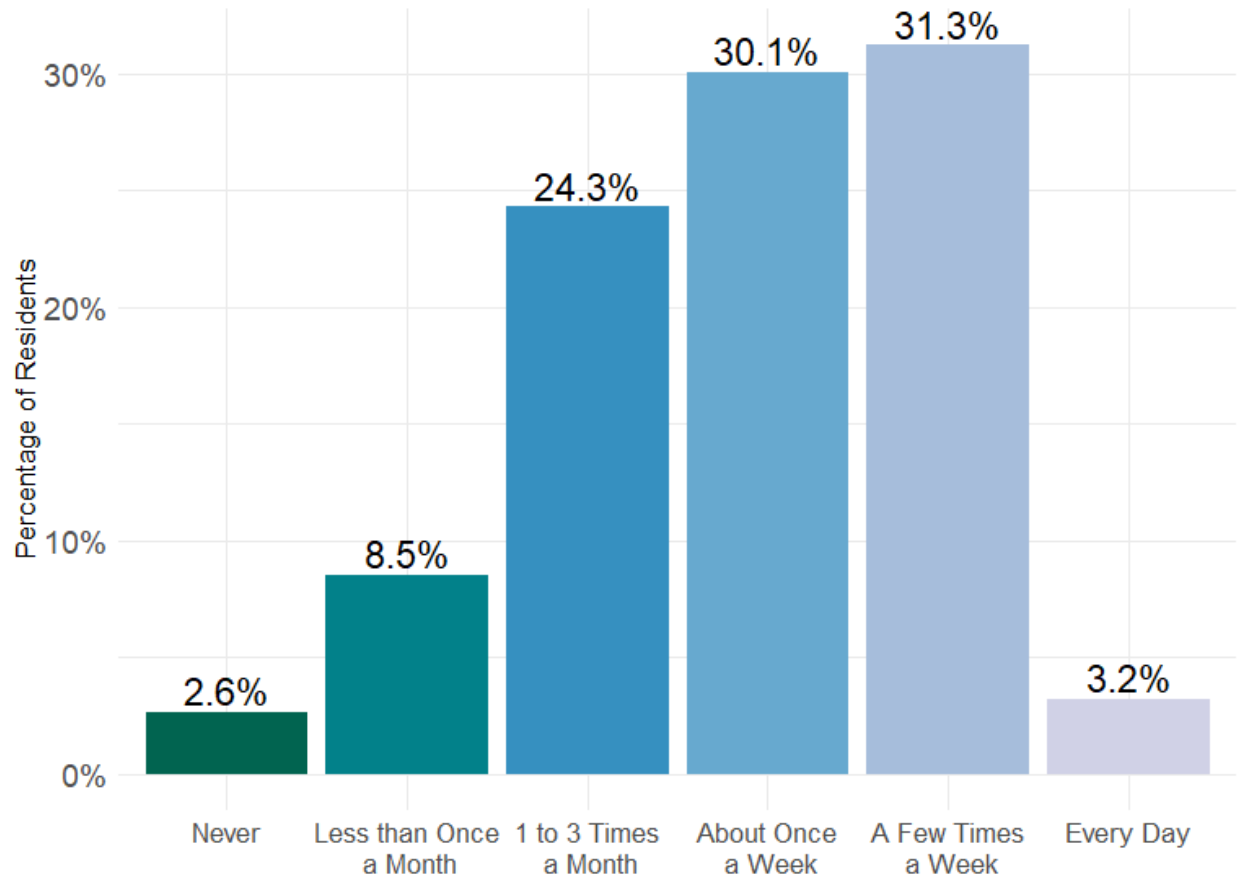


Figure 6: Frequency of seafood consumption

When limited to consumption of locally caught seafood harvested from coral reefs, consumption rates dropped to 54.3% consumption at any frequency and 17.9% consumption at least once a week (Figure 7). Over one-third of respondents said they never ate seafood from local coral reefs. Monroe County residents most frequently consumed seafood from coral reefs (24.1% consumed about once a week, 21.9% consumed a few times a week, and 1.3% consumed daily), and were also the least likely to abstain completely (9.8%).

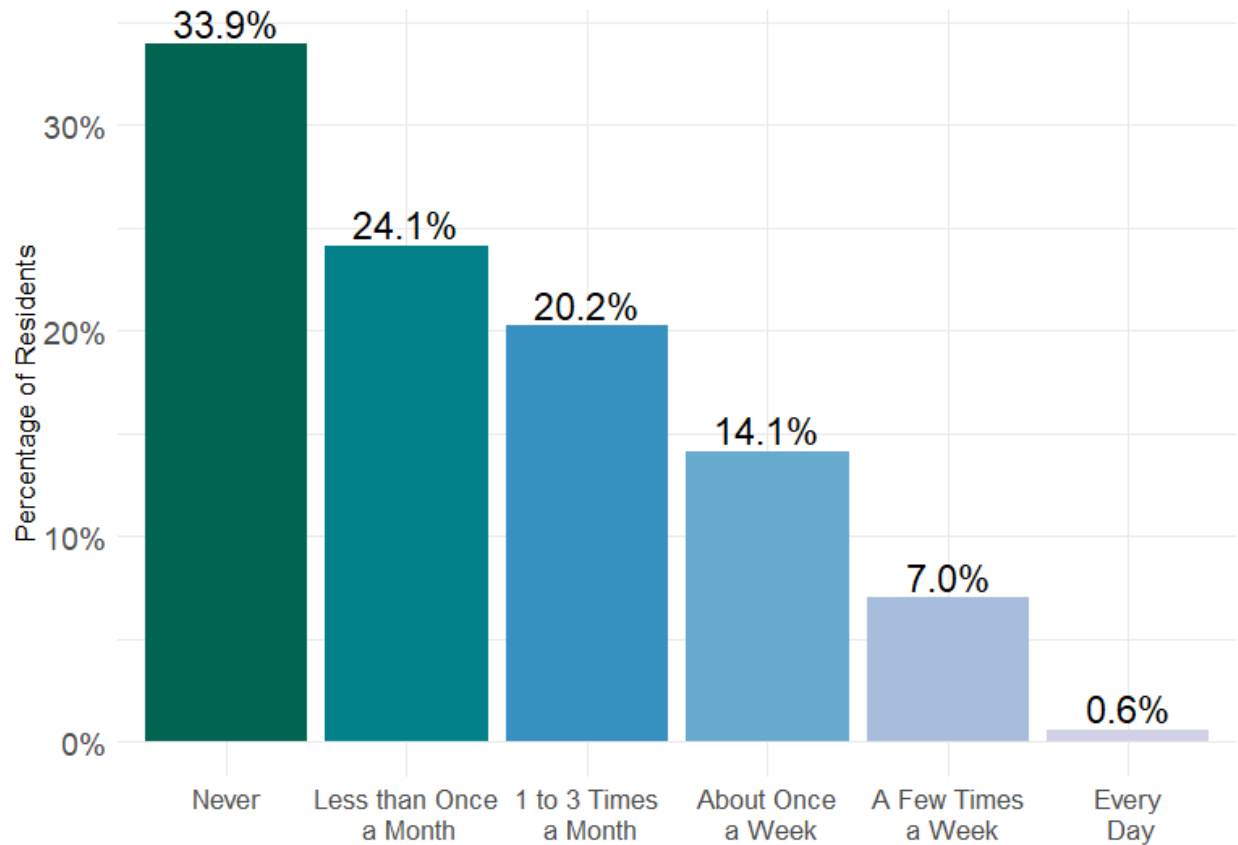


Figure 7: Frequency of seafood consumption from local coral reefs (asked only of those who eat seafood)

Residents most often purchased their seafood at a store or restaurant (77%), while 41.6% typically purchased seafood from a market or roadside vendor (Figure 8). This same trend was true for each county. Lower proportions of residents got the seafood they consumed by fishing, either fishing on their own or having family members or neighbors/friends supply them with seafood. However, Monroe County residents were more likely to obtain seafood that was caught by his/herself or someone in their household (46.3%; other counties ranged from 13.9% to 29.2%), caught by friends or neighbors (28.1%; other counties ranged from 7.8% to 15.7%), and caught by extended family members (11.4%; other counties ranged from 4.2% to 9.6%).

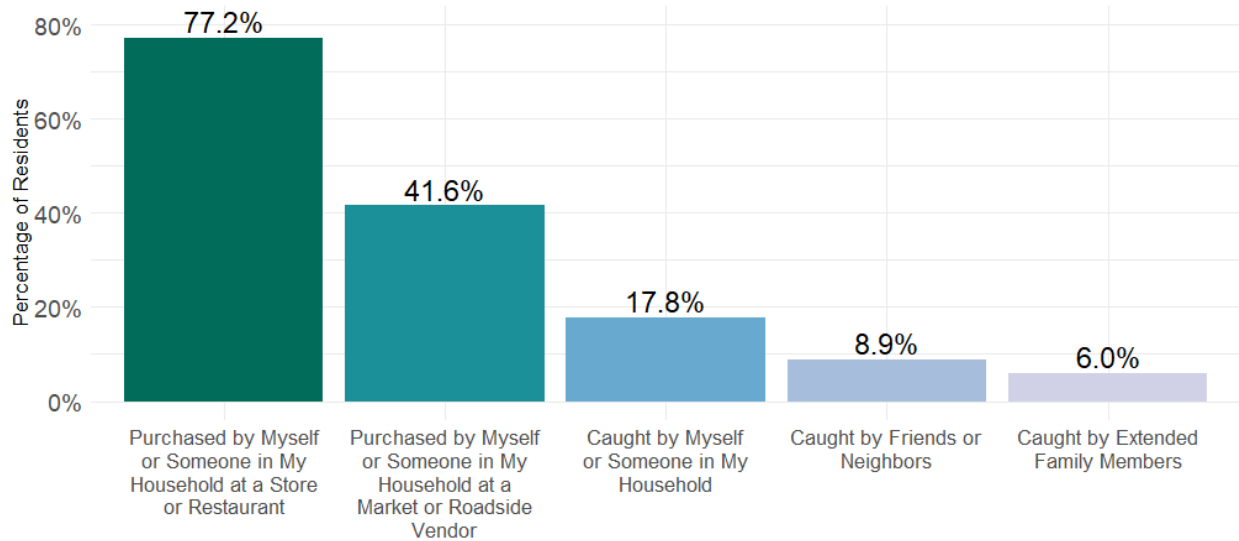


Figure 8: Primary sources of seafood for household residents

4.4 Perceived resource conditions

The condition of seven marine resources were rated by respondents (Figure 9). Three resources were perceived to be in the best condition compared to other resources: beach quality (42.8% good/very good), ocean water quality (39.0% good/very good), and mangrove quality (41.6% good/very good). However, ocean water quality and beach quality also had relatively high percentages of bad/very bad condition (35.6% and 32.4%, respectively) responses. Alternatively, current coral amount had the worst perceived condition (43.2% bad/very bad), with only 12.9% perceiving positive coral conditions. More respondents were not sure what the current conditions were for coral amount (25.9%), fish size (25.9%), or sea grass quality (24.9%) compared to other resources.

Monroe County residents appeared to have more positive perceptions of current ocean quality (61.9% good/very good; other counties' good/very good responses ranged from 35.5-40.3%), mangrove quality (65.2% good/very good; other counties' good/very good responses ranged from 41.2-53.5%), and seagrass quality (45.9% good/very good; other counties' good/very good responses ranged from 21.5-29.8%), as well as more sure of marine resource conditions. This pattern did not appear for the other marine resources, and Monroe County residents were most likely to rate coral amount as bad or very bad (55.0%; other counties ranged from 39.8-48.4%). "Not sure" was also chosen least often by Monroe County residents for all resources except for beach quality.

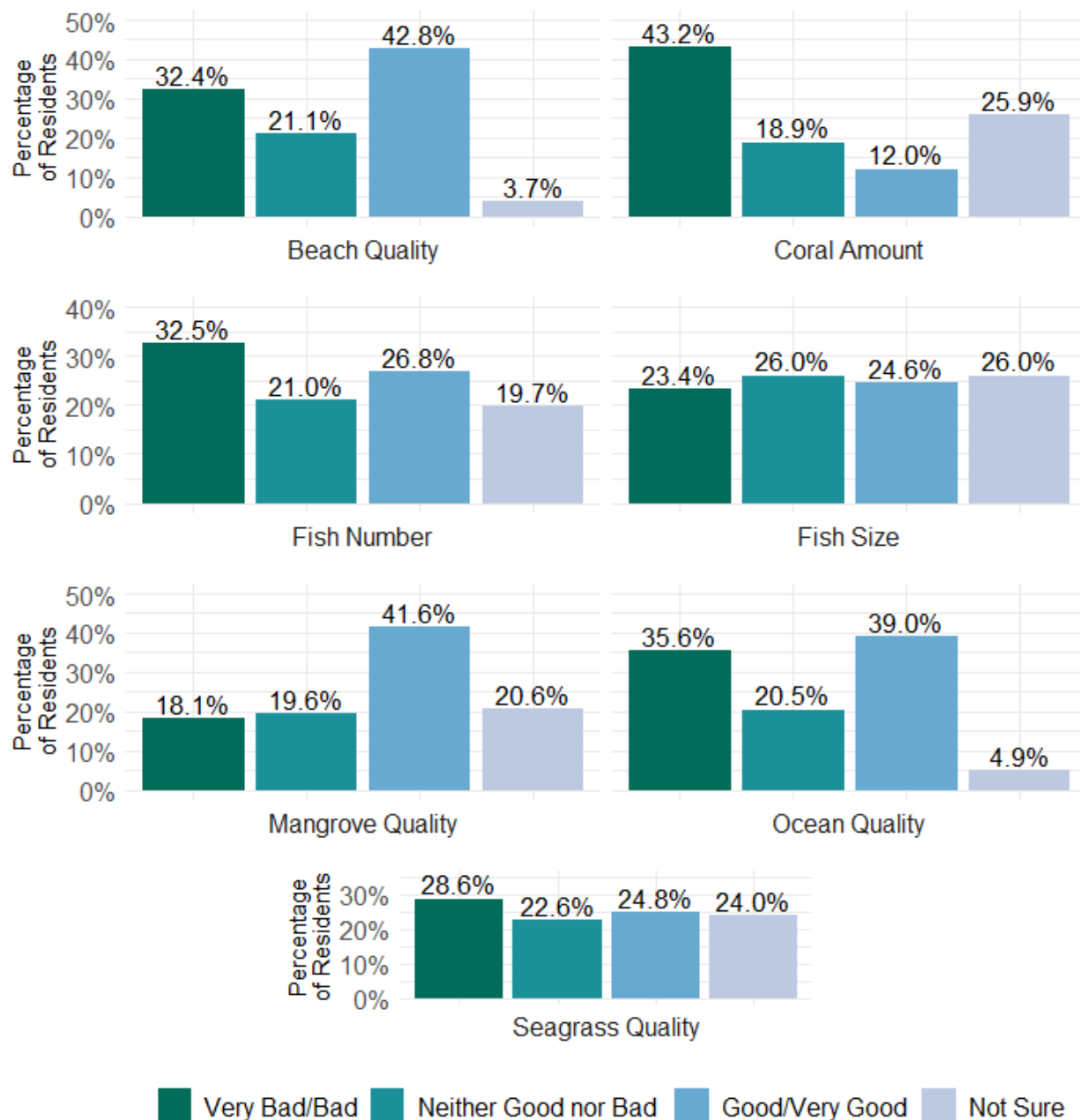


Figure 9: Perceptions of marine resource current conditions

Over the past ten years, residents felt that the condition of all seven marine resources became worse or a lot worse (with over 50% of residents perceiving worsened conditions for ocean water quality, coral amount, fish number, and beach quality) (Figure 10). While residents perceived current beach quality and ocean water quality to be relatively positive, over half of residents still perceived the current conditions to be worse or a lot worse in comparison to ten years ago (beach

quality: 54.0%; ocean water quality: 62.3%). Uncertainty regarding changes in condition was relatively consistent with uncertainty about current resource condition.

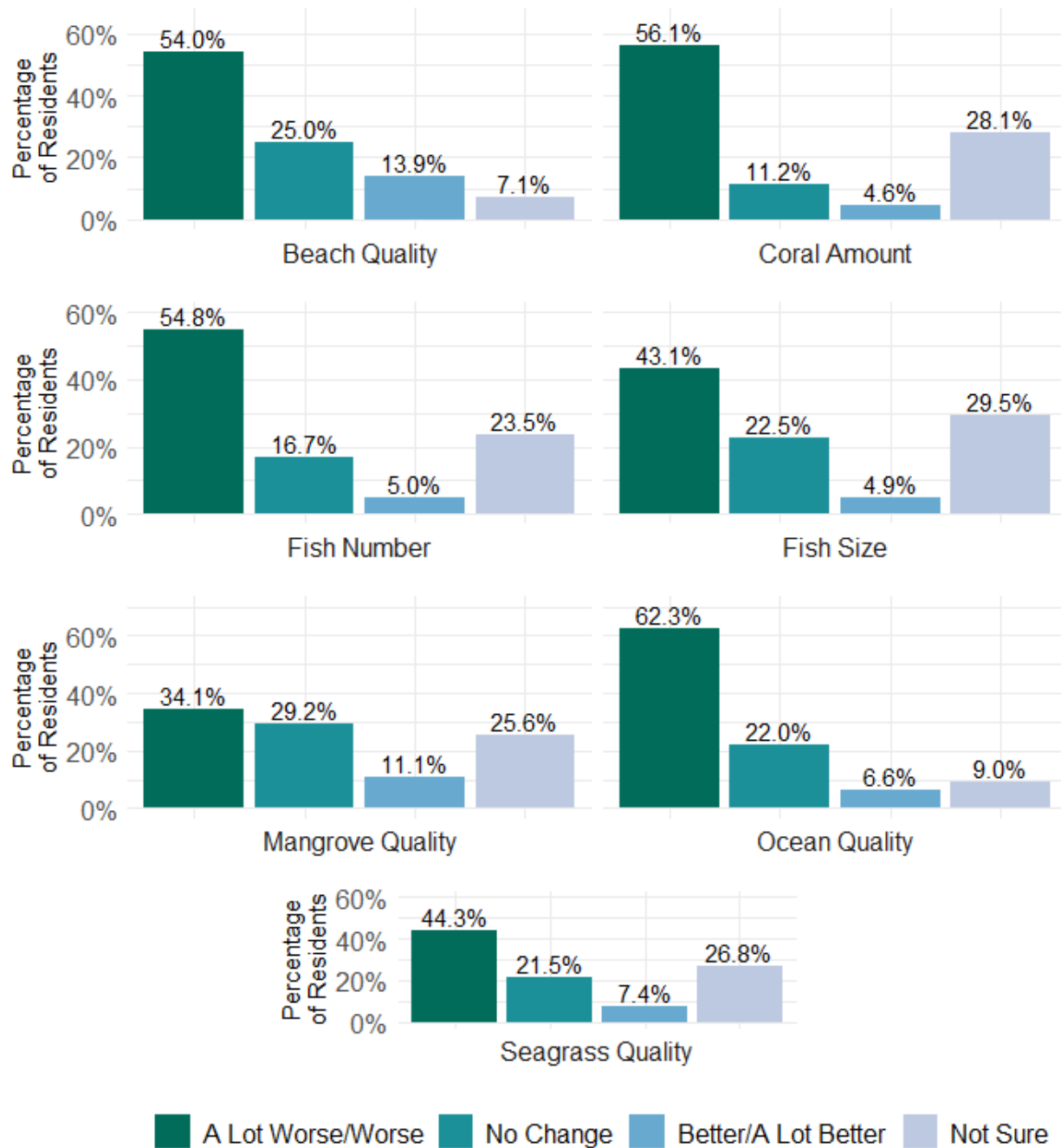


Figure 10: Perceived change in resource conditions over the past ten years

By county, many Monroe County residents believed ocean quality became a lot worse or worse (48.7%), but this proportion was higher for each of the other counties (Miami-Dade = 60.9%, Broward = 62.6%, Palm Beach = 64.0%, Martin = 74.3%). In contrast, Monroe County residents were most likely to perceive a decline in coral amount (73.2% a lot worse/worse). However, other county residents perceived a similar trend (ranging from 53.9-61.8%). Monroe County residents were, again, less likely to be “not sure” of resource condition for all resources except for beach quality.

Residents had a negative perception of marine resources overall in South Florida. The majority of residents (62.8%) perceived the overall worsening of marine resources to continue (Figure 11), regardless of county. Only 20.8% thought conditions will improve.

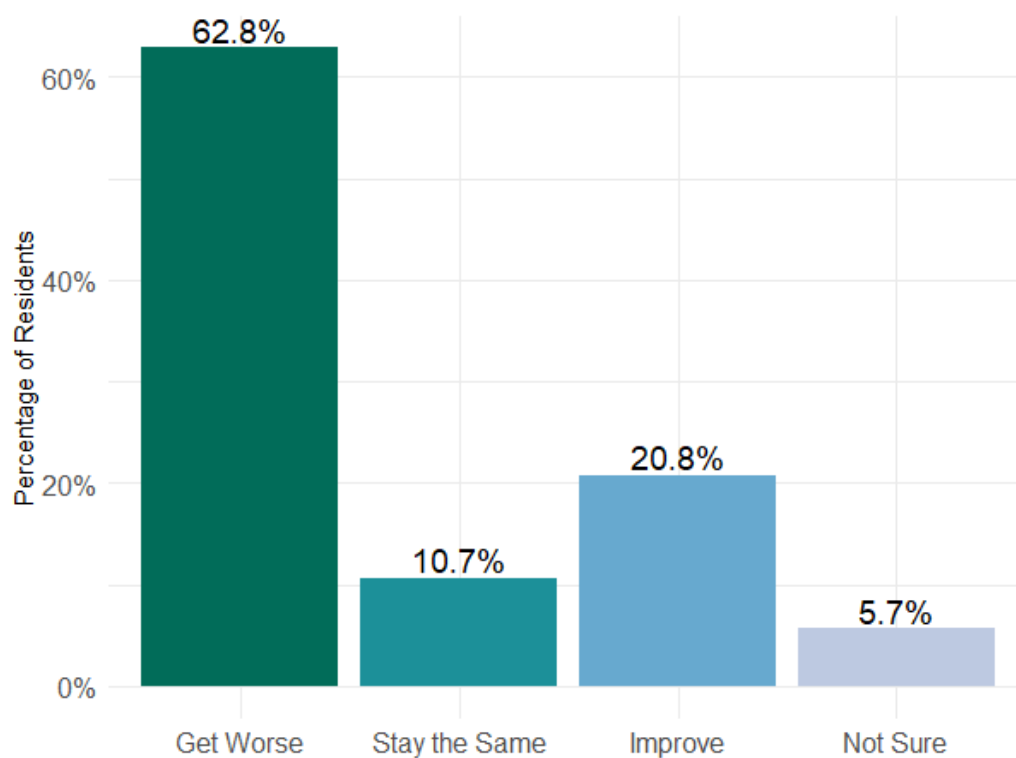


Figure 11: Perceived overall marine resource change over the next ten years

4.5 Awareness and knowledge of coral reefs

Residents generally agreed or strongly agreed with most statements regarding the various ecosystem services provided by coral reefs, with the exception of “coral reefs are only important to fishermen, divers, and snorkelers” (Figure 12). The highest proportion of agreement corresponded with “coral reefs are important to South Florida’s culture” (91.6%). Uncertainty was low overall, but highest for “coral reefs protect South Florida from erosion and natural

hazards” (8.2%). Monroe County residents were among the most likely to agree or strongly agree with the positive statements (88.5-95.6%), the most likely to disagree with the one negative statement (93.8%), and among the least likely to be not sure for all statements (0.0-2.3%).

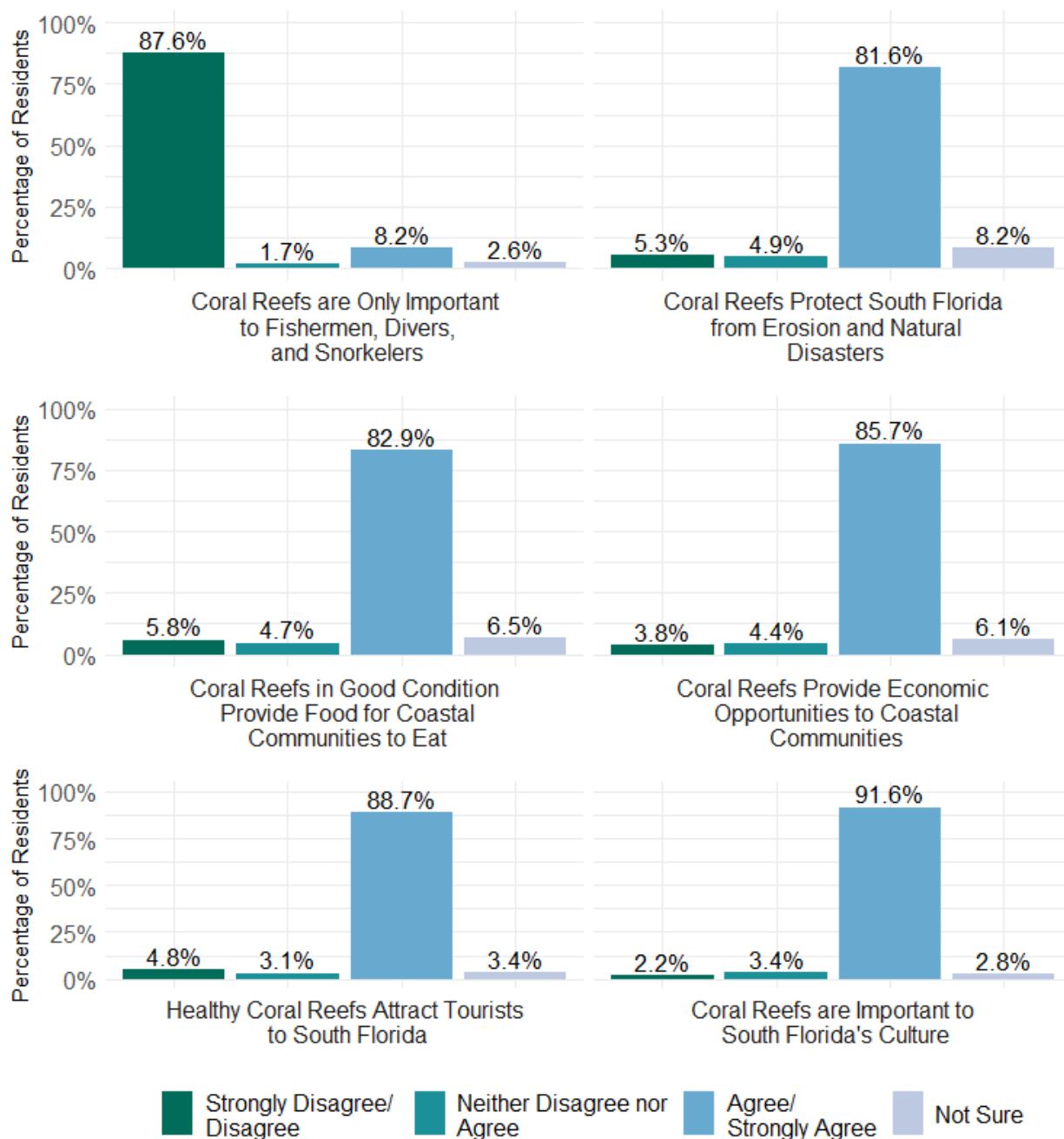


Figure 12: Perceptions of coral reef services

South Florida residents were most familiar with hurricanes and natural disasters (88.8%), pollution (88.3%), and climate change (85.8%) as threats to coral reefs (**Error! Reference**

source not found.) They were least familiar with ocean acidification (45.5%). Compared to other counties, residents of Monroe County were more familiar with all threats to reefs; notably so for coral bleaching (83.1%; other counties ranged from 48.9-60.9%), coral disease (79.4%; other counties ranged from 48.5-56.2%), fishing of prohibited species (75.8%; other counties ranged from 45.9-58.7%), and snorkeling and diving (81.7%; other counties ranged from 57.7-65.6%). Broward County residents were often the least familiar (coral bleaching = 48.9%, coral disease = 48.5%, fishing prohibited species = 45.9%, ocean acidification = 44.7%, snorkeling and diving = 57.7%, coastal or urban development = 73.8%, and damage from ships and boats = 67.3%).

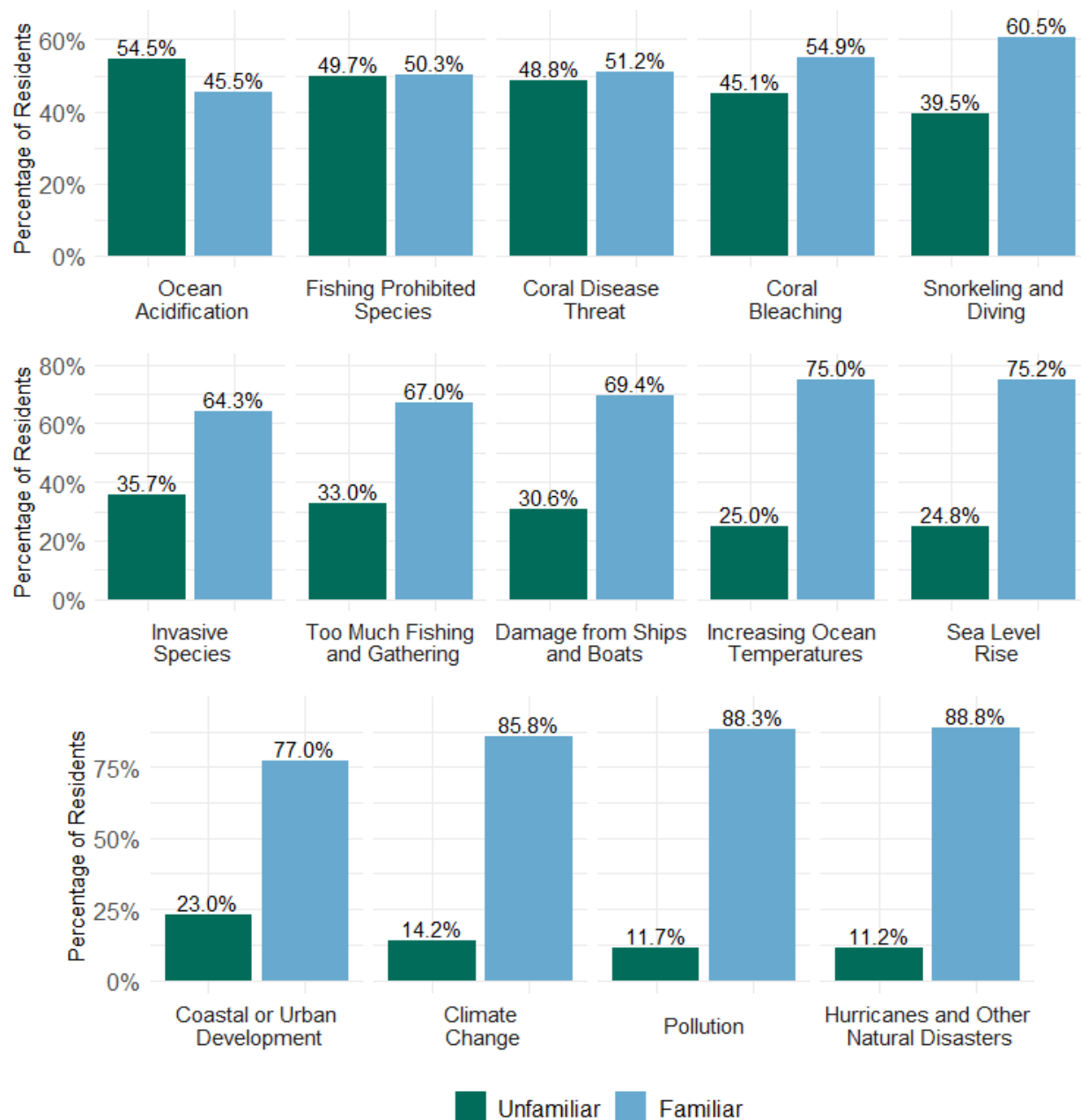


Figure 13: Familiarity with threats to coral reefs

4.6 Attitudes towards coral reef management strategies

Respondents were asked how familiar or unfamiliar they are with Marine Protected Areas (MPAs). A MPA was defined in the survey as “an area of the ocean where human activity is typically restricted to protect living, non-living, cultural, and/or historic resources, such as conservation areas and sanctuaries in the South Florida area” (see Appendix B). A majority (53.0%) of residents were familiar with marine protected areas (MPAs) in South Florida overall, but Monroe County residents were most familiar (84.5%; Martin = 63.5%, Miami-Dade = 53.9%, Palm Beach = 52.8%, Broward 49.4%). Of those familiar with MPAs, the majority of residents agreed or strongly agreed with selected positive statements about MPA functions (Figure 14). Highest levels of agreement corresponded with “MPAs help protect coral reefs” (88.1%) and “I generally support the establishment of MPAs” (85.4%).

The statement “fishermen’s livelihoods have been negatively impacted from the establishment of MPAs” showed mixed agreement (41.8% disagreed/strongly disagreed; 27.9% had some level of agreement; 17.9% neither disagreed nor agreed). Since all statements were only assessed by those familiar with MPAs, there was less variability in agreement by county; although, Monroe County residents were slightly more likely to agree or strongly agree with most statements despite fairly level frequencies of agreement among the other counties. One exception is the response to “There should be more MPAs in South Florida,” in which Monroe County residents had a higher proportion of disagree or strongly disagree (18.2%; other counties ranged from 4.6-9.6%), but only a slightly lower proportion of agree or strongly agree (65.3%; other counties ranged from 73.3-77.3%).

Residents largely supported strategies to help protect coral reefs (Figure 15). Of the five possible strategies offered, four were supported by at least 90% of South Florida residents, with opposition ranging from only 1% to 4%, and the last one was supported by about 88% of South Florida residents. Residents most strongly supported “efforts to restore damaged coral reefs” and “stricter control of sources of pollution to preserve water quality”. Broward County residents were among the least likely to oppose most management strategies, with the slight exception of “efforts to restore damaged coral reefs” (1.6% for Broward; other counties ranged from 0.4-1.4%).

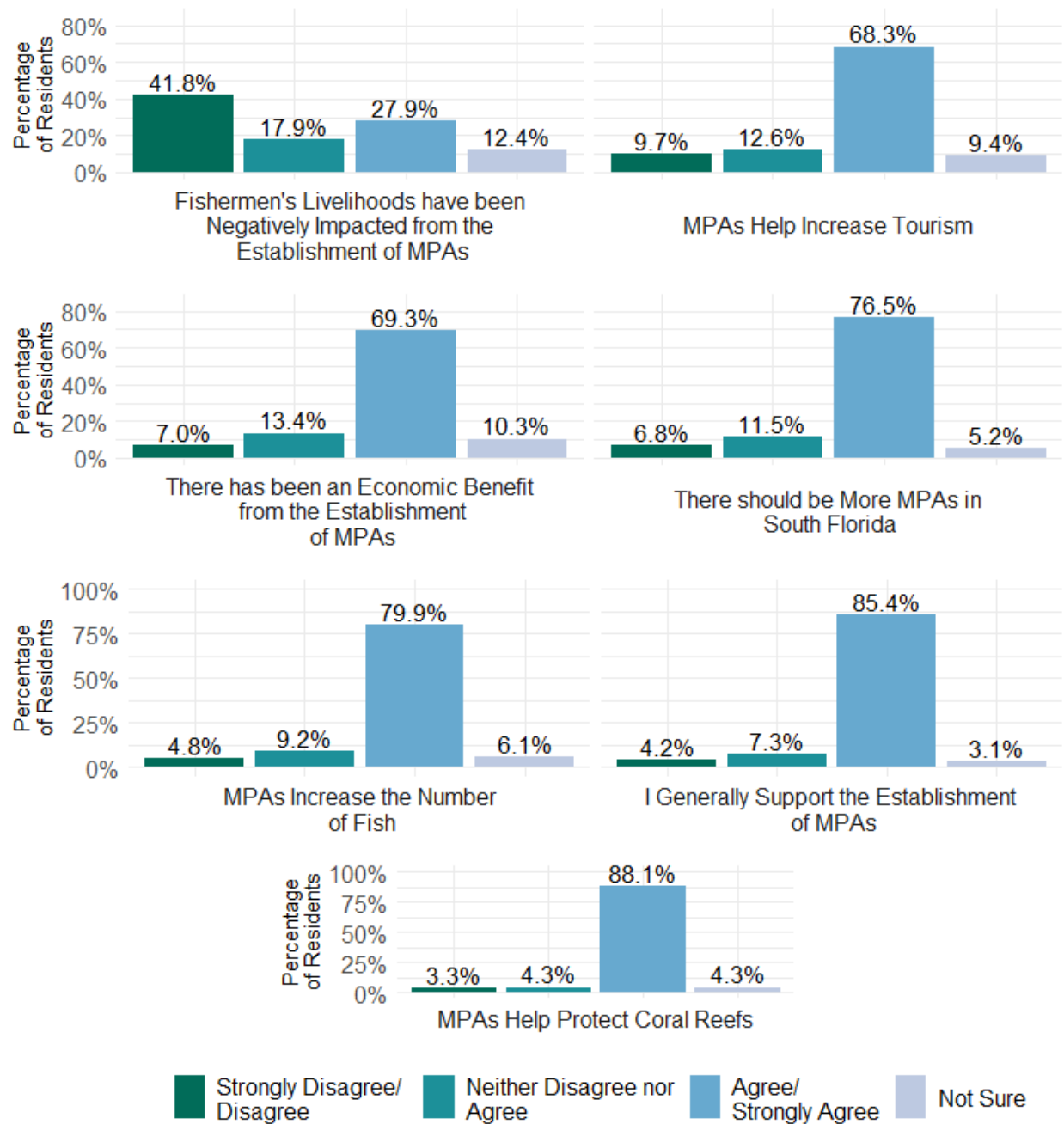


Figure 14: Agreement with MPA functions

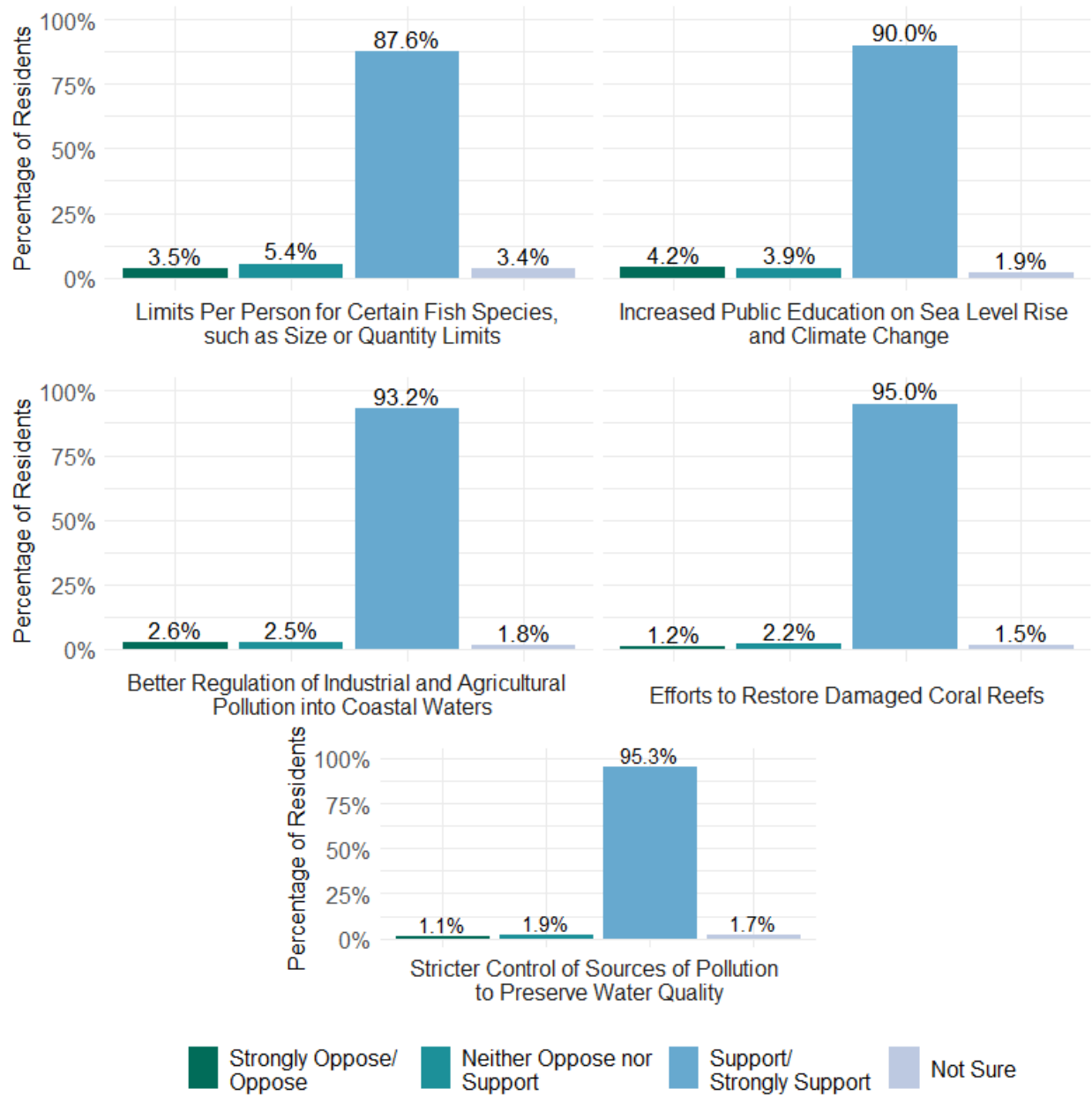


Figure 15: Support for coral reef management strategies

4.7 Knowledge of coral reef rules and regulations

South Florida residents were less likely to be familiar with general coral reef rules and regulations (South Florida = 41.6%, Martin = 52.2%, Miami-Dade = 41.8%, Palm Beach = 42.8%). Monroe County residents were most familiar with the rules and regulations (80.7%), and Broward County residents were least familiar (37.6%).

Given the number of organizations working to manage Florida’s reef, jurisdictional partners were interested in resident familiarity with key organizations (Figure 16). South Florida residents were most familiar with the Florida Fish and Wildlife Conservation Commission (78.4%) and the Florida Department of Environmental Protection (77.3%), but least familiar with the Gulf of Mexico and South Atlantic Fishery Management Councils (12.8%) and the Our Florida Reefs Community Planning Process initiative (14.9%). Monroe County residents were most familiar with all organizations, but familiarity ranged from 19.2% (Southeast Florida Action Network) to 89.9% (Florida Fish and Wildlife Conservation Commission).

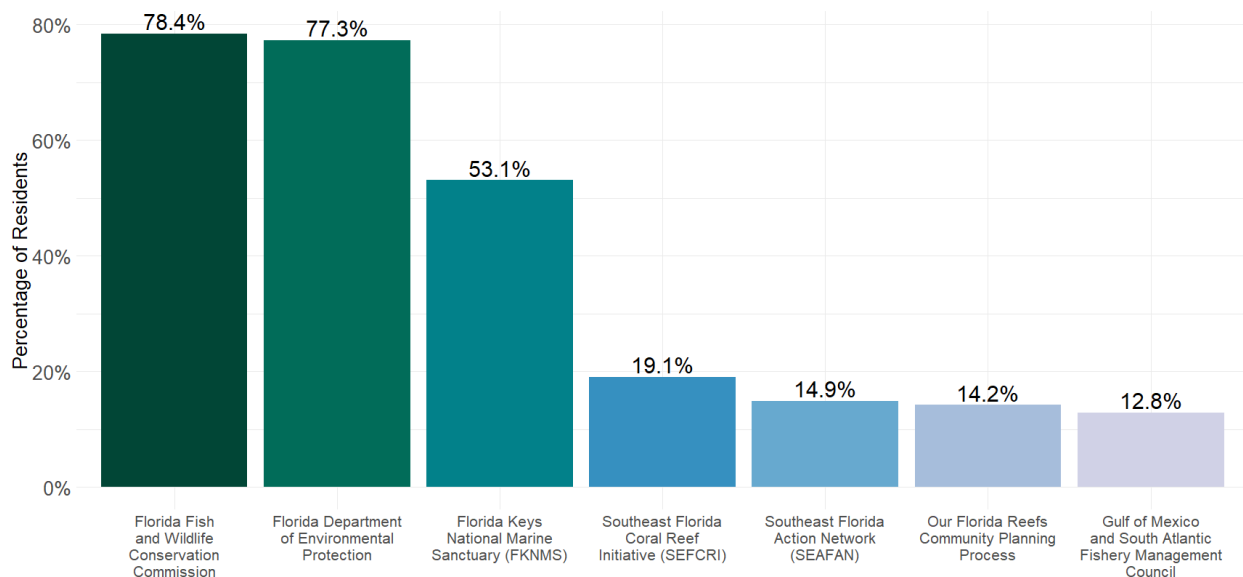


Figure 16: Percent familiar with coral reef management organizations

4.8 Participation in behaviors that may improve coral reef health

Frequency of participation in pro-environmental behaviors that may improve coral reef health varied by activity for South Florida residents (Figure 17). Over 85% of residents recycled several times a month or more, but other behavior options had less frequent participation. Between 9.5% and 15.9% of residents volunteered with environmental groups, donated to environmental causes, or engaged in coastal or beach cleanups several times a year, and the majority of residents never participated in lionfish derbies. By county, however, Martin County residents most frequently recycled (95.1% at several times a month or more), but were among the least likely to participate in lionfish derbies (94.7% never participate). Excluding recycling, Monroe County residents had the highest rates of participation (21.7-77.6%; other counties ranged from 5.3-71.4%).

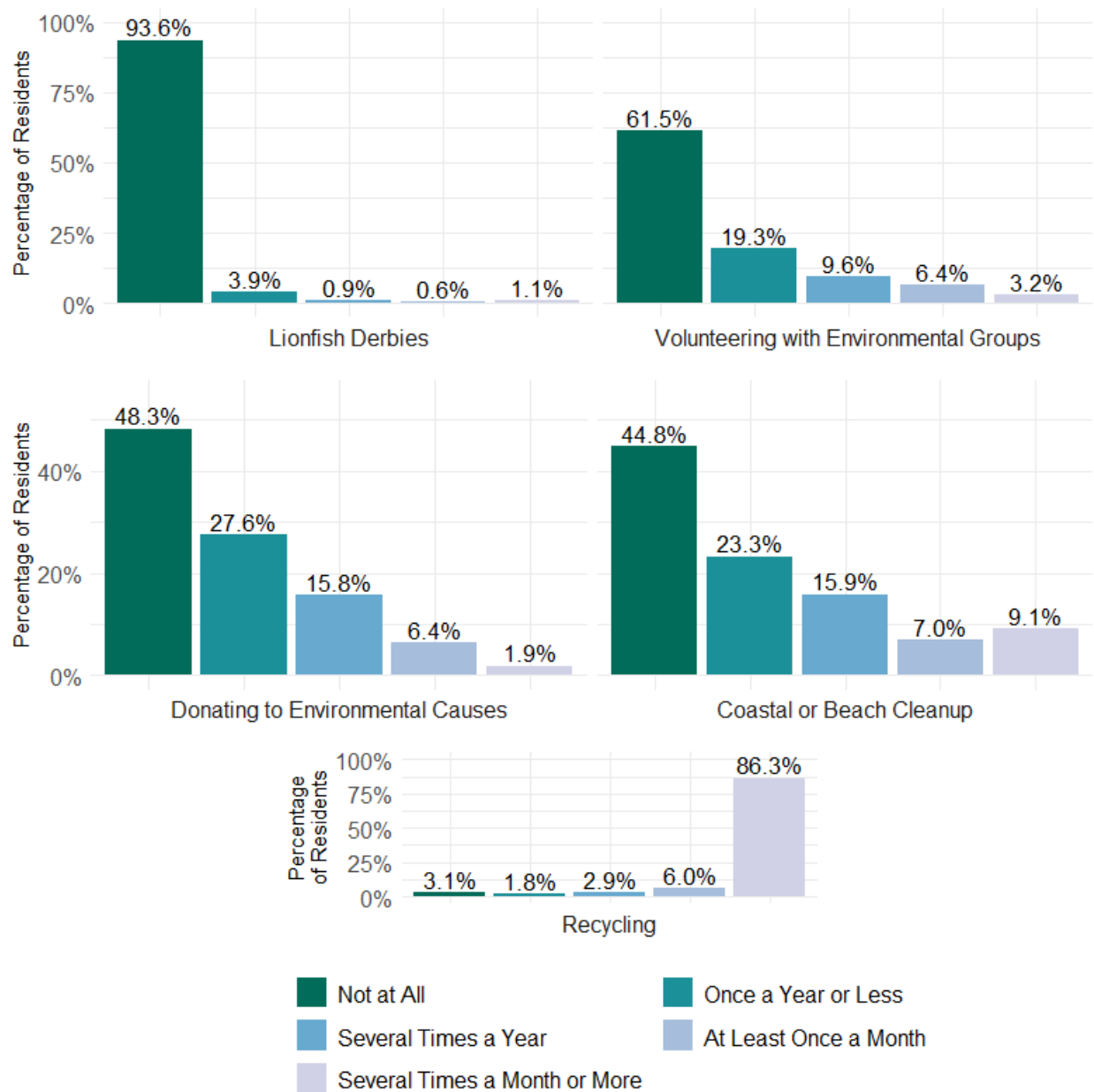


Figure 17: Frequency of participation in pro-environmental behaviors

4.9 Sources of coral reef information

South Floridians used a wide range of sources when seeking information on coral reefs (Figure 18). The most frequently used sources for information were online news sources or websites, followed by television, social media, and friends and family. Residents rarely, if ever, sought information from community leaders, the radio, or Florida's state government. By county,

Monroe County residents were more likely than other South Florida residents to have frequently used friends and family (48.4%), newspapers and other print publications (44.7%), federal government agencies (37.6%), non-profit organizations (32.9%), social media (31.1%), community leaders (28.1%), and the radio (28.0%). Martin County residents typically used online news sources or websites (51.0%), television (33.2%) and Florida's state government (22.8%) more frequently than other South Florida residents.

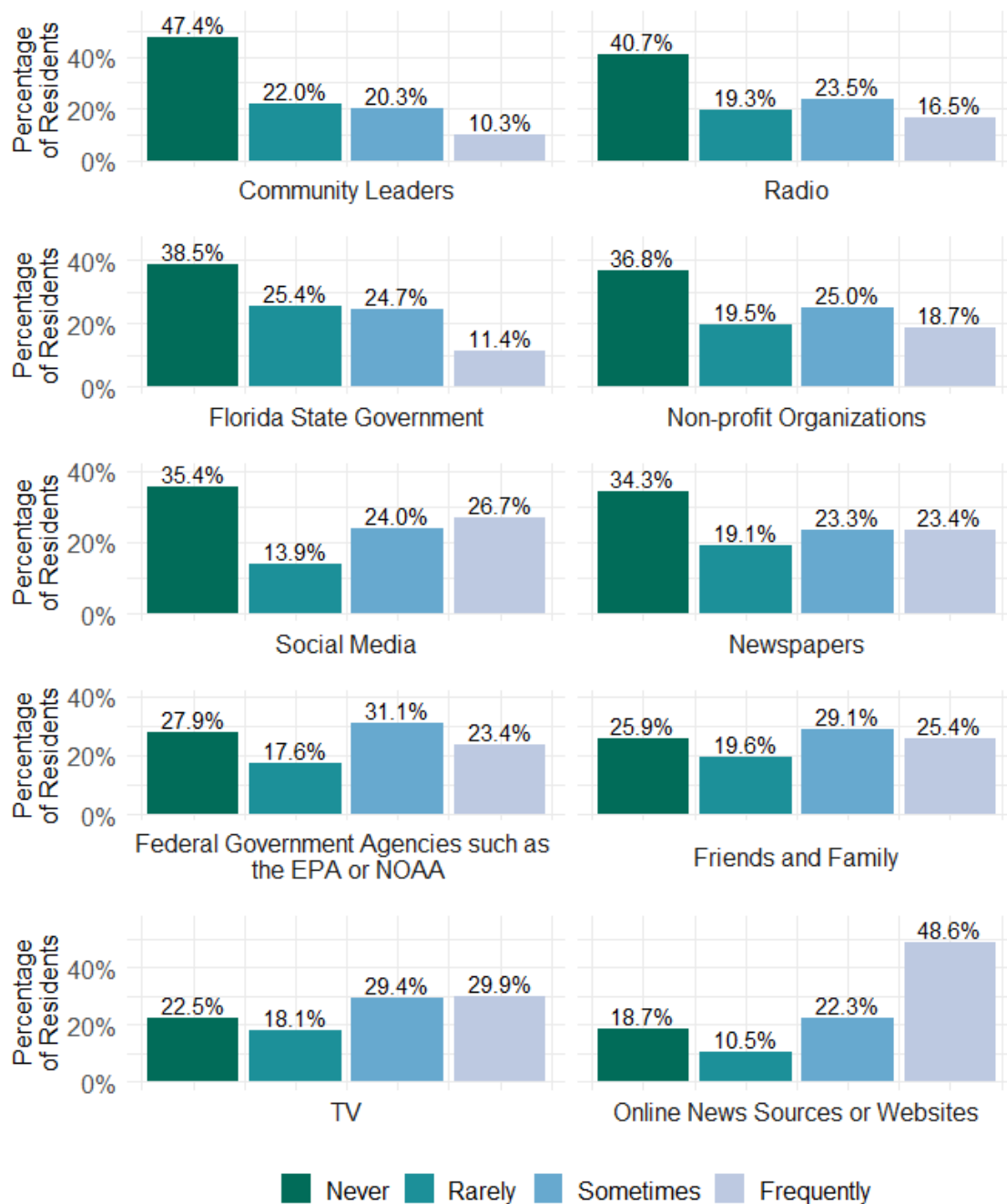


Figure 18: Usage of sources for coral reef-related information

5. Results: Trend Analysis 2014 to 2019

While the South Florida survey (Appendix B) underwent some changes and improvements from its first implementation in 2014 to its most recent implementation in 2019, CRCP is able to start tracking changes in South Florida over time. T-tests were performed to test for statistically significant differences in mean proportions of responses between residents in 2014 and residents in 2019. Trend analyses of interest are presented below. Please see Gorstein et al. (2016) for 2014 monitoring methodology and weighting protocols.

5.1 Participation in coral reef activities

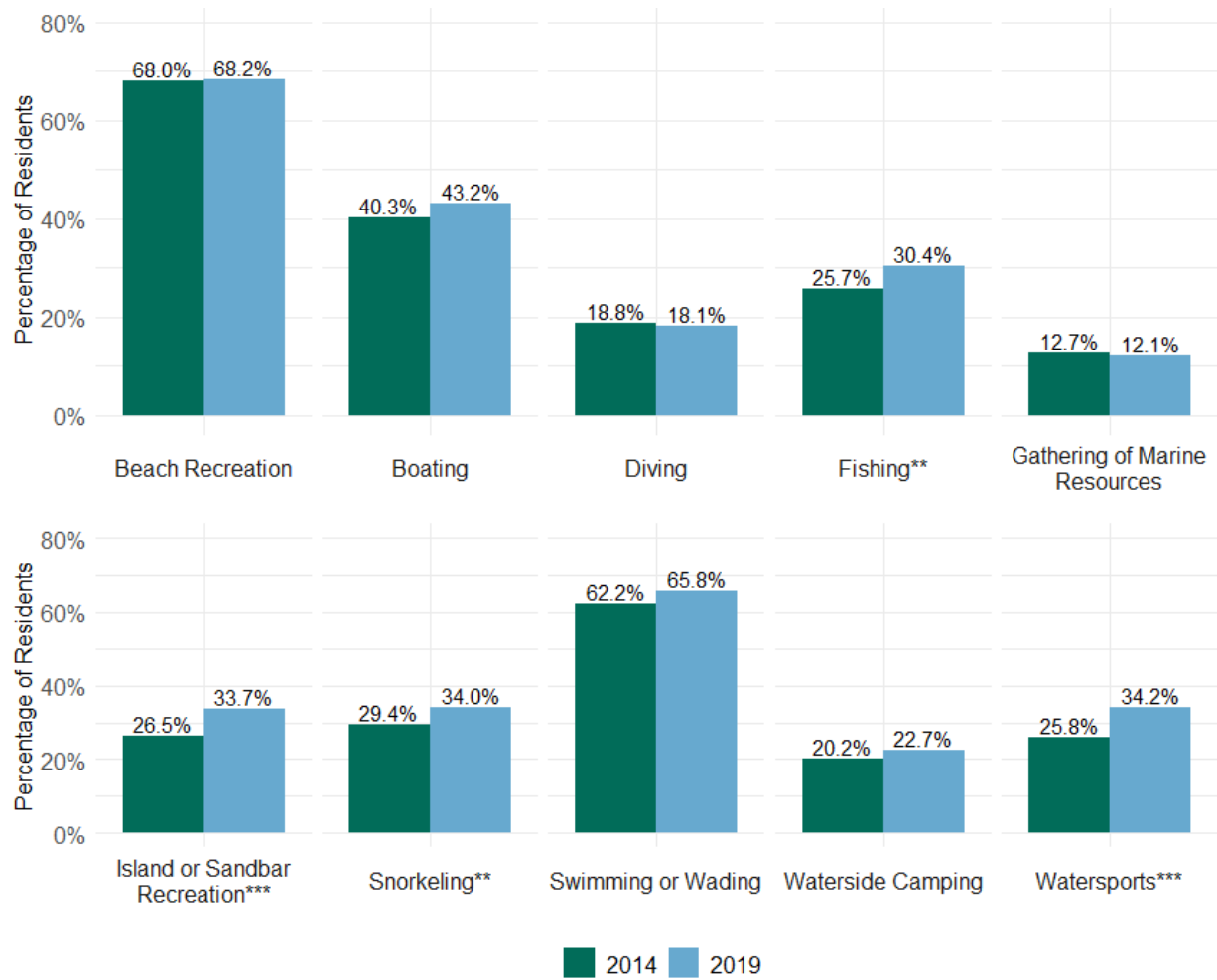
Between 2014 and 2019, there was a significant *increase* in resident participation in snorkeling (+4.6%), fishing (+4.7%), island or sandbar recreation (+7.2%), and watersports (+8.4%) in general (Figure 19). Participation rates in beach recreation, boating, diving, swimming/wading, waterside camping, and gathering of marine resources were relatively the same in 2014 and 2019.⁵

Motivations or reasons why residents participated in fishing and/or gathering were compared (Figure 20). There were significant differences between 2014 and 2019 for three out of six fishing motives: to sell, for special occasions and cultural events, and for sport (for example, tournament fishing). In 2019, fewer residents went fishing to sell their catch or for special occasions and cultural events. The most significant change between 2014 and 2019 was fishing for sport (for example, tournament fishing). In 2019, the proportion of residents who frequently fished for this reason increased by 5.5%.



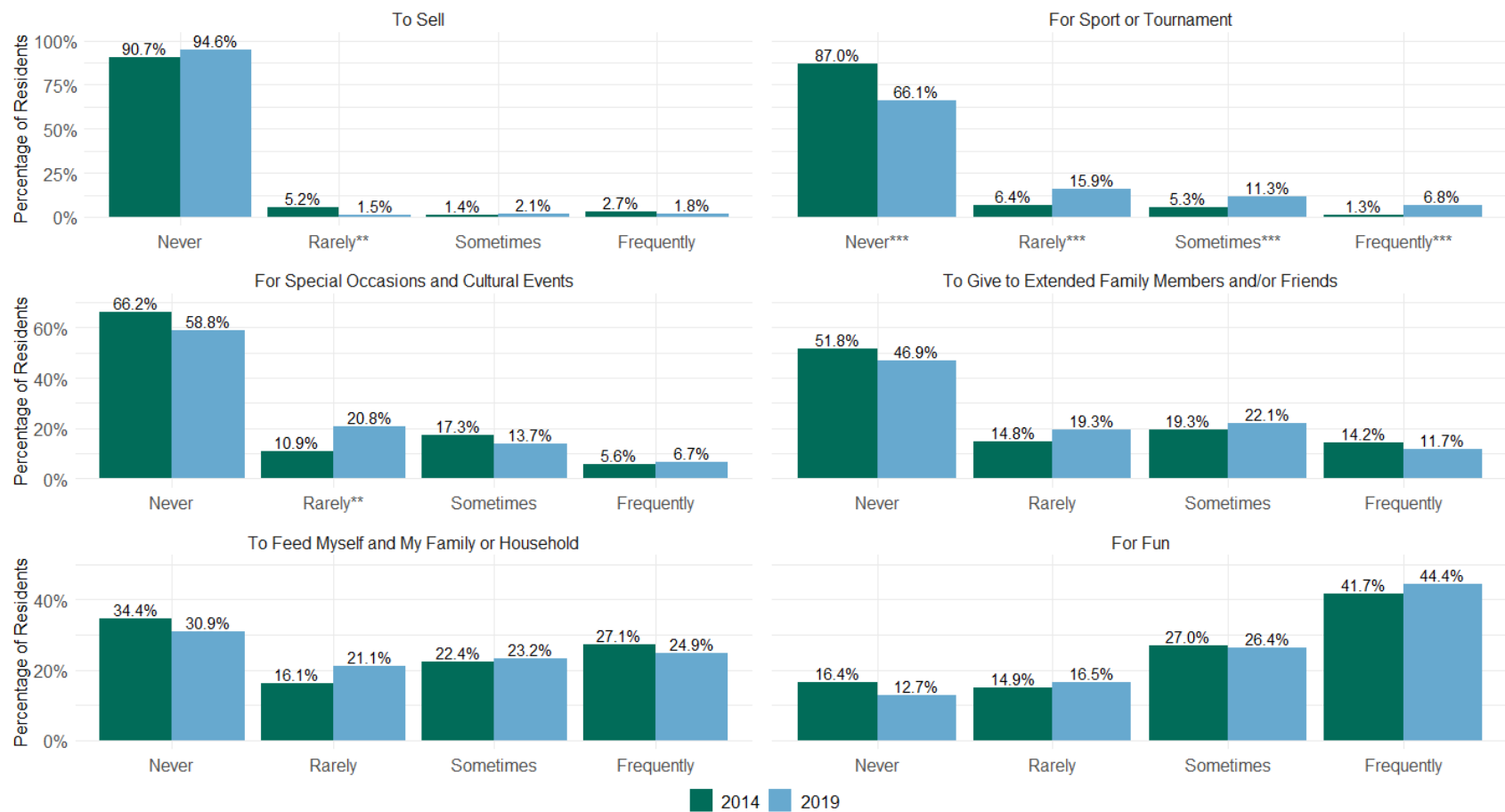
Reef off North Miami Beach. Photo: Florida Department of Environmental Protection

⁵ “Scuba diving” and “free diving” were combined in the 2019 data to be comparable with “diving, scuba or free” measured in the 2014 data. “Hook/line fishing” and “spearfishing” were combined in the 2019 data to be comparable with “fishing for finfish” measured in the 2014 data.



** indicates $p < .05$, *** indicates $p < .01$

Figure 19. Resident participation in activities during 2014 and 2019



** indicates $p < .05$, *** indicates $p < .01$

Figure 20. Reasons for resident participation in fishing in 2014 and 2019.

5.2 Reef reliance (seafood consumption)

Overall, residents exhibited similar household seafood consumption rates in 2014 and 2019 (Figure 21). In both years, approximately one-third of residents consumed seafood a few times a week, and another 30% reported eating seafood about once a week. About 25% of residents ate seafood 1-3 times a month. The proportion of residents who never ate seafood significantly declined by 3.5% in 2019.

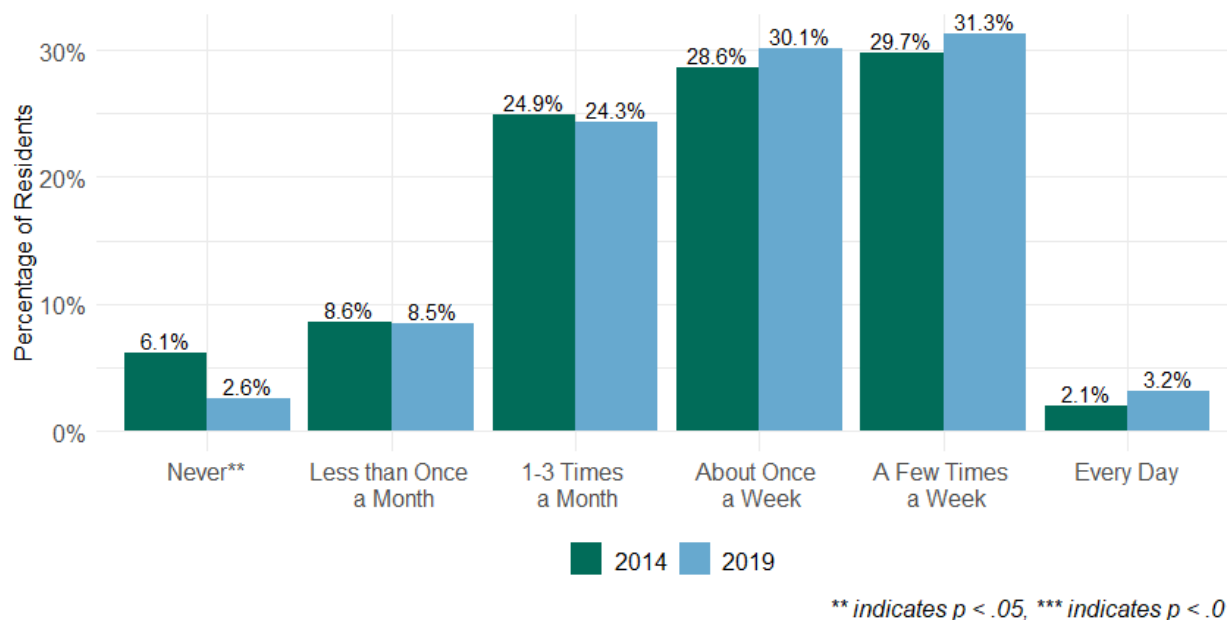


Figure 21. Resident seafood consumption in 2014 and 2019.

5.3 Perceived resource conditions

South Florida residents were compared on their perceptions of current resource conditions in 2014 and 2019, their perceptions of change in resource conditions over the past 10 years, and their beliefs about how those resources will change in the future. The 2014 survey did not ask about size of fish or seagrass quality, so those two items were excluded from the comparative analysis of resource conditions.

5.3.1 2014 and 2019 resource conditions

For each of the five resources, the proportion of residents who were not sure *decreased* from 2014 to 2019 (Figure 22). The decrease in not sure responses was often coupled with an *increase* in the proportion of bad and neither good nor bad perceptions from 2014 to 2019. The proportion of very good responses also *decreased* for each resource from 2014 to 2019.

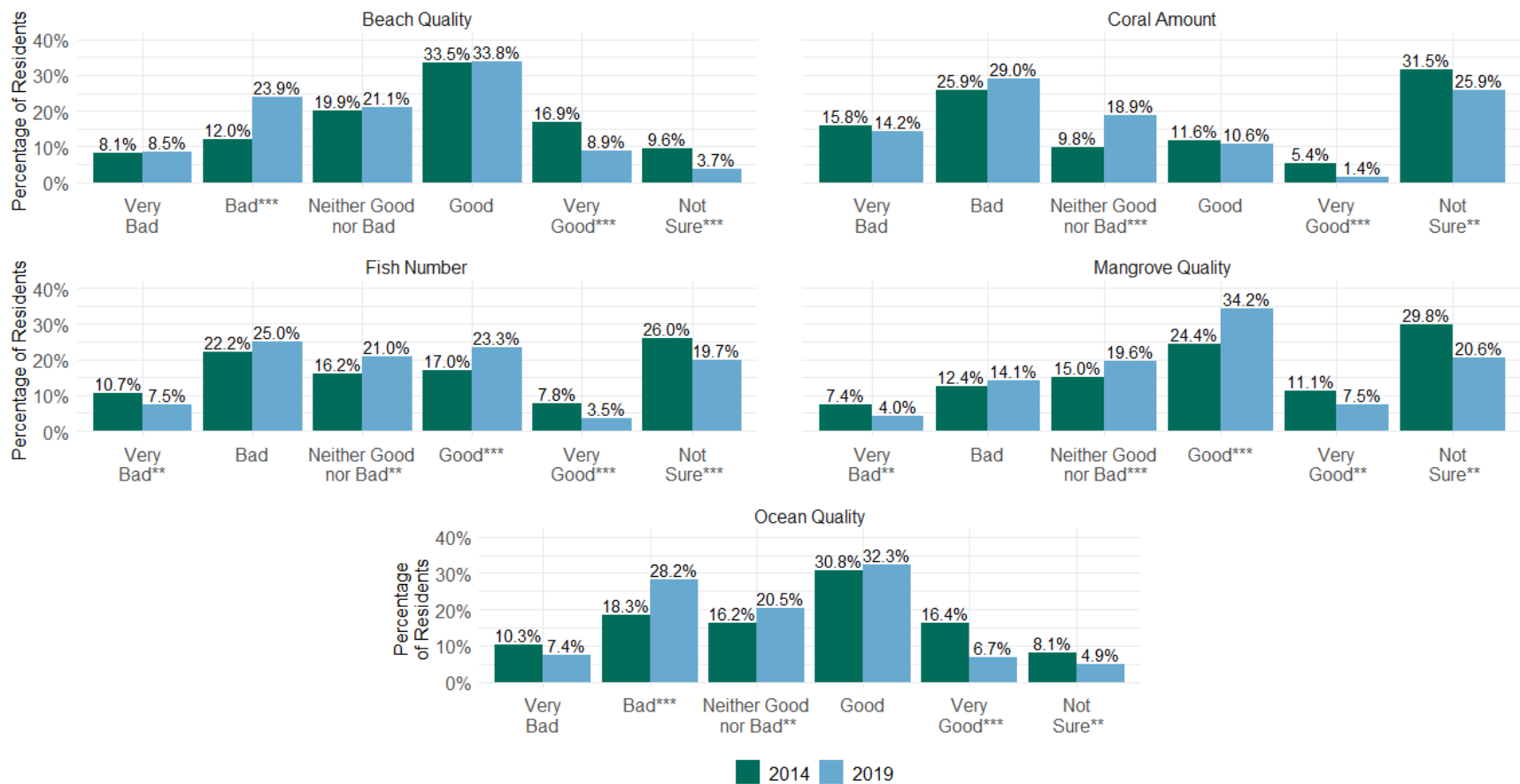
Beach quality. In 2019, there was a 12% *increase* in the perception that beach quality was bad, and perceptions of very good beach quality *declined* by 8% (Figure 22). Proportions for other ratings of beach quality were nearly identical in 2014 and 2019. In both years, one third of residents perceived beach quality as being in good condition, and 8% rated this as being very bad. Approximately 20% perceived beach quality as neither good nor bad.

Coral amount. In both 2014 and 2019, the majority of residents perceived the amount of coral as being in bad or very bad condition. In 2019, there was a 9% *increase* in the perception that the amount of coral was neither good nor bad, and perceptions of very good coral amount *decreased* by 4%.

Number of fish. There were significant differences in perceptions of the number of fish in 2014 and 2019. In 2019, perceptions that the number of fish was in good condition *increased* by 6.3%, but very good perceptions *decreased* by 4.3%. There was a 3.2% *decrease* in perceptions of fish numbers being in very bad condition, whereas 6.3% *more* residents were not sure about this condition in 2019.

Mangroves. In 2019, 34.2% of residents (nearly a 10% *increase*) perceived mangroves as being in good condition, and 9.2% *fewer* residents were not sure about this condition compared to 2014. About 3.6% *fewer* residents in 2019 perceived mangroves as being in very good condition, and there was a 3.4% *decrease* in very bad perceptions of mangroves.

Ocean quality. In both 2019 and 2014, around 30% of residents perceived ocean quality as being in good condition. In 2019, there was a 9.9% *increase* in bad perceptions of ocean quality and a 9.7% *decrease* in very good perceptions of ocean quality.



** indicates $p < .05$, *** indicates $p < .01$

Figure 22. Resident perceptions of current resource conditions in 2014 and 2019.

5.3.2 Changes in resource conditions over the past 10 years

Generally, in 2019, more residents perceived resource conditions as becoming a lot worse or somewhat worse (Figure 23). However, the proportion of residents who were not sure remained similar, if not unchanged, in 2019. Residents remained most unsure about the amount of coral, mangroves quality, and fish number.

Among the significant changes in 2019, there was a 10.6% *increase* in the perception that **ocean quality** had become somewhat worse, whereas 10.5% *fewer* residents perceived ocean quality as somewhat better or a lot better. There was a 7.2% *increase* in the perception that **beach quality** had become somewhat worse in 2019, whereas 5.7% *fewer* residents perceived this condition as becoming a lot better. Similarly, there was a 6.1% *increase* in the perception that **mangrove quality** had become somewhat worse, and a 2.8% *decrease* in perceptions of this condition becoming a lot better.

Regarding the **amount of coral**, the only significant change in 2019 was a 2% *decrease* in the perception that coral abundance had become a lot better over the past 10 years. Approximately 5% *more* residents in 2019 believed that the **number of fish** had become somewhat worse, whereas 2.2% *fewer* residents believed that fish abundance had become a lot better.



Spotted scorpion fish (*Scorpaena plumieri*) and staghorn coral (*Acropora cervicornis*); Inner Reef offshore of Sunny Isles. Photo: Florida Department of Environmental Protection



** indicates $p < .05$, *** indicates $p < .01$

Figure 23. Resident perceptions of changes in resource conditions in 2014 and 2019.

5.3.3 Change in overall resource quality in the next 10 years

Between 2014 and 2019, there were significant differences in residents' beliefs about how the quality of resources will change in the next ten years (Figure 24). In both years, the highest proportion of respondents believed that resources will become worse, but this proportion *increased* by 11% in 2019. The proportion of respondents who believed resources will improve *decreased* by 4% in 2019, and a similar pattern was also observed for the belief that resources will stay the same in the next ten years. The proportion of not sure responses *decreased* from 9% to 6% in 2019, indicating that respondents were more confident in their beliefs about how resources will change in the future.

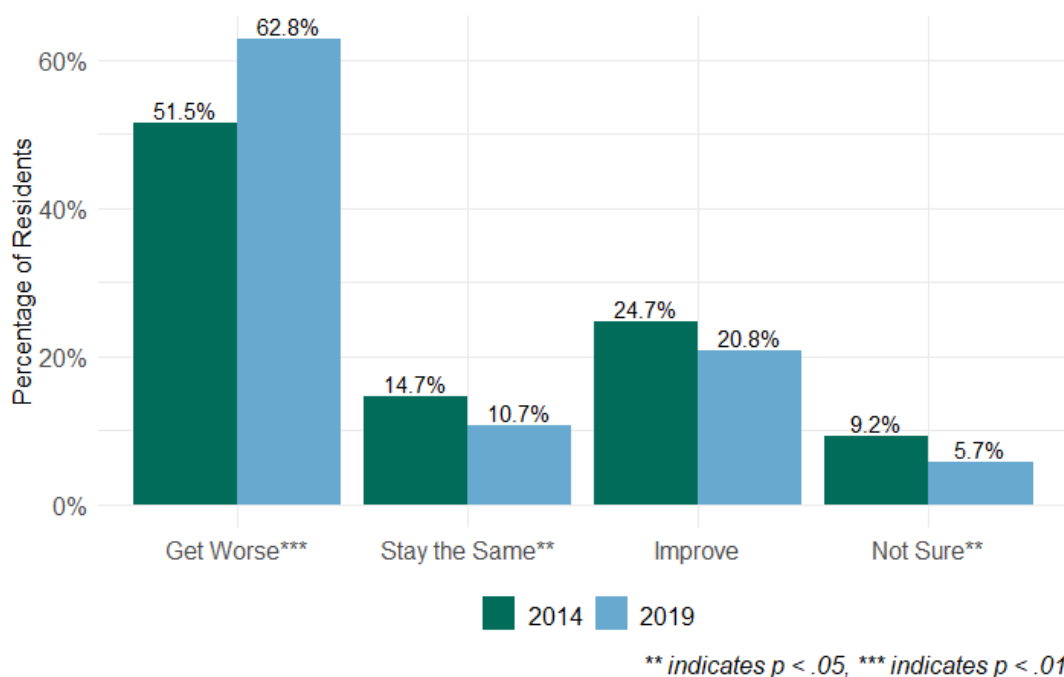


Figure 24. Residents' beliefs about how the overall quality of resources will change in the next ten years.

5.4 Awareness and knowledge of coral reefs (threats)

Residents' level of familiarity⁶ with three out of the nine threats were significantly different in 2014 and 2019 (Figure 25). In 2019, residents were *more familiar* with climate change (+7.1%) and coral bleaching (+10.8%) as threats to coral reefs but were *less familiar* with damage from

⁶ The 5-point familiarity scale was consolidated into two categories to facilitate visualization and interpretation: unfamiliar (very unfamiliar or unfamiliar) and familiar (familiar and very familiar). The category "neither familiar nor unfamiliar" was excluded.

ships and boats as a threat (-6.6%). Familiarity with the other six threats was similar in 2014 and 2019.

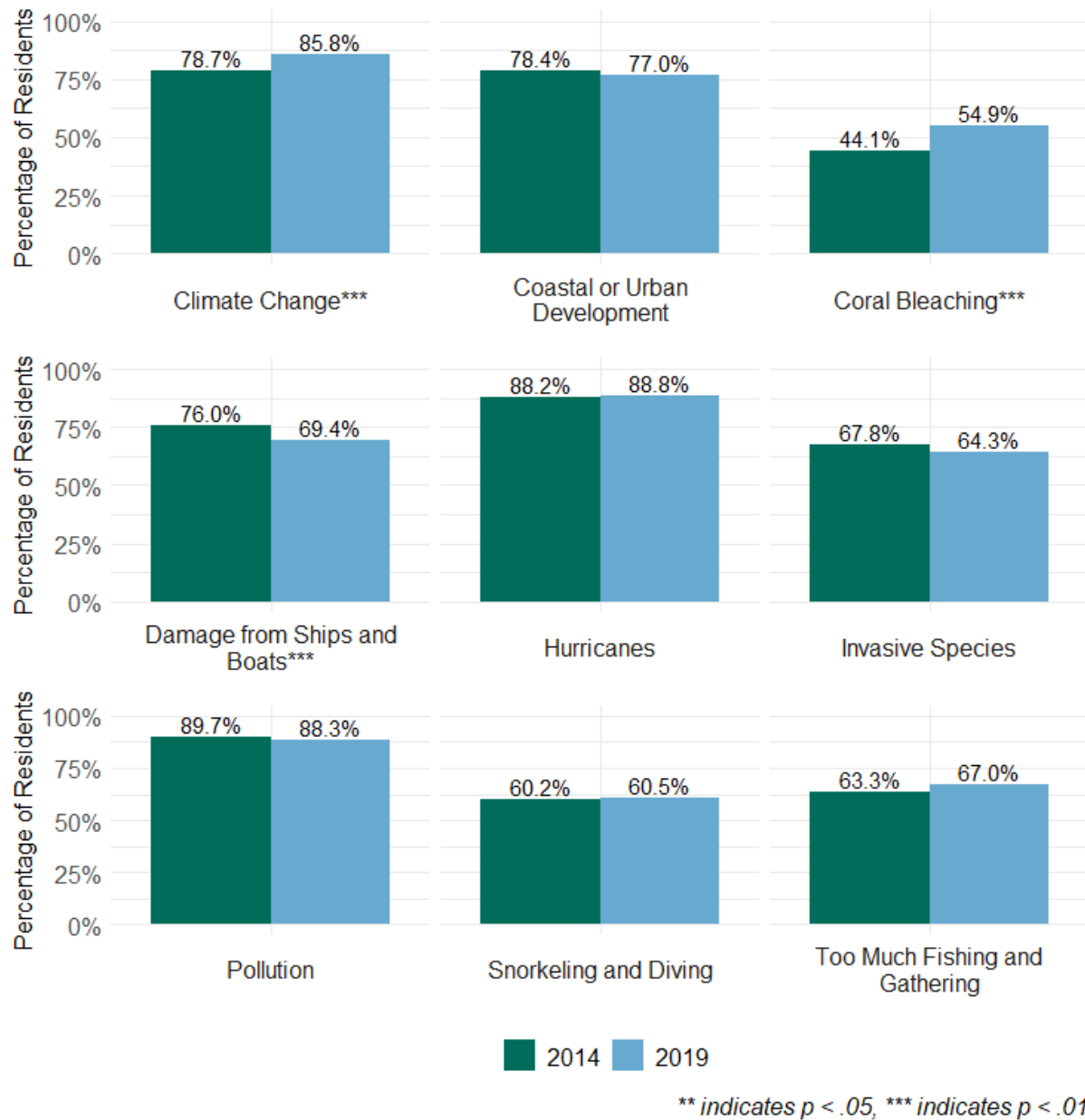


Figure 25. Residents' awareness of threats to coral reef ecosystems in 2014 and 2019.

5.5 Attitudes toward coral reef management strategies

There were two questions about attitudes toward management strategies that were included in both the 2014 and 2019 survey, and both had significant differences in the results (Figure 26). Overall, the majority of residents supported limits per person for certain fish species, such as size or quantity limits in 2014 and 2019. In 2019, the proportion of residents who supported this strategy *decreased* by 11%. Yet, there was also a 14% *increase* in the proportion of residents who strongly supported this strategy.

Residents also generally supported stricter control of sources of pollution to preserve water quality in both years, and their response patterns were similar to the first strategy. In 2019, the proportion of residents who supported stricter control of pollution sources *decreased* by 11%, but there was a 16% *increase* in residents who strongly supported this strategy.

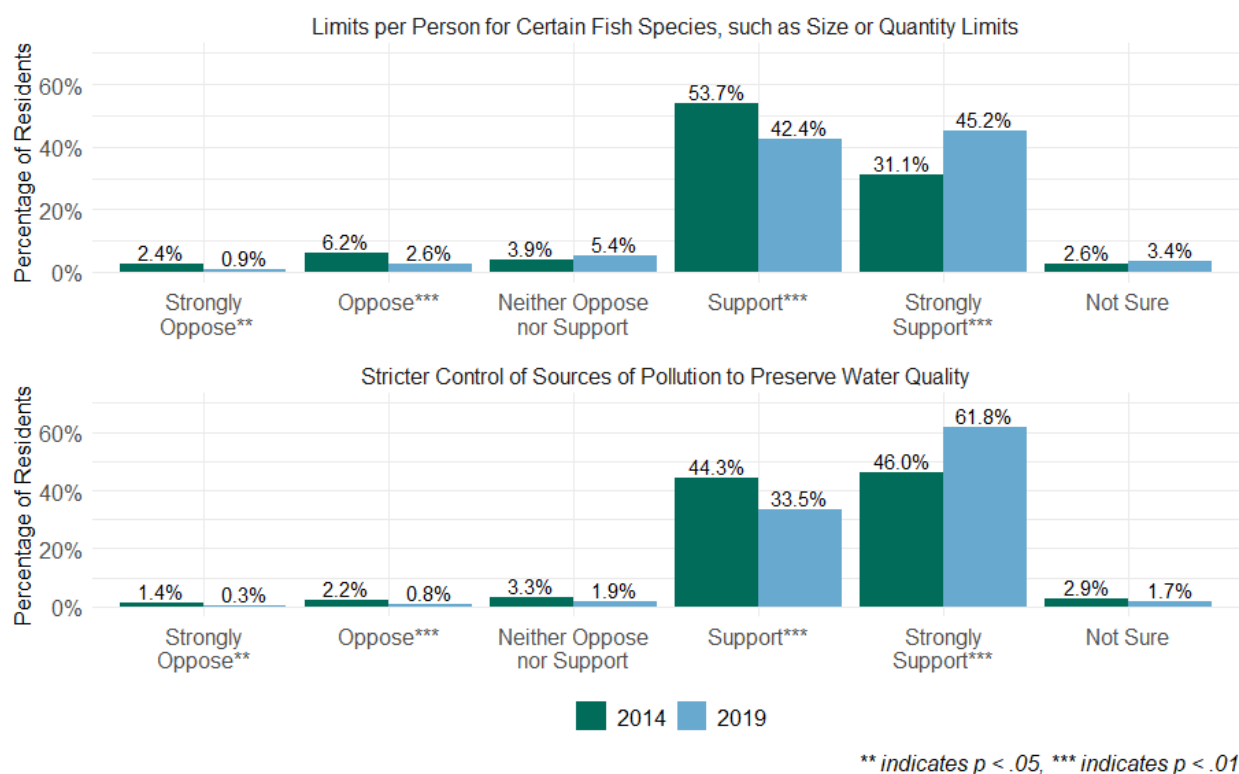


Figure 26. Residents' support for management strategies in 2014 and 2019.

5.5.1 Familiarity with organizations in South Florida

Residents' familiarity with three out of five organizations in South Florida was significantly different in 2014 and 2019 (Figure 27). Residents were *more familiar* with the Florida Department of Environmental Protection in 2019 (+6.1%) than they were in 2014. In 2019,

residents were *less familiar* with the Florida Keys National Marine Sanctuary (-5.1%) and Our Florida Reefs Community Planning Process (-4.2%).

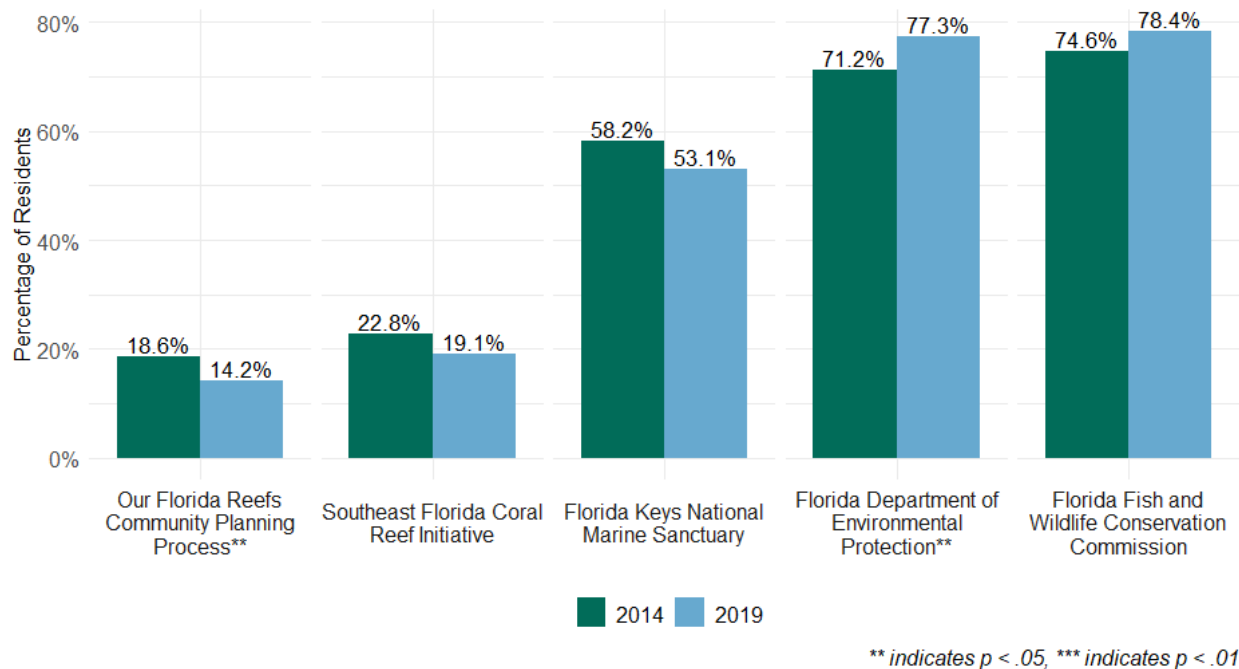


Figure 27. Residents' familiarity with Florida organizations in 2014 and 2019.

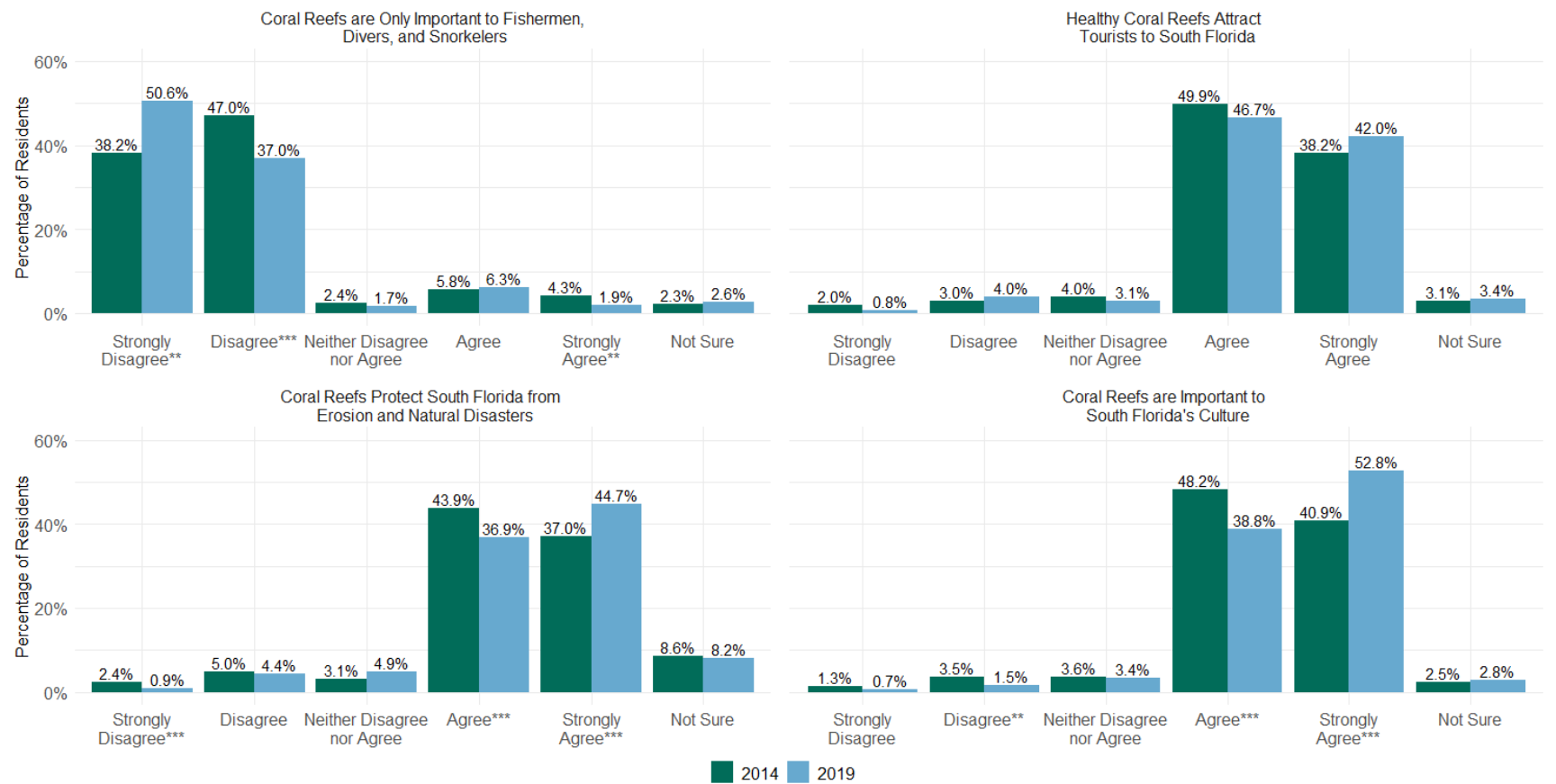
5.4 Importance of coral reefs

Four statements rated by respondents in 2014 and 2019 on the importance of corals reefs were compared (Figure 28). In both years, residents most strongly agreed that “coral reefs are important to South Florida’s culture,” and this proportion *increased* by 12% in 2019.

The majority of residents in 2014 and 2019 also agreed that “coral reefs protect South Florida from erosion and natural disasters,” and the proportion of those who strongly agreed with this statement *increased* by 7.7% in 2019.

Residents remained relatively the same in 2019 regarding their level of agreement or disagreement that “healthy coral reefs attract tourists to South Florida,” but in both years, the majority agreed or strongly agreed with this statement.

There was little agreement among residents in both years that “coral reefs are only important to fishermen, divers, and snorkelers,” and 12.4% *more* residents strongly disagreed with this statement in 2019. This increase was the most significant change from 2014 in responses regarding the importance of coral reefs.



** indicates $p < .05$, *** indicates $p < .01$

Figure 28. Residents' perceived importance of coral reefs in 2014 and 2019.

6. Discussion

The principal goal of the survey effort described in this report was to collect and analyze data regarding residents' knowledge, perceptions, and attitudes about coral reef ecosystems in South Florida. Based on the survey findings, some general conclusions about the population of South Florida in 2019 and their interactions with coral reefs are evident. Notable changes or similarities between 2014 and 2019 are also reported. We conclude this section by discussing directions for future research.

6.1 Participation in coral reef activities

Swimming/wading, beach recreation, and boating were primary activities for South Florida residents. Participation in fishing of all types remained low in 2019, but residents were more motivated to fish for sport. This suggests that sport and tournament fishing is becoming more popular among residents and may be an important driver of fishing activity in Southeast Florida. Monroe County residents tended to be more active in coral reef ecosystems than residents of the other counties. Possible explanations for high engagement in this county may be access to both the Atlantic Ocean and the Gulf of Mexico, differences in population density, or demographic differences between the Keys' communities and more urbanized lifestyles and landscapes of the northern counties. While the Florida Keys economy is driven by tourism and is especially known for boating, fishing, snorkeling and diving (Monroe County 2019), it should be noted that activity participation rates in this report reflected local residents of Monroe County and not tourists, who could have different participation rates. The popularity of these activities among residents invokes social, environmental, and management implications. Socially, frequent participation in these activities suggests higher densities of human use in the areas where these activities are offered. High densities of human use can have further impacts on ecosystem conditions, as well as the quality of recreational experiences and social conditions such as overcrowding or conflict (Manning 1999).

Sustained access to these activities and the quality of recreational experiences are linked to the coral reef ecosystem. Beach recreation, for instance, is most directly linked to coral reefs through the protection of beaches from erosion due to storm events (Shivlani 2014). Additionally, reefs provide material for natural beach replenishment (NOAA CRCP 2015). Swimming/wading and boating are near-shore activities that are linked to water quality and the existence of coral reefs. Swimming and wading depend on ocean water quality for public safety, aesthetics, and other purposes. Boating, on the other hand, can contribute to the degradation of water quality (and other marine resources). Future surveys may incorporate a question to characterize the spatial distribution of activities, which could be correlated to habitat and resource conditions.

The interactions between human use and the condition of coral reef ecosystems are important from a management perspective. The findings from the 2019 NCRMP survey can inform

management of activities valued by residents and how their behaviors may be linked to their perceptions of resource conditions and beliefs and attitudes toward about management strategies for coral reef conservation (and ultimately the delivery of ecosystem services and societal benefits).

6.2 Cultural importance of coral reefs

Ecosystem services and culture. *The majority of residents recognized that coral reefs provide a variety of ecosystem services to the South Florida region.* There was a general consensus that coral reefs offer protection from natural disasters, attract tourists to the region, provide economic opportunities and food, and are important to South Florida's culture. Residents also believed that coral reefs are important to their family's cultural beliefs and practices. While the 2019 survey did not ask about specific types of cultural beliefs and practices, the findings suggest that one important aspect of culture is food. *The large majority of resident households consumed seafood at least once a week in both 2014 and 2019.* Thus, residents continued to rely on seafood as a primary food source.

Seafood sourced from local coral reefs. Few residents in South Florida consumed seafood sourced from local coral reefs. However, 18% of residents did not respond to this question. One possible explanation is that people who eat seafood may not always know where that seafood came from, and therefore, may not have known how to respond to this survey question. Most residents purchased their seafood at a store or restaurant, where the "sources" are not always apparent to consumers.

Residents who fish were likely to be more familiar with the types of species local to reefs (including snappers, groupers, and lobsters that were frequently targeted by residents) and where their seafood came from. This is suggested by the findings for Monroe County, where *the majority of Monroe County residents consumed seafood locally sourced from coral reefs at some frequency.* Most of their seafood was personally caught by themselves, family, or friends, and may have consisted of snapper, grouper, or lobster, which were frequently targeted by fishers. This suggests that Monroe County residents may be more connected to the coastal environment with greater access to marine resources relative to other counties in the region.

6.3 Perceived resource conditions

Perceptions of resource conditions and change. Individuals who regularly observe, pursue, and use living marine resources for recreational, consumptive, and commercial purposes tend to possess a wealth of understanding about the marine environment. Overall, the proportion of residents who were not sure about current marine resource conditions decreased in 2019, suggesting that residents have become more certain about their perceptions of marine resource conditions in South Florida. Certainty about current resource condition was relatively consistent with certainty about changes in condition, suggesting that residents were likely to be consistent

in their evaluations of resource conditions across time. The findings show that residents had *positive perceptions of the conditions of beaches and ocean water quality in 2019*. Residents were also most confident about their perceptions of those two conditions compared to other resources, which makes sense considering that beach recreation, swimming/wading, and boating were primary activities residents participated in. Sustained participation in these activities will depend on quality beach and ocean water conditions.

Residents believed that the *quality of marine resources in general had become worse over the past ten years*, and that *conditions are likely to become worse in the future*. These changing conditions could have a negative impact on the activities residents frequently participate in and the quality of benefits and experiences that these activities provide. For instance, ocean water quality and the amount of coral were perceived as having a more negative outlook and suggests that these are critical issues to manage. Perceptions of these conditions varied somewhat by county, but results suggest that ocean water quality may be a more salient issue among residents of Martin County, and coral abundance a more salient issue in Monroe County. These findings indicate residents' perspectives of how resource conditions are changing, but do not necessarily reflect their values or perceived importance of these resources. These perceptions can have important implications for resource managers who wish to identify and respond effectively to locally important issues and problems.

6.4 Awareness and knowledge of coral reefs

Awareness of threats to coral reefs. Residents' perceptions of how resource conditions have changed (and will change in the future) can be connected to their awareness of coral reef threats. While the survey did not ask about the impacts of each threat on particular resource conditions, further analysis could examine the links between residents' awareness of threats and their perceptions of resource change. The survey found that residents were familiar with a variety of threats facing coral reefs, but *least familiar with ocean acidification*. They were *most familiar with threats from hurricanes, pollution, and climate change*. These are threats that can impact ocean water quality and the amount of coral, which were the two conditions residents believed would become the worst in the future.

High awareness of hurricanes was expected considering residents' experiences with Hurricane Irma in September of 2017 (less than two years before this data collection) and the long-term recovery efforts that followed. In regard to pollution, South Florida counties have dealt with water quality issues (i.e., fertilizer, stormwater runoff, wastewater/septic treatment) for decades and continue working to remove excess nutrients and other pollutants or prevent them from entering natural systems (SFWMD 2020). Residents have also been experiencing the impacts of climate change and sea level rise, and often deal with flooding and damages to roads and infrastructure. Residents were familiar with climate change but were less certain about how climate change threatens coral reefs. Yet, awareness of these connections may be increasing. The

2019 survey indicated that residents were *more familiar with climate change and coral bleaching than they were in 2014*. However, awareness of coral bleaching and coral disease outbreak in 2019 varied across counties, and Monroe County residents were more familiar with these issues. This may have been influenced by the prevalence of coral restoration occurring in the Florida Keys, including Mission Iconic Reefs, as well as outreach efforts and communication of these issues. The slight increase in awareness of coral disease also coincided with the outbreak of SCTLD throughout Florida's reefs, which has resulted in high rates of coral mortality and devastated the reef ecosystem. Further focus on informing citizens of these issues and the potential costs to people's livelihoods could help to promote stronger environmental attitudes and active engagement in conservation activities (Danielson et al. 1995).

Together with findings on perceptions of resource conditions, findings on threats to coral reefs can be useful for a) assessing public perceptions regarding the relative degree of success of current management efforts and as a means for indicating how such efforts might be adjusted to accommodate changing conditions; b) designing new management approaches that are readily understood and therefore more likely to be accepted and followed by resource users; and c) adjusting outreach and educational efforts as per changing local observations about threats to the local marine environment.

6.5 Attitudes toward coral reef management strategies

Marine Protected Areas. The survey found that the *majority of Monroe County residents were familiar with MPAs*, but *awareness among residents of the remaining counties tended to be low*. This may be due to the prevalence of MPAs in Monroe County relative to the rest of South Florida. Resource management in Monroe County is particularly complex with multiple management agencies/organizations, regulations, and zones that vary in levels of resource protection and types of uses afforded in certain areas. Overall, residents of all counties generally supported the establishment of MPAs and *agreed that MPAs protect coral reefs*. But there was less agreement, particularly among Monroe County residents, on whether there should be more MPAs. This finding may be related to the mixed opinions among residents regarding "who" is negatively impacted by MPAs, which in this survey, was fishermen and their livelihoods. The survey found that most people tended to support marine resource protection in general. However, it is important to consider that the degree of their support may vary based on how people are differentially impacted by restrictions imposed by an MPA (Bennett et al. 2019, 2020). This informs the tradeoffs between resource protection and use, and has implications to social justice (equity, perceived fairness), effective governance, and the success of marine conservation management actions.

Support for strategies to improve coral reef protection. Information on residents' attitudes can provide managers and decision-makers with a better understanding of which kinds of resource management strategies are most likely to be supported by residents. This survey found

strong support (positive attitudes) for coral restoration efforts and stricter regulations of pollution to preserve water quality. Support for these management strategies were also linked to residents' perceptions of changing resource conditions and threats to reefs. These findings suggest that South Florida residents want to see efforts to mitigate threats (i.e., pollution) to coral reefs, and prevent resource conditions (ocean water quality and amount of corals) from becoming worse. This also suggests that, in general, *current management efforts in the region are responding to residents' needs and desires* for healthy reef resources.

Residents also *strongly supported more public education on sea level rise and climate change.* These are major issues affecting coastal communities in South Florida (and nationwide), but they are also complex in the magnitude, timing, and types of impacts felt by communities. The results showed that residents were familiar with climate change but not very familiar with ocean acidification. Thus, increased outreach and communication of the links between climate change issues (including ocean acidification and sea level rise) and communities is needed.

6.6 Awareness of coral reef rules and regulations

Monroe County residents were most familiar with coral reef rules and regulations, and Broward County residents were least familiar. This may be related to the residents' activity participation rates. Residents in Monroe County had the highest participation in all marine activities, whereas Broward County had the lowest participation rates in all activities except for beach recreation. Thus, Monroe County residents who have a high avidity for multiple marine activities were likely to be more familiar with coral reef rules and regulations.

Residents indicated that they were *most familiar with the Florida Fish and Wildlife Conservation Commission (FWC) and Florida Department of Environmental Protection (FDEP).* This suggests that FWC and FDEP may be good outlets for communication with South Florida residents about coral reef resource issues. Residents were least familiar with the Gulf of Mexico and South Atlantic Fishery Management Councils and the Our Florida Reefs Community Planning Process. Low familiarity with the fishery management councils might reflect the relatively low participation rates in fishing, but major efforts to promote the Our Florida Reefs Community Planning Process were underway during this survey (see for example: <http://ourfloridareefs.org/press-room/>). The latter organization was also the least familiar to residents in the 2014 survey, so it is uncertain how effective those outreach efforts were at the time of the 2019 survey.

6.7 Participation in behaviors that may improve coral reef health

Residents varied in their participation in pro-environmental behaviors that may improve coral reef health. The *majority of residents recycled several times a month, and nearly 50% participated in coastal/beach cleanups or donated to environmental causes.* Residents volunteered with environmental groups less often, and rarely participated in lionfish derbies.

While the survey did not ask respondents for reasons why they participated (or did not), higher participation in beach cleanups may reflect residents' high participation rates in beach recreation or values for quality beach conditions. Similarly, low participation in lionfish derbies also paralleled low participation in spearfishing and diving, which are the typical activities required for these derbies. Future surveys could follow up with questions on motivations or constraints to participation in pro-environmental activities. This would help management target communication and outreach efforts to engage citizen participation in stewardship and conservation activities (Kollmuss and Agyeman 2002).

6.8 Future monitoring cycles

There were a few lessons learned from the second NCRMP socioeconomic data collection in South Florida, the first of which relates to survey instrument and questions used to measure the primary indicators. Minor changes were made to the way questions were asked to improve the 2019 survey from the 2014 survey. Moving forward, the NCRMP team will be making additional adjustments to the survey and data collection effort to further improve the accuracy and validity of the type of information generated, while maintaining comparability between monitoring rounds. Some of the improvements include clarity of wording, refinement and consistency of scales, and additional questions to better capture the “cultural importance” and “pro-environmental behavior” indicators. Making these improvements is necessary to achieve more precise and accurate measurement of indicators.

Another consideration is to administer the survey using alternative modes. While the second round of telephone interviews yielded a 12% response rate, “mail-push-to-web” or a mix of mail and online surveys typically yield higher response rates than telephone interviews alone (Messer and Dillman 2011), and can improve the representativeness of the sample (Groves 2006). The use of online surveys accommodates changing technology and younger respondents and is often the preferred mode for respondents (Loomis and Paterson, 2018). Yet, mail surveys typically produce the highest response rates of all types of survey vehicles (Messer and Dillman 2011).

NCRMP continues to collaborate with the biological and climatic NCRMP pillars and jurisdictional agencies to integrate socioeconomic and biophysical data, and to inform coral reef management and monitoring across all jurisdictions. Comparing perceived coral reef resource conditions to biological data can reveal gaps between residents' perceptions of resources and patterns observed in fisheries, benthic, and climate data. Integration of socioeconomic, biological, and climatic NCRMP data provides for a holistic understanding of the socio-ecological connections and implications of the indicators that NCRMP is monitoring. This supports communication of complex data in a way that facilitates resource management decision making.

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Appendix A: Data Collection Protocols and Weighting Efforts

Data Collection

The telephone surveys used a dual-frame sampling plan incorporating both landline and cellular telephone numbers to ensure maximum coverage and representation of those with telephones, including young adults, singles, and mobile-only households. A representative telephone database was purchased from Marketing Systems Group and Dynata that included both landline and cellular records for residents of the five counties in South Florida.

The software used for telephone data collection was Questionnaire Programming Language (QPL). The survey was programmed so that QPL branched, coded, and substituted phrases in the survey based on previous responses to ensure the integrity and consistency of the data collection. Although the QPL system automates the telephone survey process and data entry, the system is not fully automated as a professionally trained interviewer conducted each telephone survey. A central polling location at the survey contractor's office allowed for quality control and oversight over the telephone interviews. Each interviewer had been trained according to the standards established by the Council of American Survey Research Organizations.

Telephone surveying times were Monday through Friday from 10:00 a.m. to 9:00 p.m., Saturday from noon to 5:00 p.m., and Sunday from 5:00 p.m. to 9:00 p.m., local time. A five-callback design was used to maintain the representativeness of the sample, to avoid bias toward people easy to reach by telephone, and to provide an equal opportunity for all to participate. When a respondent could not be reached on the first call, subsequent calls were placed on different days of the week and at different times of the day.

A total of 36,666 unique phone numbers (17,609 landline and 19,057 cell phone) were called over the course of the survey, resulting in a total of 2,201 completed interviews (402 for landline numbers and 1,799 for cell phone numbers). During the calling effort, 10,222 of the initial 36,666 phone numbers that were called were disconnected numbers, business/government offices, those in the military, those in jail, as well as those who were deceased. These groups are considered "non-eligible" and were not included in the response rate calculations.

Eligible phone numbers included phone numbers of people who answered the phone but refused or immediately terminated the call, phone numbers that were called but went to voicemail or answering machine, and those who answered and completed the interview. The response rate was 10.02% for landline numbers and 14.67% for cell phone numbers. No names or personally identifiable information were collected during surveying.

Weighting

Weights were created for analysis in order to generalize the findings of the sample to the South Florida population using iterative proportional fitting, a method commonly referred to as

“raking.” Iterative proportional fitting creates a weight for each survey respondent to help the sample become more representative of the true population characteristics. In this analysis, weights were created to match three of the survey sample’s demographic data to the true demographic characteristics of the South Florida population: age groups (18-24, 25-34, 35-44, 45-54, 55-65, and 65 and older), sex, and Hispanic/Latino. These characteristics’ statistics were derived from the US Census Bureau 2017 ACS 5-Year estimates. A comparison between the demographics in the weighted sample is presented below:

Demographic Variable	Category	Weighted Sample Proportion	U.S. Census Bureau 2017 ACS Proportion
Age Groups	18-24	.11	.10
	25-34	.16	.16
	35-44	.17	.16
	45-54	.18	.18
	55-64	.16	.15
	65 and over	.21	.22
	No response	.08	*
Sex	Female	.51	.52
	Male	.47	.48
	No response	.02	*
Hispanic or Latino	Not Hispanic or Latino	.53	.56
	Hispanic or Latino	.43	.44
	No response	.04	*

A weight was calculated for each of the 2,201 survey respondents. Statistics about the calculated weight are presented below:

Calculated weight		
N		2,201
Central tendency and dispersion	Mean	2,260.9
	Standard deviation	2,038.7
	Standard error of the mean	43.5
	0%	87.9
	25%	270.6
	50%	1,967.5
	75%	3,553.1
	100%	9,466.0

Appendix B: 2019 Survey Instrument

OMB SUBMISSION

NOAA Coral Reef Conservation
Program National Coral Reef Monitoring
Program (NCRMP)
Resident Coral Reef
Survey OMB Control
Number 0648-0646

FLORIDA SURVEY

Survey conducted in (circle one): English Spanish

Hello, My name is _____ We are only interested in obtaining your opinions
on some important issues related to coral reefs and the environment in _____

Your participation is voluntary and will be kept strictly confidential. Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subjected to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other suggestions for reducing this burden to Peter Edwards, National Oceanic and Atmospheric Agency, National Ocean Service, Coral Reef Conservation Program, (1305 East West Highway, Silver Spring, MD, 20910, USA.

The South Florida study area is defined as the area within the following counties: Martin, Palm Beach, Broward, Miami-Dade, and Monroe.

PARTICIPATION IN REEF ACTIVITIES

First, I would like to know more about your activities in South Florida.

1. How often do you usually participate in each of the following activities in South Florida? (Would you say, 4 times a month or more, 2 to 3 times a month, once a month or less, or never?)

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	4 times a month or more	2-3 times a month	Once a month or less	Never
Swimming or wading				
Snorkeling				
SCUBA Diving				
Free Diving				
Waterside or beach camping				
Beach recreation such as beach sports, sunbathing, or picnics				
Boating				
Hook and Line Fishing, that is, fishing for finfish				
Spear Fishing				
Gathering of marine resources, such as lobsters, conch, or seaweed				
Watersports, such as surfing, kayaking, paddle boarding, or kite surfing				
Island or Sandbar Recreation				

SKIP PATTERN-- If respondent answers 'never' to fishing and gathering of marine resources, then skip to #4:

CORAL REEF RELIANCE / CULTURAL IMPORTANCE OF REEFS

2. How often do you fish for, harvest, or catch marine resources for each of the following reasons in South Florida?

(Would you say, frequently, sometimes, rarely, or never?)

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Frequently	Sometimes	Rarely	Never
To feed myself and my family or household				
To sell				
To give to extended family members and/or friends				
For fun				
For special occasions and cultural events				
For sport, for example, tournament fishing				

3. How often do you fish for, harvest, or catch the following types of fish/shellfish in South Florida?

(Would you say, frequently, sometimes, rarely, or never?)

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Frequently	Sometimes	Rarely	Never
Snappers or Groupers				
Parrotfish or Surgeonfish				
Lobsters				
Conch				
Kingfish, Cero, Cobia, or Sailfish				
Dolphin fish, Wahoo, or Tuna				
Lionfish				

4. How often do you or your family eat fish/seafood?
Family is defined as all persons living under the same roof.
(Would you say...?)
(*READ RESPONSE OPTIONS*)

- a. Every day
- b. A few times a week
- c. About once a week
- d. 1-3 times a month
- e. Less than once a month
- f. Never

SKIP PATTERN -- If respondent answers 'never' then skip to question #7

5. How often do you or your family eat **locally-caught** fish/seafood that is harvested **from coral reefs**? (For example parrotfish, snapper, spiny lobster, or grouper from nearby coral reefs)? (Would you say...?)
(*READ RESPONSE OPTIONS*)

- a. Every day
- b. A few times a week
- c. About once a week
- d. 1-3 times a month
- e. Less than once a month
- f. Never

6. What are the top TWO sources of the fish or seafood your family eats?
Is your seafood...?

(*READ RESPONSE OPTIONS; SELECT TOP TWO SOURCES*)

- a. Purchased by myself or someone in my household at a store or restaurant
- b. Purchased by myself or someone in my household at a market or roadside vendor
- c. Caught by myself or someone in my household
- d. Caught by extended family members
- e. Caught by friends or neighbors

PERCEIVED RESOURCE CONDITION

Next, I am going to ask you about your opinions on marine resources in South Florida.

7. In your opinion, how would you rate the current condition of each of the following marine resources in South Florida? Please tell me if you would rate each one as very bad, bad, neither bad nor good, good, or very good.

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Very Bad	Neither Bad nor Good	Good	Very Good	Not Sure
Ocean Water Quality, for example, if it is clean and clear					
Amount of Coral					
Number of Fish					
Size of Fish					
Beach quality, for example, if it is long and wide, clean, and/or not crowded					
Mangroves					
Seagrasses					

8. How would you say the condition of each of those same marine resources has changed in the past 10 years in South Florida? Would you say the resource has gotten a lot worse, gotten somewhat worse, not changed, gotten somewhat better, or gotten a lot better?

RANDOMIZATION – The items in the table below are administered in the same order as they were for Q7 above, which was initially randomized. (Note response categories are NOT randomized.)

	A lot Worse	Somewhat Worse	No Change	Somewhat Better	A lot Better	Not Sure
Ocean Water Quality, for example, if it is clean and clear						
Amount of Coral						
Number of Fish						
Size of Fish						
Beach quality, for example, if it is long and wide, clean, and/or not crowded						
Mangroves						
Seagrasses						

9. In the next 10 years, do you think the condition of the marine resources overall in South Florida will get worse, stay the same or improve?
- Get worse
 - Stay the same
 - Improve
 - Not sure

AWARENESS AND KNOWLEDGE OF CORAL REEFS – Threats including climate change

Now I would like to know about your awareness of and opinions on coral reefs.

10. Please tell me the extent to which you disagree or agree with each of the following statements.

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	Not Sure
Coral reefs protect South Florida from erosion and natural disasters.						
Coral reefs are only important to fishermen, divers and snorkelers.						
Healthy coral reefs attract tourists to South Florida.						
Coral reefs in good condition provide food for coastal communities to eat						
Coral reefs provide economic opportunities to coastal communities						
Coral reefs are important to South Florida's culture.						

11. How unfamiliar or familiar are you with each of the following potential threats facing the coral reefs in South Florida?

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Very Unfamiliar	Unfamiliar	Neither Familiar nor Unfamiliar	Familiar	Very Familiar
Climate change					
Coral bleaching					
Hurricanes and other natural disasters					
Pollution, such as stormwater, wastewater, chemical runoff and trash or littering					
Coastal or urban development					
Invasive species, for example, lionfish					
Too much fishing and gathering					
Damage from ships and boats, such as groundings or anchoring					
Snorkeling and diving					
Ocean Acidification					
Fishing prohibited species, such as queen conch					

	Very Unfamiliar	Unfamiliar	Neither Familiar nor Unfamiliar	Familiar	Very Familiar
Sea Level Rise					
Coral Disease Outbreak					
Increasing ocean temperatures					

ATTITUDES TOWARDS CORAL REEF MANAGEMENT STRATEGIES AND ENFORCEMENT

The following questions are about coral reef management strategies and activities.

12. How unfamiliar or familiar are you with rules and regulations associated with coral reefs in South Florida?

- a. Very Unfamiliar
- b. Unfamiliar
- c. Neither Unfamiliar nor Familiar
- d. Familiar
- e. Very Familiar

13. A Marine Protected Area is an area of the ocean where human activity is typically restricted to protect living, non-living, cultural, and/or historic resources, such as conservation areas and sanctuaries in the South Florida area. How unfamiliar or familiar are you with Marine Protected Areas, also called MPAs?

- a. Very Unfamiliar
- b. Unfamiliar
- c. Neither Unfamiliar nor Familiar
- d. Familiar
- e. Very Familiar

SKIP PATTERN-- If respondent answers 'Very unfamiliar' or 'Unfamiliar', then skip to #15:

14. Please tell me the extent to which you disagree or agree with each of the following statements.

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Not Sure
MPAs protect coral reefs in South Florida						
MPAs increase the number of fish in South Florida						
There should be more MPAs in South Florida						
There has been economic benefit to South Florida from the establishment of MPAs						
Fishermen's livelihoods have been negatively impacted from the establishment of MPAs in South Florida						
MPAs help increase tourism in South Florida						
I generally support the establishment of MPAs in South Florida						

15. Next, please tell me the extent to which you oppose or support each of the following strategies to improve the protection of coral reefs in South Florida.

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Strongly Oppose	Oppose	Neither Support nor Oppose	Support	Strongly Support	Not Sure
Limits per person for certain fish species, such as size or quantity limits						
Stricter control of sources of pollution to preserve water quality						
Better regulation of industrial and agricultural pollution into coastal waters						
Efforts to restore damaged coral reefs						
Increased public education on sea level rise and climate change						

16. How unfamiliar or familiar are you with each of the following organizations and processes that are working to improve the management of coral reefs and other marine resources in South Florida?

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Very Unfamiliar	Unfamiliar	Neither Familiar	Familiar	Very Familiar
SEFCRI Southeast Florida Coral Reef Initiative, referred to as the SEFCRI					
Florida Keys National Marine Sanctuary, referred to as the FKNMS					
Florida Department of Environmental Protection					
Florida Fish and Wildlife Conservation Commission					
Our Florida Reefs Community Planning Process					
Gulf of Mexico and South Atlantic Fishery Management Council					
Southeast Florida Action Network, referred to as SeaFAN					

17. How unimportant or important are coral reef environments important to you and your family's cultural beliefs and practices?
- Very unimportant
 - Unimportant
 - Neither unimportant nor important
 - Important
 - Very important

PARTICIPATION IN BEHAVIORS THAT MAY IMPROVE CORAL HEALTH

18. How often do you participate in each of the following activities to protect the environment in South Florida?
(Would you say several times a month or more, at least once a month, several times a year, once a year or less, or not at all?)

RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

	Several times a Month or more	At least once a month	Several times a year	Once a year or less	Not at all
Recycling					
Coastal Cleanup or beach clean up					
Volunteering with environmental groups					
Donating to environmental causes					
Lionfish Derbies					

VERSION 1: ADMINISTERED TO 75% OF RESPONDENTS (RANDOMLY ASSIGNED)

19a. Please carefully consider the following HYPOTHETICAL plan to protect coral reefs in South Florida:

There is a need to raise funds to improve management of coral reefs. IF the state government of Florida was considering adding a “Reef Conservation Tax” to your existing local sales tax to raise these funds, the funds generated from the “Reef Conservation Tax” would go directly to agencies involved in the conservation of coral reefs. The funds would pay for some of the management actions described in previous questions in this survey. These management activities would improve the amount of reef fish, reduce pollution from the land, and restore damaged coral reefs.

Suppose, in order to implement the new policy, Florida had to call a statewide referendum in which all residents age 18 and older were asked to vote on the amount of the tax increase. If the majority of residents vote in favor of the increase, then the tax would be implemented.

Please note, there is currently NO actual tax under consideration.

If the proposed hypothetical tax were to cause your household expense to increase by **\$XX per year**, or in other words, **\$Y extra per month**, would you vote YES or NO for the “Reef Conservation Tax?” Please consider what decision you would make if you really had to spend the extra money, given your current budget.

(CHECK ONLY ONE ANSWER)

Yes

No

RANDOMIZATION OF AMOUNTS – The amounts provided to respondent in Q19 Version 1 above are randomly assigned. The options include:

\$10 per year, about 83 cents extra per month
\$25 per year, about \$2.08 extra per month
\$50 per year, about \$4.17 extra per month
\$100 per year, about \$8.33 extra per month
\$250 per year, about \$20.83 extra per month
\$500 per year, about \$41.67 extra per month

19b. VERSION 2: ADMINISTERED TO 25% OF RESPONDENTS (RANDOMLY ASSIGNED)

Please carefully consider the following HYPOTHETICAL plan to protect coral reefs in South Florida:

There is a need to raise funds to improve management of coral reefs. IF the state government of Florida was considering adding a “Reef Conservation Tax” to your existing local sales tax to raise these funds, the funds generated from the “Reef Conservation Tax” would go directly to agencies involved in the conservation of coral reefs. The funds would pay for some of the management actions described in previous questions in this survey. These management activities would improve the amount of reef fish, reduce pollution from the land, and restore damaged coral reefs.

Please note, there is currently NO actual tax under consideration.

Would you SUPPORT or OPPOSE a “Reef Conservation Tax” to generate funds for conservation of coral reefs IF it were to cost your household **\$XX per year**, which is about **\$Y extra per month**, would you SUPPORT or OPPOSE the “Reef Conservation Tax?” Please consider what decision you would make if you really had to spend the extra money, given your current budget.

(CHECK ONLY ONE ANSWER)

Support

Oppose

RANDOMIZATION OF AMOUNTS – The amounts provided to respondent in Q19 Version 2 above are randomly assigned. The options are the same as for Q19 Version 1 and include:

\$10 per year, about 83 cents extra per month
\$25 per year, about \$2.08 extra per month
\$50 per year, about \$4.17 extra per month
\$100 per year, about \$8.33 extra per month
\$250 per year, about \$20.83 extra per month
\$500 per year, about \$41.67 extra per month

SKIP PATTERN—If respondent answers “yes” to Q19 Version 1 or “support” to Q19 Version 2, skip to #21:

20. What are the main reasons you would [vote NO / OPPOSE] the “Reef Conservation Tax”? (*CHECK ALL THAT APPLY*)
Wording “vote NO” vs. “OPPOSE” dependent on which Q19 version respondent received.
- a. This increased tax would be too expensive for me
 - b. I don’t trust the government to give the money to the environmental agencies
 - c. I don’t think the environmental agencies are effective
 - d. I prefer to donate directly to environmental organizations
 - e. I don’t believe in raising taxes on principle
 - f. I think that current management is effective and doesn’t require more economic resources
 - g. Other (ENTER OTHER REASON(S) GIVEN)

Now we are going to ask you just a few more questions about where you get your information.

21. How often do you use each of the following sources of information to provide you accurate information on coral reefs and coral reef related topics in South Florida? (Would you say frequently, sometimes, rarely, or never?)
RANDOMIZATION – The items in the table rows below are randomized by the computer for each respondent. (Note response categories are NOT randomized.)

Sources	Frequently	Sometimes	Rarely	Never
Newspapers and/or other print publications				
Radio				
TV				
Online news sources or websites				
Social Media				
Friends and family				
Community leaders				
Florida state Government				
Federal government agencies, such as the National Oceanic and Atmospheric Administration (or NOAA) and the Environmental Protection Agency (or EPA)				
Non-profit organizations				

DEMOGRAPHICS

I just have a few more questions that will help us to interpret our results. As a reminder, the information you provide is completely confidential.

22. Are you male or female?
- a. Male
 - b. Female
23. What is your year of birth? _____
24. How long have you lived in South Florida?
- a. 1 year or less
 - b. 2-5 years
 - c. 6-10 years
 - d. more than 10 years
 - e. all my life
25. What is your ZIP code? _____
26. Are you Hispanic?
- a. Yes
 - b. No
27. What race/ethnicity do you consider yourself?
- a. American Indian or Alaskan Native
 - b. Asian
 - c. Black or African American
 - d. White
 - e. Native Hawaiian or other Pacific Islander
 - f. 2 or more races
 - g. Other, please specify _____
 - h. No response
28. What is the highest level of education you have completed?
- a. 8th Grade or Less
 - b. Some high school
 - c. High School Graduate or GED
 - d. Some college, community college, or Associate's Degree
 - e. College Graduate
 - f. Graduate School, Law School, or Medical School
 - g. No Response
29. Is your occupation affiliated with the marine environment or industry?
- a. Yes
 - b. No

30. **[If 'Yes' to #30]** Which industry best fits your primary profession?
(*READ CATEGORIES AS NECESSARY*)
- a. Commercial fishing
 - b. Charter fishing
 - c. Dive/snorkel operation
 - d. Marina/boat operation
 - e. Other watersports
 - f. Eco-tour operation
 - g. Ecological research
 - h. Ocean/coastal management
 - i. Artisan
 - j. Education
 - k. Other, please specify _____
31. May I ask, what is your annual household income?
- a. Under \$10,000
 - b. \$10,000-19,999
 - c. \$20,000-29,999
 - d. \$30,000-39,999
 - e. \$40,000-49,999
 - f. \$50,000-59,999
 - g. \$60,000-74,999
 - h. \$75,000-99,999
 - i. \$100,000-149,999
 - j. \$150,000 or More
 - k. No Response

That's the end of the survey. Thank you for your time and cooperation.

Appendix C: South Florida County Results for 2019

Table C1: Proportion of participation in activities by county

Recreation Activity	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Beach Recreation	69.7%	71.2%	68.3%	69.9%	65.6%
Boating	37.7%	58.6%	44.3%	76.4%	44.7%
Free Diving	11.2%	19.3%	11.6%	38.8%	13.6%
Island or Sandbar Recreation	29.5%	47.9%	34.4%	58.8%	34.9%
SCUBA Diving	10.5%	17.4%	12.4%	29.9%	15.2%
Snorkeling	28.7%	41.9%	34.1%	71.7%	37.7%
Swimming or Wading	64.4%	73.7%	64.6%	80.8%	68.0%
Waterside Camping	23.1%	24.8%	24.0%	29.9%	18.9%
Watersports	31.4%	46.4%	34.6%	55.3%	34.8%
Extractive Activity					
Hook and Line Fishing	24.6%	43.3%	29.0%	57.0%	33.4%
Gathering of Marine Resources	9.8%	19.7%	10.8%	44.3%	14.8%
Spear Fishing	4.0%	12.8%	6.7%	29.4%	10.9%

Table C2: Frequency proportion of reasons for fishing and gathering reasons by county

Reason and Frequency	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
To Feed Myself and My Family or Household					
Never	40.4%	25.7%	29.6%	12.7%	26.1%
Rarely	20.6%	13.4%	22.9%	14.1%	20.5%
Sometimes	23.3%	27.0%	22.0%	31.8%	23.4%
Frequently	15.7%	33.9%	2.5%	41.5%	30.1%
To Sell					
Never	93.1%	88.9%	96.7%	89.8%	94.3%
Rarely	1.2%	4.7%	0.7%	0.6%	2.7%
Sometimes	2.9%	1.6%	2.2%	3.6%	0.9%
Frequently	2.9%	4.8%	0.4%	6.1%	2.2%
To Give to Extended Family Members and/or Friends					
Never	52.2%	38.3%	44.8%	38.6%	47.1%
Rarely	20.1%	21.3%	20.7%	23.1%	15.7%
Sometimes	19.5%	26.9%	23.7%	22.8%	21.2%
Frequently	8.29%	13.6%	10.8%	15.5%	16.0%
For Fun					
Never	16.7%	11.1%	13.9%	14.6%	7.0%
Rarely	21.3%	11.1%	14.4%	14.0%	16.0%
Sometimes	28.7%	21.6%	26.9%	24.7%	24.1%
Frequently	33.3%	56.2%	44.8%	46.8%	53.0%
For Special Occasions and Cultural Events					
Never	61.0%	49.3%	60.2%	47.1%	57.0%
Rarely	24.0%	25.4%	16.8%	22.3%	22.9%
Sometimes	10.3%	16.8%	17.1%	20.4%	10.9%
Frequently	4.7%	8.6%	6.0%	10.3%	9.3%
For Sport; for example, Tournament Fishing					
Never	70.7%	59.6%	67.4%	59.0%	61.1%
Rarely	14.3%	17.2%	15.8%	16.9%	17.1%
Sometimes	11.2%	12.9%	12.1%	14.4%	9.6%
Frequently	3.7%	10.2%	4.6%	9.7%	12.3%

Table C3: Proportion of frequency of fishing for certain species by county

Species and Frequency	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Snappers or Groupers					
Never	28.8%	14.1%	14.7%	8.8%	22.7%
Rarely	25.5%	25.1%	18.4%	12.6%	21.1%
Sometimes	29.0%	31.6%	31.9%	34.7%	28.9%
Frequently	16.8%	29.2%	35.0%	43.8%	27.4%
Parrotfish or Surgeonfish					
Never	77.3%	87.6%	90.1%	90.6%	90.4%
Rarely	15.3%	8.9%	7.8%	7.7%	9.0%
Sometimes	5.7%	3.1%	1.7%	1.3%	0.6%
Frequently	1.6%	0.4%	0.4%	0.3%	0
Lobsters					
Never	54.9%	48.8%	57.2%	23.1%	51.3%
Rarely	20.1%	17.1%	16.6%	21.2%	15.8%
Sometimes	18.6%	18.3%	16.7%	26.1%	20.8%
Frequently	5.4%	15.8%	9.4%	29.7%	12.2%
Conch					
Never	81.5%	91.4%	96.6%	94.5%	91.4%
Rarely	17.3%	5.6%	2.4%	4.0%	5.8%
Sometimes	1.2%	0.8%	0.4%	0.7%	2.4%
Frequently	0	2.2%	0.6%	0.8%	0.4%
Kingfish, Cero, Cobia, or Sailfish					
Never	56.4%	30.5%	57.1%	41.4%	42.1%
Rarely	18.6%	22.1%	25.0%	24.2%	14.0%
Sometimes	15.9%	23.9%	11.8%	19.5%	29.4%
Frequently	9.2%	23.5%	6.1%	14.9%	14.4%
Dolphin Fish, Wahoo, or Tuna					
Never	45.9%	23.3%	34.9%	22.7%	29.5%
Rarely	23.7%	21.8%	19.8%	19.8%	18.5%
Sometimes	13.7%	23.0%	26.1%	27.5%	25.3%
Frequently	16.8%	31.9%	19.3%	30.0%	26.7%
Lionfish					
Never	76.7%	80.1%	80.7%	61.6%	80.5%
Rarely	12.5%	7.6%	10.4%	10.3%	9.4%
Sometimes	3.6%	6.0%	4.0%	13.5%	4.7%
Frequently	7.2%	6.2%	4.9%	14.6%	5.4%

Table C4: Cultural importance of coral reef environments by county

Importance Level	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Very Unimportant/Unimportant	11.8%	7.8%	11.8%	3.1%	10.3%
Neither Unimportant nor Important	13.3%	6.8%	12.1%	8.7%	10.4%
Important/Very Important	75.0%	85.3%	76.1%	88.2%	79.3%

Table C5: Frequency of seafood consumption by county

Frequency	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Never	2.6%	4.0%	2.7%	1.3%	2.4%
Less than Once a Month	8.5%	4.9%	6.6%	5.8%	12.5%
1 to 3 Times a Month	26.7%	25.4%	24.1%	21.1%	21.5%
About Once a Week	28.8%	27.5%	30.2%	27.3%	32.0%
A Few Times a Week	28.8%	36.3%	32.7%	43.3%	30.5%
Every Day	4.5%	2.0%	3.6%	1.1%	1.0%

Table C6: Frequency of seafood consumption from local coral reefs by county

Frequency	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Never	27.7%	20.4%	27.1%	9.8%	31.2%
Less than Once a Month	21.3%	21.9%	20.1%	16.4%	17.3%
1 to 3 Times a Month	15.2%	26.7%	15.5%	20.0%	19.1%
About Once a Week	9.3%	11.0%	12.1%	24.1%	13.1%
A Few Times a Week	7.1%	7.5%	4.8%	21.9%	4.5%
Every Day	0.0%	1.4%	0.8%	1.3%	0.4%
No Response	19.5%	11.2%	19.6%	6.5%	14.4%

Table C7: Top two sources of seafood by county

Source	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Purchased by Myself or Someone in My Household at a Store or Restaurant	82.3%	67.9%	75.2%	45.7%	76.9%
Purchased by Myself or Someone in My Household at a Market or Roadside Vendor	40.4%	35.1%	47.6%	31.7%	34.0%
Caught by Myself or Someone in My Household	13.9%	29.2%	16.5%	46.3%	22.5%
Caught by Extended Family Members	7.9%	9.6%	5.2%	11.4%	4.2%
Caught by Friends or Neighbors	7.6%	15.7%	7.8%	28.1%	10.9%

Table C8: Perceptions of marine resource current condition by county

Resource and Perception	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Ocean Quality					
Very Bad/Bad	34.9%	44.9%	36.5%	16.8%	34.7%
Neither Good nor Bad	20.3%	18.0%	21.7%	19.8%	18.6%
Good/Very Good	40.3%	35.5%	37.6%	61.9%	39.1%
Not Sure	4.5%	1.7%	4.1%	1.4%	7.5%
Coral Amount					
Very Bad/Bad	39.8%	48.4%	43.9%	55.0%	45.2%
Neither Good nor Bad	20.6%	17.6%	19.1%	16.0%	16.5%
Good/Very Good	12.0%	7.0%	11.7%	18.9%	12.7%
Not Sure	27.6%	27.0%	25.3%	10.1%	25.6%
Number of Fish					
Very Bad/Bad	26.9%	37.2%	36.4%	31.8%	32.2%
Neither Good nor Bad	21.0%	22.4%	18.9%	19.3%	24.8%
Good/Very Good	30.8%	28.5%	23.5%	40.8%	26.6%
Not Sure	21.3%	11.9%	21.2%	8.1%	16.4%
Size of Fish					
Very Bad/Bad	19.5%	23.1%	27.4%	29.4%	20.8%
Neither Good nor Bad	26.7%	27.5%	23.7%	25.1%	29.2%
Good/Very Good	27.2%	25.6%	23.6%	34.8%	22.5%
Not Sure	26.6%	23.8%	25.3%	10.7%	27.5%
Beach Quality					
Very Bad/Bad	27.1%	27.3%	38.4%	28.9%	28.7%
Neither Good nor Bad	22.7%	17.3%	20.9%	26.7%	19.2%
Good/Very Good	46.9%	51.4%	37.0%	36.0%	47.9%
Not Sure	3.3%	4.0%	3.7%	8.3%	4.1%
Mangroves Quality					
Very Bad/Bad	14.1%	19.4%	22.1%	17.3%	15.5%
Neither Good nor Bad	22.7%	14.8%	17.9%	14.0%	19.8%
Good/Very Good	42.0%	53.5%	40.2%	65.2%	41.2%
Not Sure	21.2%	12.3%	19.9%	3.4%	23.5%
Seagrass Quality					
Very Bad/Bad	23.4%	41.1%	34.8%	31.1%	22.1%
Neither Good nor Bad	21.8%	19.0%	22.7%	15.6%	24.4%
Good/Very Good	29.8%	21.5%	21.6%	45.9%	22.9%
Not Sure	24.9%	18.4%	20.9%	7.5%	30.6%

Table C9: Perceived change in resource conditions over the past ten years by county

Resource and Perception	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Ocean Quality					
A Lot Worse/Worse	62.6%	74.3%	60.9%	48.7%	64.0%
No Change	22.7%	16.5%	21.6%	31.7%	22.1%
Better/A Lot Better	6.3%	4.3%	7.3%	14.7%	5.7%
Not Sure	8.4%	4.9%	10.2%	4.9%	8.3%
Coral Amount					
A Lot Worse/Worse	53.9%	61.8%	57.2%	73.2%	54.9%
No Change	12.0%	11.1%	9.8%	9.1%	13.0%
Better/A Lot Better	6.2%	1.6%	4.3%	5.4%	3.3%
Not Sure	27.8%	25.4%	28.7%	12.3%	28.8%
Number of Fish					
A Lot Worse/Worse	52.2%	63.5%	55.7%	62.5%	55.2%
No Change	17.8%	17.3%	14.3%	21.4%	19.3%
Better/A Lot Better	5.0%	3.8%	5.7%	5.7%	3.9%
Not Sure	25.0%	15.4%	24.3%	10.5%	21.6%
Size of Fish					
A Lot Worse/Worse	36.1%	48.0%	46.3%	51.5%	45.5%
No Change	27.8%	25.8%	18.9%	26.2%	21.5%
Better/A Lot Better	4.8%	3.1%	5.4%	7.7%	4.1%
Not Sure	31.3%	23.1%	29.4%	14.6%	28.8%
Beach Quality					
A Lot Worse/Worse	52.6%	52.7%	56.2%	43.0%	52.6%
No Change	28.3%	28.9%	22.8%	30.4%	24.1%
Better/A Lot Better	14.6%	10.8%	13.7%	15.3%	13.6%
Not Sure	4.5%	7.6%	7.3%	11.3%	9.7%
Mangroves Quality					
A Lot Worse/Worse	32.0%	36.3%	37.0%	34.2%	31.0%
No Change	32.7%	33.5%	27.6%	38.8%	26.7%
Better/A Lot Better	11.0%	11.2%	10.5%	17.0%	12.0%
Not Sure	24.3%	19.1%	25.0%	9.9%	30.4%
Seagrass Quality					
A Lot Worse/Worse	38.3%	60.6%	47.5%	48.7%	44.3%
No Change	26.8%	16.0%	18.2%	26.0%	20.8%
Better/A Lot Better	8.7%	4.2%	8.0%	11.7%	4.4%
Not Sure	26.3%	19.2%	26.3%	13.6%	30.4%

Table C10: Perceived overall marine resource change over the next 10 years by county

All Resources	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Get Worse	62.7%	67.7%	64.9%	61.2%	58.7%
Stay the Same	10.3%	8.5%	10.4%	9.3%	12.1%
Improve	22.7%	16.0%	19.2%	22.0%	21.7%
Not Sure	4.3%	7.9%	5.4%	7.5%	7.6%

Table C11: Perceptions of coral reef services by county

Role and Agreement	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Coral Reefs Protect South Florida from Erosion and Natural Disasters					
Strongly Disagree/Disagree	5.4%	3.3%	6.1%	4.6%	4.0%
Neither Disagree nor Agree	4.9%	5.1%	5.6%	4.6%	3.6%
Agree/Strongly Agree	84.2%	86.2%	78.6%	88.5%	83.0%
Not Sure	5.5%	5.5%	9.7%	2.3%	9.3%
Coral Reefs are Only Important to Fishermen, Divers, and Snorkelers					
Strongly Disagree/Disagree	87.8%	93.5%	85.8%	93.8%	89.4%
Neither Disagree nor Agree	2.0%	1.8%	1.8%	1.0%	0.9%
Agree/Strongly Agree	8.3%	3.9%	9.1%	4.9%	7.0%
Not Sure	1.9%	0.8%	3.3%	0.3%	2.6%
Healthy Coral Reefs Attract Tourists to South Florida					
Strongly Disagree/Disagree	6.6%	3.1%	4.2%	1.1%	4.0%
Neither Disagree nor Agree	3.8%	1.9%	2.4%	3.1%	3.6%
Agree/Strongly Agree	86.9%	93.9%	90.3%	94.8%	86.9%
Not Sure	2.6%	1.1%	3.1%	1.1%	5.5%
Coral Reefs in Good Condition Provide Food for Coastal Communities to Eat					
Strongly Disagree/Disagree	8.3%	6.0%	5.0%	5.7%	4.0%
Neither Disagree nor Agree	6.1%	4.3%	4.5%	3.2%	3.5%
Agree/Strongly Agree	80.1%	84.3%	83.5%	89.2%	85.0%
Not Sure	5.4%	5.5%	7.0%	2.0%	7.6%
Coral Reefs Provide Economic Opportunities to Coastal Communities					
Strongly Disagree/Disagree	4.4%	5.2%	4.0%	2.9%	2.4%
Neither Disagree nor Agree	5.0%	1.6%	5.2%	1.2%	2.7%
Agree/Strongly Agree	85.4%	90.8%	84.2%	93.6%	88.1%
Not Sure	5.3%	2.4%	6.6%	2.3%	6.8%
Coral Reefs are Important to South Florida's Culture					
Strongly Disagree/Disagree	2.5%	2.0%	2.4%	2.7%	1.6%
Neither Disagree nor Agree	5.3%	1.1%	2.4%	1.7%	3.1%
Agree/Strongly Agree	90.1%	95.5%	92.1%	95.6%	92.1%
Not Sure	2.1%	1.5%	3.2%	0.0%	3.3%

Table C12: Threat familiarity by county

Threat	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Climate Change	85.5%	77.3%	87.4%	90.0%	84.1%
Coastal or Urban Development	73.8%	82.8%	77.6%	85.5%	79.0%
Coral Bleaching	48.9%	60.9%	56.3%	83.1%	58.1%
Coral Disease Outbreak	48.5%	56.2%	50.1%	79.4%	54.8%
Damage from Ships and Boats	67.3%	69.5%	70.8%	82.1%	68.8%
Fishing Prohibited Species	45.9%	58.7%	52.0%	75.8%	50.6%
Hurricanes	90.6%	89.0%	87.1%	95.6%	88.9%
Increasing Ocean Temperatures	75.5%	71.6%	74.5%	82.9%	75.2%
Invasive Species	63.0%	82.6%	60.4%	91.6%	69.5%
Ocean Acidification	44.7%	48.9%	45.0%	57.8%	46.5%
Pollution	87.3%	96.3%	88.7%	91.9%	87.8%
Sea Level Rise	74.1%	69.9%	77.5%	77.9%	73.0%
Snorkeling and Diving	57.7%	63.3%	59.1%	81.7%	65.6%
Too Much Fishing and Gathering	67.3%	65.2%	66.0%	77.4%	68.2%

Table C13: Agreement with MPA functions by county

Statement and Agreement Level	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
MPAs Protect Coral Reefs					
Strongly Disagree/Disagree	3.4%	2.0%	2.4%	6.1%	5.0%
Neither Disagree nor Agree	3.7%	5.7%	5.4%	3.7%	2.8%
Agree/Strongly Agree	85.9%	89.7%	88.5%	87.5%	89.9%
Not Sure	7.0%	2.6%	3.8%	2.7%	2.3%
MPAs Increase the Number of Fish					
Strongly Disagree/Disagree	3.7%	3.3%	4.4%	8.0%	7.0%
Neither Disagree nor Agree	11.3%	7.9%	10.0%	6.5%	5.5%
Agree/Strongly Agree	78.4%	85.3%	79.4%	82.1%	81.7%
Not Sure	6.7%	3.5%	6.2%	3.3%	5.8%
There Should be More MPAs					
Strongly Disagree/Disagree	4.6%	9.6%	6.4%	18.2%	8.7%
Neither Disagree nor Agree	12.0%	15.1%	12.0%	12.7%	9.5%
Agree/Strongly Agree	77.3%	73.3%	76.2%	65.3%	77.3%
Not Sure	6.2%	2.0%	5.3%	3.8%	4.5%
There has been an Economic Benefit from the Establishment of MPAs					
Strongly Disagree/Disagree	4.4%	4.0%	7.7%	10.9%	9.0%
Neither Disagree nor Agree	12.8%	16.9%	15.9%	10.4%	9.2%
Agree/Strongly Agree	70.2%	73.1%	66.7%	71.6%	72.5%
Not Sure	12.6%	6.0%	9.8%	7.2%	9.2%

Fishermen's Livelihoods have been Negatively Impacted from the Establishment of MPAs					
Strongly Disagree/Disagree	35.0%	42.7%	42.1%	48.3%	48.6%
Neither Disagree nor Agree	19.4%	23.7%	18.6%	13.8%	14.6%
Agree/Strongly Agree	31.2%	23.8%	26.1%	29.8%	27.6%
Not Sure	14.5%	9.8%	13.2%	8.1%	9.1%
MPAs Help Increase Tourism					
Strongly Disagree/Disagree	9.0%	11.5%	10.2%	13.7%	8.9%
Neither Disagree nor Agree	13.6%	14.0%	11.9%	11.0%	12.6%
Agree/Strongly Agree	66.9%	68.4%	68.5%	70.4%	69.4%
Not Sure	10.5%	6.1%	9.3%	4.9%	9.1%
I Generally Support the Establishment of MPAs					
Strongly Disagree/Disagree	3.2%	4.5%	3.7%	6.7%	5.9%
Neither Disagree nor Agree	8.4%	6.1%	7.8%	6.0%	5.4%
Agree/Strongly Agree	84.5%	88.0%	84.8%	85.5%	87.3%
Not Sure	3.9%	1.4%	3.7%	1.8%	1.4%

Table C14: Support for coral reef management strategies by county

Strategy and Support Level	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Limits per Person for Certain Fish Species, such as Size or Quantity Limits					
Strongly Oppose/Oppose	2.0%	3.6%	4.4%	4.0%	3.8%
Neither Oppose nor Support	6.9%	4.9%	4.4%	3.0%	5.7%
Support/Strongly Support	87.4%	89.8%	87.3%	90.6%	87.9%
Not Sure	3.7%	1.8%	3.9%	2.5%	2.6%
Stricter Control of Sources of Pollution to Preserve Water Quality					
Strongly Oppose/Oppose	0.3%	0.7%	1.6%	1.5%	1.2%
Neither Oppose nor Support	2.9%	1.7%	1.2%	1.8%	1.9%
Support/Strongly Support	95.9%	96.9%	94.6%	95.1%	95.9%
Not Sure	1.0%	0.7%	2.6%	1.6%	1.0%
Better Regulation of Industrial and Agricultural Pollution into Coastal Waters					
Strongly Oppose/Oppose	1.8%	3.4%	3.1%	1.5%	2.4%
Neither Oppose nor Support	2.7%	2.3%	2.3%	2.5%	2.7%
Support/Strongly Support	94.4%	93.3%	92.6%	94.6%	92.6%
Not Sure	1.0%	1.0%	2.0%	1.4%	2.3%
Efforts to Restore Damaged Coral Reefs					
Strongly Oppose/Oppose	1.6%	1.1%	1.4%	0.5%	0.4%
Neither Oppose nor Support	2.7%	3.2%	1.8%	2.2%	2.3%
Support/Strongly Support	94.9%	94.6%	94.7%	95.6%	95.7%
Not Sure	0.8%	1.2%	2.1%	1.7%	1.6%
Increased Public Education on Sea Level Rise and Climate Change					
Strongly Oppose/Oppose	2.4%	6.9%	5.0%	5.7%	4.7%

Neither Oppose nor Support	3.8%	7.7%	3.9%	6.4%	3.4%
Support/Strongly Support	92.2%	84.8%	88.9%	85.7%	89.9%
Not Sure	1.6%	0.7%	2.2%	2.2%	2.0%

Table C15: Familiarity with coral reef management organizations by county

Organization	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Southeast Florida Coral Reef Initiative (SEFCRI)	18.6%	28.1%	16.0%	33.4%	23.8%
Florida Keys National Marine Sanctuary (FKNMS)	50.7%	56.5%	54.4%	85.2%	51.3%
Florida Department of Environmental Protection	78.5%	88.4%	74.8%	84.4%	78.5%
Florida Fish and Wildlife Conservation Commission	74.5%	86.5%	77.6%	89.9%	84.2%
Our Florida Reefs Community Planning Process	11.7%	15.3%	14.7%	28.3%	15.8%
Gulf of Mexico and South Atlantic Fishery Management Council	10.9%	20.4%	11.7%	39.8%	15.1%
Southeast Florida Action Network (SeaFAN)	12.6%	18.7%	14.9%	19.2%	17.6%

Table C16: Participation in pro-environmental behaviors by county

Activity and Frequency	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Recycling					
Not at All	2.9%	1.0%	2.9%	3.9%	4.1%
Once a Year or Less	1.5%	0.9%	2.5%	2.0%	0.8%
Several Times a Year	5.0%	0.8%	2.2%	2.3%	1.3%
At Least Once a Month	6.9%	2.3%	6.2%	3.9%	4.9%
Several Times a Month or More	83.7%	95.1%	86.3%	88.0%	88.9%
Coastal or Beach Cleanup					
Not at All	39.5%	28.6%	52.1%	22.4%	40.7%
Once a Year or Less	29.8%	21.9%	18.3%	21.8%	24.7%
Several Times a Year	16.5%	22.9%	14.5%	22.9%	16.3%
At Least Once a Month	5.4%	13.6%	7.6%	15.8%	6.5%
Several Times a Month or More	8.8%	13.0%	7.4%	17.0%	11.9%
Volunteering with Environmental Groups					
Not at All	60.8%	57.5%	62.3%	45.5%	62.8%
Once a Year or Less	19.4%	15.4%	19.6%	21.2%	19.1%
Several Times a Year	10.5%	11.9%	8.2%	17.3%	10.3%
At Least Once a Month	7.4%	7.6%	7.3%	7.7%	2.7%
Several Times a Month or More	2.0%	7.6%	2.6%	8.3%	5.1%
Donating to Environmental Causes					
Not at All	49.5%	34.9%	52.2%	29.4%	41.2%
Once a Year or Less	27.9%	30.0%	26.7%	28.5%	29.0%
Several Times a Year	15.4%	22.7%	13.2%	28.8%	19.9%
At Least Once a Month	5.6%	8.8%	7.3%	7.3%	5.4%
Several Times a Month or More	1.7%	3.6%	0.6%	6.0%	4.5%

Lionfish Derbies					
Not at All	94.7%	88.4%	94.2%	78.3%	92.3%
Once a Year or Less	3.0%	6.8%	3.8%	12.2%	4.4%
Several Times a Year	1.4%	2.7%	0.2%	7.0%	1.0%
At Least Once a Month	0.3%	0.7%	0.3%	1.2%	1.4%
Several Times a Month or More	0.7%	1.4%	1.5%	1.4%	0.9%

Table C17: Usage of sources for coral reef related information by county

Source and Frequency	County				
	Broward	Martin	Miami-Dade	Monroe	Palm Beach
Newspapers/Other Print Publications					
Never	35.5%	24.9%	36.8%	15.9%	30.6%
Rarely	18.4%	13.8%	19.6%	11.9%	20.0%
Sometimes	23.1%	33.5%	22.8%	27.5%	23.0%
Frequently	23.0%	27.8%	21.0%	44.7%	26.4%
Radio					
Never	41.5%	47.5%	38.2%	27.3%	44.4%
Rarely	17.5%	18.5%	19.9%	17.8%	20.6%
Sometimes	24.8%	22.1%	23.5%	26.9%	22.0%
Frequently	16.2%	11.9%	18.5%	28.0%	13.0%
TV					
Never	22.4%	20.3%	24.7%	25.9%	18.7%
Rarely	15.5%	12.4%	20.2%	20.1%	18.2%
Sometimes	31.6%	34.2%	28.2%	28.2%	28.5%
Frequently	30.5%	33.2%	26.9%	25.8%	34.6%
Online News Sources or Websites					
Never	20.6%	18.6%	16.6%	13.7%	20.5%
Rarely	9.6%	10.4%	10.3%	11.9%	11.8%
Sometimes	21.9%	20.1%	24.2%	27.5%	19.1%
Frequently	48.0%	51.0%	48.8%	46.9%	48.6%
Social Media					
Never	34.9%	34.1%	33.2%	33.4%	40.1%
Rarely	13.9%	17.3%	12.7%	14.6%	15.7%
Sometimes	27.3%	24.3%	24.8%	20.9%	18.5%
Frequently	23.9%	24.2%	29.3%	31.1%	25.6%
Friends and Family					
Never	26.4%	22.4%	25.3%	9.9%	27.8%
Rarely	17.2%	10.3%	22.7%	9.9%	18.4%
Sometimes	29.4%	32.1%	28.5%	31.8%	29.1%
Frequently	26.9%	35.1%	23.5%	48.4%	24.7%
Community Leaders					
Never	46.1%	36.2%	50.7%	22.3%	45.6%
Rarely	21.2%	20.6%	23.3%	18.3%	21.1%
Sometimes	23.3%	25.4%	16.6%	31.3%	22.2%
Frequently	9.4%	17.8%	9.5%	28.1%	11.0%
Florida State Government					
Never	37.7%	33.2%	42.4%	25.7%	33.7%
Rarely	29.6%	19.3%	25.7%	27.8%	20.1%
Sometimes	23.2%	24.7%	20.5%	29.0%	33.9%
Frequently	9.5%	22.8%	11.3%	17.5%	12.2%
Federal Government Agencies					
Never	27.6%	23.2%	26.9%	8.6%	31.6%

Rarely	20.0%	19.4%	15.2%	16.2%	19.0%
Sometimes	28.1%	29.6%	33.6%	37.6%	30.1%
Frequently	24.3%	27.7%	24.4%	37.6%	19.3%
Non-profit Organizations					
Never	34.4%	26.0%	39.4%	19.7%	37.1%
Rarely	23.2%	17.1%	16.2%	13.2%	21.9%
Sometimes	26.1%	33.0%	24.8%	34.2%	22.3%
Frequently	16.3%	23.9%	19.6%	32.9%	18.7%

Wilbur L. Ross, Jr., Secretary
United States Department of Commerce

Benjamin Friedman, Acting Under Secretary
National Oceanic and Atmospheric Administration

Nicole R. LeBoeuf, Acting Assistant Administrator
National Ocean Service

