NOAA Technical Memorandum CRCP 49

National Coral Reef Monitoring Program Socioeconomic Monitoring Component

Summary Findings for Puerto Rico, 2022

NOAA Coral Reef Conservation Program
Silver Spring, MD

January 2024

United States Department of Commerce	National Oceanic and Atmospheric Administration	National Ocean Service
Gina Raimondo Secretary	Richard Spinrad Under Secretary	Nicole LeBoeuf Assistant Administrator

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National Oceanic and Atmospheric Administration

[1] *Lynker, Inc. under contract to NOAA Office for Coastal Management, Coral Reef Conservation Program*

[2] *CSS, Inc. under contract to NOAA National Ocean Service, National Centers for Coastal Ocean Science*

[3] *NOAA National Ocean Service, National Centers for Coastal Ocean Science*

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About this Document

The mission of the National Oceanic and Atmospheric Administration (NOAA) is to understand and predict changes in climate, weather, ocean and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems. As a line office 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. Coral Reef Conservation Program (CRCP) along with the National Centers for Coastal Ocean Science (NCCOS) uses the NOAA Technical Memorandum NOS series to achieve timely dissemination of scientific and technical information.

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Executive Summary

The Socioeconomic Component of the National Coral Reef Monitoring Program (NCRMP) collects socioeconomic data across all United States (U.S.) coral reef territories and jurisdictions to inform human connections indicators. These indicators fall under the broad categories of population demographics, 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 understand the status and trends of each jurisdiction's population, social and economic structure, interactions with coral reef resources, and responses to local coral reef management. The National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) uses this information to help address coral reef issues at local, regional, and national levels, as well as to inform continuing research and communication products. NOAA 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 outreach programs are designed to achieve their goals.

This report presents primary data collected for the second socioeconomic monitoring cycle in Puerto Rico (the first monitoring cycle was completed in 2015). The survey was conducted in person with household residents from January to November 2022. Results are representative of the resident population of Puerto Rico as a whole, as well as the coastal north, coastal south, and inland strata. The following are key highlights from the results:

- **Activity Participation:** Swimming/wading and beach recreation were primary activities for Puerto Rico residents in 2015 and 2022, but participation in all activities declined in 2022.
- **Importance of Coral Reefs:** Residents believed that Puerto Rico's coral reefs are important for seafood, tourism, fisheries, human health, local livelihoods, and protection from natural disasters. Residents also believed that coral reefs are important to local culture, notably cultural beliefs and establishing or maintaining social relationships.
- **Seafood:** Most resident households consumed seafood in some of their meals or more, and almost half of those residents ate seafood from local coral reefs throughout the year.
- **Perceived Resource Conditions:** Residents perceived ocean water quality, the amount of live coral, diversity of live coral, amount of fish, and diversity of fish as being in bad condition, and they believed that these conditions will worsen.
- **Threats to Coral Reefs:** Residents believed that pollution, marine litter, climate change, and lack of regulation enforcement were the most severe threats to coral reefs. Residents believed coral disease, coral bleaching, and ocean acidification were threats, but were more uncertain about their threat severity.
- **Conservation Behaviors:** Over 85% of residents believed that it is extremely important for Puerto Rico residents to engage in activities that help protect coral reefs. Residents participated in several routine conservation actions (e.g., reducing household electricity

and water use, using fewer single-use products), but most residents did not volunteer in less frequent activities such as restoration, beach clean-ups, citizen science, or environmental education. The main barriers to engaging in conservation behaviors were due to lack of opportunity, inconvenience, high cost, or lack of awareness or knowledge of how to take such actions.

- **Marine Protected Areas:** The majority of residents were aware of marine protected areas (MPAs) or natural reserves in Puerto Rico, and supported the creation of new MPAs. Residents generally believed that the establishment of MPAs has led to the improvement of tourism, protection of coral reefs, the amount of fish, and food for coastal communities.
- **Support for Management Strategies:** There was strong support for stricter control of pollution sources, increasing law enforcement surveillance, implementing new requirements for improved wastewater treatment, and encouraging community participation in marine resource management.
- **Awareness of Coral Reef Rules and Regulations:** Most residents believed that it is unacceptable to do certain behaviors on a coral reef, such as discharging pollutants in seawater, operating a boat in a shallow reef area, or fishing in no-take areas. Residents believed it was more acceptable to take seashells or coral from reefs, or to feed fish, birds, or marine animals.

In general, the results indicate that Puerto Rico's residents have important human connections to coral reefs and rely on these ecosystems for a variety of cultural and socioeconomic benefits. Results also suggest that residents want to see efforts to mitigate threats to coral reefs (e.g., restrict sources of pollution) and prevent resource conditions (e.g., ocean water quality, amount of live coral) from becoming worse. Targeted outreach, particularly about ocean acidification, coral disease, and bleaching, could help increase awareness of threats to coral reefs, how those threats are linked to sustained benefits and quality of life, and what people can do to help conserve coral reefs.

The findings on perceptions of resource conditions and 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 per changing local observations about threats to the local marine environment.

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1. Introduction

Coral reefs are among the most valuable ecosystems on Earth, providing food, protection from storms, tourism, recreation, and other ecosystem services or benefits to adjacent coastal communities (Brander and Van Beukering 2013). 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 of biological, climatic, and socioeconomic indicators for all United States (U.S.) states and territories where coral reefs are present. The novel inclusion of a socioeconomic monitoring component to the NCRMP represents a progressive, interdisciplinary approach for the CRCP. More information about all components of the NCRMP can be explored in the "NOAA Coral Reef Conservation Program: National Coral Reef Monitoring Plan" (NOAA CRCP 2021).[1]

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 on 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.

The Socioeconomic Component uses a suite of 13 survey indicators to measure the relationship between coral reefs and coral reef adjacent communities (Lovelace and Dillard 2012).[2] Indicators enable researchers to track changes over time by simplifying intellectually complex concepts into smaller and more measurable parts (Schirnding 2002). Primary and secondary data streams inform the indicators for each of the seven inhabited U.S. coral reef jurisdictions: South Florida, the U.S. Virgin Islands, Puerto Rico, Hawai'i, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands (CNMI) (Table 1). A detailed description of the 13 indicators can be found in the team's indicator development report (Abt Associates, Inc. 2019).[3]

A socioeconomic survey is implemented in each inhabited jurisdiction once every 5-7 years to inform 7 of the 13 indicators:

[1] https://www.coris.noaa.gov/activities/NCRMP_Plan_2021/welcome.html
[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
[3] https://repository.library.noaa.gov/view/noaa/21177

- 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

The survey includes a standard set of questions for all jurisdictions as well as a subset of jurisdiction-specific questions relevant to local management needs. All survey questions are periodically approved for use by the Office of Management and Budget (OMB) under OMB#0648-0646. Surveys from the first socioeconomic monitoring cycle occurred from 2014 to 2018 (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), and the second monitoring cycle began in 2019. After each monitoring cycle, scores for all 13 socioeconomic indicators are calculated. More information on NCRMP's Socioeconomic Component can be found at the project website: www.coris.noaa.gov/monitoring/socioeconomic.html.

Table 1: 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 Kaua'i, Maui, Moloka'i, O'ahu, Hawai'i, Lāna'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
U.S. Virgin Islands	Islands of St. Croix, St. Thomas, and St. John

This technical memorandum presents the findings from the second Puerto Rico NCRMP socioeconomic primary data collection and is organized as follows: Section 2 provides an overview of Puerto Rico, Section 3 details the methodology used in data collection and analysis, Section 4 provides descriptive statistics for the current (2022) round of monitoring, Section 5 provides trend analyses between the first (2015) and second (2022) rounds of monitoring, and Section 6 provides discussion and ideas for future monitoring.

2. Jurisdiction Description

The Commonwealth of Puerto Rico is an unincorporated United States territory in the northeastern Caribbean Sea, extending south of the 18th parallel north. It is an archipelago that includes the mainland, the surrounding inhabited islands of Culebra and Vieques, as well as

uninhabited Mona and Caja de Muertos (under jurisdiction of Puerto Rico Department of Natural and Environmental Resources; DNER), Desecheo (under jurisdiction of U.S. Fish and Wildlife Service; USFWS), and other minor islands and cays (Figure 1). Its coastline totals 700 miles, inclusive of its surrounding islands (NOAA 1975). Puerto Rico has a tropical climate (Kottek et al. 2006), and temperatures are moderate year-round, with averages around 80°F (27°C) in lower elevations and 70°F (21°C) in the mountains and higher elevations. The rainy season is typically from April through November, and hurricane season occurs between June and November, with the peak in September.

Figure 1: Map of Puerto Rico.

From 2010 to 2020, Puerto Rico's population decreased from 3,725,789 to 3,285,874 people, respectively (U.S. Census Bureau 2020). Of the 78 municipalities in Puerto Rico (see Table 3), San Juan is the most populous and urbanized municipality. It holds just below 10% of the island's population and contains the nation's capital (the city of San Juan), while Culebra is the most sparsely populated municipality and has remained more rural (U.S. Census Bureau 2020). The majority of the territory speaks Spanish, though both English and Spanish are the official languages (Napoleoni 2020).

Tourism is an important part of the Puerto Rican economy, contributing over $2.4 billion in direct economic contributions, and over $7.4 billion in total economic contributions to the Puerto Rican economy in 2014 (World Travel and Tourism Council (WTTC) 2015). Due to its unique island culture, favorable Caribbean climate, and beautiful beaches and reefs, Puerto Rico is a frequently visited tourist destination.

The coral reef ecosystem in Puerto Rico is a complex mosaic of interrelated habitats that includes seagrass beds and mangrove forests in addition to coral reefs (Garcia-Sais et al. 2008). Mangrove forests in Puerto Rico can be found on coral cays and along coastal shorelines,

however the natural functions and processes of these coral reefs, mangrove forests, and other wetlands have been disturbed by coastal development and past large-scale agriculture. In addition to anthropogenic impacts to Puerto Rico's coastal ecosystems, NOAA has been concerned with the declining health of important reef-building corals (NOAA CRCP 2023). In 2006, NOAA Fisheries published a final rule to list elkhorn (*Acropora palmata*) and staghorn (*A. cervicornis*) corals as threatened species under the Endangered Species Act (ESA) of 1973, as amended (NOAA NMFS 2006). In 2014, NOAA Fisheries published another final rule to list an additional 5 species of Caribbean corals as threatened (*Dendrogyra cylindrus, Orbicella annularis, Orbicella faveolata, Orbicella franksi,* and *Mycetophyllia ferox*) under the ESA (NOAA NMFS 2014). Puerto Rico reefs are also at risk from other threats including coral bleaching, disease, and hurricane impacts. For example, the massive coral bleaching events throughout the Caribbean in 2005, and currently in 2023, have highlighted concerns regarding the sensitivity of coral reefs to climate change (Garcia-Sais et al. 2008), and Hurricane Maria's damage in 2017 triggered teams to assess and reattach broken coral colonies in 2018 (NOAA CRCP 2020). There have also been substantial efforts to restore coral reefs in Puerto Rico, with over 100,000 farmed and planted coral fragments as of 2020 (NOAA CRCP 2020).

3. Methodology

An in-person survey of household residents (aged eighteen and older) on the main island of Puerto Rico, as well as the islands of Culebra and Vieques, was conducted from January to November 2022. The survey instrument is included in Appendix A. The project team implemented a three-stage stratified cluster sampling design so that results would be representative of (i.e., generalizable to) each mainland stratum, as well as to the general population. First, the study area was stratified into three mainland strata (coastal north, coastal south, and inland) and one island strata (Culebra and Vieques) (Figure 2). The first stage of sampling randomly selected 19 clusters from each of the three mainland strata and two clusters from the island area's stratum for a total of 59 clusters. Second, surveyors selected households from within each of the selected clusters, and third, surveyors randomly selected one adult from within each selected household. Local field interviewers visited selected resident households up to two times to invite them to participate in the survey. Due to low response rates during the initial phase of data collection, 11 additional clusters from the mainland strata were added to the sample. Figure 2 shows the surveyed areas relative to locations of coral reef and hard bottom habitat.

On September 18, 2022, Hurricane Fiona made landfall in southwest Puerto Rico and caused catastrophic damage across the island, particularly in the western part of the island. Roads and bridges were damaged, many residents across the country experienced prolonged power and water outages, and at least 25 deaths occurred (Pasch, Reinhart, and Alaka 2023). Data collection was paused on September 18th, and after much deliberation, only resumed on Culebra and Vieques on October 21st due to relatively lower impact and faster recovery on these two islands.

Data collection for 12 unfinished clusters on the mainland was discontinued. Despite these changes, survey results were weighted to be representative of the Commonwealth as a whole as well as each of the three mainland strata. (Note: Too few surveys were completed for the islands area stratum for the findings to be statistically representative of this area; however, completed surveys from this stratum were included in the overall Commonwealth findings.).

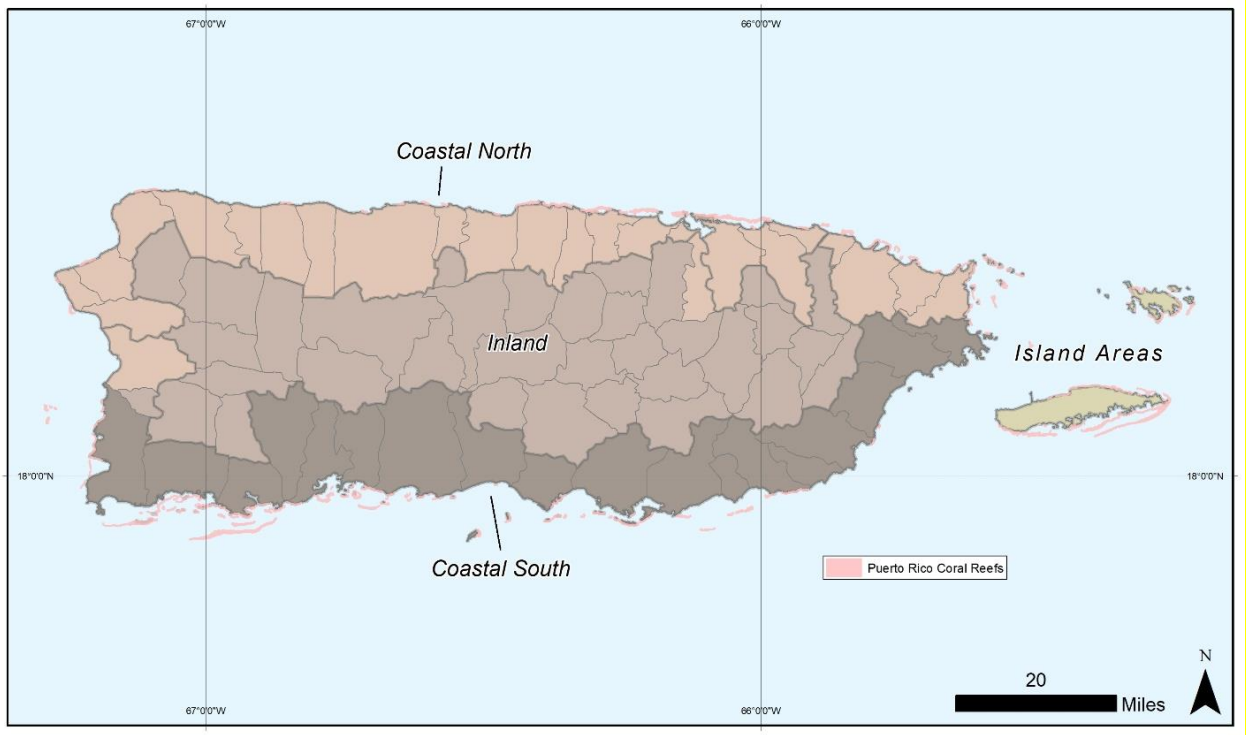

Figure 2: Map of sampling areas and locations of coral reef and hardbottom habitat in Puerto Rico.

A total of 980 surveys were completed, yielding an overall response rate of 22%. Ninety-five percent of surveys were completed in Spanish. For more information on data collection procedures, please see Appendix B.1. Data were weighted to adjust for the sample design and to address potential non-response bias. For more details on data weighting and trimming protocols, please see Appendix B.2.

Table 2 provides weighted estimates of key demographic variables for Puerto Rican residents. Most people lived in the coastal north, identified as native born, and had been living in Puerto Rico for over 10 years. More than 70% of residents had less than a college degree, and over half had an annual household income under $25,000. A slight majority of residents were employed full-time or retired, and over one-quarter were unemployed. Most residents did not have a marine-related occupation.

Table 2: Weighted estimates of key demographics for Puerto Rico residents (*N*=980).

Demographic Variables		Study area residents (%)
Strata of Residence	Coastal north	42.6
	Coastal south	19.0
	Inland	38.1
	Island areas	0.3
Sex	Female	52.6
Race	American Indian or Alaskan Native	2.8
	Black or African American	16.2
	White	27.0
	Asian	0.3
	Native Hawaiian or Pacific Islander	0.1
	Other	38.7
Age	18-34	24.8
	35-44	33.1
	45-54	17.0
	55-64	16.5
	65+	25.7
Education	Some college or less	74.1
	College degree or higher	25.8
Household Income	Under $25,000	65.1
	$25,000-$49,999	21.2
	$50,000-$99,999	12.0
	$100,000 or higher	1.7
Residential Tenure	1 year or less	0.2
	2-5 years	1.1
	6-10 years	0.5
	More than 10 years	98.1
Native Born	Yes	92.7
Employment Status	Employed full time	33.6
	Employed part time	10.0
	Unemployed	26.1
	Retired	30.6
Employment in marine occupation	Yes	15.6

Data analysis of all monitoring cycles includes descriptive statistics, as well as examinations of statistical relationships between variables (e.g., cross tabulations, mean comparisons). All data are publicly archived with the National Center for Environmental Information (NCEI Accession 0282980) available at https://www.ncei.noaa.gov/archive/accession/0282980.

4. Results: Summary Findings

Survey results are organized into the following subsections: 4.1 Participation in coral reef activities, 4.2 Cultural importance of reefs and reef reliance, 4.3 Perceived resource conditions, 4.4 Awareness and knowledge of coral reefs, 4.5 Attitudes towards coral reef management strategies, 4.6 Participation in behaviors that may improve coral reef health, and 4.7 Sources of coral reef information. The majority of these data support measurement of the seven NCRMP socioeconomic indicators reliant upon primary data; however, other data of jurisdictional importance from the 2022 survey are incorporated here as well. Key findings by stratum are also summarized and presented. All stratum-level data tables are provided in Appendix C, and these tables are referenced throughout this section.

Field surveyors collecting socioeconomic data. Photo credit: Melissa Santiago.

4.1 Participation in coral reef activities

Beach recreation was the most popular marine activity among residents, followed by swimming and wading (Figure 3). The least frequented activities were gathering marine resources, diving, and surfing. More residents in the coastal south participated in fishing and diving activities than coastal north or inland residents (Table C1).

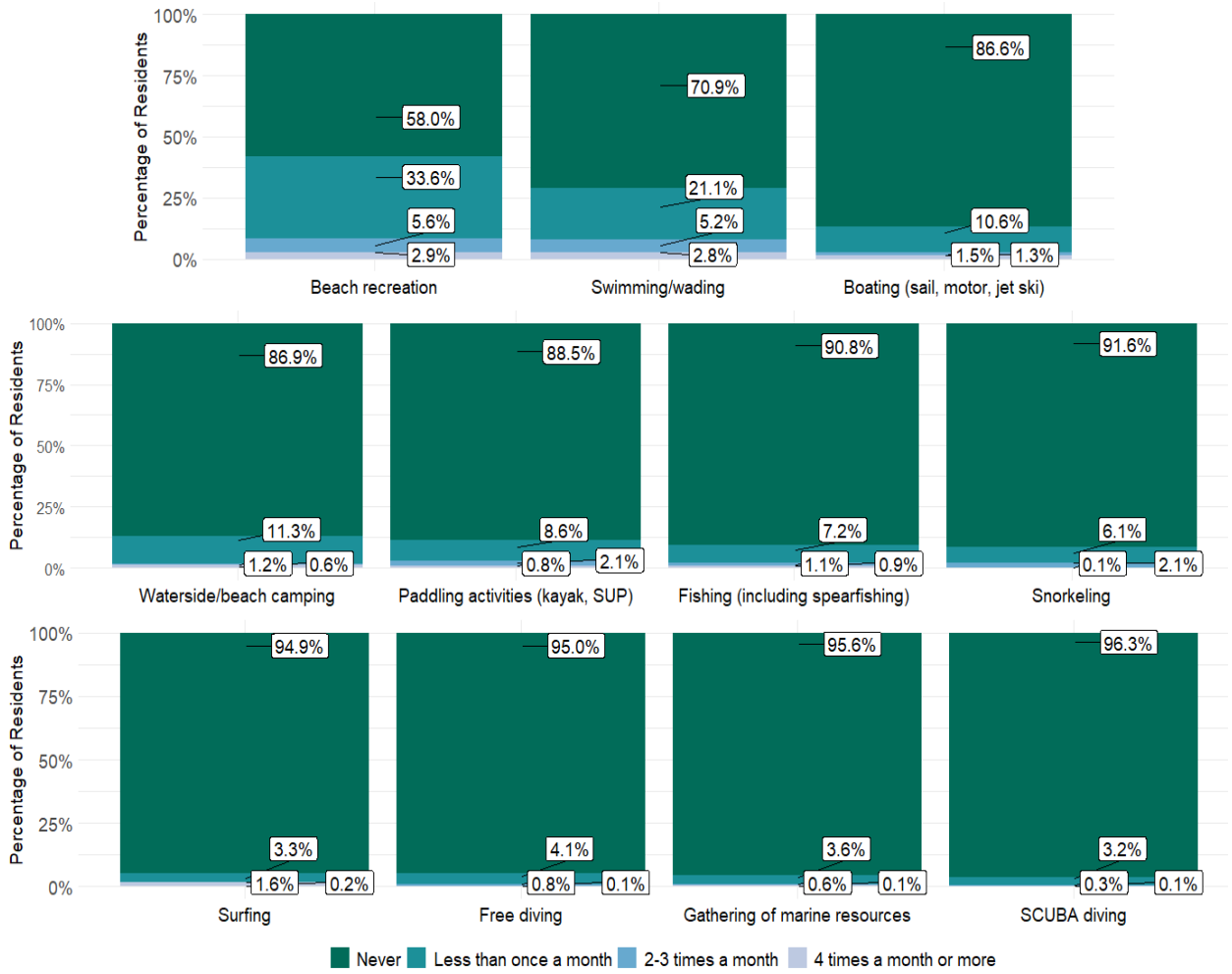

Figure 3: Frequency of participation in coral reef activities.

Residents also indicated the zone where they most often participated in activities (Figure 4). Overall, residents were most likely to use Zone A followed by Zone E for marine recreation (Table C2).

Figure 4: Map of activity zones shown to survey respondents.

Where people lived and the activities they participated in also influenced their zone selection. Most residents in the coastal north visited Zone A, most residents in the coastal south visited Zone D, and most residents who lived inland varied between Zones A and B for their marine activities (Table C2). Table 3 shows activity participation by zone, but incorporates overall participation levels across all activities. For example, since beach recreation or swimming and wading were popular activities with higher numbers of participants, these activities are shown as higher percentages for all zones and highest for Zones A, E, and D. Zone B had relatively higher proportions of boating and paddling activities than other zones, but less gathering of marine resources, and Zones B and C had relatively higher proportions of free diving. Zone C had relatively higher proportions of fishing activity and waterside/beach camping, but relatively the least surfing and paddling activities. Zones C and D had relatively higher proportions of marine resource gathering. Zone E had proportionally lower fishing activity, but higher snorkeling.

Table 3: Activities by geographic zone.

	Zone A	Zone B	Zone C	Zone D	Zone E
Swimming/wading	23.1%	17.2%	14.8%	17.5%	22.5%
Snorkeling	6.1%	7.0%	3.7%	3.0%	7.1%
SCUBA diving	2.0%	4.0%	2.3%	3.2%	2.2%
Free diving	2.6%	5.7%	6.0%	2.8%	3.7%
Waterside/beach camping	8.2%	7.3%	15.1%	9.7%	9.3%
Beach recreation	32.5%	20.5%	18.7%	30.0%	31.6%
Boating (sail, motor, jet ski)	6.6%	14.5%	10.2%	11.0%	9.1%
Fishing (including spearfishing)	5.4%	5.0%	16.2%	6.9%	2.7%
Gathering of marine resources	2.5%	1.6%	5.1%	5.9%	1.6%
Surfing	4.3%	3.5%	1.5%	3.9%	2.8%
Paddling activities (kayak, SUP)	6.7%	13.7%	6.3%	6.1%	7.4%

*Calculated as xZone/y, where xZone is the number of people who did x activity in a specified zone and y is the total number of people who participated in any activity within that same zone.

Residents most commonly fished or harvested marine resources for recreation, followed by subsistence (Figure 5). Residents were least likely to fish for cultural reasons; however, coastal north residents were more likely to be motivated by cultural reasons compared to other residents (Table C3).

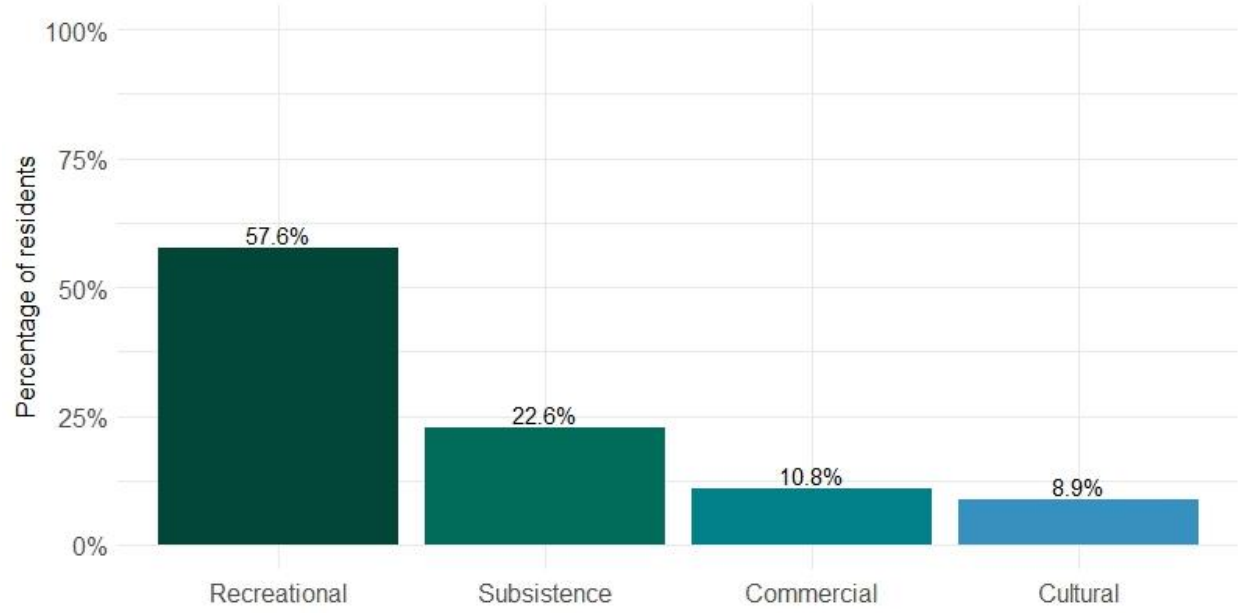

Figure 5: Reasons for time spent fishing or harvesting marine resources.

Puerto Rico flag. Photo credit: Seann Regan.

4.2 Cultural importance of reefs and reef reliance

4.2.1 Seafood consumption

Most resident households consumed seafood for at least some of their meals, and a smaller majority of residents consumed seafood from local coral reefs throughout the year (Figure 6). About a tenth of residents were unsure if their seafood came from local coral reefs. These trends were similar among all strata (Table C4 & C5).

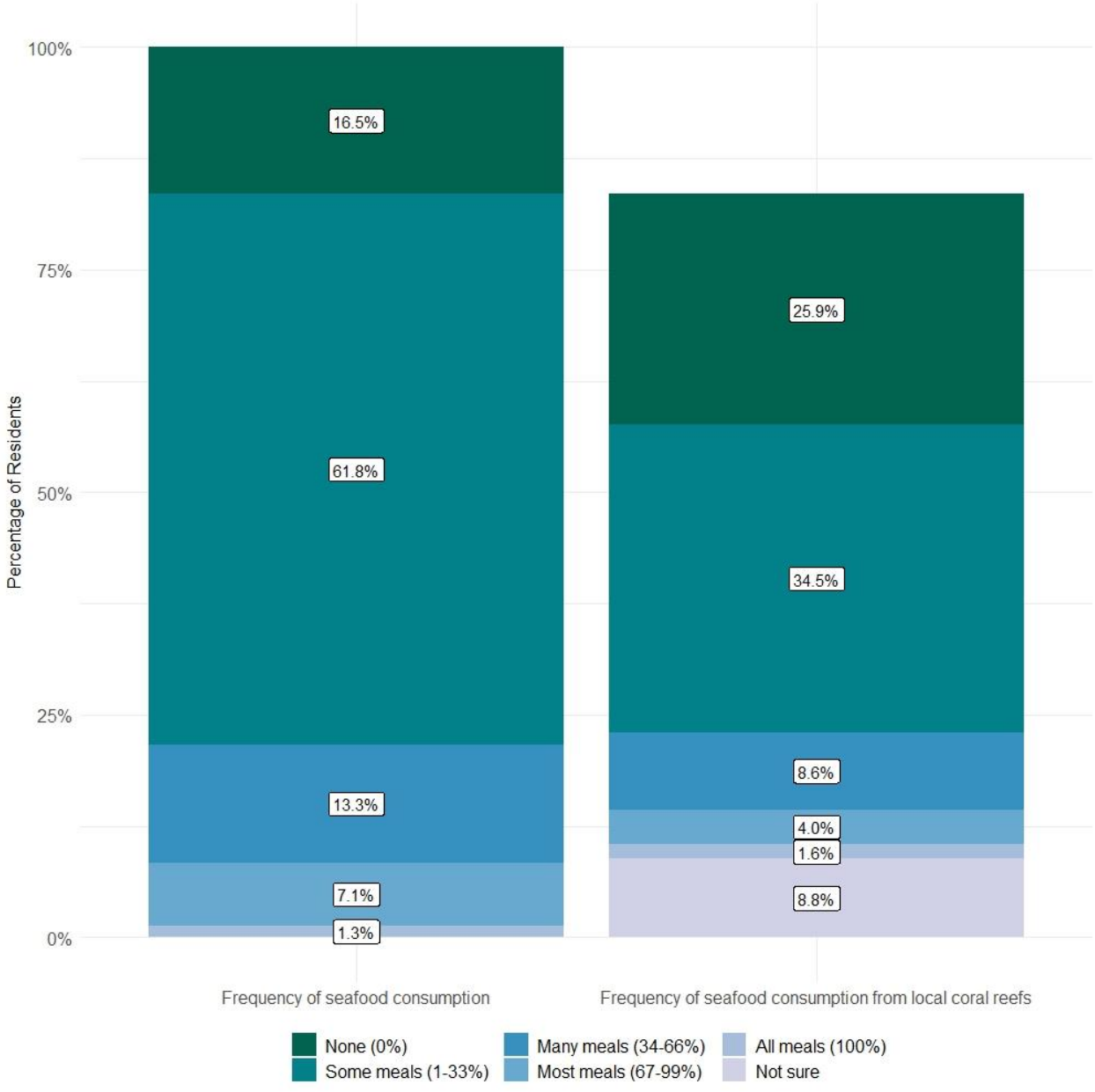

Figure 6: Frequency of seafood consumption, generally, and seafood consumption from local coral reefs.

4.2.2 Cultural importance

Residents generally believed that coral reefs were culturally important (Figure 7). On average, residents were most likely to find coral reefs important for local language (e.g., in word choices, business and place names); however, they also felt that coral reefs were extremely important for cultural folklore. Coral reefs were thought to be least important for religious practices, and residents were most unsure about the importance for ancestral connections. Residents in the coastal south were more likely to believe coral reefs were less culturally important (Table C6).

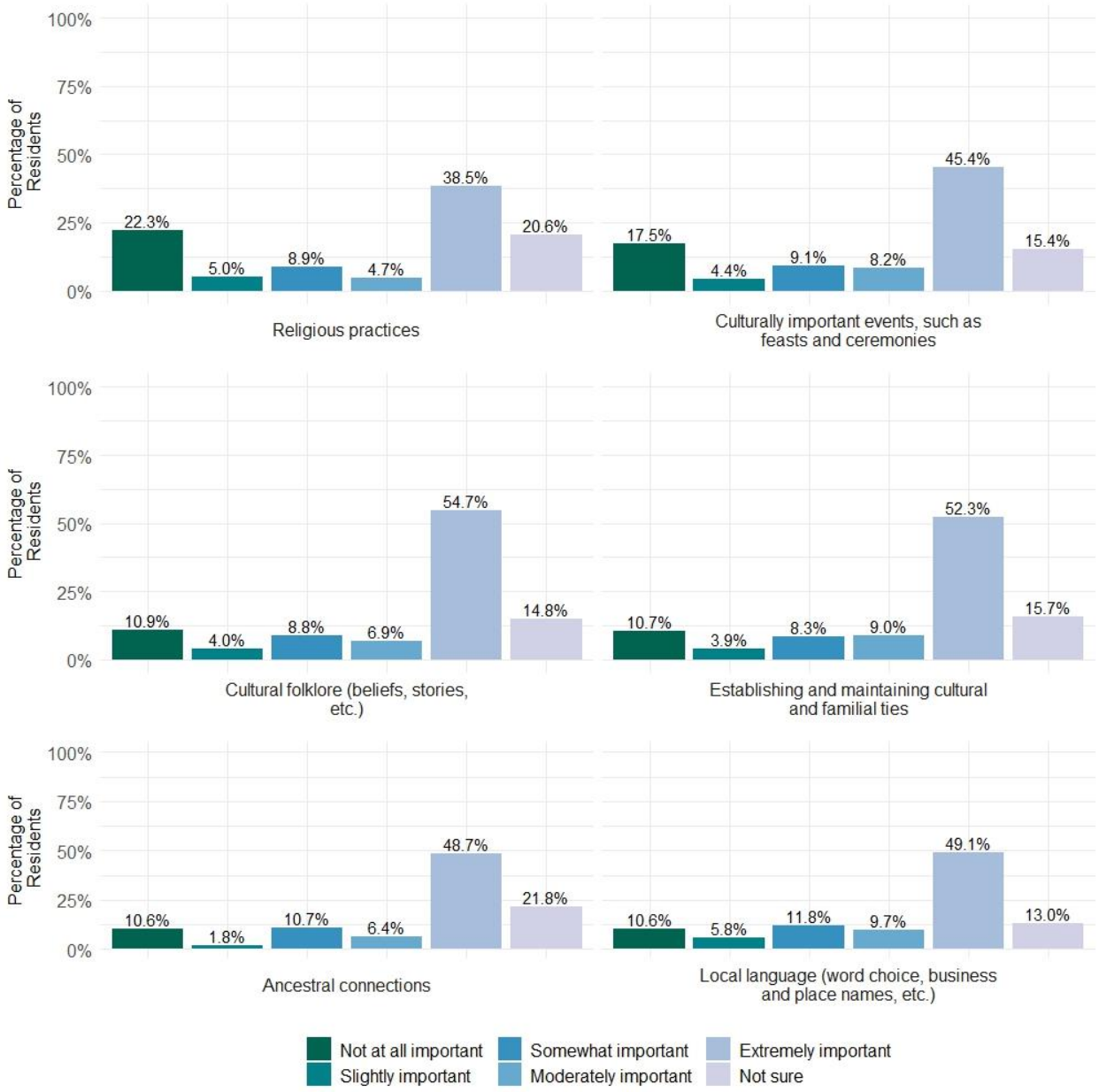

Figure 7: Cultural importance of coral reefs.

4.3 Marine resource importance and perceived conditions

4.3.1 Importance to quality of life

The majority of residents believed that all listed marine resources were extremely important to their quality of life (Figure 8). The diversity of corals and fish were less likely to be extremely important to residents who lived inland compared to coastal (north and south) residents (Table C7).

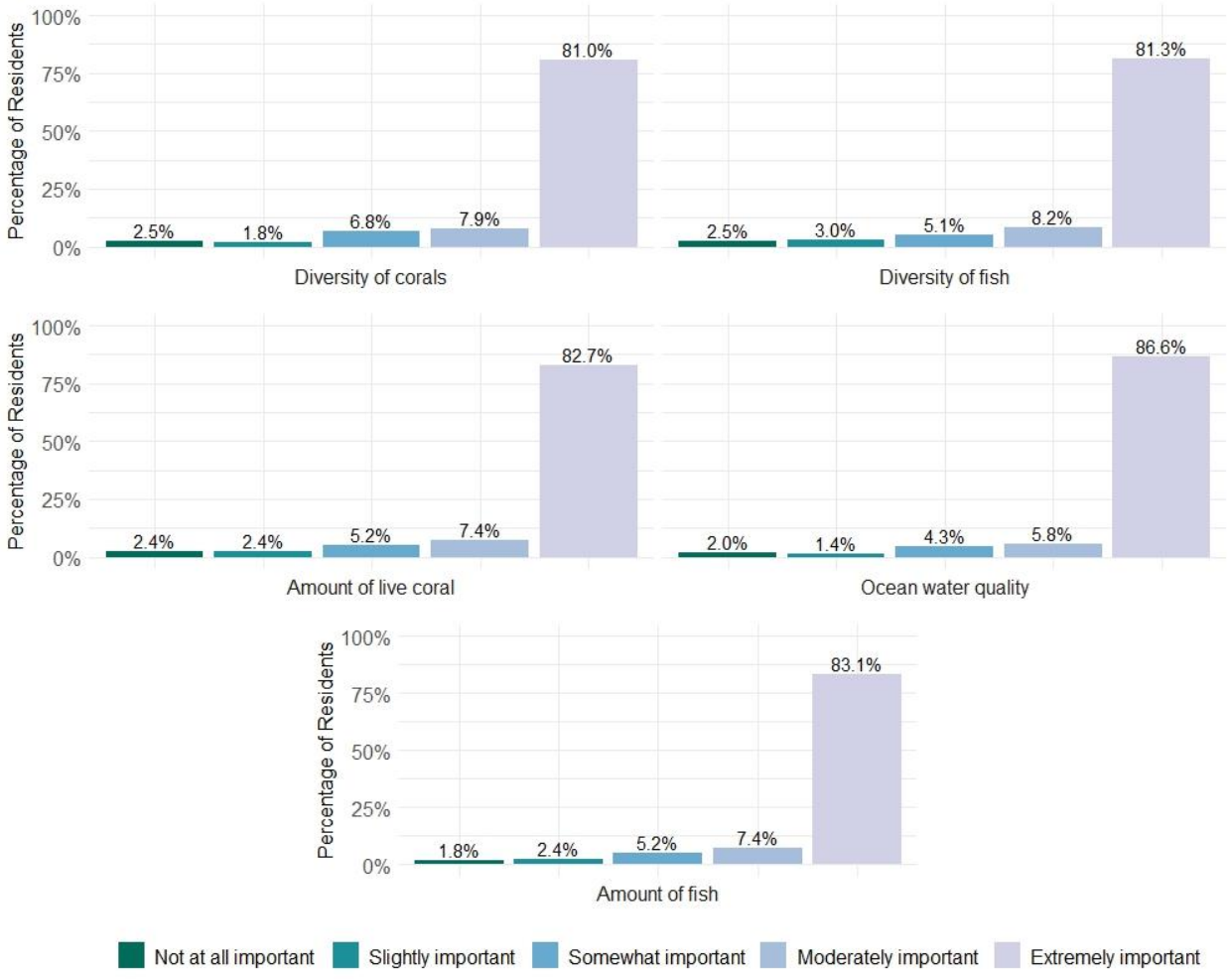

Figure 8: Marine resource importance to quality of life.

4.3.2 Perceived resource conditions

Residents were generally split on their perceptions of current resource conditions, but they felt all listed resources were most likely to be in bad condition (Figure 9). Residents were most unsure about the diversity and amount of live coral. Residents in the coastal north were slightly more optimistic about current resource conditions compared to other residents (Table C8).

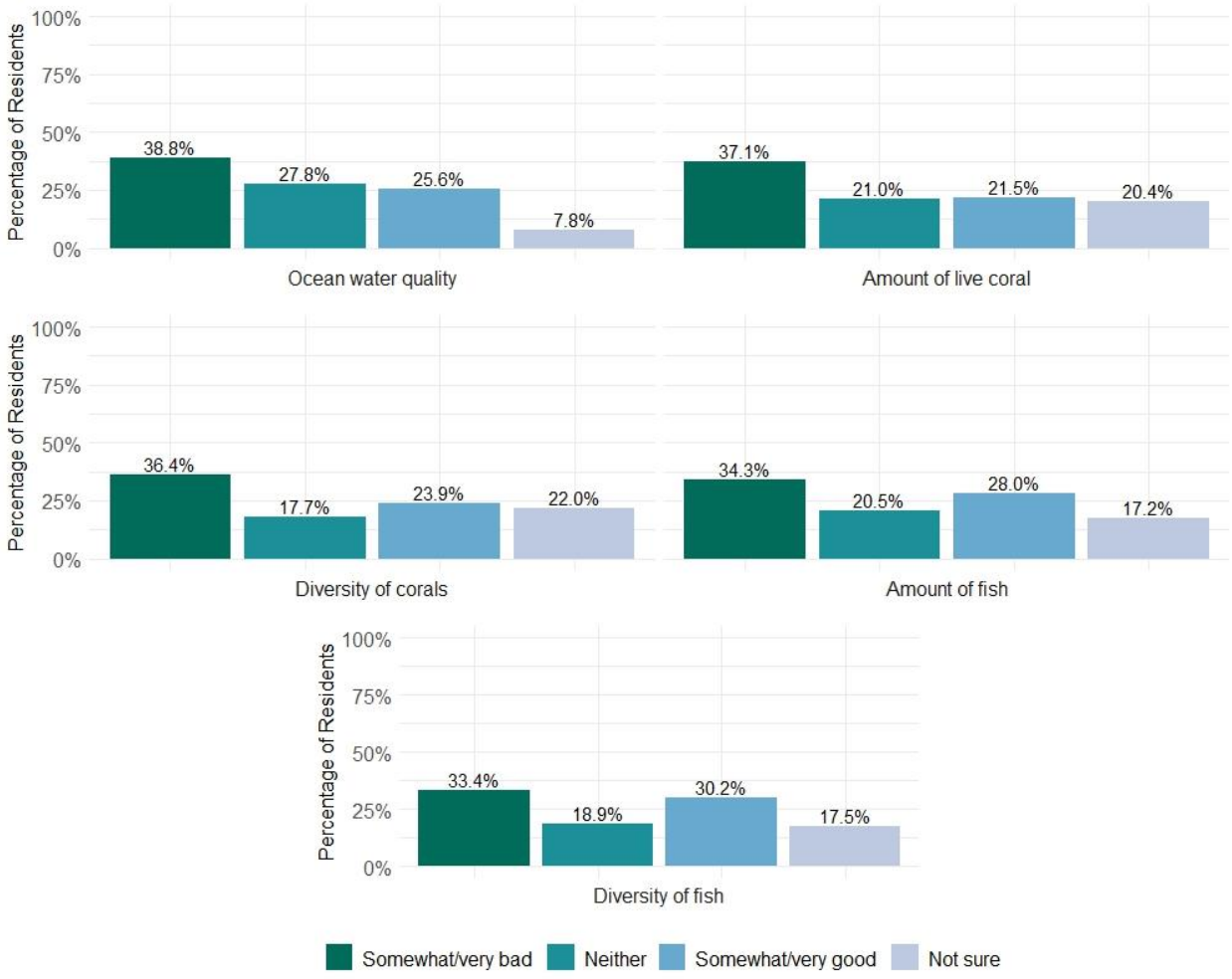

Figure 9: Perceived current resource conditions.

Residents felt that the condition of all five marine resources would worsen over the next ten years (Figure 10). Of the five resources included, residents were only more uncertain about the future condition of water quality than they were about its current condition. Residents in the coastal north were also more optimistic about the future conditions of resources compared to residents in the coastal south or inland (Table C9).

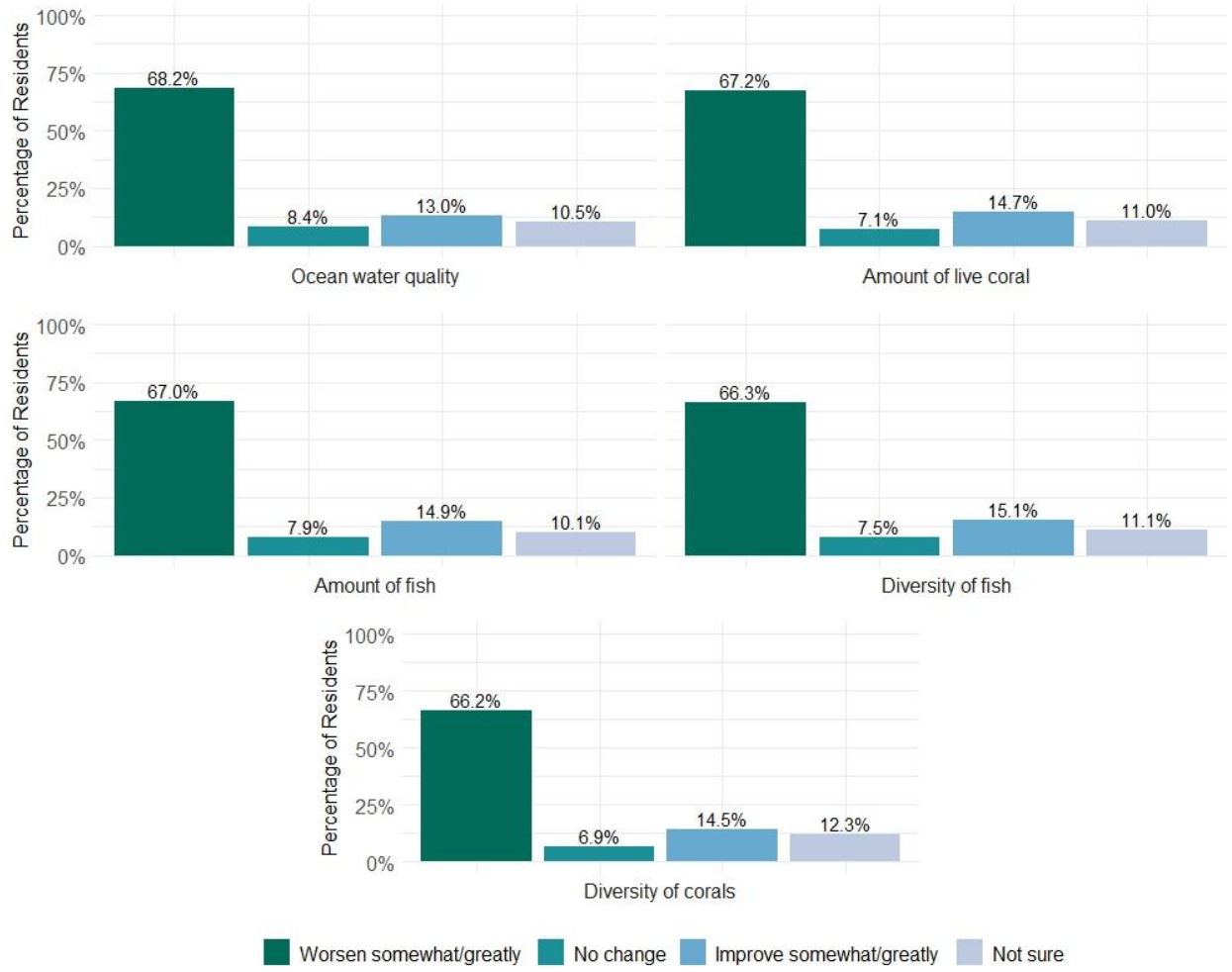

Figure 10: Perceived projected resource conditions (next ten years).

Harbor views. Photo credit: Seann Regan.

4.4 Awareness and knowledge of coral reefs

Most residents believed that coral reefs are important for providing a range of ecosystem services or benefits in Puerto Rico (Figure 11). Residents were most likely to find coral reefs extremely important for protection from natural disasters and for providing food for coastal communities. Some residents were unsure of the importance of the listed ecosystem services. Coastal north residents valued coral reefs more for outdoor recreation and Puerto Rico's tourism-based economy, while coastal south residents valued coral reefs more for Puerto Rico's fishery-based economy (Table C10).

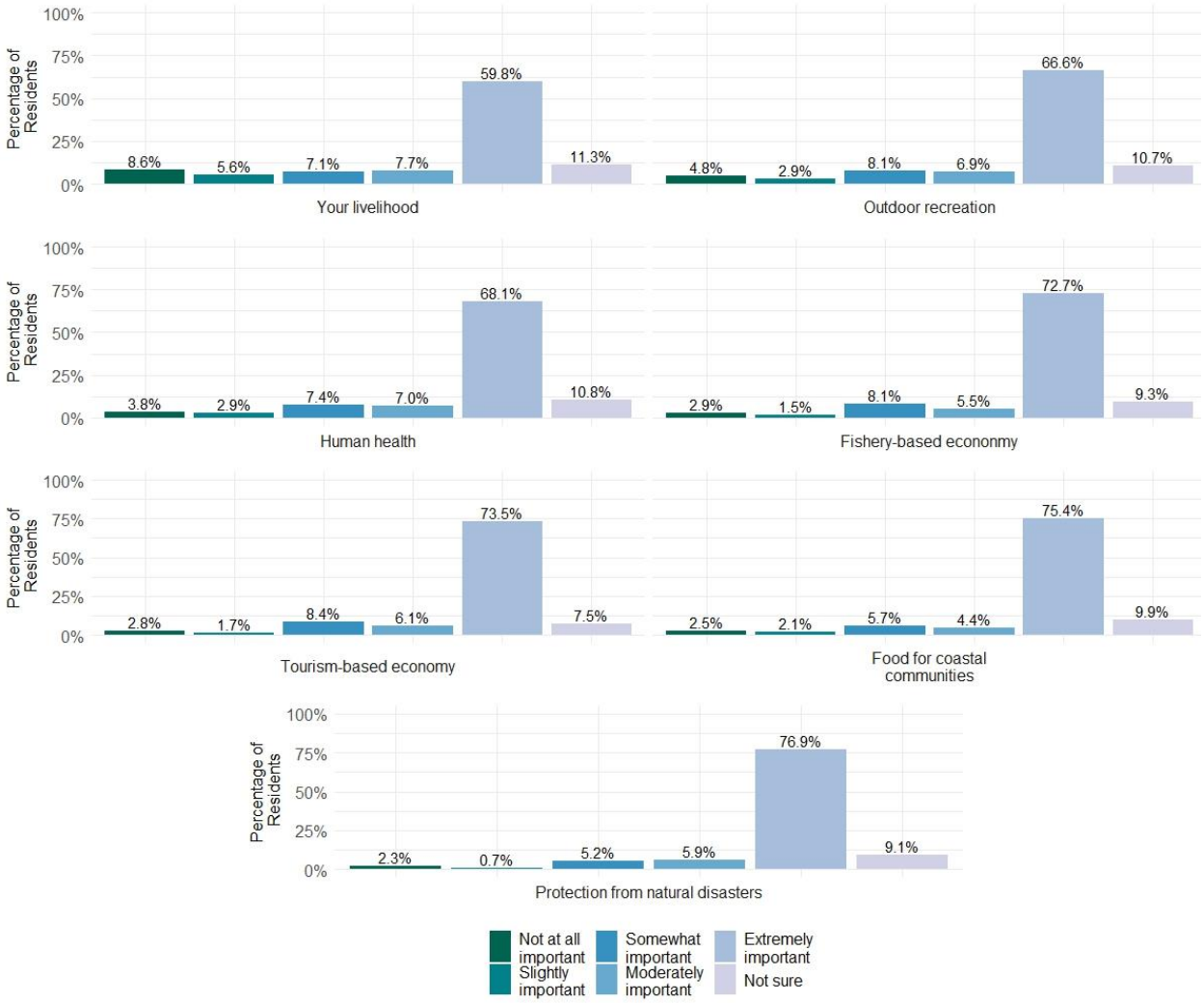

Figure 11: Importance of coral reefs for providing ecosystem services.

Threat recognition and familiarity was high for the majority of listed items, but relatively lower for divers and snorkelers (Figure 12). Residents were most unsure about the threat status of divers and snorkelers as well. Ocean acidification and coral bleaching had the lowest familiarity. Threat recognition and familiarity were similar across strata (Table C11).

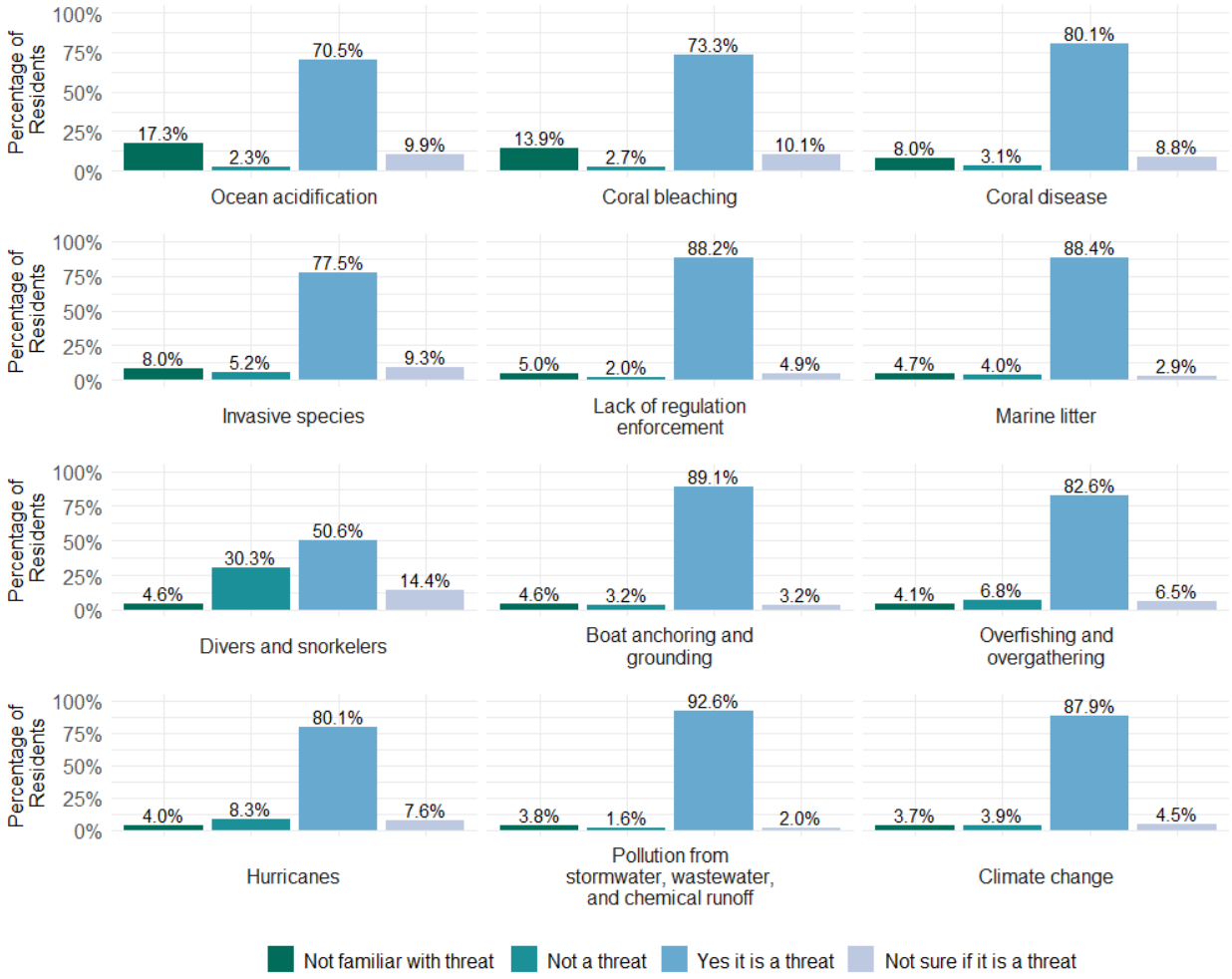

Figure 12: Familiarity of threats to coral reefs.

For residents who perceived the listed items as threats, the majority believed that those items posed a severe threat to coral reefs, with the exception of divers and snorkelers (Figure 13). For most items, residents in the coastal north and inland areas believed threats to be more moderate to severe as compared to coastal south residents (Table C12).

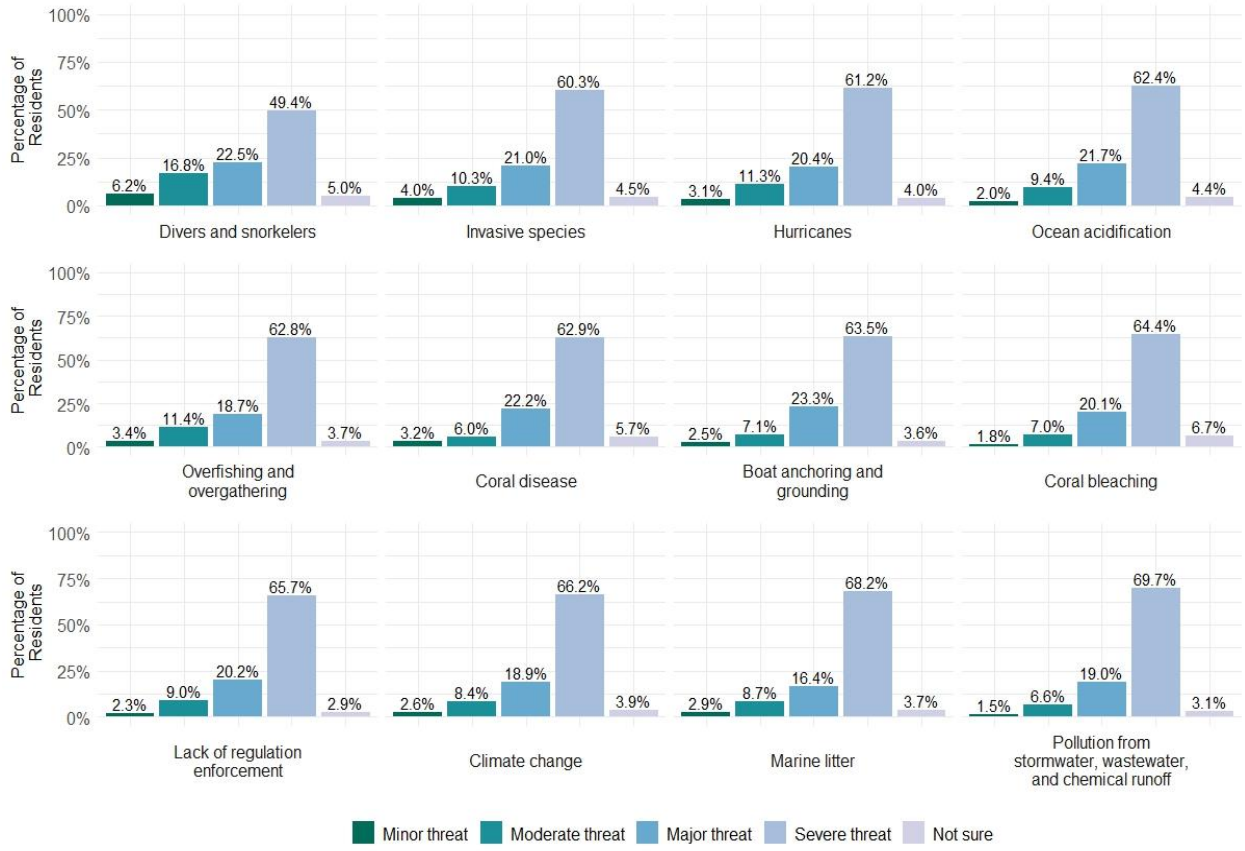

Figure 13: Perceived severity of threats to coral reefs.

4.5 Attitudes towards coral reef management strategies

4.5.1 Marine Protected Areas

The survey defined a marine protected area (MPA) or natural reserve as "an area of the ocean where particular human activities are restricted to protect living, non-living, cultural, and/or historic resources" (Appendix A). Prior to taking this survey, the majority of residents were aware of existing MPAs or natural reserves in Puerto Rico (Table C13). Around one half of MPA-aware residents perceived positive impacts from MPAs, including improvement to their personal livelihood. While the majority felt there had been positive change, over a quarter believed they had no effect on their livelihoods and nearly one-fifth believed they negatively impacted the fishery-based economy (Figure 14). Between about one-sixth and one-fifth of MPA-aware residents were unsure of impacts. Generally, MPA-aware coastal north residents were most likely to believe related ecosystem services had worsened from MPAs, while inland residents were more likely to believe ecosystem services had improved (Table C14).

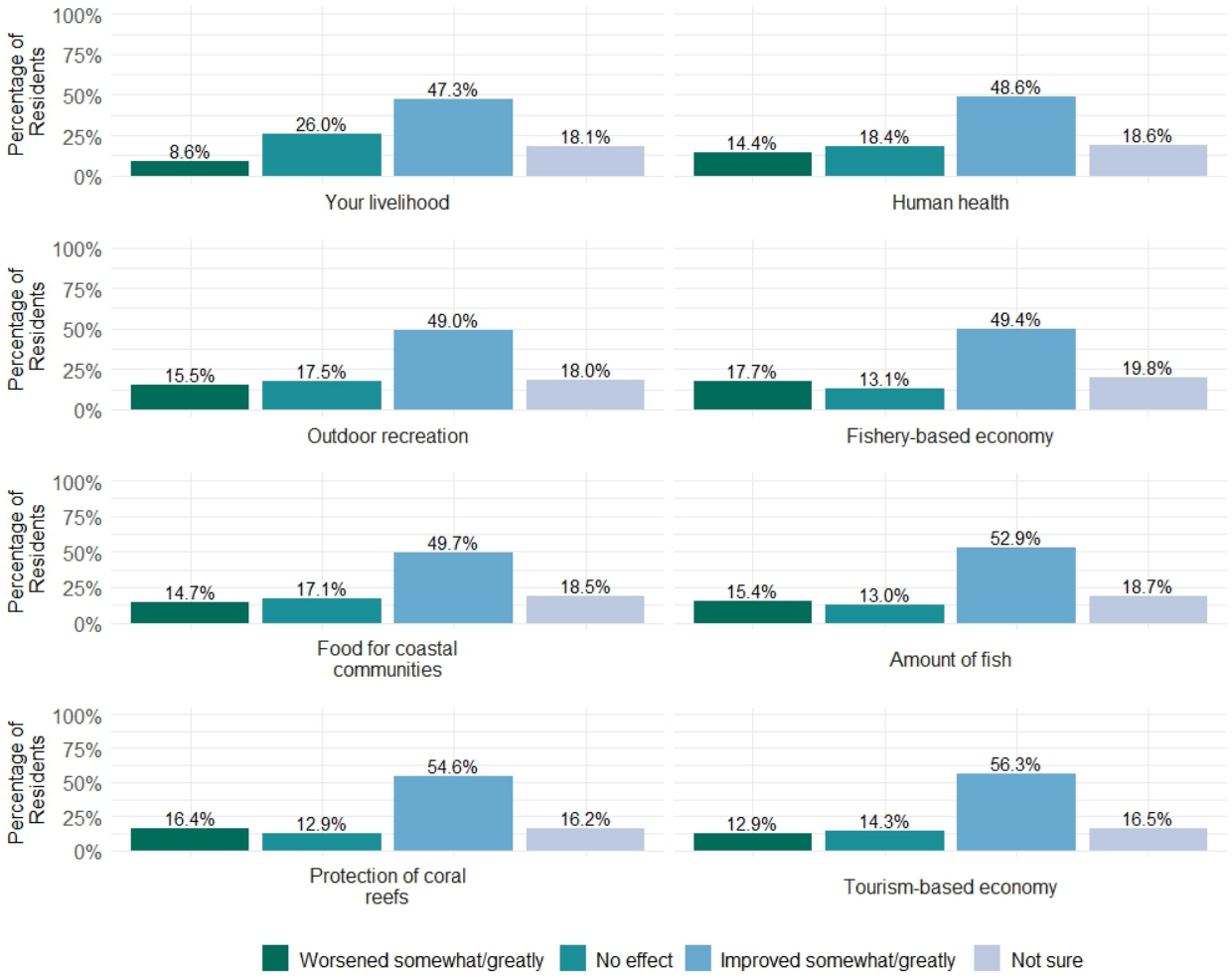

Figure 14: Perceived impacts from Marine Protected Areas.

4.5.2 Support for Management Strategies

Residents were generally supportive of all listed management strategies (Figure 15). Residents were slightly more supportive of restricting sources of pollution for improved water quality, increasing law enforcement surveillance efforts, and establishing new requirements for improved wastewater treatment. Residents in the coastal north were more likely to strongly support all management items compared to other residents, except for establishing new requirements for improved wastewater treatment, which had the strongest support from inland residents (Table C15).

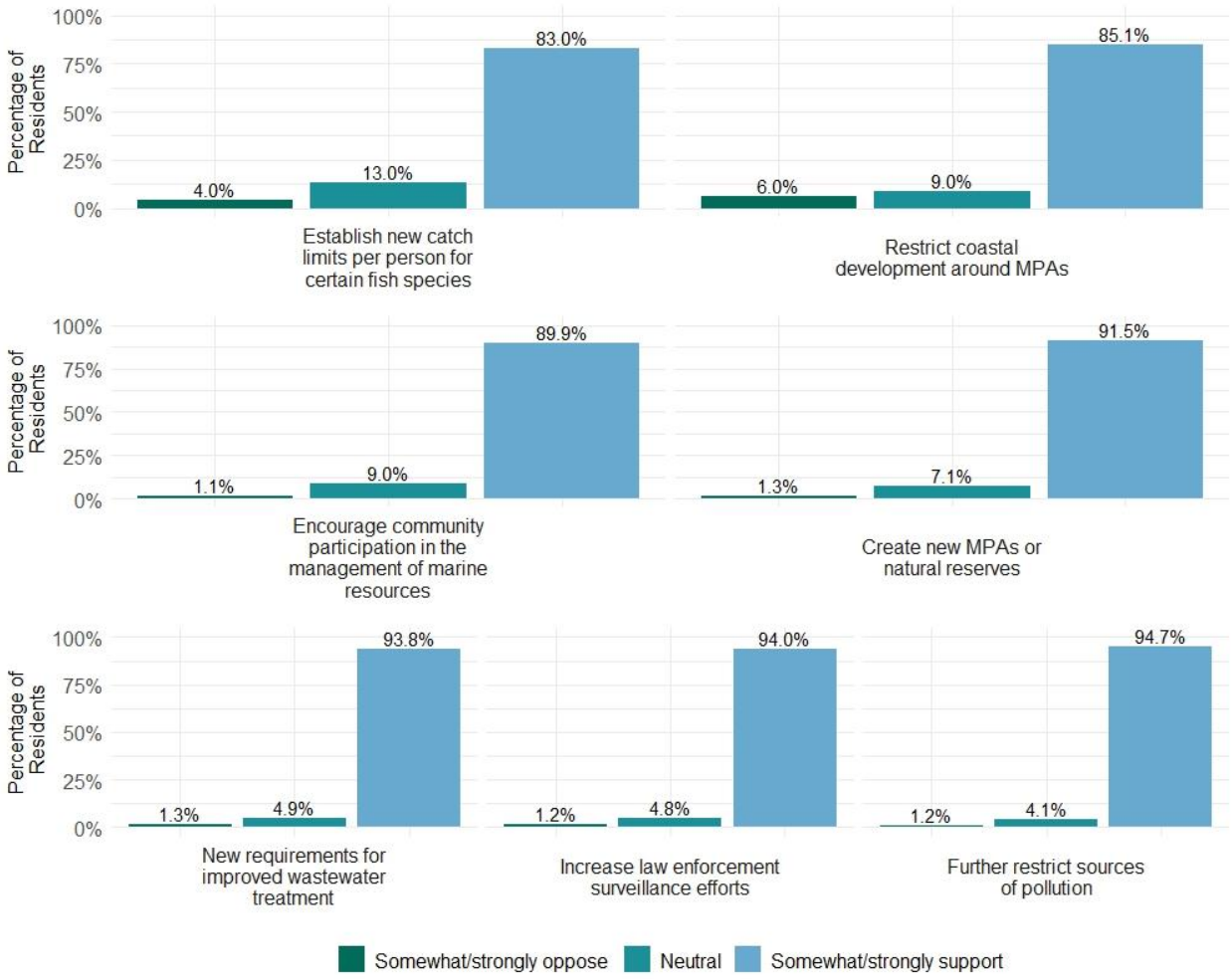

Figure 15: Support for coral reef management strategies.

4.6 Participation in behaviors that may improve coral reef health

4.6.1 Routine behaviors

The majority of residents believed that it is extremely important for Puerto Rico residents to engage in activities that help protect coral reefs (Table C16), and residents participated in most of the included routine environmental behaviors (Figure 16). Residents most commonly reduced household electricity use, used fewer single use products, and reduced household water use routinely. About one half of residents routinely composted or used reef-safe forms of sun protection. Residents in the coastal south were less likely to recycle, use reef-safe forms of sun protection, and promote environmentally responsible practices with others compared to other Puerto Rican residents (Table C17).

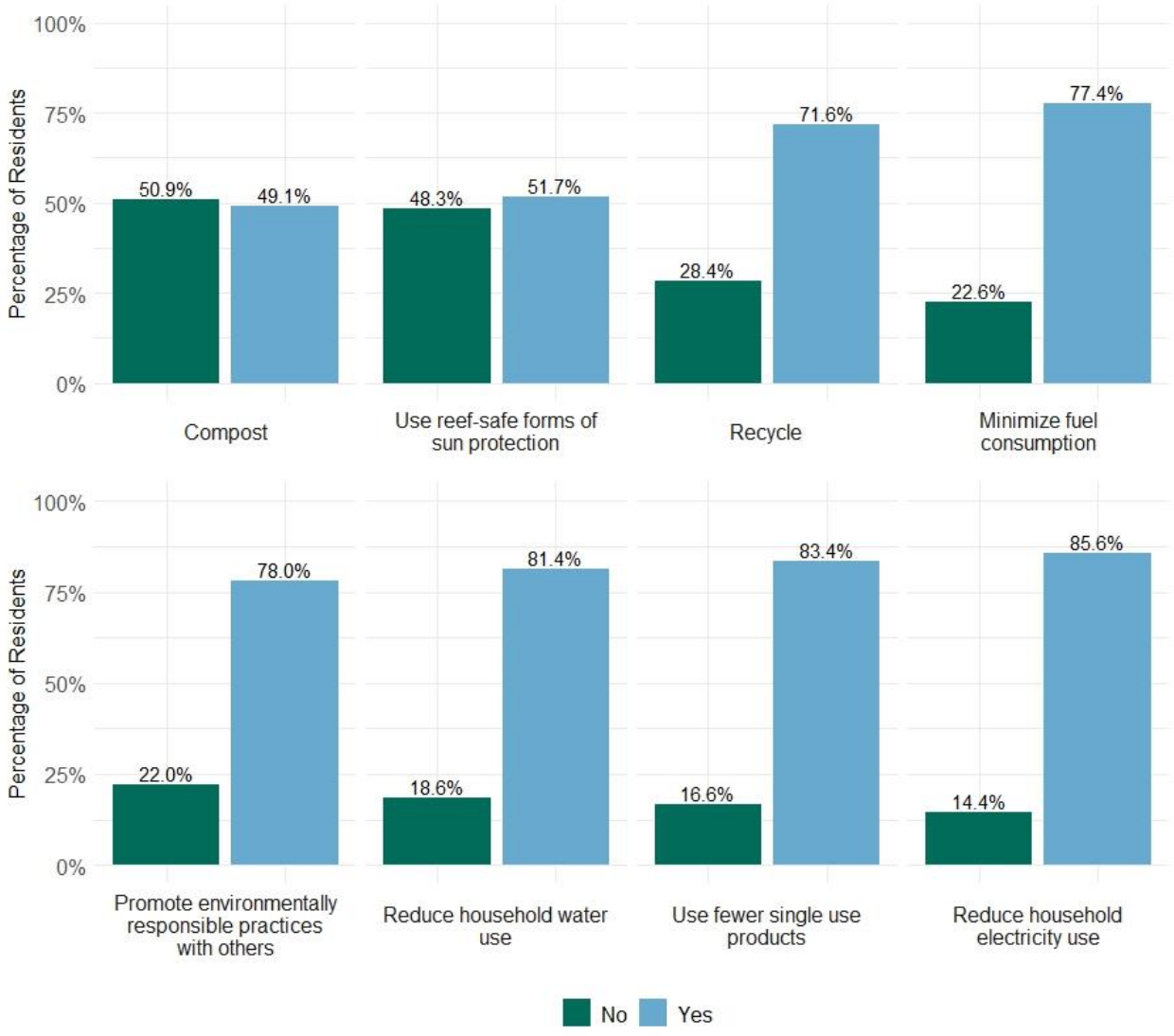

Figure 16: Participation in routine pro-environmental behaviors.

Of the reasons provided, the number one reason for not participating in the above routine behaviors was typically lack of opportunity (Figure 17). This was especially the case for promoting environmentally responsible behaviors with others. Inconvenience and lack of knowledge were also frequently chosen reasons. Inland residents were more likely to claim a lack of opportunity for their non-participation than coastal residents (Table C18).

Figure 17: Reasons for not engaging in routine pro-environmental behaviors.

4.6.2 Annual behaviors

The majority of residents did not engage in any annual pro-environmental behaviors in the last 12 months of taking this survey (Figure 18). Residents were least likely to have joined or renewed a membership in a conservation organization. Coastal residents were more likely to donate to environmental causes, join or renew a membership in a conservation organization, or volunteer in environmental restoration activities than inland residents (Table C19).

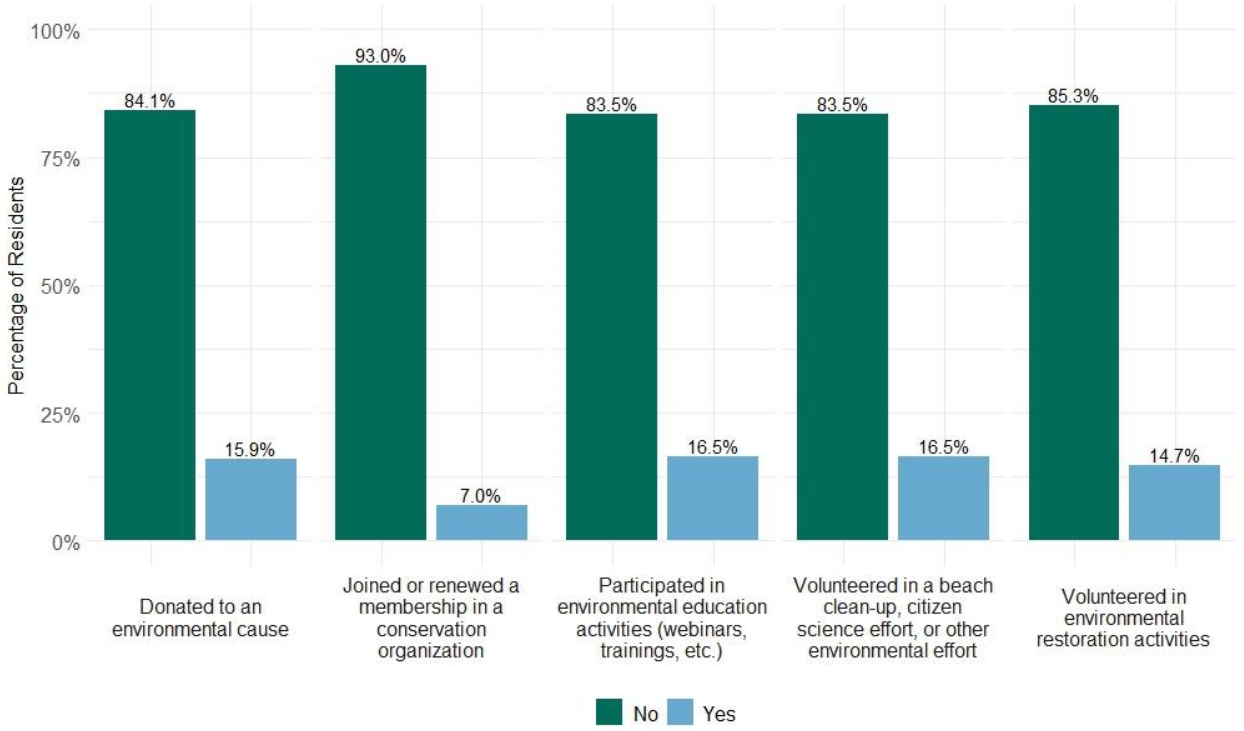

Figure 18: Participation in annual pro-environmental behaviors.

Coastal cemetery and coastline. Photo credit: Seann Regan.

Of the reasons provided, the number one reason for not participating in the listed annual behaviors was lack of opportunity (Figure 19). Not knowing how to participate was the next most common reason, while inconvenience and cost were infrequently chosen. Coastal north residents were more likely to state lack of knowledge than inland or coastal south residents (Table C20).

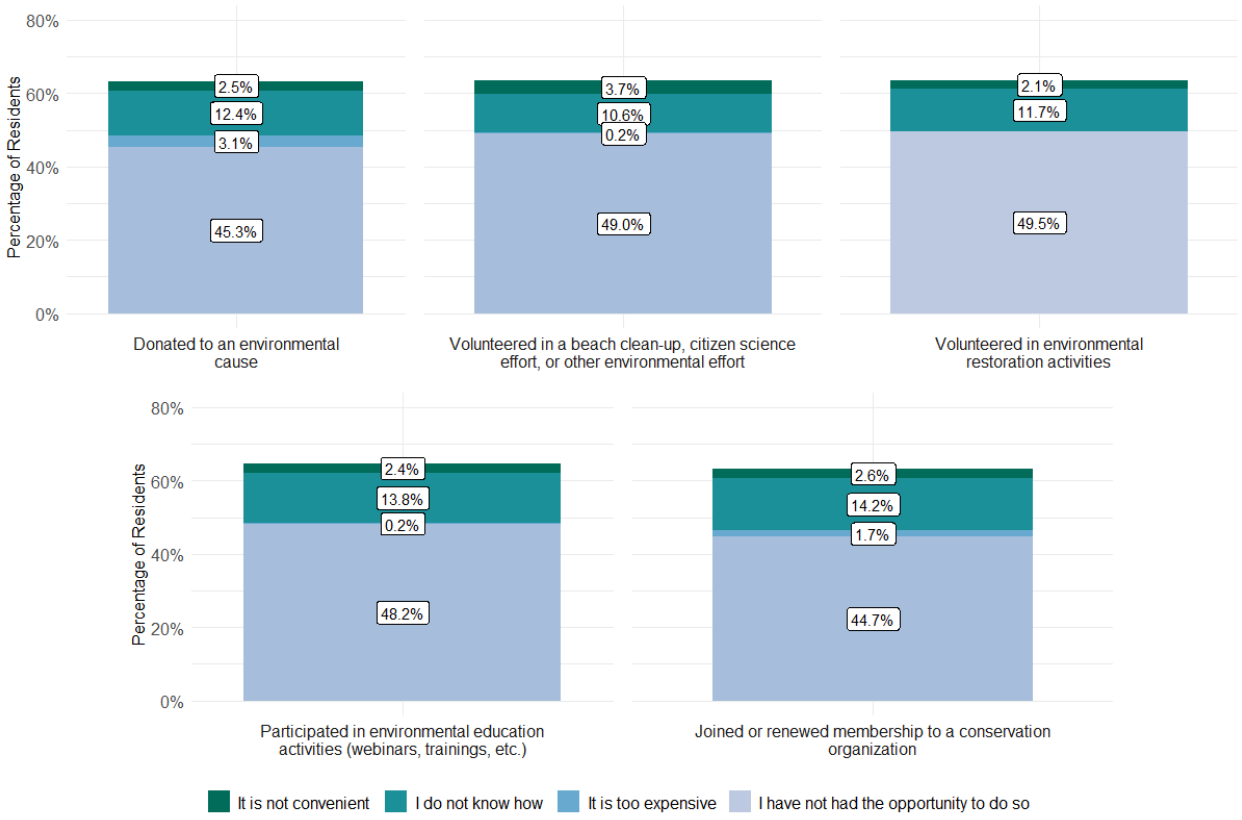

Figure 19: Reasons for not participating in annual pro-environmental behaviors. *Maximum value is 80%

4.6.3 Longer-term behaviors

Just under one-fifth of residents had installed a solar energy system within the last 5 years of taking this survey, and about one quarter of residents have updated the septic or sewer system on their property within the same timeline (Figure 20). By contrast, nearly half of residents have installed a water storage system in the last 5 years. Residents in the coastal north were more likely to install a water storage system or solar energy system compared to other residents, while residents in the coastal south were more likely to update theirs septic or sewer systems compared to other residents (Table C21).

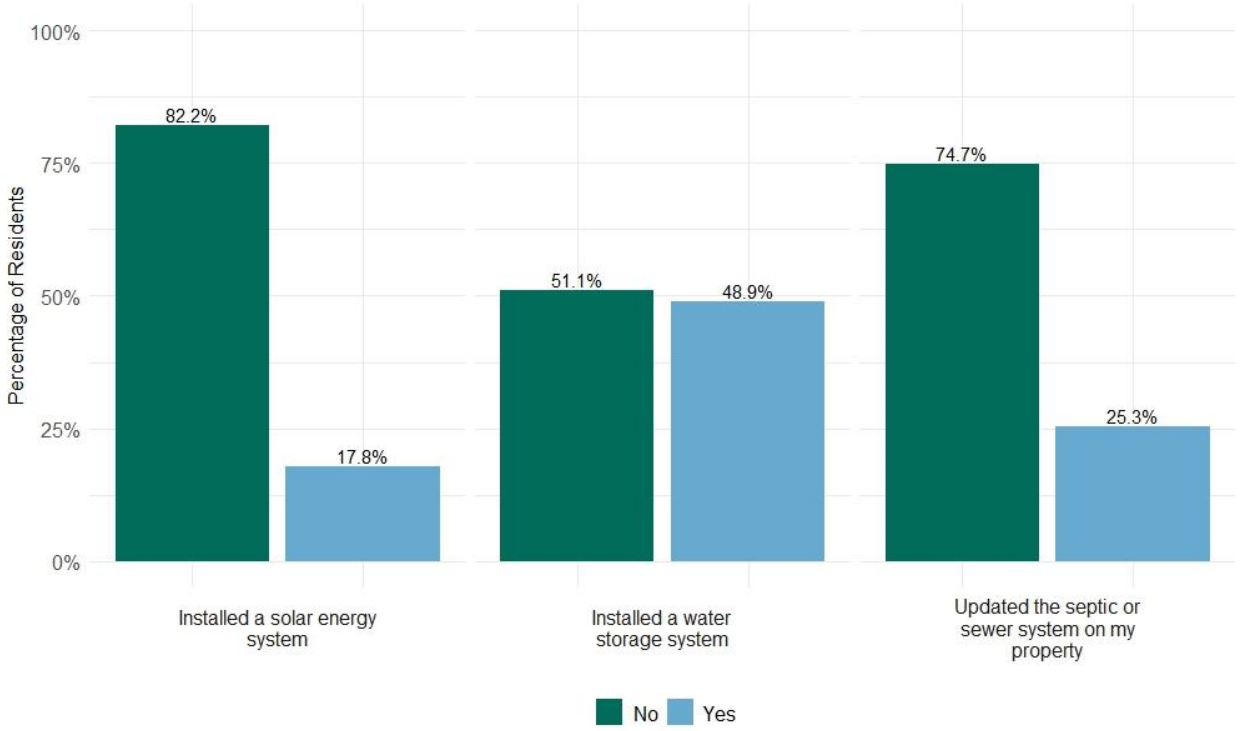

Figure 20: Participation in longer-term pro-environmental behaviors (in the last 5 years).

San Juan. Photo credit: Seann Regan

Of the reasons provided, the most common reason for having not installed a solar energy system was cost, whereas lack of opportunity was most often stated for the other two activities (Figure 21). Inconvenience was one of the least shared reasons. Inland residents were more likely to state lack of opportunity than coastal (north and south) residents (Table C22).

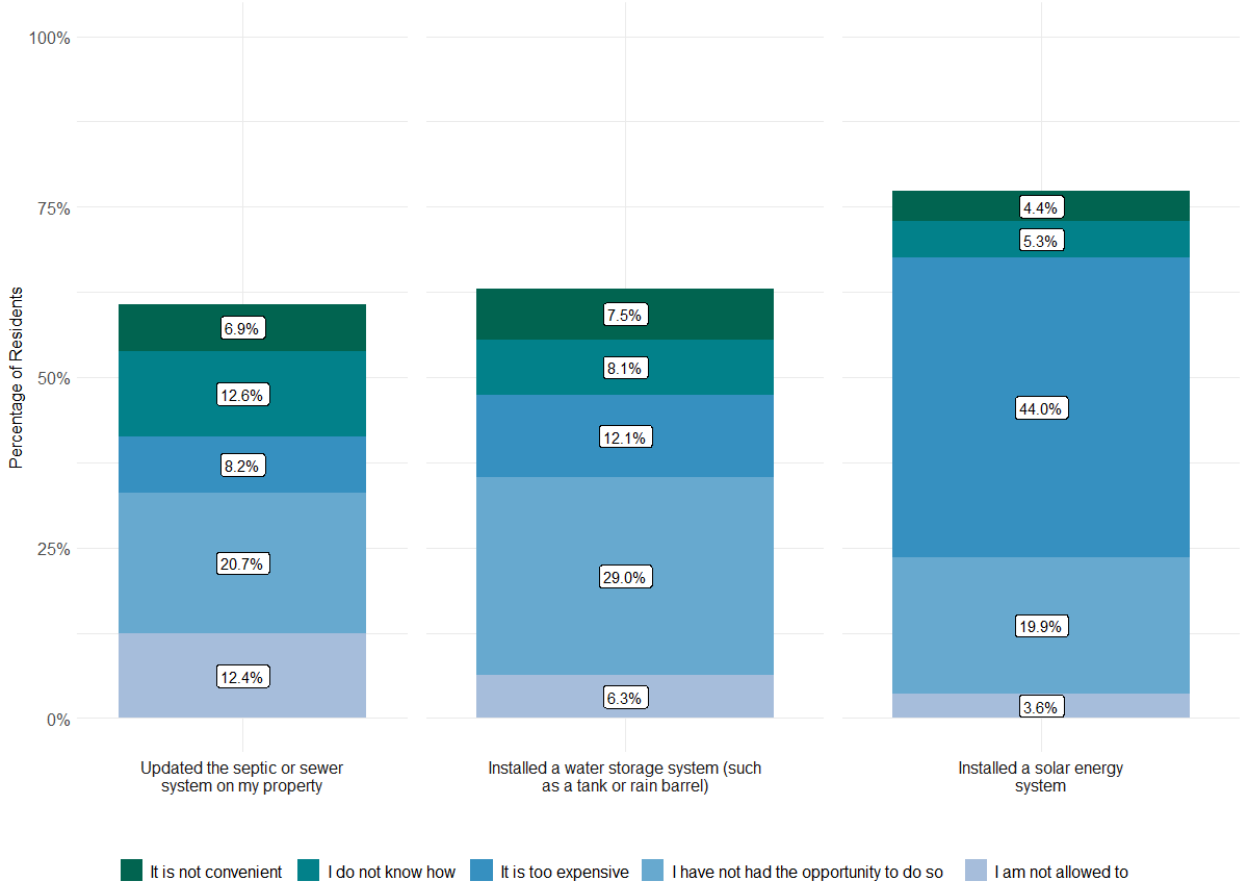

Figure 21: Reasons for not participating in longer-term pro-environmental behaviors.

4.7 Awareness of coral reef rules and regulations

The majority of residents believed that most of the listed coral reef behaviors were unacceptable; however, residents were somewhat likely to believe that taking seashells or coral from reefs and feeding fish, birds, or marine animals were neutral or acceptable activities (Figure 22). Residents in the coastal south were more likely to be neutral than residents in the coastal north or inland (Table C23).

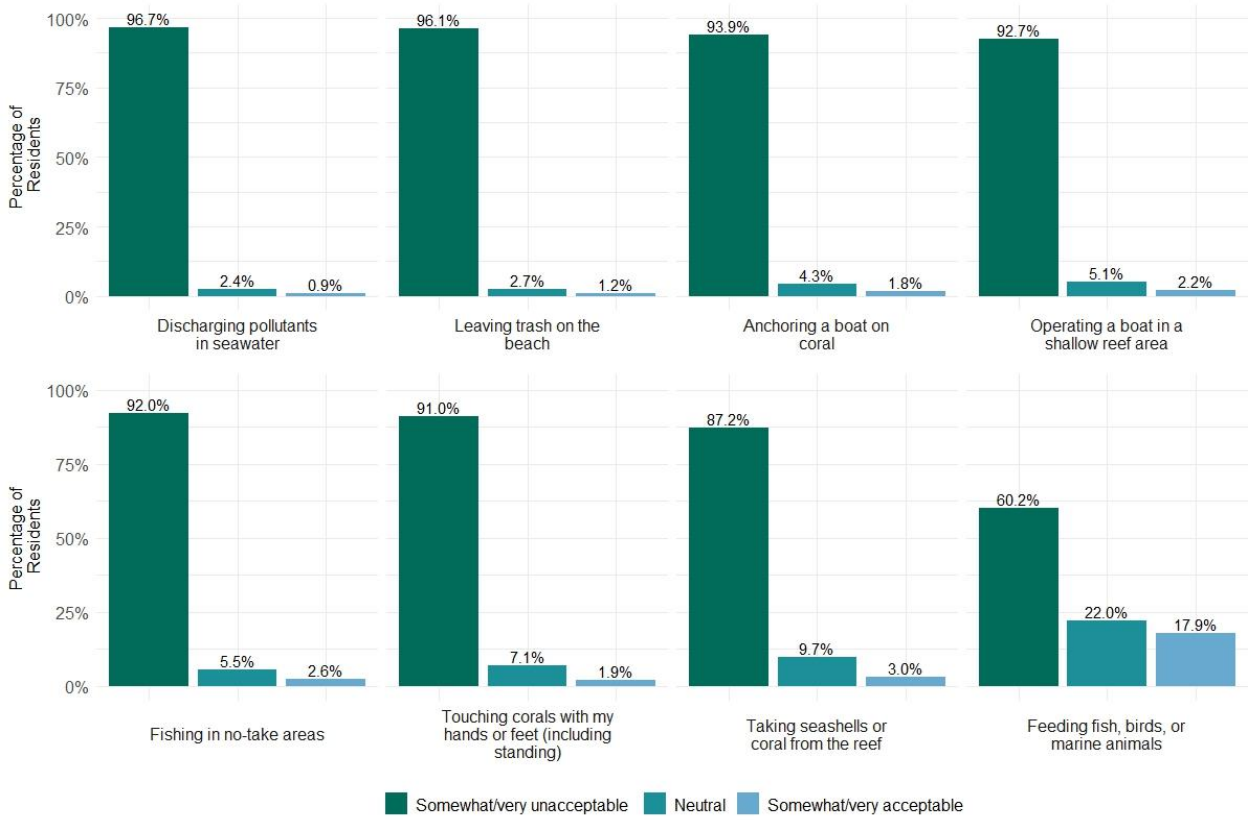

Figure 22: Acceptability of coral reef behaviors.

5. Results: Trend Analysis for 2015 to 2022

With two cycles of survey data from 2015 and 2022, NCRMP is able to track changes in socioeconomic conditions in Puerto Rico over time, where data are available.[4] Key trend analyses are presented below. Where appropriate, *t*-tests were performed to test for statistically significant differences in mean percentages of responses between residents in 2015 and residents in 2022 (*p*-values are indicated in the figures below).[5]

5.1 Participation in coral reef activities

Between 2015 and 2022, there was a statistically significant decrease in resident participation in all activities, except for gathering marine resources which remained relatively stable (Figure 23). The largest decreases in participation between survey years were in beach recreation, waterside/beach camping, swimming/wading, and boating.

[4] The 2022 Puerto Rico survey (Appendix A) underwent some improvements since its first implementation in 2015, and trends are only shown when appropriate.

[5] Due to slight differences in survey measurement scales, statistical comparisons were not done for the results presented on motivations for fishing and gathering, seafood consumption, and the importance of coral reefs.

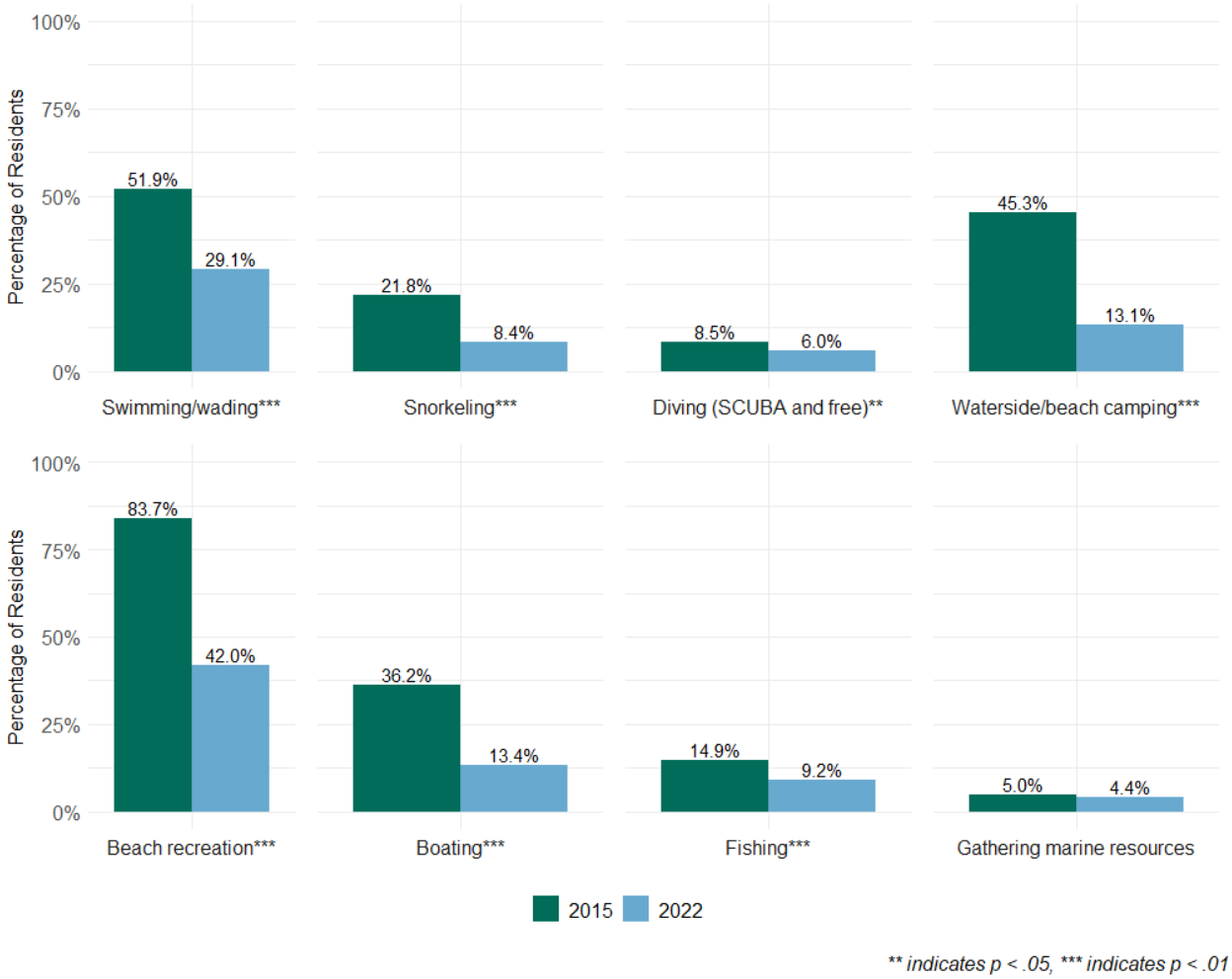

Figure 23: Resident participation in coral reef activities during 2015 and 2022.

Reasons for fishing in 2015 and 2022 were also examined, but statistical differences were not tested due to differences in the way this question was asked between surveys. In general, residents' fishing and gathering motivations decreased along with participation rates (Figure 24).[6] In both survey years, residents mostly fished and gathered for recreation or sport.

[6] For purposes of analysis, the four-point frequency scale used in the 2015 survey was recoded into a binary scale consistent with the four categories of fishing motivations used in the 2022 survey. Recoding is a common practice as long as the meaning of the scales is maintained.

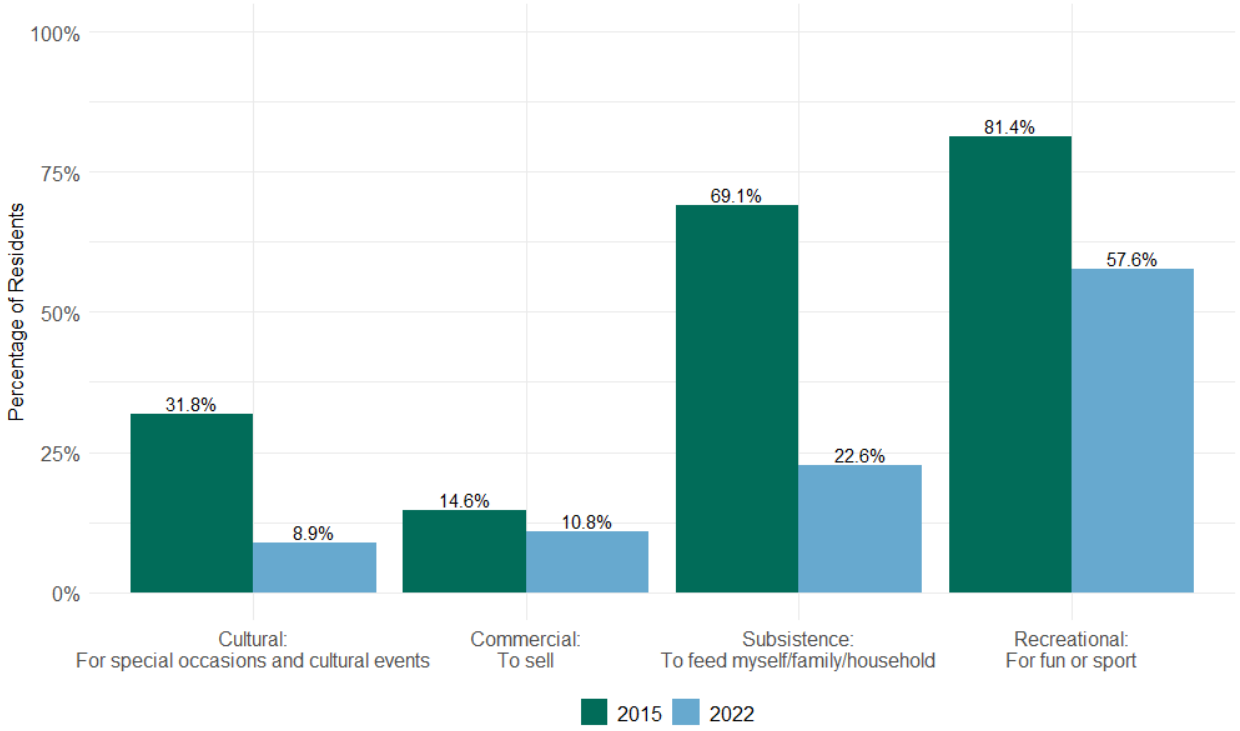

Figure 24: Reasons for resident participation in fishing in 2015 and 2022.

Exploring San Juan. Photo credit: Seann Regan.

5.2 Seafood consumption

Frequency of seafood consumption in 2015 and 2022 were examined, but no statistical comparisons were tested due to differences in scales. Overall, there was a decreasing trend in weekly seafood consumption among resident households between 2015 and 2022 (Figure 25).

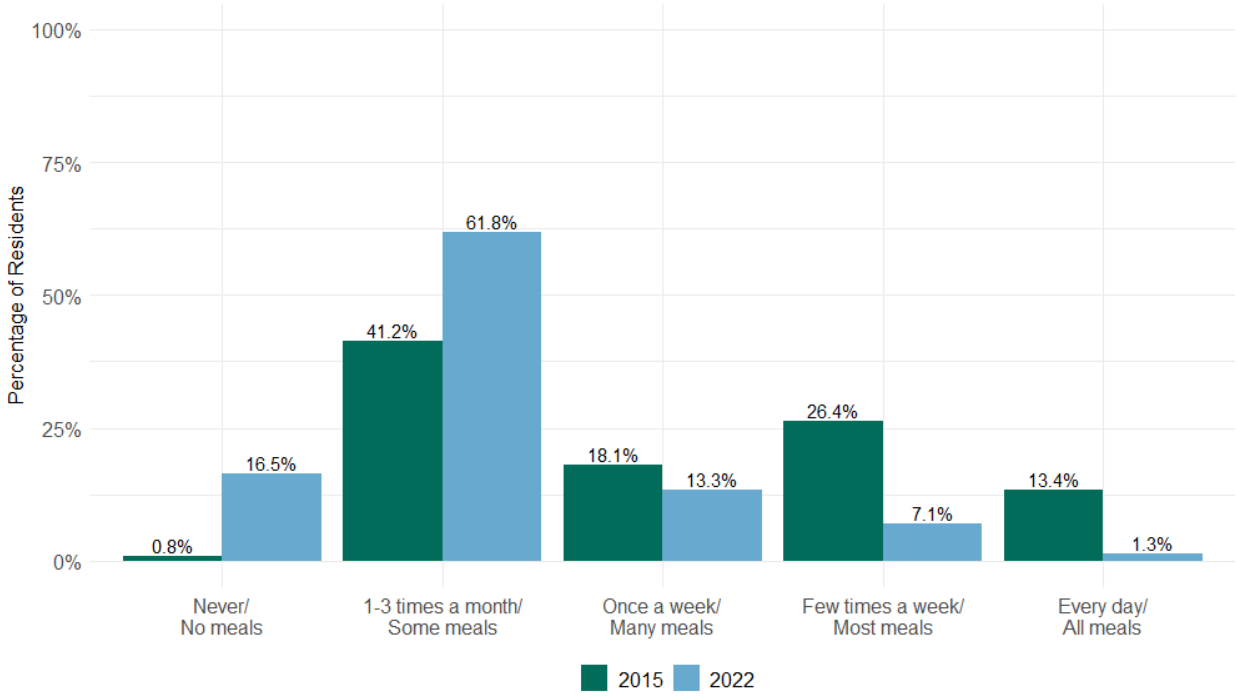

Figure 25: Frequency of resident seafood consumption in 2015 and 2022.

5.3 Importance of coral reefs

Two statements rated by residents in 2015 and 2022 on the importance of coral reefs were examined, but no statistical comparisons were made due to differences in scales (Figure 26). In 2015, the majority of residents agreed or strongly agreed that coral reefs protect Puerto Rico from erosion and natural disasters and are important for the tourism-based economy within the territory. In 2022, the majority of residents rated these statements as being slightly to extremely important.

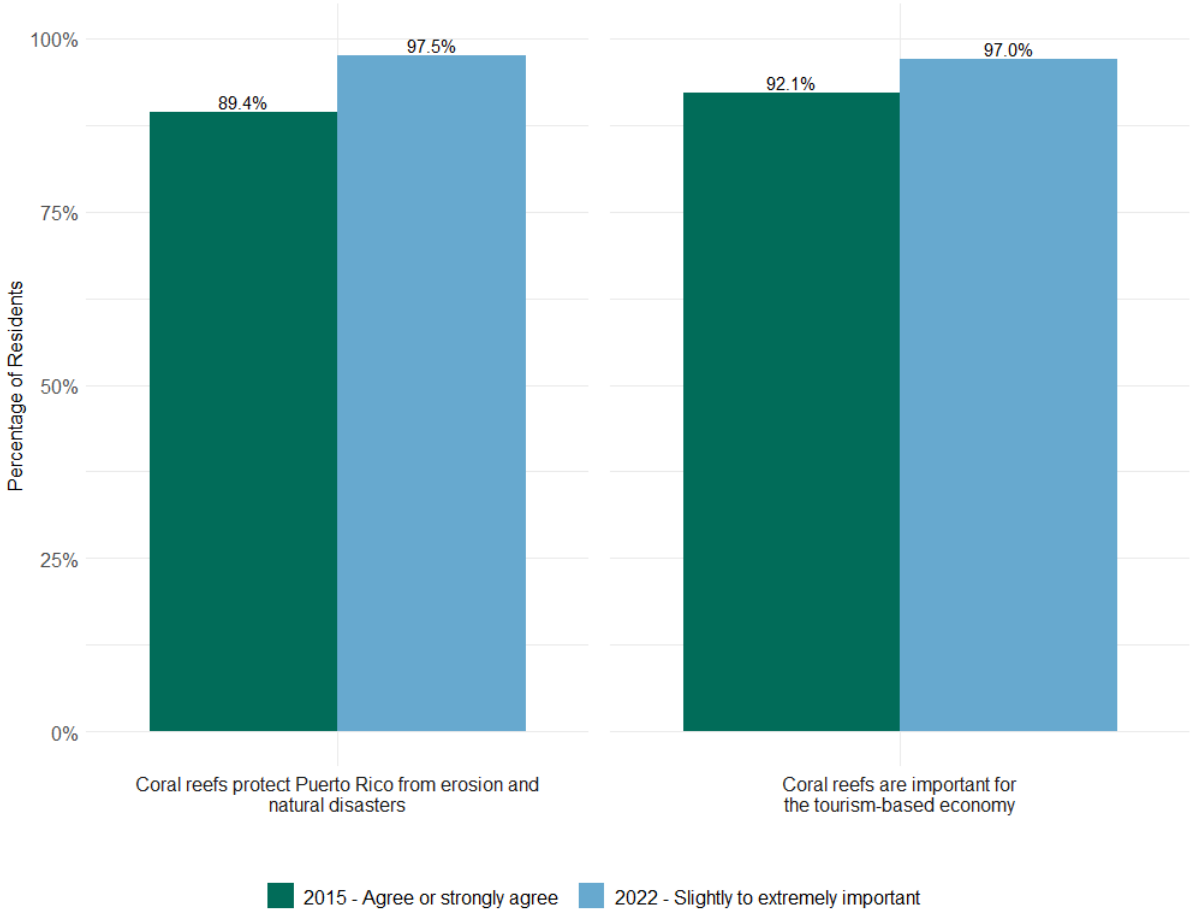

Figure 26: Residents' perceived importance of coral reefs in 2015 and 2022.

5.4 Perceived resource conditions and threats

Both the 2015 and 2022 surveys asked about the current condition of four marine resources: number of fish, diversity of fish, amount of live coral, and ocean water quality. In general, residents' perceptions of all four resource conditions were more neutral in 2015, and in 2022, there was a significant increase in the percentage of residents who were not sure about these conditions (Figure 27).

Residents' familiarity of potential threats to coral reefs in 2015 and 2022 were also examined (Figure 28).[7] Overall, residents were more familiar with threats to coral reefs in 2022 than they were in 2015. The largest increases in resident threat familiarity between survey years were for coral disease (52.8%), overfishing and overgathering (45.4%), and coral bleaching (43.9%). Most residents remained familiar with the threat of hurricanes in 2022.

[7] Due to slight differences between the scales used in the 2015 and 2022 surveys, responses were consolidated into "unfamiliar" and "familiar" categories for purposes of analysis and visualization.

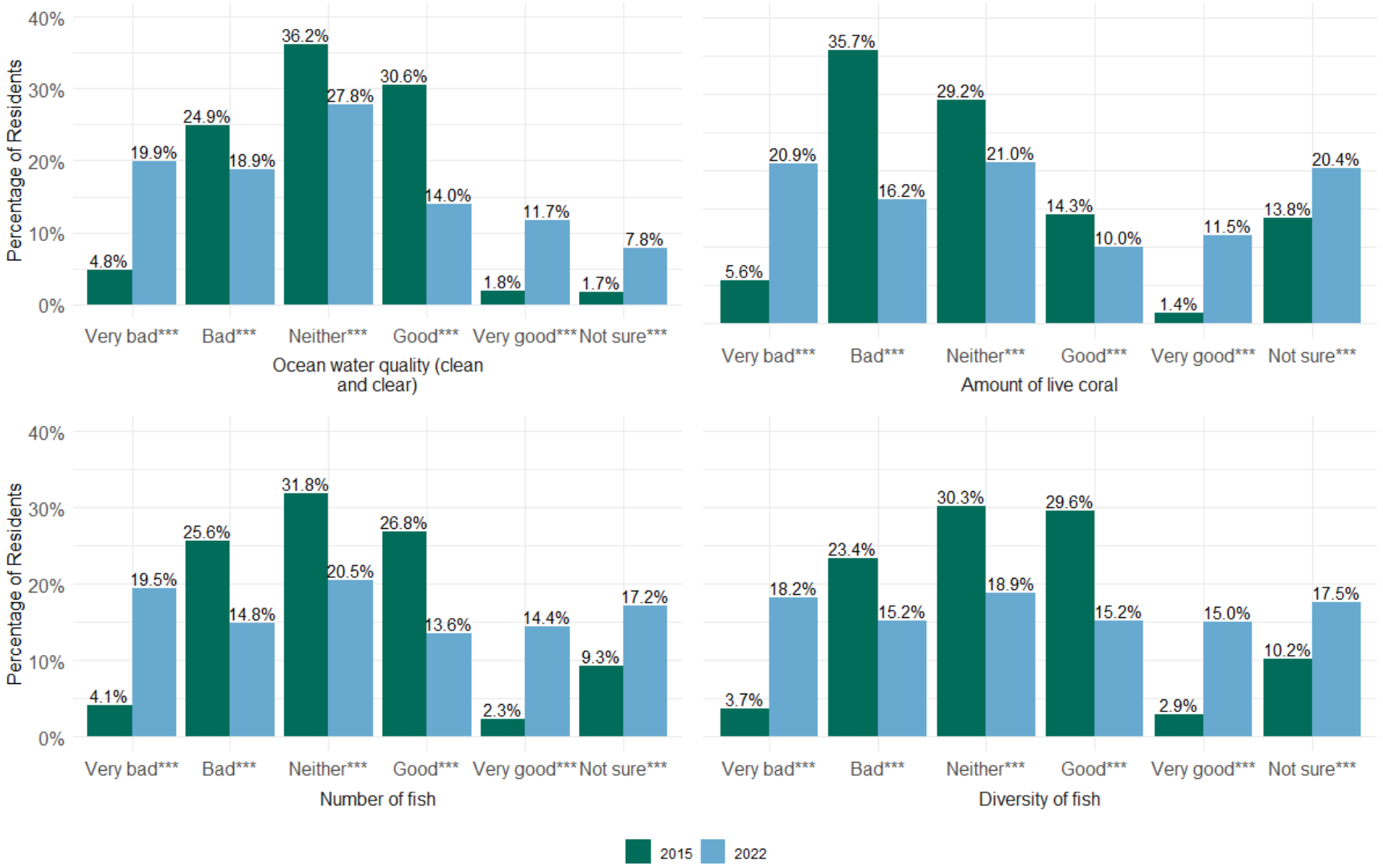

Figure 27: Resident perceptions of current resource conditions in 2015 and 2022.

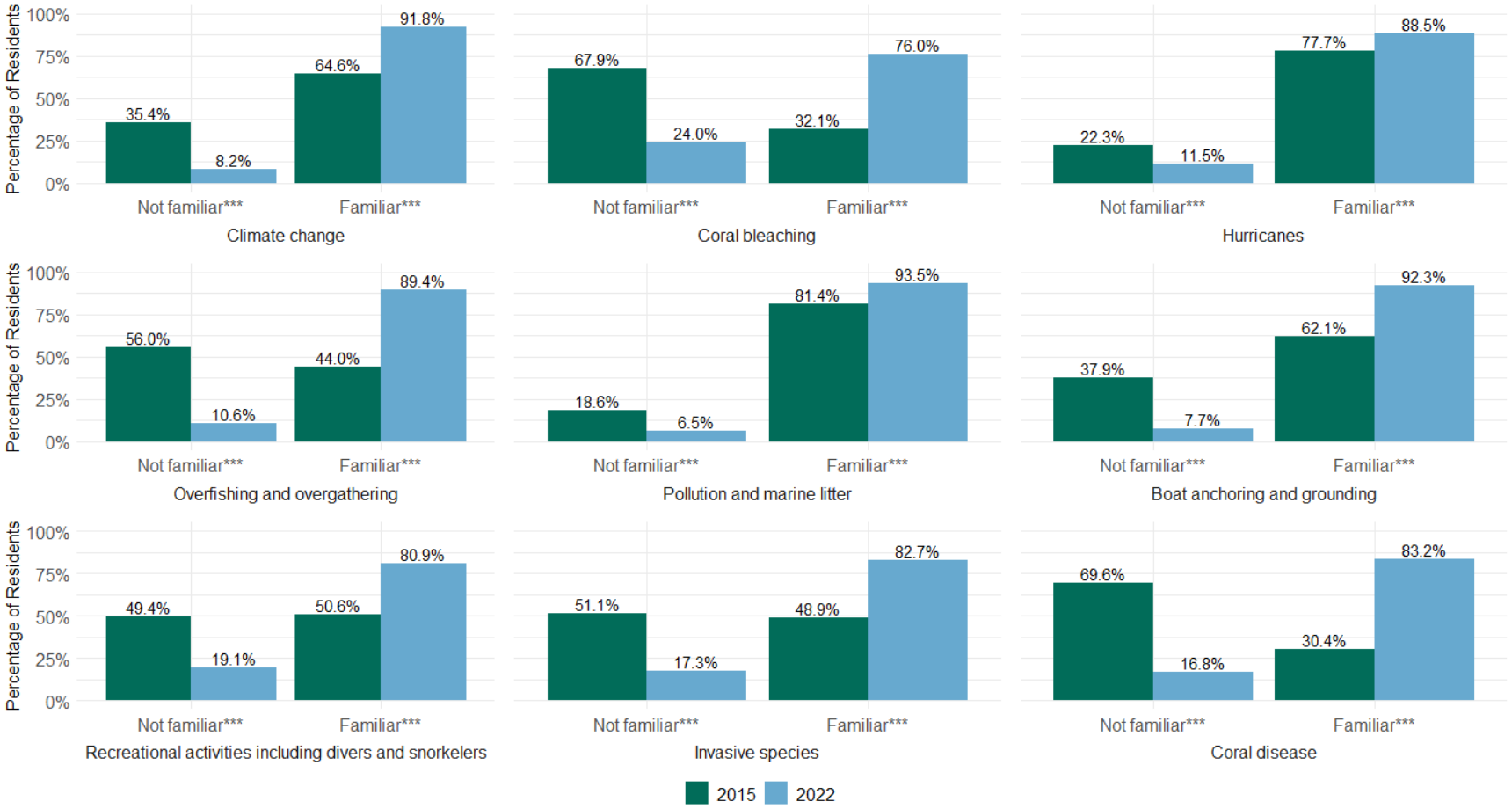

Figure 28: Residents' familiarity of coral reef threats in 2015 and 2022.

5.5 Attitudes toward coral reef management strategies

Between 2015 and 2022, the percentage of residents who were familiar with marine protected areas increased by 49.4% (Figure 29). In both surveys, a marine protected area was defined as "an area of the ocean where particular human activities are restricted to protect living, non-living, cultural, and/or historic resources."

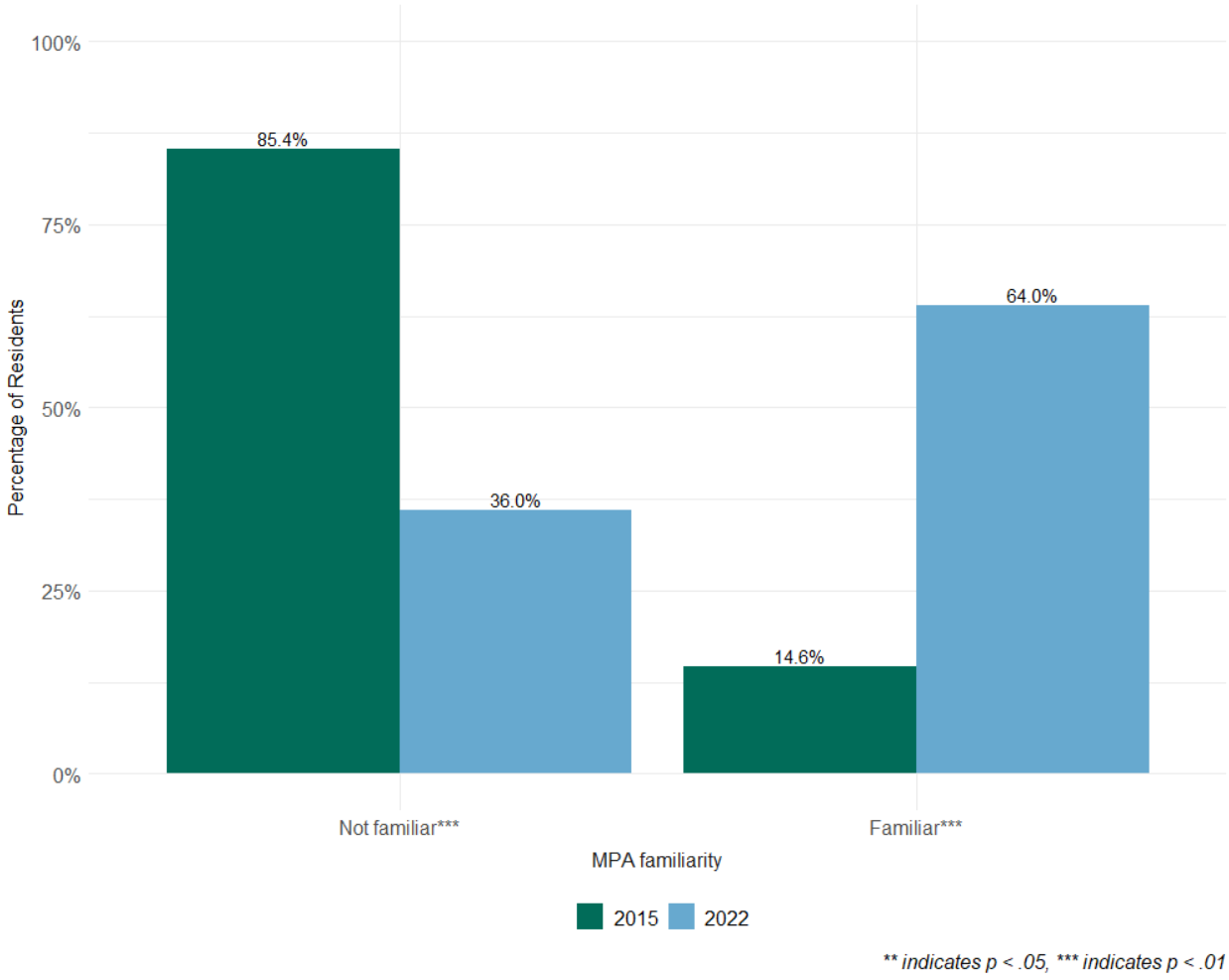

Figure 29: Residents' familiarity of Marine Protected Areas in 2015 and 2022.

Four statements rated by residents in 2015 and 2022 on the impact of MPAs on coral reefs were examined, but no statistical comparisons were made due to differences in survey questions and scales (Figure 30). Between 2015 and 2022, most Puerto Rican residents believed that MPAs improved the protection of coral reefs, the number of fish, and tourism in the jurisdiction. However, in both years, there was less agreement about the impacts of MPAs to fishermen's livelihoods or fishery-based economy.

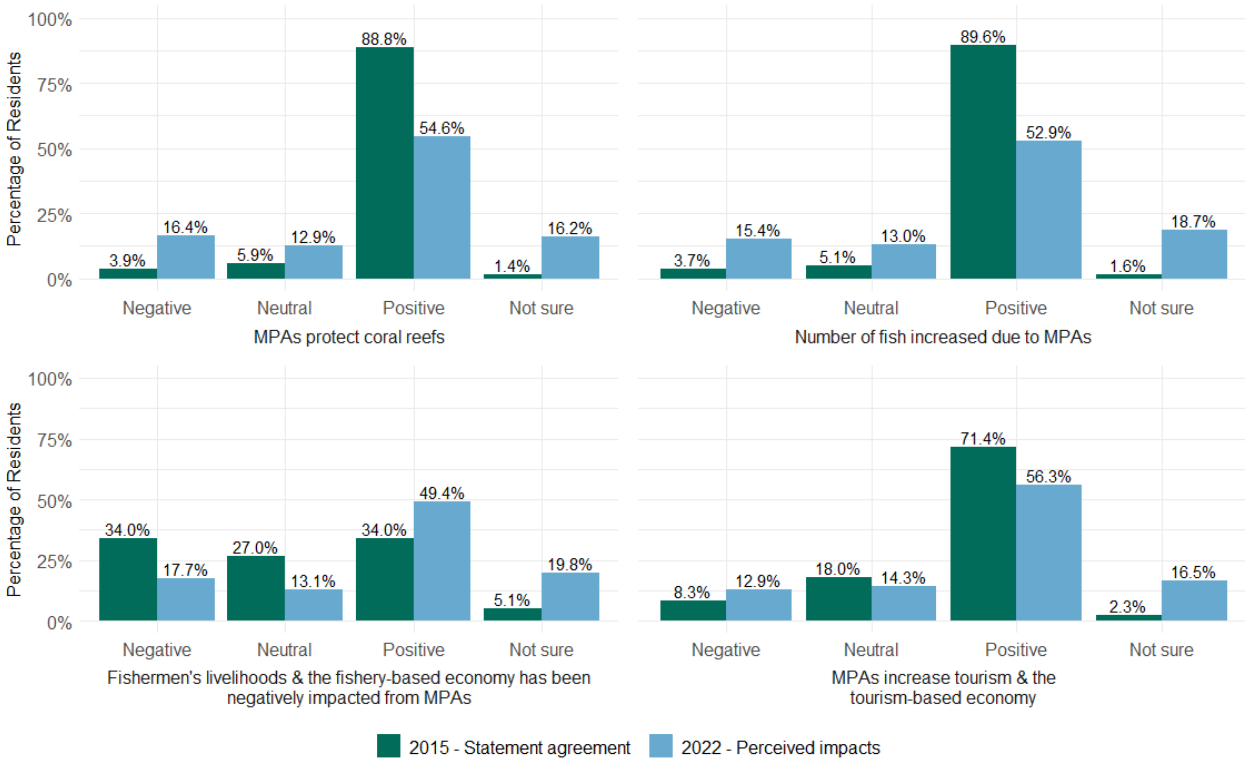

Figure 30: Residents' perceptions of Marine Protected Area impacts in 2015 and 2022.

Residents' attitudes toward establishing new catch limits per person for certain species, increasing law enforcement surveillance efforts, restricting sources of pollution, and encouraging community participation in management were included in both the 2015 and 2022 surveys, and there were statistically significant differences in the results (Figure 31). The percentage of residents who strongly supported these four management strategies significantly increased in 2022.

Puerto Rico coastline. Photo credit: Seann Regan.

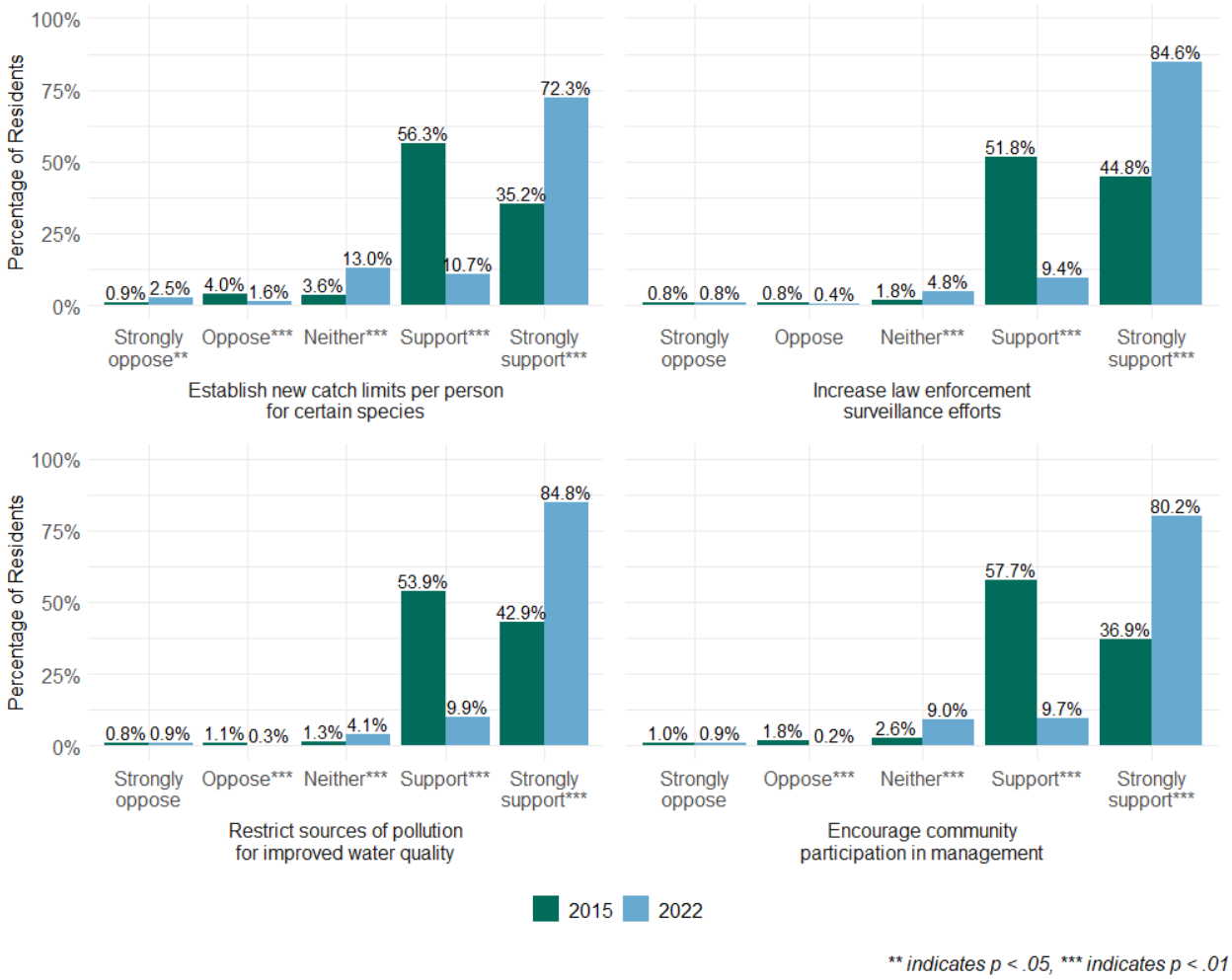

Figure 31: Residents' support for management strategies in 2015 and 2022.

6. Discussion

The results from the 2022 NCRMP socioeconomic survey can inform important management decisions related to residents' coral reef behaviors, perceptions, beliefs, and attitudes toward coral reef management strategies in Puerto Rico. Based on the survey findings, some general inferences about the population of Puerto Rico in 2022 and their interactions with coral reefs are evident. Notable changes or similarities between 2015 and 2022 are also discussed. This report concludes with recommendations for future research and monitoring.

Participation in coral reef activities

Beach recreation and swimming/wading were primary activities for Puerto Rico residents in both 2015 and 2022, but frequency of participation declined in 2022. In general, participation in marine-based activities, such as diving and snorkeling, was not common among residents. Declining participation rates in 2022 may have been influenced by COVID-19 restrictions or

precautions such as social distancing and stay-at-home measures. Activity participation may have also been interrupted by Hurricane Fiona during the data collection period in September 2022. Sustained access to activities and the quality of those experiences are linked to ecosystem conditions and perceptions of resource quality (Manning 1999). Beach recreation, for instance, is most directly linked to coral reefs through the protection of beaches from erosion due to storm events (Shivlani et al. 2003). Swimming and wading depend on ocean water quality for public health and safety, aesthetics, and other benefits, but may also impact the health of corals by introducing toxic sunscreen residues or other transferable chemicals.

Importance of coral reefs

The majority of residents recognized that coral reefs provide a variety of ecosystem services to Puerto Rico. There was general consensus that coral reefs are important for protection from natural disasters, seafood, tourism, fisheries, human health, and livelihoods in Puerto Rico.

Residents also believed that *coral reefs are important to local culture, notably cultural beliefs and establishing or maintaining social relationships.* For example, while participation in fishing was generally low, some residents fished to maintain traditional practices or to feed themselves and/or their community. Most resident households consumed seafood in at least some of their meals, and almost half of those residents ate seafood from local coral reefs throughout the year. These findings, along with other studies, suggest an important cultural context of fishing in sustaining ties within the community, cultural identity, and food traditions (Griffith et al. 2013), and underscore the need for sustainable management of coral reef fisheries.

Perceived resource conditions

In 2022, residents were more likely to *perceive the conditions of ocean water quality, amount of live coral, diversity of live coral, amount of fish, and diversity of fish as being somewhat or very bad*, and most residents believed that resource conditions would become worse in the future. These five marine resource conditions were rated as being extremely important to residents' quality of life, and the diversity of corals and fish were particularly important to residents who lived in coastal regions. These findings can be further understood in conjunction with the biophysical conditions observed. For instance, NCRMP biological monitoring indicates that the diversity of fish populations is in critical condition and this observation is consistent with residents' perceptions (Grove et al. 2023; NOAA CRCP 2020). Negative perceptions of ocean water quality have important implications to public health and safety messaging considering swimming/wading and beach recreation were primary activities for residents. Poor water quality also has an adverse effect on coral conditions as well as the availability of fishery and marine resources that residents rely on for subsistence or cultural purposes.

There were some differences in perceptions based on region of residence. Perceptions of resource conditions were slightly more negative among residents in the coastal south and inland regions than they were in the north. This is an interesting finding as the northern region includes

San Juan, which is a highly populated and urbanized municipality, and nearby coral reefs are susceptible to degradation from anthropogenic factors.

Awareness of threats to coral reefs

Residents recognized a variety of threats to coral reefs and believed that *pollution, marine litter, climate change, and lack of regulation enforcement were the most severe issues*. Coral disease, coral bleaching, and ocean acidification were also recognized as threats, but residents were least familiar with these topics and more uncertain about the severity of these issues. This is a particularly important finding considering the ongoing spread of stony coral tissue loss disease, prevalence of coral bleaching events, and declines in coral cover throughout the Caribbean (Grove et al. 2023). Furthermore, awareness of ocean acidification has been low nationwide (The Ocean Project 2012; Mossler et al. 2017; Cooke and Kim 2019), so more communication and outreach is needed to enhance public awareness of climate change impacts, and how these issues threaten not only coral reefs, but also the quality of lives in Puerto Rico.

Attitudes toward coral reef management strategies

The majority of residents were aware of marine protected areas (MPAs) or natural reserves in Puerto Rico. Residents generally *believed that the establishment of MPAs had led to improved benefits for coral reefs and coastal communities* such as improvements for tourism, protection of coral reefs, amount of fish, and food for coastal communities. The importance of these ecosystem services to residents and their beliefs that MPAs lead to improvements in these services are consistent with residents' support for MPAs. However, there were some negative perceptions and uncertainty about the impact of MPAs to the fishery-based economy. Some residents also thought that MPAs had no effect on peoples' livelihoods, but over 50% of residents in the coastal south indicated their livelihoods had improved. Varying perceptions may be due to residents' proximity to the location of MPAs or how they are differentially impacted by MPA regulations (Bennett et al. 2019).

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 for stricter control of pollution sources, increasing law enforcement surveillance, implementing new requirements for improved wastewater treatment, and encouraging community participation in marine resource management*. The latter strategy, community participation, is particularly important to fostering trust in management and ensuring fair decision-making processes and more equitable management outcomes (Bennett et al. 2019; Loomis et al. 2019).

Support for these management strategies is also consistent with residents' values and perceptions of resource conditions and threats to reefs. The findings suggest that Puerto Rico residents want to see efforts to mitigate threats to coral reefs (e.g., restricting sources of pollution) and prevent resource conditions (i.e., ocean water quality, live coral, fish) from becoming worse. Additional

management strategies that are supported by residents could be taken to help maintain or improve resource conditions.

Conservation Behaviors

Over 85% of residents believed that it is extremely important for Puerto Rico residents to engage in activities that help protect coral reefs. Residents indicated several conservation actions they are taking, such as reducing household electricity use or using fewer single use products. However, there are also barriers to participating in conservation or restoration activities, including a lack of opportunity, high cost, inconvenience, and lack of awareness or knowledge of how to take such actions. An example of how barriers can start be overcome is in a recent program through which the Puerto Rico government has provided funding for solar panels in homes. While this survey found relatively low use of solar panels, this finding has likely changed since this program was implemented.

Most residents believed that it is unacceptable to do certain behaviors around coral reefs, such as discharging pollutants into seawater, operating a boat in a shallow reef area, or fishing in no-take areas. This suggests that residents are aware of appropriate coral reef conduct that is consistent with the rules and regulations, but more outreach may be needed on appropriate human-wildlife interactions (e.g., feeding fish, birds, or marine mammals; taking seashells or coral from reefs), as these were found to be more acceptable.

Future research and monitoring

There were a few lessons learned from the second NCRMP socioeconomic data collection in Puerto Rico related to the sampling design, data collection, and analysis. The 2022 data collection made improvements to the sampling design by stratifying the jurisdiction into the coastal north, inland, and coastal south regions, and also attempted to sample the island areas of Culebra and Vieques. This design allowed for data to be representative at a finer scale than the jurisdiction-wide approach used in 2015. However, impacts from Hurricane Fiona caused the sampling period to end earlier than planned resulting in insufficient samples from Culebra and Vieques, and incomplete coverage in the western region of Puerto Rico. Despite this premature stop to data collection, the survey responses from each stratum (except the island areas) were sufficient to ensure a 95% confidence interval and under a 5% margin of error.

Future monitoring cycles should avoid data collection during hurricane season as much as possible and continue following a stratified sampling design that allows for a stronger and more representative sample of residents. Future monitoring should consider increasing the sampling resolution in order to better understand diverse sub-populations and spatial patterns in Puerto Rico and expand how NCRMP socioeconomic data can be used to inform management decisions. It is also important that nonresponse data are collected to determine more accurate response rates and representation of the data. This was a limitation of the first and second cycles of data collection.

As NCRMP is a national monitoring program with the goal of measuring 13 socioeconomic indicators over time, there is limited ability to change the survey instrument. However, future complementary research could ask about the impacts of coral reef threats on particular resource conditions, and further analysis could examine the links between residents' awareness of threats and their perceptions of resource change. Related, additional studies could examine climate literacy, social vulnerability, adaptation, and community resiliency to climate change issues. Additional analyses or studies could also examine how level of support and perceived benefits of MPAs vary by stakeholder group (such as those who fish), as well as the preferences of those groups for different management strategies and regulations. This would inform the tradeoffs between resource protection and use, and has implications for social justice and equity, effective governance, and the success of marine conservation management actions (Loomis et al. 2019).

NCRMP's Socioeconomic Component continues to collaborate with the biological and climate NCRMP teams 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 biophysical data can reveal gaps between residents' perceptions of resources and patterns observed in fisheries, benthic, and climate data. Future analyses could examine how differing perceptions of coral reef health by region may correlate with differences in biophysical conditions. Integration of socioeconomic, biological, and climate NCRMP data provides a more 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 better science-based resource management decision making.

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Appendix A: 2022 Survey Instrument

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

Survey administered in: English or Spanish
Idioma de la encuesta (encierre con un círculo una de las opciones): inglés o español

[SCRIPT 1] Hello, my name is _____ and I am working on behalf of the National Oceanic and Atmospheric Administration (NOAA). NOAA's National Coral Reef Monitoring Program is conducting surveys with residents of {jurisdiction} to learn how people interact with coral reefs and how perceptions of coral reef conditions in {jurisdiction} are changing over time. The information collected will be used to help management better serve local communities. Your household was randomly selected to participate in this survey.

[GUIÓN 1] Hola, mi nombre es _____ y estoy trabajando con la Oficina Nacional de Administración Oceánica y Atmosférica (NOAA, por su sigla en inglés). El Programa Nacional de Monitoreo de Arrecifes de Coral de NOAA está realizando encuestas con los residentes de Puerto Rico para aprender sobre cómo las personas interactúan con los arrecifes de coral y cómo sus percepciones sobre las condiciones de los arrecifes de coral en Puerto Rico están cambiando con el tiempo. La información recopilada se usará para ayudar a manejar mejor las comunidades locales. Su hogar fue seleccionado al azar para participar en esta encuesta.

S1. Just one person is needed to complete this survey. May I please speak to the person 18 or older in your household who has had the most recent birthday? (Note: If selected person is not available, choose the next eligible person available). *Sólo se necesita una persona para completar esta encuesta. ¿Puedo hablar con una persona mayor de 18 años de edad que haya cumplido años más recientemente? (Nota: Si la persona seleccionada no está disponible, elija la siguiente persona elegible que esté disponible).*

- The person who answered the door is eligible *La persona que abrió la puerta es elegible* > Continue to SCRIPT 2 *Proceda al guión 2*
- New individual comes to the door *Otra persona se acerca a la puerta* > Re-read SCRIPT 1 with new individual, then proceed to SCRIPT 2 *Repita el guión 1 con el nuevo individuo, luego proceda al guión 2*
- No eligible persons available *No hay personas elegibles disponibles* > Proceed with "not available" protocol, thank the current individual, and end survey *Proceda con el protocolo de "no disponible", agradezca al individuo presente y culmine la encuesta*
- The person declines *La persona se niega* > Proceed with NR1 *Proceda con NR1*

[SCRIPT 2] The survey should take no more than 20 minutes to complete. Your participation is voluntary, but is very important to the success of this study. You may skip any of the questions or stop the survey at any time. All information you provide is confidential. Your name and address will never be identified or associated with the results.

[GUIÓN 2] La encuesta debe tomar un máximo de 20 minutos en completarse. Su participación es voluntaria, pero es muy importante para el éxito de este estudio. Puede omitir cualquiera de las preguntas o detener la encuesta en cualquier momento. Toda la información que proporcione es confidencial. Su nombre y dirección nunca serán identificados ni relacionados con los resultados.

S2. Are you willing to participate in this survey? *¿Quiere participar en esta encuesta?*

- Yes (person agreed to be interviewed) *Sí (la persona aceptó ser entrevistada)* > Continue to S3 *Proceda al S3*
- No (person did not agree to be interviewed) *No (la persona no aceptó ser entrevistada)* > Proceed with nonresponse question NR1 *Proceda con la pregunta no respondida NR1*

S3: Do you live in Puerto Rico at least three months of the year? *¿Vive en Puerto Rico al menos tres meses al año?*

- Yes (the person lives here for at least 3 months a year) *Sí (la persona vive aquí al menos 3 meses por año)* > Start survey *Comience encuesta*
- No (the person does not live here for at least 3 months a year) *No (la persona no vive aquí al menos 3 meses por año)* > End survey *Culmine encuesta*

NR1. Are there any particular reasons why you would prefer not to participate in the survey that you would be willing to share? *¿Existe alguna razón en particular por la que preferiría no participar en la encuesta que estarías dispuesto a compartir?*

- Yes *Sí* > Allow respondent to comment and record reasons in NR2 *Permita al respondiente comentar y anote las razones en NR2*
- No *No* > Thank the individual and end survey *Agradezca al individuo y culmine la encuesta*

NR2. [For Interviewer] Did the respondent make any of the following comments, whether or not these exact words were used? (Check all that apply). *[Para el encuestador] ¿El/la encuestado/a hizo alguno de los siguientes comentarios (ya sea que se usaron estas mismas palabras o no)? (Marque todas las opciones que correspondan).*

- I'm TOO BUSY/I don't have time (If this is a reason, ask for a convenient time to interview) *Estoy DEMASIADO/A OCUPADO/A No tengo tiempo (Si esta es una razón presentada, pregunte por un momento conveniente para la entrevista)*
- I DO NOT LIKE surveys *NO ME GUSTAN las encuestas*
- I am NOT INTERESTED *NO ME INTERESA ESTE TEMA*
- Surveys are a WASTE OF TIME *Las encuestas son una PÉRDIDA DE TIEMPO*
- I DON'T TRUST surveys *NO CONFÍO EN las encuestas*
- Surveys are an INVASION OF PRIVACY *Las encuestas son una INVASIÓN DE LA PRIVACIDAD*
- Unfavorable PAST EXPERIENCE with surveys *EXPERIENCIA PREVIA desfavorable con encuesta*
- Other reason *Otra razón*

NR3. [For Interviewer] Please record the following observations during your interaction with the respondent. *[Para el encuestador] Por favor documente las siguientes observaciones durante su interacción con el/la encuestado/a.*

- Gender of respondent: ____Male/*Masculino* ____Female/*Femenino*
- Age/*Edad*: ____18-29 ____30-49 ____50-69 ____70+
- Race/*Raza*: (add check all that apply options from Q28a and b)
- Presence of children in household *Presencia de niños/as en el hogar*: _yes _no _not sure

PARTICIPATION IN REEF ACTIVITIES
PARTICIPACIÓN EN ACTIVIDADES EN LOS ARRECIFES

[SCRIPT] In this first section, we would like to understand your coastal and marine-based activities in Puerto Rico. *[GUIÓN] En esta primera sección, nos gustaría comprender las actividades costeras y marinas que usted realiza en Puerto Rico.*

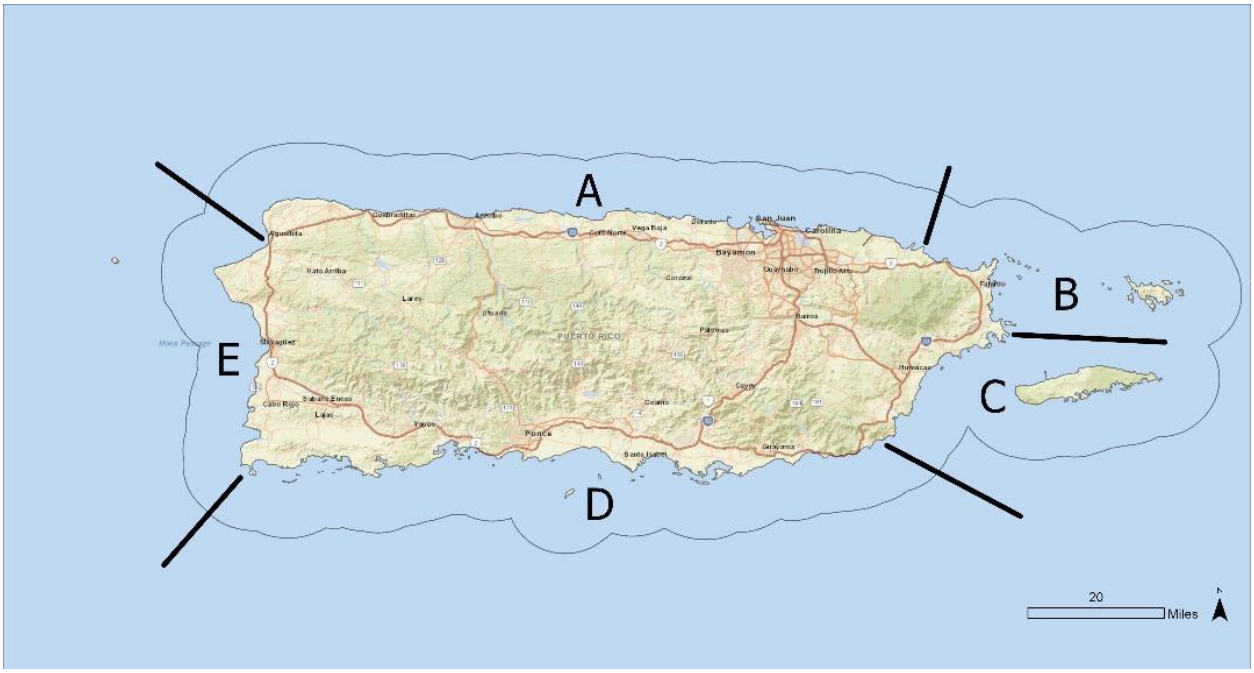
1. **In the past 12 months, how many days did you participate in each of the following activities in Puerto Rico? Please answer "0" if you did not participate in the activity.**
   En los últimos 12 meses, ¿cuántos días participó en cada una de las siguientes actividades en Puerto Rico? Responda «0» si no participó en la actividad.

	Number of days *Cantidad de días*
Swimming or wading/*Nadar o cruzar*	
Snorkeling/*Esnórqueling (buceo de superficie)*	
SCUBA diving/*Buceo*	
Free diving/*Buceo a pulmón (buceo libre)*	
Waterside/beach camping/*Acampar al lado del agua/en la playa*	
Beach recreation (beach sports, picnics, etc.)/*Actividades recreativas en la playa (deportes de playa, pícnic, etc.)*	
Boating (sail, motor, jet ski)/*Navegar (bote de vela, lancha a motor, motora acuática o "jet ski")*	
Paddling activities (kayaking, stand up paddle boarding)/*Actividades de remo (kayak, table a remos o "paddle board")*	
Surfing	
Fishing (including spearfishing)/*Pesca (incluyendo pesca con arpón)*	
Gathering of marine resources (lobsters, conch, octopus, seaweed, shells, etc.)/ *Recolectar recursos marinos (langostas, carrucho, pulpos, algas, conchas, etc.)*	

SKIP LOGIC: IF RESPONDENT DID NOT PARTICIPATE IN ANY ACTIVITIES (0 DAYS FOR ALL), SKIP TO Q4.

2. **Please look at the map of Puerto Rico and the boundaries of each zone. For each activity, in which zone did you most often participate? *Observe el mapa de Puerto Rico y los límites de cada zona. Para cada actividad, ¿en qué zona participó con más frecuencia?***

   (SHOW RESPONDENT APPROPRIATE MAP)
   (MUÉSTRELE EL MAPA CORRESPONDIENTE AL ENCUESTADO)



	Zone A	Zone B	Zone C	Zone D	Zone E	Not sure
[ASK IF POSITIVE VALUE IN Q1] Swimming or wading/*Nadar o cruzar*						
[ASK IF POSITIVE VALUE IN Q1] Snorkeling/*Esnórqueling (buceo de superficie)*						
[ASK IF POSITIVE VALUE IN Q1] SCUBA diving/*Buceo*						
[ASK IF POSITIVE VALUE IN Q1] Free diving/*Buceo a pulmón (buceo libre)*						
[ASK IF POSITIVE VALUE IN Q1] Waterside/beach camping /*Acampar al lado del agua/en la playa*						
[ASK IF POSITIVE VALUE IN Q1] Beach recreation (beach sports, picnics, etc.)/*Actividades recreativas en la playa (deportes de playa, pícnic, etc.)*						
[ASK IF POSITIVE VALUE IN Q1] Boating (sail, motor, jet ski)/*Navegar (bote de vela, lancha a motor, motora acuática o "jet ski")*						
[ASK IF POSITIVE VALUE IN Q1] Paddling activities (kayaking, stand up paddle boarding)/*Actividades de remo (kayak, table a remos o "paddle board")*						
[ASK IF POSITIVE VALUE IN Q1] Surfing						
[ASK IF POSITIVE VALUE IN Q1] Fishing (including spearfishing)/*Pesca (incluyendo pesca con arpón)*						
[ASK IF POSITIVE VALUE IN Q1] Gathering of marine resources (lobsters, conch, octopus, seaweed, shells, etc.)/ *Recolectar recursos marinos (langostas, carrucho, pulpos, algas, conchas, etc.)*						

SKIP LOGIC: IF RESPONDENT DID NOT PARTICIPATE IN 'FISHING' OR 'GATHERING' in Q1, SKIP TO Q4.

3. Which of the following best describes your primary motivation for fishing and gathering? (Choose one). *¿Cuál de las siguientes opciones describe mejor su principal motivación para pescar y recolectar? (Seleccione solo una).*

1. Recreational: I fish primarily for sport or pleasure, but may also sell a few fish.
   Recreativa: Pesco principalmente por deporte o por placer, pero es posible que también venda algunos peces.
2. Subsistence: I fish primarily to catch fish to feed myself, my family, and/or my community.
   Subsistencia: Pesco principalmente para atrapar peces para alimentarme a mí mismo, a mi familia o a mi comunidad.
3. Commercial: I fish primarily for some or all of the money I make in one year.
   Comercial: Pesco principalmente para obtener una parte o la totalidad del dinero que gano en un año.
4. Cultural: I fish primarily to keep traditional practices alive.
   Cultural: Pesco principalmente para mantener vivas las prácticas tradicionales.

IMPORTANCE OF CORAL REEFS
IMPORTANCIA DE LOS ARRECIFES DE CORAL

[SCRIPT] For the next several questions, we would like to understand your household's reliance on seafood and the cultural importance of coral reefs in Puerto Rico. *[GUION] En las próximas preguntas, nos gustaría entender la dependencia alimenticia de su familia a pescados y mariscos, y también la importancia cultural de los arrecifes de coral en Puerto Rico.*

4. On average, how many of the meals eaten within your household contain seafood? – INTERVIEWER STATES SCALE. *En promedio, ¿cuántas de las comidas que se consumen en su hogar contienen pescados y mariscos? –ENCUESTADOR LEE LA ESCALA EN VOZ ALTA.*

None of the meals *Ninguna de las comidas* (0%)	Some of the meals *Algunas de las comidas* (1-33%)	Many of the meals *Muchas de las comidas* (34-66%)	Most of the meals *La mayoría de las comidas* (67-99%)	All of the meals *Todas* (100%)
1	2	3	4	5

SKIP LOGIC: IF 'NONE OF THE MEALS', SKIP TO Q6.

5. On average, how many of the meals eaten within your household contain seafood from local coral reefs in Puerto Rico? (Examples include reef fish such as parrotfish and hogfish, bottomfish such as snappers and groupers, and other shellfish and marine life that depend on coral reefs such as lobster, octopus, and conch. This does not include pelagic fish such as wahoo and mahi mahi.)
En promedio, ¿cuántas de las comidas que se consumen en su hogar contienen pescados y mariscos que provienen de los arrecifes de coral locales en Puerto Rico? (Los ejemplos incluyen peces de arrecife como el pez loro y el pez capitán, peces del fondo como pargos y meros y otros mariscos y especies marinas que dependen de los arrecifes de coral como langostas, pulpos y carruchos. Esto no incluye peces pelágicos como el peto y el dorado).

None of the meals *Ninguna de las comidas* (0%)	Some of the meals *Algunas de las comidas* (1-33%)	Many of the meals *Muchas de las comidas* (34-66%)	Most of the meals *La mayoría de las comidas* (67-99%)	All of the meals *Todas* (100%)
1	2	3	4	5

6. How important are coral reefs to each of the following in Puerto Rico? – INTERVIEWER REPEATS SCALE AS NEEDED. *¿Qué importancia tienen los arrecifes de coral para cada una de las siguientes en Puerto Rico? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO*.

	Not at all important *No es importante en lo absoluto*	Slightly *Levemente importante*	Somewhat *Algo importante*	Moderately *Moderada-mente importante*	Extremely *Muy importante*	Not Sure *No estoy seguro/a*
Culturally important events, such as feasts and ceremonies / *Eventos de importancia cultural, como fiestas y ceremonias*						
Establishing and maintaining cultural and familial ties / *Forjar y mantener lazos culturales y familiares*						
Ancestral connections / *Lazos ancestrales*						
Religious practices / *Prácticas religiosas*						
Local language (word choice, business and place names, etc.)/ *Idioma local (elección de palabras, nombres de negocios y de lugares, etc.)*						
Cultural folklore (beliefs, stories, etc.) / *Folclore cultural (creencias, historias, etc.)*						

PERCEIVED RESOURCE CONDITION
PERCEPCIÓN DEL ESTADO DE LOS RECURSOS

[SCRIPT] In the next few questions, you will be presented with a series of marine resources, and will be asked to rate how important they are to you, as well as their current conditions and how you think those conditions may change in the future. *[GUION] Para las próximas preguntas, le presentaremos una serie de recursos marinos, y le pediremos que califique cuán importantes son para usted. También le preguntaremos acerca de su condición actual y cómo cree usted que estas condiciones pueden cambiar en el futuro.*

7. How important are each of the following marine resources to your quality of life? – INTERVIEWER REPEATS SCALE AS NEEDED. *¿Qué importancia tienen cada uno de los siguientes recursos marinos para su calidad de vida? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO.*

	Not at all important *No es importante en lo absoluto*	Slightly *Levemente importante*	Somewhat *Algo importante*	Moderately *Moderada-mente importante*	Extremely *Muy importante*	Not Sure *No estoy seguro/a*
Ocean water quality (clean and clear) / *Calidad del agua de mar*						
Amount of live coral / *Cantidad de coral vivo*						
Amount of fish / *Cantidad de peces*						
Diversity of fish / *Variedad de peces*						

Diversity of corals / *Variedad de corales*						

8. How would you rate the current condition of each of the following marine resources in Puerto Rico? – INTERVIEWER REPEATS SCALE AS NEEDED. *¿Cómo calificaría la condición actual de cada uno de los siguientes recursos marinos en Puerto Rico? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO.*

	Very bad *Muy Mala*	Somewhat bad *Medianamente mala*	Neither bad nor good *Ni buena ni mala*	Somewhat good *Medianamente buena*	Very good *Muy Buena*	Not sure *No estoy seguro/a*
Ocean water quality (clean and clear) / *Calidad del agua de mar*						
Amount of live coral / *Cantidad de coral vivo*						
Amount of fish / *Cantidad de peces*						
Diversity of fish / *Variedad de peces*						
Diversity of corals / *Variedad de corales*						

9. Over the next 10 years, how do you think the condition of each of those same marine resources will change in Puerto Rico? – INTERVIEWER REPEATS SCALE AS NEEDED. *En los próximos 10 años, ¿cómo cree que cambiará la condición de cada uno de esos recursos marinos en Puerto Rico? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO*.

	Worsen greatly *Empeorará mucho*	Worsen somewhat *Empeorará medianamente*	No Change *No habrá cambio*	Improve somewhat *Mejorará medianamente*	Improve greatly *Mejorará mucho*	Not sure *No estoy seguro/a*
Ocean water quality (clean and clear) / *Calidad del agua de mar*						
Amount of live coral / *Cantidad de coral vivo*						
Amount of fish / *Cantidad de peces*						
Diversity of fish / *Variedad de peces*						
Diversity of corals / *Variedad de corales*						

AWARENESS AND KNOWLEDGE OF REEFS AND REEF THREATS
CONCIENCIA Y CONOCIMIENTO DE ARRECIFES Y AMENAZAS A LOS ARRECIFES

[SCRIPT] This next section will ask about reef awareness and importance in Puerto Rico. *[GUION] Esta próxima sección incluye preguntas acerca de su conocimiento sobre los arrecifes y su importancia en Puerto Rico.*

10. **How important are coral reefs in Puerto Rico to each of the following? -INTERVIEWER REPEATS SCALE AS NEEDED. *¿Qué importancia tienen los arrecifes de coral en Puerto Rico para cada una de los siguientes? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO.***

	Not at all important/ *No es importante en lo absoluto*	Slightly/ *Levemente importante*	Somewhat/ *Algo importante*	Moderately/ *Moderada-mente importante*	Extremely/ *Muy importante*	Not Sure/ *No estoy seguro/a*
Protection from natural disasters / *Protección contra desastres naturales*						
Outdoor recreation / *Recreación al aire libre*						
Food for coastal communities / *Alimento para comunidades costeras*						
Tourism-based economy / *Economía turística*						
Fishery-based economy/ *Economía pesquera*						
Your livelihood / *Su sustento*						
Human health / *Salud pública/humana*						

11. **Which of the following do you believe are threats to coral reefs in Puerto Rico? Please indicate:**
¿Cuáles de las siguientes considera que son amenazas para los arrecifes de coral en Puerto Rico? Indique:
YES – this is a threat to coral reefs; *SÍ, esta es una amenaza para los arrecifes de coral;*
NO – this is not a threat to coral reefs; *NO, esta no es una amenaza para los arrecifes de coral;*
NOT SURE – I have heard of this, but I am not sure if it is a threat to coral reefs; *NO ESTOY SEGURO/A - He oído hablar de esto, pero no estoy seguro/a si es una amenaza para los arrecifes de coral;*
NOT FAMILIAR – I have never heard of this term. *NO ESTOY FAMILIARIZADO/A: nunca he oído hablar de este término.*

	Yes *Sí*	No *No*	Not sure *No Estoy seguro/a*	Not familiar *No estoy familiarizado/a*
Climate change / *Cambio climático*				
Coral bleaching / *Blanqueamiento de corales*				
Hurricanes / *Huracanes*				
Pollution from stormwater, wastewater, and chemical runoff / *Contaminación por aguas pluviales, aguas residuales y escorrentías de sustancias químicas*				
Marine litter / *Desechos marinos*				
Invasive species / *Especies invasivas*				

Overfishing and overgathering / *Sobrepesca y sobrerrecolección*				
Boat anchoring and grounding/ *Anclaje y encalladura de embarcaciones*				
Ocean Acidification / *Acidificación oceánica*				
Divers and snorkelers / *Aficionados al buceo a pulmón y buceo de superficie (esnórquel)*				
Coral disease/ *Enfermedad de los corales*				
Lack of regulation enforcement / *Falta de mecanismos que aseguren el cumplimiento de las leyes*				

SKIP LOGIC: IF 'YES' TO ANY ITEM, ASK ABOUT EACH ITEM IN Q12. IF 'NO', 'NOT SURE', OR 'NOT FAMILIAR' WITH ALL ITEMS, SKIP TO Q13

12. How severe are each of the following threats to coral reefs in Puerto Rico? –INTERVIEWER REPEATS SCALE AS NEEDED. *¿Qué tan graves son las siguientes amenazas para los arrecifes de coral en Puerto Rico? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO.*

	Minor threat *Amenaza menor*	Moderate threat *Amenaza moderada*	Major threat *Amenaza mayor*	Severe threat *Amenaza grave*	Not sure *No estoy seguro/a*
[ASK IF 'YES' IN Q11] Climate change / *Cambio climático*					
[ASK IF 'YES' IN Q11] Coral bleaching / *Blanqueamiento de corales*					
[ASK IF 'YES' IN Q11] Hurricanes / *Huracanes*					
[ASK IF 'YES' IN Q11] Pollution from stormwater, wastewater, and chemical runoff / *Contaminación por aguas pluviales, aguas residuales y escorrentías de sustancias químicas*					
[ASK IF 'YES' IN Q11] Marine litter / *Desechos marinos*					
[ASK IF 'YES' IN Q11] Invasive species / *Especies invasivas*					
[ASK IF 'YES' IN Q11] Overfishing and overgathering / *Sobrepesca y sobrerrecolección*					
[ASK IF 'YES' IN Q11] Boat anchoring and grounding/ *Anclaje y encalladura de embarcaciones*					
[ASK IF 'YES' IN Q11] Ocean Acidification / *Acidificación oceánica*					
[ASK IF 'YES' IN Q11] Divers and snorkelers / *Aficionados al buceo a pulmón y buceo de superficie (esnórquel)*					
[ASK IF 'YES' IN Q11] Coral disease/ *Enfermedad de los corales*					
[ASK IF 'YES' IN Q11] Lack of regulation enforcement / *Falta de mecanismos que aseguren el cumplimiento de las leyes*					

ATTITUDES TOWARDS CORAL REEF MANAGEMENT STRATEGIES
ACTITUDES HACIA LAS ESTRATEGIAS DE MANEJO DE LOS ARRECIFES DE CORAL

[SCRIPT] There are many different management strategies for protecting coral reefs in Puerto Rico. In the next few questions, we are interested in your opinions on some of these strategies. *[GUION] Existen muchas y diversas estrategias de manejo distintas para proteger los arrecifes de coral en Puerto Rico. En las preguntas siguientes, nos interesa conocer sus opiniones sobre algunas de estas estrategias.*

13. A Marine Protected Area (MPA) or natural reserve is an area of the ocean where particular human activities are restricted to protect living, non-living, cultural, and/or historic resources. Before today, were you aware of existing MPAs or natural reserves in Puerto Rico?
Un Área Marina Protegida (AMP) o reserva natural es un área del océano donde determinadas actividades humanas están restringidas para proteger a los recursos vivos, no vivos, culturales o históricos. Antes de hoy, ¿estabas al tanto de las AMP o reservas naturales existentes en Puerto Rico?

1. Yes/*Sí* (*IF* Yes/*Sí, GO TO Q14*)
2. No/*No* (*IF NO, SKIP TO Q15*)

14. How do you think the establishment of Marine Protected Areas (MPAs) or natural reserves impacted the following in Puerto Rico? – INTERVIEWER REPEATS SCALE AS NEEDED.
¿Qué impacto crees que tuvo la creación de las Áreas Marina Protegida (AMP) o reservas naturales en los siguientes aspectos en Puerto Rico? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO.

	Worsened greatly *Empeoró mucho*	Worsened somewhat *Empeoró medianamente*	No effect *No tuvo ningún impacto*	Improved somewhat *Mejoró medianamente*	Improved greatly *Mejoró mucho*	Not sure *No estoy seguro/a*
Protection of coral reefs / *Protección de los arrecifes de corales*						
Amount of fish / *Cantidad de peces*						
Tourism-based economy / *Economía turística*						
Fishery-based economy / *Economía pesquera*						
Your livelihood / *Su sustento*						
Outdoor recreation / *Recreación al aire libre*						
Food for coastal communities / *Alimento para comunidades costeras*						
Human health / *Salud pública/humana*						

15. Next, how much do you oppose or support each of the following management strategies in Puerto Rico? – INTERVIEWER REPEATS SCALE AS NEEDED. *A continuación, ¿en qué medida se opone o apoya cada una de las siguientes estrategias de manejo en Puerto Rico? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO.*

	Strongly Oppose *Me opongo totalmente*	Somewhat oppose *Me opongo parcialmente*	Neutral *Soy neutral*	Somewhat support *Apoyo parcialmente*	Strongly Support *Apoyo totalmente*
Establish new catch limits per person for certain fish species / *Establecer nuevos límites de pesca por persona para determinadas especies de peces*					
Create new Marine Protected Areas (MPAs) or natural reserves / *Crear nuevas Áreas Marina Protegida (AMP) o reservas naturales*					
Establish new requirements for improved wastewater treatment / *Establecer nuevos requisitos para mejorar el tratamiento de las aguas residuales*					
Encourage community participation in the management of marine resources / *Fomentar la participación comunitaria en la gestión de los recursos marinos*					
Increase law enforcement surveillance efforts / *Incrementar los esfuerzos de vigilancia al cumplimiento de las leyes*					
Further restrict sources of pollution for improved water quality / *Restringir aún más las fuentes de contaminación para mejorar la calidad del agua*					
Restrict coastal development around Marine Protected Areas (MPAs) / *Restringir el desarrollo costero en las cercanías a las Áreas Marina Protegida (AMP)*					

PARTICIPATION IN BEHAVIORS THAT MAY IMPROVE CORAL HEALTH
PARTICIPACIÓN EN COMPORTAMIENTOS QUE PUEDEN MEJORAR LA SALUD DE LOS ARRECIFES DE CORAL

[SCRIPT] Now, we'll talk about some activities that can help protect coral reef ecosystems in Puerto Rico.
[GUION] Ahora hablaremos sobre las actividades que pueden ayudar a proteger los ecosistemas de los arrecifes de coral en Puerto Rico.

16. How important is it for Puerto Rico residents to engage in activities that help to protect coral reefs? *¿Qué tan importante es para los residentes de Puerto Rico participar en actividades que ayuden a proteger los arrecifes de coral?*

Not at all important *No es importante en lo absoluto*	Slightly important *Levemente Importante*	Somewhat important *Algo importante*	Moderately important *Moderadamente Importante*	Very important *Muy Importante*
1	2	3	4	5

17. Which of the following do you do routinely (whenever possible)?
¿Cuál de las siguientes actividades realiza habitualmente (siempre que sea posible)?

	Yes/*Sí*	No
Reduce household water use / *Reducir el consumo de agua en el hogar*		
Reduce household electricity use / *Reducir el consumo de electricidad en el hogar*		

Compost / *Compostaje*		
Recycle / *Reciclar*		
Use reef-safe forms of sun protection / *Utilizar protección solar segura para los arrecifes*		
Promote environmentally responsible practices with others / *Promover prácticas ambientalmente responsables con los demás*		
Minimize fuel consumption / *Minimizar el consumo de combustible*		
Use fewer single use products (plastic bags or cups, Styrofoam, etc.) / *Usar menos productos de un solo uso (bolsas o vasos de plástico, espuma de poliestireno, etc.)*		

SKIP PATTERN: IF 'YES' FOR ALL ITEMS, SKIP TO Q19. IF 'NO' FOR ANY ITEM, ASK ABOUT EACH ITEM IN Q18.

18. Which of the following are reasons why you do not engage in those activities routinely? (Check all that apply). *¿Cuál de las siguientes actividades realiza habitualmente (siempre que sea posible)?*

	I do not know how *No sé cómo*	It is not convenient *No es conveniente*	It is too expensive *Es muy costoso*	I have not had the opportunity to do so *No he tenido la oportunidad de hacerlo*	None of these reasons *Ninguna de estas razones*
[ASK IF 'NO' IN Q17] Reduce household water use / *Reducir el consumo de agua en el hogar*					
[ASK IF 'NO' IN Q17] Reduce household electricity use / *Reducir el consumo de electricidad en el hogar*					
[ASK IF 'NO' IN Q17] Compost / *Compostaje*					
[ASK IF 'NO' IN Q17] Recycle / *Reciclar*					
[ASK IF 'NO' IN Q17] Use reef-safe forms of sun protection / *Utilizar protección solar segura para los arrecifes*					
[ASK IF 'NO' IN Q17] Promote environmentally responsible practices with others / *Promover prácticas ambientalmente responsables con los demás*					
[ASK IF 'NO' IN Q17] Minimize fuel consumption / *Minimizar el consumo de combustible*					
[ASK IF 'NO' IN Q17] Use fewer single use products (plastic bags or straws, Styrofoam, etc.) / *Usar menos productos de un solo uso (bolsas o vasos de plástico,*					

19. In the past 12 months, have you done any of the following activities? *En los últimos 12 meses, ¿realizó alguna de las siguientes actividades?*

	Yes/*Sí*	No
Donated to an environmental cause / *Donó a una causa ambiental*		

Volunteered in a beach clean-up, citizen science effort, or other environmental effort / *Trabajó como voluntario en una limpieza de playa, esfuerzo de ciencia ciudadana u otro esfuerzo ambiental*		
Joined or renewed a membership in a conservation organization / *Se inscribió o renovó su membresía en una organización de conservación*		
Volunteered in environmental restoration activities / *Fue voluntario en actividades de restauración ambiental*		
Participated in environmental educational activities (webinars, trainings, etc.) / *Participó en actividades de educación ambiental (seminarios virtuales, capacitaciones, etc.)*		

SKIP PATTERN: IF 'YES' FOR ALL ITEMS, SKIP TO Q21. IF 'NO' FOR ANY ITEM, ASK ABOUT EACH ITEM IN Q20.

20. Which of the following are reasons why you have not engaged in any of those activities in the past 12 months? (Check all that apply). *¿Cuáles de las siguientes son razones por las que no realizó ninguna de esas actividades en los últimos 12 meses? (Marque todas las opciones que correspondan).*

	I do not know how *No sé cómo*	It is not convenient *No es conveniente*	It is too expensive *Es muy costoso*	I have not had the opportunity to do so *No he tenido la oportunidad de hacerlo*	None of these reasons *Ninguna de estas razones*
[ASK IF 'NO' IN Q19] Donated to an environmental cause / *Donó a una causa ambiental*					
[ASK IF 'NO' IN Q19] Volunteered in a beach clean-up, citizen science effort, or other environmental effort / *Trabajó como voluntario en una limpieza de playa, esfuerzo de ciencia ciudadana u otro esfuerzo ambiental*					
[ASK IF 'NO' IN Q19] Joined or renewed a membership in a conservation organization / *Se inscribió o renovó su membresía en una organización de conservación*					
[ASK IF 'NO' IN Q19] Volunteered in environmental restoration activities / *Fue voluntario en actividades de restauración ambiental*					
[ASK IF 'NO' IN Q19] Participated in environmental educational activities (webinars, trainings, etc.) / *Participó en actividades de educación ambiental (seminarios virtuales, capacitaciones, etc.)*					

21. In the past 5 years, have you done any of the following?
En los últimos 5 años, ¿realizó alguna de las siguientes actividades?

	Yes/*Sí*	No
Updated the septic or sewer system on my property / *Mejoré el sistema séptico o alcantarillado sanitario en mi propiedad*		
Installed water storage system (such as a tank or rain barrel) / *Instalé un sistema de almacenamiento de agua (como un tanque o un barril de lluvia)*		
Installed a solar energy system / *Instalé un sistema de energía solar*		

SKIP PATTERN: IF 'YES' FOR ALL ITEMS, SKIP TO Q23. IF 'NO' FOR ANY ITEM, ASK ABOUT EACH ITEM IN Q22.

22. Which of the following are reasons why you have not engaged in those activities? (Check all that apply). *¿Cuáles de las siguientes son razones por las que no participó en esas actividades? (Marque todas las opciones que correspondan).*

	I do not know how *No sé cómo*	It is not convenient *No es conveniente*	It is too expensive *Es muy costoso*	I have not had the opportunity to do so *No he tenido la oportunidad de hacerlo*	I am not allowed to *No está permitido*	None of these reasons *Ninguna de estas razones*
[ASK IF 'NO' IN Q21] Updated the septic or sewer system on my property / *Mejoré el sistema séptico o alcantarillado sanitario en mi propiedad*						
[ASK IF 'NO' IN Q21] Installed water storage system (such as a tank or rain barrel) / *Instalé un sistema de almacenamiento de agua (como un tanque o un barril de lluvia)*						
[ASK IF 'NO' IN Q21] Installed a solar energy system / *Instalé un sistema de energía solar*						

23. The rules and regulations surrounding coral reefs are sometimes misunderstood. How unacceptable or acceptable to you are each of the following practices in Puerto Rico?– INTERVIEWER REPEATS SCALE AS NEEDED. *En ocasiones, las reglas y leyes relativas a los arrecifes de coral se malinterpretan. ¿Qué tan aceptables o inaceptables para usted son cada una de las siguientes prácticas en Puerto Rico? – ENCUESTADOR REPITE LA ESCALA EN VOZ ALTA, SEGÚN SEA NECESARIO*

	Very unacceptable *Muy inaceptable*	Somewhat unacceptable *Parcialmente inaceptable*	Neutral *Neutral*	Somewhat acceptable *Parcialmente aceptable*	Very acceptable *Muy aceptable*
Operating a boat in a shallow reef area / *Operar una embarcación en una zona de arrecifes poco profunda*					
Leaving trash on the beach / *Dejar basura en la playa*					
Anchoring a boat on coral / *Anclar una embarcación en un arrecife de coral*					
Feeding fish, birds, or maine mammals / *Alimentar peces, aves o mamíferos marinos*					
Touching corals with my hands or feet (including standing) / *Tocar los corales con las manos o los pies (incluso pararse sobre ellos)*					
Taking seashells or coral from the reef / *Llevarse conchas marinas o corales del arrecife*					

Fishing in no-take areas / *Pescar en zonas de no-extracción*					
Discharging pollutants in seawater / *Arrojar contaminantes al mar*					

DEMOGRAPHICS
DATOS DEMOGRÁFICOS

[SCRIPT] There are just a few more questions that will help us to interpret our results and ensure we're repsenting enveryone's opinion. As a reminder, the information you provide is completely confidential.
[GUION] Tenemos algunas preguntas adicionales que nos ayudarán a interpretar nuestros resultados para asegurarnos que tomamos en consideración las opiniones de todos. Le recordamos que la información que nos provea es completamente confidencial.

24. Do you identify as any of the following?*¿Se identifica con alguna de las siguientes?*

a. Male / *Masculino*
b. Female / *Femenino*
c. Other / *Otro*
d. No response / *Sin respuesta*

25. In what year were you born? *¿En qué año nació?* _____

26. Were you born in Puerto Rico? *¿Nació en Puerto Rico?*

a. Yes / *Sí*
b. No / *No*

27. How many years have you lived in Puerto Rico?
¿Cuántos años hace que vive en Puerto Rico? _____

28. A) What race do you consider yourself? Check all that apply.
¿Qué raza se considera? (Marque todas las opciones que correspondan).

a. Native American or Alaskan Native / *Indio americano o nativo de Alaska*
b. Asian / *Asiático*
c. Black or African American / *Negro o afroamericano*
d. Native Hawaiian or other Pacific Islander / *Nativo de Hawái o de otras islas del Pacífico*
e. White / *Blanco*
f. Other / *Otro*
g. No response / *sin respuesta*

28. B) What ethnicity do you consider yourself? (Choose one).
¿De qué origen étnico se considera? (Seleccione solo una).

a. Hispanic / *Origen hispano, latino o español*
b. Not Hispanic, Latino, or Spanish origin / *No de origen hispano, latino o español*

29. What is the highest level of education you have completed? (Choose one).
¿Cuál es el nivel más alto de educación que completó? (Seleccione solo una).

a. 8th Grade or Less / *Menos de 8 grado*
b. Some high school / *Algunos años de escuela superior*
c. High School Graduate, GED / *Graduado/a de escuela superior, certificado de equivalencia*
d. Some college, community college or AA / *Algunos años de universidad, carrera técnica, grado asociado o título universitario de 2 años*
e. College Graduate / *Graduado/a de la universidad*
f. Graduate School, Law School, Medical School / *Escuela de posgrado, Facultad de derecho, Facultad de medicina*

30. What is your current employment status? Check all that apply.
¿Cuál es su situación laboral actual? (Marque todas las opciones que correspondan).

a. Unemployed / *Desempleado*
b. Employed full time / *Empleado de tiempo completo*
c. Employed part time / *Empleado de tiempo parcial*
d. Retired / *Jubilado*

31. Is your current or most recent occupation related to one or more of the following? (Check all that apply).
¿Está su ocupación actual, o la más reciente, relacionada con uno o más de los siguientes sectores? (Marque todas las opciones que correspondan).

a. Commercial fishing / *Pesca comercial*
b. Outdoor recreation / *Recreación al aire libre*
c. Tourism / *Turismo*
d. Coastal science / *Ciencias costeras*
e. Not related to any of the above / *No está relacionada con ninguno de los anteriores*

32. How many adults aged 18 years or older live in your household, including yourself?
¿Cuántos adultos de más de 18 años de edad viven en su hogar, incluyéndose usted mismo?

_____

33. What is your annual household income?
¿Cuál es el ingreso anual de su hogar?

a. Less than $10,000 / *Menos de $10,000*
b. $10,000-14,999
c. $15,000-24,999
d. $25,000-34,999
e. $35,000-49,999
f. $50,000-74,999
g. $75,000-99,999
h. $100,000-149,999
i. $150,000-$199,999
j. $200,000 or more / *$200,000 o más*
k. No Response / *No respuesta*

Thank you for your time and contribution to this research!
¡Muchas gracias por su tiempo y contribución a esta investigación!

Appendix B: Data Collection Protocols and Weighting Efforts

B.1 Data Collection

The sample design for this survey effort involved three stages. A brief overview of the three stage sampling design is bulleted below, with more detailed descriptions of the sampling selection process following.

- **Stage 1:** Select clusters (i.e., tracts) within each of four strata (i.e., North Coastal, South Coastal, Inland and Islands) with probability proportional to their size.
- **Stage 2:** Select households from within each of the selected clusters from each of the four strata using a random starting point.
- **Stage 3:** Randomly select one adult from within each selected household.

In stage one (December 2021), we chose Census block groups using a systematic, proportionate-to-size (PPS) technique to identify the target clusters. Given that the block groups vary from a few hundred to over one thousand households in size, we selected a random starting point within the cluster in order to define an area for interviewing attempts to be completed. An equal number of interviews were planned in each cluster. For example, 59 block groups out of the island's total 2,594 were chosen, and the field team planned to conduct approximately 21 interviews in each to reach the total of 1,239. The number of clusters selected, by stratum, is shown in Table B1. We specifically included the municipalities of Culebra and Vieques in the sample because the NOAA team identified them as socially essential or historically significant. The adjusted sample size was calculated based on assuming a 30% response rate and approximately a 15% non-eligible/non-deliverable rate. The municipalities included in the final selection are shown in Figure B1.

Table B1. Puerto Rico strata and sample sizes (2019 data from the American Community Survey).

Strata	Municipios	Population 18+	Households	Primary Clusters	Interval	Target Completes per cluster	Adjusted Sample Size *	Target Completes
Inland	34	1,062,049	442,920	19	23,312	21	1,565	399
North Coastal	24	1,192,634	537,780	19	28,304	21	1,565	399
South Coastal	18	502,266	209,214	19	11,011	21	1,565	399
Island Areas	2	8,275	2,740	2	1,370	21	165	42
	78	2,765,224	1,192,654	59			4,859	1239

Figure B1. Municipios/pueblos selected for data collection.

In stage two (after review of stage 1 but before field work), we systematically chose households within each cluster for interview attempts. We selected random starting points within each cluster. We paired each starting point with a randomly selected alternate starting point within the same Census block group in case field teams could not locate the initial address or if it was determined to be unworkable in some other way. To the greatest extent possible we worked to create alternate starting points that were geographically separated from the primary starting points (while still in the same Census Block Group) to attempt to distance the field team from the conditions that made the primary starting point unworkable. Further, we selected a separate group of alternate clusters to provide a backup for each of the 59 primary clusters. We reviewed starting points to project whether each survey area had an adequate residential population (or whether it was strictly industrial or commercial). We did this by reviewing Census block population data and inspecting satellite maps. The randomly assigned starting points were adjusted slightly as needed in order to ensure that the starting point represented an intersection or street location that could be reliably located via Google search / GPS, and was not in an inaccessible location (wooded area, etc.). The study design would only allow for selection if there is a resident population according to the data for the Census Block Group; thus, we only moved points and had no need to remove the cluster selected. We aimed to collect approximately 21 responses in 19 clusters for each of the 3 primary strata. Each cluster was selected from a Census Block Group, which can vary in geographical size from a handful of city blocks to rural areas that can be measured in square miles. The Blocks Groups selected for this project included typical residential and rural areas selected using a PPS methodology.

In stage three (during data collection), one adult (aged 18+) from each selected household was randomly selected using the last birthday method to ensure a random selection from all eligible individuals within the household. Households were randomly selected by following detailed walking rules. The key points of the walking rules are included directly below. A detailed description of the exact walking rules provided to the surveyors is included in Appendix E.

Walking Rules (key points):

- Begin with the dwelling unit closest to the starting point.
- Attempt survey. If not successful, leave the postcard invitation.
- Skip the next household / dwelling unit.
- Continue working away from the starting point in a systematic manner, repeating the two steps above.
- If all housing units within the cluster boundary have been exhausted, you may return to the starting point and interview / distribute to previously skipped units.

Response Rate Achievement Plan

The goal of the data collection was to achieve 400 survey responses from each of the three primary strata. Originally, we planned to visit 59 clusters and enumerate up to 150 households per cluster with the goal of hitting approximately 21 completes in each cluster; however, we knew the number of completes had the potential to be lower or higher in a cluster depending on response rate. Therefore, we began by visiting approximately 70 eligible houses per cluster (i.e., excluding vacant or destroyed households), which we estimated would give about 21 completes based on a 30% response rate; field teams would visit each house twice with the second visit as least 10 days after the first, and visits to an individual cluster performed on different day/time segments (e.g., weekday AM, weekend PM). As data collection progressed, it became apparent that visiting approximately 70 eligible houses per cluster was likely not going to produce the minimum desired number of completions per stratum (of approximately 400 each to attain an approximate 5 percent margin of error per stratum). Therefore, after discussions with the NOAA team, we set a secondary target of 267 completes per stratum to achieve a 6 percent margin or error per stratum. In addition, we adjusted our data collection to include expanding data collection efforts in 11 clusters. An average of 141 households were visited in the "expanded" clusters, each receiving two visits – the same as in the non-expanded clusters. We expanded 3 clusters in the north coastal stratum, 6 clusters in the south coastal stratum, and 2 clusters in the inland stratum, for a total of 11 expanded clusters across the island. The number of expanded clusters in each stratum was chosen based on evaluating completion trends within each stratum separately and projecting how many more houses would need to be visited in order to reach the minimum desired number of completions per stratum. The clusters within each stratum were selected at random to ensure that the sampling process remained unbiased.

Data Collection Methods and Data Processing Methods

Field teams conducted in-person surveys with household respondents as well as dropped off postcards that provided the household with a unique code should they want to complete the

survey online. Field teams visited eligible houses twice, as outlined in Figure B2, and used ArcGIS Field Maps to document which houses they visited and the status of each visit. The possible statuses they could choose from are shown in Figure B3. Houses eligible for a second visit are those marked by a green symbol in Figure B3. The ERG team monitored online survey submissions and updated Field Maps approximately every week to change the status of houses that completed online survey submissions to a completed interview status option. This regular update of Field Maps ensured that field teams did not visit a house a second time if they had already submitted a survey via web.

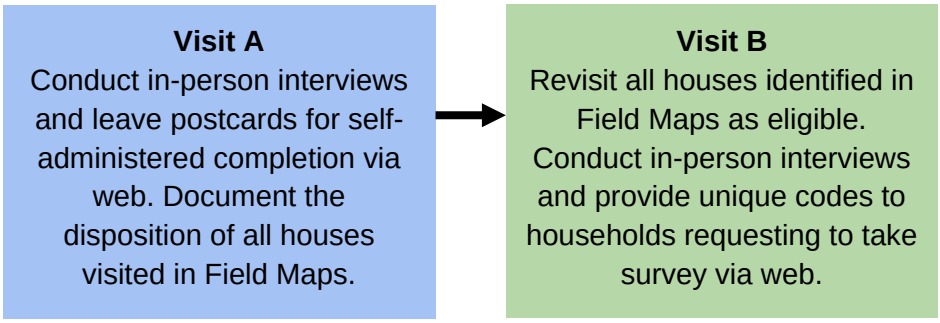


Figure B2. Two visits per household strategy.

Figure B3. House status selection options.

Impact of Hurricane Fiona on Data Collection. Hurricane Fiona made landfall in southwest Puerto Rico on September 18, 2022 and caused catastrophic damage across the island. The hurricane brought strong winds and heavy rain, including dropping more than 30 inches of rain in some areas. Roads and bridges were damaged, and many residents across the country experienced prolonged power and water outages. Hurricane Fiona resulted in at least 25 deaths according to Puerto Rico's Department of Health as of December 22nd, 2022, with another 20

deaths under investigation.[8] The western part of the island was hit hardest by Hurricane Fiona, while the islands of Vieques and Culebra (representing the Island Areas strata) were less severely impacted. Hurricane Fiona hit Puerto Rico while data collection was still occurring.

Table B2 shows the status of cluster visits at the time of the hurricane. Forty-five clusters had been fully completed (both first and second visits to households had been completed), however 6 clusters had been started but still needed the second visit completed, and 8 clusters had not been visited at all (still needed both a first and second visit). The islands of Vieques and Culebra had not been visited.

Table B2. Number of clusters needing first or second visits at the time of Hurricane Fiona.

Visits still needed	Coastal North	Coastal South	Inland	Island Areas	Total
0 (completed cluster)	16	13	16	0	45
1 (2nd visit needed)	2	3	1	0	6
2 (1st and 2nd visit needed)	1	3	2	2	8

Figure B4 shows the status of cluster visits at the conclusion of data collection. The majority of clusters that were not completed were in the west or southwest regions of Puerto Rico. The team discussed whether data collection should continue following Hurricane Fiona and after receiving on-the-ground updates from our Albizu University partners and from NOAA's jurisdictional partners, as well as consulting with their leadership team, the NOAA team decided that data collection would continue for the islands of Vieques and Culebra, but in light of the devastation caused by Hurricane Fiona data collection would be canceled for the rest of the unfinished clusters. After completing the visits to Vieques and Culebra (together representing the Island stratum), a total of 12 clusters remained partially or completely unfinished.

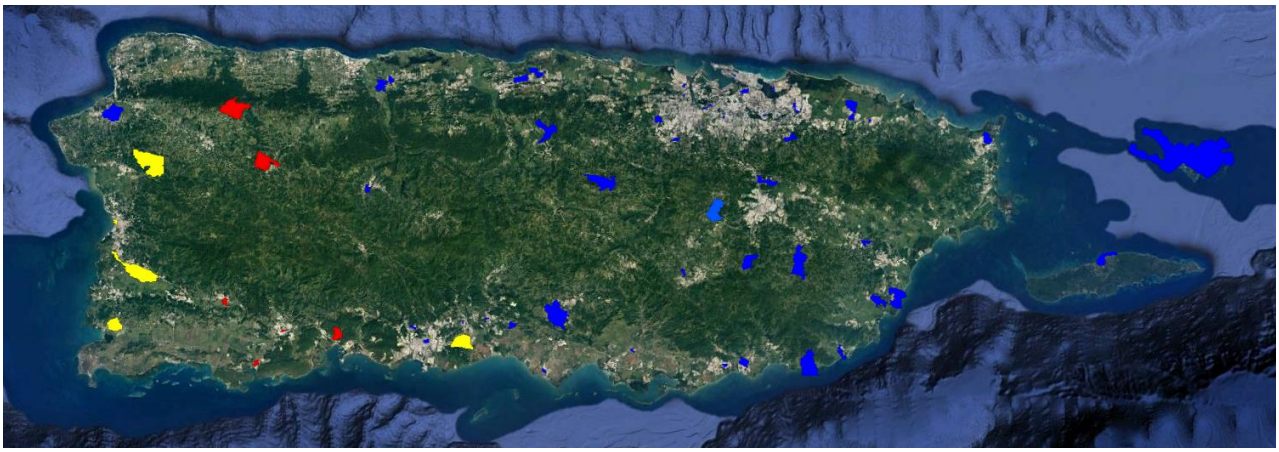


Figure B4. Status of cluster visits at the conclusion of data collection (Nov. 4th, 2023); blue = 2 cluster visits completed, yellow = 1 cluster visit completed,red = no cluster visits completed. The island clusters of Culebra and Vieques were only visited once, as originally planned.

[8] https://www.salud.gov.pr/CMS/494

Dates of Data Collection. Data collection began on January 28th, 2022 and continued until the landfall of Hurricane Fiona on September 18th, 2022. Due to the devastation caused by Hurricane Fiona, data collection paused from September 18th until October 21st. Data collection resumed on October 22nd with a visit to Vieques. Data collection concluded on November 4th, 2022 with the visit to Culebra.

Data Processing Methods. ERG programmed and administered the electronic survey using QualtricsTM survey software. Survey responses were collected either directly by respondents online through an internet browser or in the field by student interviewers using Samsung tablets and the Qualtrics Offline mobile application. Electronically submitted data was maintained in the cloud by the Qualtrics server. ERG exported data files from Qualtrics as CSV (comma-separated values) files and imported the data into Stata for processing and cleaning. In the initial stages of data processing, we checked all submitted responses to ensure there were no submissions with the same unique identifier. No entirely duplicate submissions (entries consisting of the same answers to all questions) were also searched for and none were identified. We recoded missing values according to survey skip and display logic for each question. For example, if a question was not displayed due to a previous response, the missing cell was recoded to 999 (indicating the question was not asked). Questions that were seen but unanswered were recoded to 777 (indicating there was no response to the question). As a result, there were no empty cells in the final dataset. A Data Transformation Log was maintained to keep a record of any changes to cells from the raw dataset to the cleaned dataset. A final cleaned dataset was exported from Stata to Excel for weighting. Prior to the weighting, the cleaned Qualtrics dataset was aligned with the Field Maps data. This alignment ensured that each household visited (as documented by the Field Maps data) contained the appropriate survey submission data from Qualtrics (if a survey was submitted). The alignment between Qualtrics and Field Maps was done using the unique code that was associated with each Qualtrics survey submission. The first two letters of the unique code identified which cluster the submission was associated with. In some cases, the field crew teams had documented that different postcards were used in a cluster (e.g., AB postcards were used in cluster DD). The detailed documentation kept by the field crew teams ensured that we could correctly identify which cluster the Qualtrics submissions were associated with. We also used the geolocation information associated with each Qualtrics survey submission as an additional way to verify that the Qualtrics survey submissions were aligned with the appropriate cluster and Field Maps record. The complete, cleaned dataset included a record for each household visited. This dataset was then used as a basis to determine which surveys were deemed sufficient. Once the sufficient surveys had been identified, they were weighted following the steps outlined in Appendix B.2. The final weights associated with each submitted survey were then incorporated into the complete dataset that included a record for all households visited

Determining Sufficient Survey Responses

In total, 5,250 households were visited during the data collection effort. Of all households visited, 13% were abandoned or demolished, 54% did not answer the door, and 6% refused. Of

the total visited, 18 attempted to take the survey but were removed prior to performing the weighting analysis because they either did not meet the initial screening criteria or did not meet NOAA's rules for sufficiency. Additional detail on the screening criteria and rules for sufficiency are provided below.

Screening Criteria. Respondents who failed to qualify during the initial screening (criteria below) were eliminated from the final dataset. Surveys were eliminated if any of the following were true:

- The person in the household who was 18 years or older and with the most recent birthday was not available to complete the survey.
- The respondent did not live in Puerto Rico for at least three months of the year.
- The respondent refused to participate in the survey.

Rules for Sufficiency. NOAA developed rules for determining whether a survey was considered sufficient or insufficient. Only surveys that met the sufficiency criteria were included in the final dataset for weighting. Insufficient surveys included the following:

- Surveys with completion rates less than 50%.
- Surveys that have a duration time below the first percentile (about 4 minutes).[9]

Table B3 provides the reason for removal of the 18 surveys. Nearly 83% of all surveys removed were removed based on the screening criteria, and the other 17% were removed based on the sufficiency criteria. It is important to note that values reported in Table B3 are based on first removing surveys that did not meet the screening criteria, and then removing surveys that did not meet the sufficiency criteria. There are surveys that qualified for removal based on both the screening criteria and the sufficiency rules—these surveys are included in the screening criteria row of Table B3. Table B3 did not double count any survey submissions.

Table B3. Reason for removal of surveys by strata.

Reason for removal	Coastal North	Coastal South	Inland	Island Areas	Total
Screening criteria	7	2	4	2	15
Insufficient	2	0	1	0	3
Total removed	**9**	**2**	**5**	**2**	**18**

Table B4 summarizes the number of surveys that were attempted, the number and reason for the removal of surveys, and the final number of surveys considered for analysis for each stratum.

[9] Duration time was calculated not including non-respondents, screen outs, and surveys with implausible duration times. Two surveys were identified as having implausible duration times (116 minutes and 455 minutes). Based on how the response time was calculated, it is possible that a seemingly implausibly long in-person response could be a result of the survey being taken on a tablet but not being submitted until much later. Therefore, although these surveys were not included in the duration time calculation, the survey responses themselves were kept in the final dataset.

Over 300 sufficient surveys were received from each of the main strata (Coastal North, Coastal South, and Inland). Given that only six sufficient surveys were received from the Island Areas, it is not appropriate to report results at the individual Island level stratum. The results section of this report reflects this by reporting strata specific results for Coastal North, Coastal South, and Inland strata (excluding the Island stratum), but includes the six Island results when reporting results for Puerto Rico as a whole.

Table B4. Number of attempted surveys, number of surveys removed, and final number of sufficient surveys by strata.

Dataset	Coastal North	Coastal South	Inland	Island Areas	Total
Households visited	1754	1756	1585	155	5250
Attempted surveys	350	317	323	8	998
Removed-Screening criteria	7	2	4	2	15
Removed-Insufficient	2	0	1	0	3
Sufficient surveys (final dataset)	**341**	**315**	**318**	**6**	**980**

The respondent was able to complete the survey in either English or Spanish, whichever language they preferred. This was accomplished online via a button that allowed the survey to be toggled between the two languages. In-person surveys were administered by bilingual students from the University of Albizu. Table B5 presents the percentage of sufficient surveys that were administered in either English or Spanish for each of the four strata. The vast majority of surveys (95%) were completed in Spanish.

Table B5. Language of administered survey.

Language	Coastal North	Coastal South	Inland	Island Areas	Total
English	6%	3%	4%	33%	5%
Spanish	94%	97%	96%	67%	95%

Table B6 presents the mode of completion of each of the sufficient surveys, shown as a percent of each strata. Of the 980 sufficient surveys, 92% were completed in-person with an interviewer reading the questions to the respondent and 8% completed by the respondent themselves via the online survey platform (self-administered through Qualtrics).

Table 6. Mode of survey completion (online/in-person).

Mode	Coastal North	Coastal South	Inland	Island Areas	Total
Online	9%	7%	9%	33%	8%
In-person	91%	93%	91%	67%	92%

Table B7 presents the number of attempts made to each of the 980 households that submitted sufficient surveys, shown as a percentage of each strata. The survey design was such that the Island Areas were only planned to receive one visit, but that all other eligible households in the other three strata would receive up to two attempts. Of the 980 households across Puerto Rico that submitted sufficient surveys, 501 received only one visit (51%), while 479 received two visits (49%).

Table B7. Number of survey attempts.

Number of Attempts	Coastal North	Coastal South	Inland	Island Areas	Total
One Attempt	53%	42%	57%	100%	51%
Two Attempts	47%	58%	43%	0%	49%

Table B8 presents the response rate for each stratum, including the response rates based on the survey mode (online or in-person). The total, overall response rate was calculated based on the total number of sufficient surveys divided by the total number of households visited, excluding ineligible households where an interview attempt could not be made (abandoned or demolished building) (980/4533=21.6%). The total online response rate was calculated as the total number of online completes divided by the total number of households visited, excluding ineligible households (83/4533=1.8%). The total in-person response rate was similarly calculated as the total number of in-person completes divided by the total number of households visited, excluding ineligible households (897/4533=19.8%).

Table B8. Response Rate Percentages and the Values Used to Calculate Response Rates.

Response Rate	Coastal North	Coastal South	Inland	Island Areas	Total
Online	2.0% (32/1571)	1.4% (21/1459)	2.0% (28/1393)	1.8% (2/110)	1.8% (83/4533)
In-Person	19.7% (309/1571)	20.2% (294/1459)	20.8% (290/1393)	3.6% (4/110)	19.8% (897/4533)
Total Response Rate	21.7% (341/1571)	21.6% (315/1459)	22.8% (318/1393)	5.5% (6/110)	21.6% (980/4533)

The dispositions that were included in the calculation of the total number of households visited where an interview attempt could be made (eligible households) included: completed interview; door answered, eligible respondent not available; eligible respondent agreed to complete via web[10]; nobody answered; refusal[11]; request return visit. The response rates for surveys

[10] All eligible households (including "respondent agreed to complete via web") were included in the online, in-person, and total response rate calculations.

[11] The survey instrument was designed so that any respondent who answered "no" to "Are you willing to participate in this survey" was then asked a series of nonresponse questions to assess why the respondent refused and to gather observable demographic information (see Questions NR1 through NR3 in the survey text included in Appendix A). The survey data showed that none of the nonresponse questions were answered.

administered in-person were much higher than the online/self-administered response rate. The overall response rate across all strata and both survey modes was calculated to be 21.6%.

B.2 Weighting

Data were weighted to account for sample design and non-response, and then calibrated based on key variables (age category, gender, education, race, and household income) within each stratum to ensure data were representative of the adult population of Puerto Rico. This was accomplished through 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 true population characteristics. In this analysis, base weights were computed as the product of three stages of random selection that included (1) random selection of clusters within each of 4 strata (2) random selection of households within selected clusters and (3) random selection of adults within selected households. The sampling design for this survey effort reflects a complex, multistage process. Therefore, a base weight is calculated and applied in order to correct for the unequal probabilities of selection at each of the three stages of the sampling. The base weights are computed as the inverse of the overall probability of selection that reflects each of the three stages of sampling.

To account for nonresponse caused by both survey-related factors (i.e., field period, incentives, survey topic/sponsor, and survey mode) as well as various other survey unit factors (i.e., demographics, sampled unit's experience with surveys and/or the topic or in this case, household level indicators such as region or rental status), a nonresponse adjustment was made in order to account and correct for nonresponses among surveyed households.

These weights were then calibrated to match five of the survey sample's demographic data to the true demographic characteristics of the Puerto Rico population: sex (male, female, unknown), age group (18-24, 25-34, 35-44, 45-54, 55-64, 65-74 and 75 or older), education level (less than high school, high school or GED, some college or Associates degree, college degree, master's degree or higher), and median household income (less than $10,000, $10,000-14,999, $15,000-24,999, $25,000-49,000, $50,000 or higher, unknown). These population controls were from the 2020 U.S. Census.

Finally, weights were trimmed to ensure no single final weight dominated the distribution. A 2.5% trim was ultimately implemented because it was found to balance the bias and variance of the weights the best. After the trimming was performed, the final weights were derived by computing a final post-stratification adjustment that multiplied the trimmed weights by a fixed constant of 1.0501 to ensure that the final weights summed to the target population value of 2,670,101. A comparison between the demographics in the weighted sample is presented in Table B9.

Table B9. Demographics of true population and weighted respondents.

Demographic Variables		Population	Weighted Respondents
Location of Residence	Coastal north	43.2	42.6
	Coastal south	18.1	19.0
	Inland	38.4	38.1
	Island areas	0.3	0.3
Gender	Male	46.7	46.8
	Female/other	53.3	53.2
Age	18-24	12.1	10.7
	25-34	15.5	14.1
	35-44	15.5	15.9
	45-54	16.3	16.8
	55-64	16.1	16.8
	65-74	13.6	14.3
	75+	10.9	11.5
Education	Less than high school	23.0	23.2
	High school or GED	28.0	27.9
	Some college / Associates degree	23.0	23.2
	College degree	19.0	19.7
	Master's degree or more	7.0	6.1
Household Income	Under $10,000	16.3	16.5
	$10,000-$14,999	7.1	7.5
	$15,000-$24,999	11.0	11.1
	$25,000-$49,999	14.5	14.5
	$50,000 or higher	11.4	10.5
	Unknown	39.7	39.9

Appendix C: Puerto Rico and Strata Results for 2022

Table C1: Proportion of participation in activities by stratum.

Activity	Coastal north	Coastal south	Inland	Total
Fishing (including spearfishing)	6.9%	12.8%	9.6%	9.2%
Gathering marine resources	3.7%	7.6%	3.2%	4.4%
Beach recreation (beach sports, picnics, etc.)	44.4%	39.1%	40.6%	42.0%
Swimming/wading	35.3%	22.6%	24.6%	29.1%
Waterside/beach camping	14.5%	8.6%	13.8%	13.1%
Boating (sail, motor, jet ski)	13.5%	8.5%	15.4%	13.4%
SCUBA diving	2.8%	9.1%	2.0%	3.7%
Free diving	4.4%	7.8%	4.1%	5.0%
Snorkeling	7.2%	8.4%	9.5%	8.4%
Paddling activities (kayak, stand up paddleboarding, etc.)	11.8%	8.2%	12.6%	11.5%
Surfing	4.9%	7.6%	3.2%	4.4%

Table C2: Zone activity participated in.

Activity	Zone	Coastal north	Coastal south	Inland	Total
Swimming/ wading	A	50.8%	5.1%	52.1%	44.2%
	B	11.1%	4.9%	18.4%	12.6%
	C	1.3%	10.5%	3.5%	3.8%
	D	6.6%	46.0%	13.2%	14.3%
	E	28.7%	31.8%	12.8%	24.0%
	Not sure	1.5%	1.7%	0%	1.1%
Snorkeling	A	72.6%	2.3%	32.9%	41.9%
	B	3.8%	33.0%	25.9%	18.3%
	C	4.0%	0.9%	0%	3.4%
	D	0%	26.7%	8.7%	8.7%
	E	19.6%	34.1%	32.5%	27.3%
	Not sure	0%	2.9%	0%	0.6%
SCUBA diving	A	77.9%	1.8%	19.6%	31.1%
	B	14.0%	22.7%	43.2%	23.9%
	C	0%	10.0%	0%	4.8%
	D	0%	37.6%	18.2%	20.8%
	E	8.2%	27.9%	18.9%	19.4%
	Not sure	0%	0%	0%	0%
Free diving	A	65.5%	2.1%	9.7%	29.0%
	B	8.9%	20.1%	51.8%	25.0%
	C	1.7%	22.1%	0%	9.1%

	D	0%	38.5%	9.0%	13.7%
	E	23.9%	17.2%	29.5%	23.2%
	Not sure	0%	0%	0%	0%
Waterside/ beach camping	A	39.2%	0%	44.1%	36.0%
	B	14.3%	6.0%	12.1%	12.4%
	C	7.1%	28.8%	3.8%	8.9%
	D	0%	42.3%	33.4%	18.3%
	E	37.0%	22.3%	5.7%	22.9%
	Not sure	2.4%	0.6%	1.0%	1.6%
Beach recreation	A	50.3%	4.5%	51.8%	42.7%
	B	10.5%	4.7%	13.0%	10.4%
	C	1.6%	8.9%	1.7%	3.3%
	D	4.4%	52.3%	16.1%	16.9%
	E	28.5%	26.2%	15.4%	23.3%
	Not sure	4.7%	3.4%	2.1%	3.5%
Boating (sail, motor, jet ski)	A	34.2%	3.7%	29.4%	28.1%
	B	22.2%	6.7%	29.4%	23.7%
	C	0.6%	8.8%	8.6%	5.8%
	D	11.1%	42.7%	23.8%	20.1%
	E	30.4%	38.2%	8.8%	21.6%
	Not sure	1.5%	0%	0%	0.7%
Paddling activities (kayak, stand up paddle-boarding)	A	32.5%	0%	46.1%	33.4%
	B	34.9%	4.1%	24.4%	26.1%
	C	2.8%	12.9%	0%	4.2%
	D	5.6%	41.7%	12.3%	13.0%
	E	23.0%	38.3%	12.8%	20.6%
	Not sure	1.3%	3.0%	4.4%	2.7%
Surfing	A	67.6%	2.1%	63.2%	46.8%
	B	22.6%	0%	18.1%	14.6%
	C	0%	0%	0%	2.1%
	D	0%	55.9%	9.5%	18.1%
	E	9.8%	37.8%	9.3%	17.2%
	Not sure	0%	4.2%	0%	1.2%
Fishing (including spearfishing)	A	77.6%	0%	34.3%	36.1%
	B	9.0%	3.6%	22.0%	12.8%
	C	0%	20.9%	16.1%	14.4%
	D	6.9%	41.4%	14.5%	19.8%
	E	6.5%	27.1%	0.8%	9.8%
	Not sure	0%	7.1%	12.3%	7.2%
Gathering marine resources	A	81.8%	2.1%	17.8%	33.5%
	B	0%	1.4%	27.9%	8.3%
	C	2.3%	14.5%	0%	9.2%

	D	0%	55.4%	54.2%	34.4%
	E	16.0%	20.0%	0%	12.4%
	Not sure	0%	6.5%	0%	2.3%

Table C3: Primary motivation for fishing and gathering by stratum.

Motivation	Coastal north	Coastal south	Inland	Total
Recreational	44.7%	56.4%	72.5%	57.6%
Subsistence	28.3%	25.1%	12.3%	22.6%
Commercial	10.2%	14.4%	9.7%	10.8%
Cultural	16.7%	4.0%	5.5%	8.9%

Table C4: Percent of meals eaten within household containing seafood by stratum.

Percent	Coastal north	Coastal south	Inland	Total
None (0%)	14.7%	15.1%	19.4%	16.5%
Some meals (1-33%)	60.0%	64.9%	62.1%	61.8%
Many meals (34-66%)	15.7%	13.5%	10.5%	13.3%
Most meals (67-99%)	8.5%	6.2%	5.9%	7.1%
All meals (100%)	1.1%	0.3%	2.1%	1.3%

Table C5: Percent of meals eaten within household containing seafood from local coral reefs in Puerto Rico by stratum.

Percent	Coastal north	Coastal south	Inland	Total
None (0%)	35.6%	24.4%	29.4%	31.1%
Some meals (1-33%)	38.7%	46.2%	41.7%	41.4%
Many meals (34-66%)	10.3%	11.0%	10.2%	10.3%
Most meals (67-99%)	4.7%	4.6%	4.8%	4.7%
All meals (100%)	0.9%	2.5%	2.7%	1.9%
Not sure	9.8%	11.4%	11.1%	10.6%

Table C6: Importance of coral reefs to culture.

Value	Importance	Coastal north	Coastal south	Inland	Total
Ancestral connections	Not at all	7.1%	17.0%	11.4%	10.6%
	Slightly	2.4%	0.7%	1.8%	1.8%
	Somewhat	6.8%	9.8%	15.4%	10.7%
	Moderately	4.9%	4.9%	8.6%	6.4%
	Extremely	54.4%	43.2%	45.0%	48.7%
	Not sure	24.4%	24.5%	17.8%	21.8%
Cultural folklore (beliefs, stories, etc.)	Not at all	7.3%	17.6%	11.6%	10.9%
	Slightly	3.6%	1.0%	5.9%	4.0%
	Somewhat	6.6%	8.0%	11.7%	8.8%
	Moderately	6.8%	6.0%	7.5%	6.9%

	Extremely	59.3%	51.4%	50.9%	54.7%
	Not sure	16.4%	16.0%	12.4%	14.8%
Culturally important events, such as feasts and ceremonies	Not at all	15.6%	21.5%	17.6%	17.5%
	Slightly	4.0%	2.9%	5.7%	4.4%
	Somewhat	7.6%	7.2%	12.0%	9.1%
	Moderately	7.2%	10.1%	8.5%	8.2%
	Extremely	48.4%	45.3%	41.5%	45.4%
	Not sure	17.2%	13.0%	14.7%	15.4%
Establishing and maintaining cultural and familial ties	Not at all	8.7%	17.9%	9.5%	10.7%
	Slightly	3.7%	1.8%	5.2%	3.9%
	Somewhat	5.2%	8.7%	11.7%	8.3%
	Moderately	9.3%	8.4%	9.1%	9.0%
	Extremely	55.4%	46.4%	51.6%	52.3%
	Not sure	17.8%	16.8%	13.0%	15.7%
Local language (word choice, business and place names, etc.)	Not at all	8.4%	15.3%	10.7%	10.6%
	Slightly	4.6%	6.7%	6.8%	5.8%
	Somewhat	8.3%	15.1%	14.1%	11.8%
	Moderately	7.9%	6.5%	13.2%	9.7%
	Extremely	55.7%	39.9%	46.2%	49.1%
	Not sure	15.0%	16.6%	9.0%	13.0%
Religious practices	Not at all	21.2%	26.9%	21.3%	22.3%
	Slightly	3.1%	6.7%	6.3%	5.0%
	Somewhat	8.7%	8.3%	9.3%	8.9%
	Moderately	3.1%	2.0%	7.9%	4.7%
	Extremely	40.7%	34.5%	38.1%	38.5%
	Not sure	23.2%	21.6%	17.1%	20.6%

Table C7: Perceptions of marine resource importance to quality of life

Resource	Current condition	Coastal north	Coastal south	Inland	Total
Ocean water quality	Not at all	1.8%	1.7%	2.3%	2.0%
	Slightly	1.6%	2.7%	0.4%	1.4%
	Somewhat	3.8%	2.9%	5.6%	4.3%
	Moderately	6.0%	4.2%	6.4%	5.8%
	Extremely	86.7%	88.5%	85.4%	86.6%
Amount of live coral	Not at all	1.8%	2.8%	2.8%	2.4%
	Slightly	3.5%	2.0%	1.4%	2.4%
	Somewhat	4.8%	6.5%	5.0%	5.2%
	Moderately	6.4%	6.7%	8.9%	7.4%
	Extremely	83.5%	82.0%	82.0%	82.7%
Amount of fish	Not at all	2.0%	1.7%	1.8%	1.8%
	Slightly	2.6%	2.8%	1.9%	2.4%

	Somewhat	3.8%	7.0%	6.0%	5.2%
	Moderately	8.4%	3.6%	8.3%	7.4%
	Extremely	83.2%	84.9%	82.1%	83.1%
Diversity of corals	Not at all	1.4%	4.1%	2.8%	2.5%
	Slightly	2.8%	3.3%	3.1%	1.8%
	Somewhat	3.1%	4.9%	7.5%	6.8%
	Moderately	8.6%	5.8%	8.8%	7.9%
	Extremely	84.1%	81.8%	77.8%	81.0%
Diversity of fish	Not at all	1.4%	2.9%	3.6%	2.5%
	Slightly	2.0%	2.3%	1.4%	3.0%
	Somewhat	6.6%	5.7%	7.7%	5.1%
	Moderately	7.2%	7.6%	9.0%	8.2%
	Extremely	82.8%	81.6%	78.4%	81.3%

Table C8: Percpetions of marine resource current condition by stratum.

Resource	Current condition	Coastal north	Coastal south	Inland	Total
Ocean water quality	Very bad	20.0%	20.8%	19.6%	19.9%
	Somewhat bad	17.8%	15.6%	21.7%	18.9%
	Neither bad nor good	26.0%	28.1%	29.5%	27.8%
	Somewhat good	15.9%	14.8%	11.3%	14.0%
	Very good	12.3%	11.1%	11.1%	11.7%
	Not sure	7.9%	9.6%	6.8%	7.8%
Amount of live coral	Very bad	21.7%	21.9%	19.6%	20.9%
	Somewhat bad	16.4%	9.8%	19.1%	16.2%
	Neither bad nor good	19.4%	20.3%	23.4%	21.0%
	Somewhat good	10.6%	13.9%	7.0%	10.0%
	Very good	13.0%	12.4%	9.3%	11.5%
	Not sure	18.9%	21.7%	21.5%	20.4%
Amount of fish	Very bad	18.5%	21.8%	19.6%	19.5%
	Somewhat bad	15.1%	10.4%	16.6%	14.8%
	Neither bad nor good	18.2%	19.8%	23.5%	20.5%
	Somewhat good	16.6%	14.2%	9.6%	13.6%
	Very good	15.6%	13.0%	13.8%	14.4%
	Not sure	16.0%	20.8%	16.9%	17.2%
Diversity of corals	Very bad	21.8%	23.0%	24.2%	22.9%
	Somewhat bad	15.2%	8.3%	14.3%	13.6%
	Neither bad nor good	16.1%	20.5%	18.1%	17.7%
	Somewhat good	10.7%	12.4%	13.0%	12.0%
	Very good	14.2%	10.8%	9.8%	11.9%
	Not sure	22.0%	25.0%	20.6%	22.0%
Diversity of fish	Very bad	15.5%	20.0%	20.4%	18.2%
	Somewhat bad	17.2%	9.5%	15.6%	15.2%
	Neither bad nor good	17.2%	20.7%	19.7%	18.9%

	Somewhat good	14.8%	15.0%	15.6%	15.2%
	Very good	18.1%	13.4%	12.3%	15.0%
	Not sure	17.1%	21.3%	16.3%	17.5%

Table C9: Perceived change in resource conditions over the next ten years by stratum.

Resource	Change in condition	Coastal north	Coastal south	Inland	Total
Ocean water quality	Worsen greatly	44.3%	44.7%	45.9%	44.8%
	Worsen somewhat	22.1%	24.6%	23.9%	23.3%
	No change	7.8%	10.7%	7.4%	8.4%
	Improve somewhat	10.6%	6.8%	7.5%	8.7%
	Improve greatly	4.6%	4.4%	3.9%	4.3%
	Not sure	10.5%	8.8%	11.4%	10.5%
Amount of live coral	Worsen greatly	40.9%	48.1%	47.1%	44.5%
	Worsen somewhat	24.5%	16.9%	23.4%	22.6%
	No change	6.8%	10.2%	5.5%	7.1%
	Improve somewhat	12.8%	6.6%	8.3%	9.9%
	Improve greatly	5.3%	4.5%	4.4%	4.8%
	Not sure	9.8%	13.7%	11.3%	11.0%
Amount of fish	Worsen greatly	41.7%	44.3%	45.7%	43.6%
	Worsen somewhat	24.1%	21.2%	23.7%	23.4%
	No change	6.9%	11.5%	6.9%	7.9%
	Improve somewhat	12.8%	8.4%	9.8%	10.8%
	Improve greatly	5.0%	3.2%	3.6%	4.1%
	Not sure	9.5%	11.5%	10.2%	10.1%
Diversity of corals	Worsen greatly	38.9%	47.1%	47.6%	43.7%
	Worsen somewhat	25.4%	16.3%	22.2%	22.5%
	No change	6.0%	11.3%	5.3%	6.9%
	Improve somewhat	11.0%	7.0%	7.6%	9.0%
	Improve greatly	6.7%	3.3%	5.5%	5.6%
	Not sure	11.8%	15.0%	11.7%	12.3%
Diversity of fish	Worsen greatly	39.9%	43.3%	46.8%	43.0%
	Worsen somewhat	25.5%	21.2%	21.6%	23.2%
	No change	6.5%	11.0%	6.6%	7.5%
	Improve somewhat	13.1%	7.0%	10.8%	11.0%
	Improve greatly	4.6%	3.6%	3.9%	4.1%
	Not sure	10.5%	13.9%	10.4%	11.1%

Table C10: Importance of coral reefs to various ecosystem services by stratum.

Value	Importance	Coastal north	Coastal south	Inland	Total
Protection from natural disasters	Not at all	1.4%	2.9%	2.9%	2.3%
	Slightly	0.9%	0.1%	0.7%	0.7%
	Somewhat	4.1%	5.1%	6.4%	5.2%
	Moderately	6.2%	5.2%	5.9%	5.9%
	Extremely	78.2%	78.5%	74.6%	76.9%
	Not sure	9.2%	8.2%	9.5%	9.1%
Outdoor recreation	Not at all	2.7%	6.3%	6.5%	4.8%
	Slightly	2.1%	1.3%	4.6%	2.9%
	Somewhat	4.5%	10.3%	11.0%	8.1%
	Moderately	7.3%	9.0%	5.3%	6.9%
	Extremely	71.4%	62.8%	63.0%	66.6%
	Not sure	12.0%	10.2%	9.6%	10.7%
Tourism-based industry	Not at all	2.8%	3.8%	2.4%	2.8%%
	Slightly	1.6%	0%	2.6%	1.7%
	Somewhat	5.1%	13.0%	10.0%	8.4%
	Moderately	6.7%	7.1%	4.7%	6.1%
	Extremely	75.1%	69.2%	73.9%	73.5%
	Not sure	8.8%	6.9%	6.5%	7.5%
Fishery-based industry	Not at all	3.5%	4.0%	4.6%	2.9%
	Slightly	1.8%	0%	1.8%	1.5%
	Somewhat	5.6%	8.0%	11.1%	8.1%
	Moderately	4.1%	8.8%	5.5%	5.5%
	Extremely	75.1%	72.1%	70.1%	72.7%
	Not sure	9.8%	7.0%	9.9%	9.3%
Food for coastal communities	Not at all	2.7%	2.0%	2.4%	2.5%
	Slightly	2.4%	1.3%	2.3%	2.1%
	Somewhat	4.7%	5.9%	6.8%	5.7%
	Moderately	3.5%	5.3%	5.0%	4.4%
	Extremely	74.9%	76.9%	75.0%	75.4%
	Not sure	11.8%	8.6%	8.5%	9.9%
Human health	Not at all	4.1%	3.7%	3.5%	3.8%
	Slightly	2.8%	0.1%	4.5%	2.9%
	Somewhat	6.4%	7.5%	8.5%	7.4%
	Moderately	7.1%	11.4%	4.8%	7.0%
	Extremely	68.3%	65.7%	68.8%	68.1%
	Not sure	11.4%	11.5%	9.9%	10.8%
Your livelihood	Not at all	9.5%	10.1%	7.0%	8.6%
	Slightly	5.4%	3.8%	6.7%	5.6%
	Somewhat	5.8%	7.5%	8.3%	7.1%
	Moderately	7.2%	8.3%	7.7%	7.7%

	Extremely	60.5%	54.1%	61.8%	59.8%
	Not sure	11.7%	16.2%	8.5%	11.3%

Table C11: Threat familiarity by stratum.

Threat	Familiarity	Coastal north	Coastal south	Inland	Total
Climate change	Not familiar	2.1%	5.6%	4.5%	3.7%
	No	2.6%	7.7%	3.5%	3.9%
	Yes	92.0%	83.9%	85.3%	87.9%
	Not sure	3.3%	2.8%	6.8%	4.5%
Coral bleaching	Not familiar	10.1%	23.4%	13.6%	13.9%
	No	2.0%	3.9%	2.9%	2.7%
	Yes	76.3%	62.5%	75.4%	73.3%
	Not sure	11.6%	10.2%	8.2%	10.1%
Hurricanes	Not familiar	3.3%	5.3%	4.1%	4.0%
	No	7.9%	7.5%	9.0%	8.3%
	Yes	79.9%	82.0%	79.6%	80.1%
	Not sure	8.9%	5.3%	7.3%	7.6%
Pollution from stormwater, wastewater, and chemical runoff	Not familiar	3.5%	6.5%	2.8%	3.8%
	No	1.6%	3.1%	1.0%	1.6%
	Yes	92.7%	88.9%	94.5%	92.6%
	Not sure	2.3%	1.4%	1.8%	2.0%
Marine litter	Not familiar	3.2%	6.7%	5.3%	4.7%
	No	3.5%	5.4%	4.0%	4.0%
	Yes	90.2%	85.7%	87.6%	88.4%
	Not sure	3.1%	2.2%	3.1%	2.9%
Invasive species	Not familiar	5.2%	8.3%	10.9%	8.0%
	No	4.2%	5.4%	5.9%	5.2%
	Yes	80.6%	75.2%	75.4%	77.5%
	Not sure	10.0%	11.1%	7.8%	9.3%
Overfishing and overgathering	Not familiar	2.5%	4.4%	5.8%	4.1%
	No	5.4%	6.0%	8.7%	6.8%
	Yes	83.9%	85.4%	79.8%	82.6%
	Not sure	8.2%	4.2%	5.7%	6.5%
Boat anchoring and grounding	Not familiar	4.0%	5.0%	5.0%	4.6%
	No	3.6%	4.6%	2.0%	3.2%
	Yes	88.7%	88.4%	89.6%	89.1%
	Not sure	3.6%	2.0%	3.3%	3.2%
Divers and snorkelers	Not familiar	3.1%	5.8%	5.8%	4.6%
	No	27.9%	32.9%	31.8%	30.3%
	Yes	50.3%	49.8%	51.2%	50.6%
	Not sure	18.7%	11.5%	11.2%	14.4%

Ocean acidification	Not familiar	11.8%	22.6%	21.0%	17.3%
	No	2.6%	3.9%	1.1%	2.3%
	Yes	74.0%	64.1%	69.5%	70.5%
	Not sure	11.5%	9.4%	8.4%	9.9%
Coral disease	Not familiar	7.0%	8.6%	8.9%	8.0%
	No	1.2%	3.4%	5.0%	3.1%
	Yes	83.1%	77.4%	78.1%	80.1%
	Not sure	8.7%	10.7%	8.0%	8.8%
Lack of regulation enforcement	Not familiar	3.8%	5.2%	6.3%	5.0%
	No	1.7%	3.2%	1.6%	2.0%
	Yes	88.1%	85.8%	89.5%	88.2%
	Not sure	6.3%	5.8%	2.6%	4.9%

Table C12: Threat impact perception by stratum.

Threat	Threat level	Coastal north	Coastal south	Inland	Total
Climate change	Minor	0.8%	6.6%	2.8%	2.6%
	Moderate	10.8%	11.1%	3.7%	8.4%
	Major	17.4%	11.1%	24.6%	18.9%
	Severe	66.6%	64.3%	66.9%	66.2%
	Not sure	4.3%	6.9%	2.0%	3.9%
Coral bleaching	Minor	1.7%	4.5%	0.9%	1.8%
	Moderate	7.1%	8.0%	6.1%	7.0%
	Major	21.6%	16.1%	20.2%	20.1%
	Severe	63.8%	62.4%	66.0%	64.4%
	Not sure	5.8%	9.1%	6.8%	6.7%
Hurricanes	Minor	1.0%	6.9%	3.6%	3.1%
	Moderate	12.3%	13.1%	9.3%	11.3%
	Major	20.6%	18.7%	20.5%	20.4%
	Severe	61.5%	58.4%	62.6%	61.2%
	Not sure	4.6%	2.9%	4.0%	4.0%
Pollution from stormwater, wastewater, and chemical runoff	Minor	0.9%	3.7%	1.3%	1.5%
	Moderate	7.4%	8.5%	4.9%	6.6%
	Major	16.9%	18.6%	21.6%	19.0%
	Severe	72.6%	63.9%	69.1%	69.7%
	Not sure	2.2%	5.2%	3.1%	3.1%
Marine litter	Minor	1.6%	3.2%	4.2%	2.9%
	Moderate	8.4%	11.6%	7.3%	8.7%
	Major	19.3%	11.7%	15.4%	16.4%
	Severe	66.6%	67.3%	70.9%	68.2%
	Not sure	4.2%	3.5%	4.0%	3.7%
	Minor	4.3%	3.5%	4.0%	4.0%

Invasive species	Moderate	12.4%	15.4%	4.6%	10.3%
	Major	17.9%	17.0%	26.6%	21.0%
	Severe	60.4%	57.5%	61.9%	60.3
	Not sure	5.0%	6.5%	2.8%	4.5%
Overfishing and overgathering	Minor	3.3%	5.6%	2.5%	3.4%
	Moderate	10.7%	13.4%	10.9%	11.4%
	Major	19.6%	14.6%	19.8%	18.7%
	Severe	62.5%	61.6%	64.0%	62.8%
	Not sure	4.0%	4.8%	2.8%	3.7%
Boat anchoring and grounding	Minor	1.3%	3.8%	3.2%	2.5%
	Moderate	5.9%	10.2%	6.4%	7.1%
	Major	22.5%	18.9%	26.3%	23.3%
	Severe	66.7%	62.1%	61.1%	63.5%
	Not sure	3.6%	4.9%	2.9%	3.6%
Divers and snorkelers	Minor	4.9%	7.5%	7.1%	6.2%
	Moderate	15.5%	19.6%	16.6%	16.8%
	Major	23.2%	16.5%	24.5%	22.5%
	Severe	50.8%	48.7%	48.8%	49.4%
	Not sure	5.7%	7.7%	3.0%	5.0%
Ocean acidification	Minor	0%	5.2%	2.9%	2.0%
	Moderate	10.8%	12.8%	6.0%	9.4%
	Major	20.2%	11.7%	28.1%	21.7%
	Severe	64.1%	61.4%	61.2%	62.4%
	Not sure	4.9%	8.8%	1.8%	4.4%
Coral disease	Minor	1.0%	7.7%	3.6%	3.2%
	Moderate	7.0%	5.7%	4.6%	6.0%
	Major	19.8%	15.0%	28.7%	22.2%
	Severe	66.0%	62.2%	59.7%	62.9%
	Not sure	6.1%	9.3%	3.4%	5.7%
Lack of regulation enforcement	Minor	1.1%	3.8%	2.9%	2.3%
	Moderate	10.9%	10.0%	6.1%	9.0%
	Major	19.5%	20.1%	21.0%	20.2%
	Severe	65.9%	60.9%	67.9%	65.7%
	Not sure	2.6%	5.1%	2.1%	2.9%

Table C13: Familiarity with marine protected areas by stratum.

Familiarity	Coastal north	Coastal south	Inland	Total
No	36.6%	36.1%	35.5%	36.0%
Yes	63.4%	63.9%	64.5%	64.0%

Table C14: Perceived impacts of marine protected areas by stratum.

Statement	Change in condition	Coastal north	Coastal south	Inland	Total
Protection of coral reefs	Worsened greatly	11.4%	12.3%	5.9%	9.6%
	Worsened somewhat	7.5%	3.8%	7.5%	6.8%
	No change	8.7%	12.9%	17.6%	12.9%
	Improved somewhat	18.2%	22.1%	23.9%	21.2%
	Improved greatly	38.4%	35.4%	26.8%	33.4%
	Not sure	15.7%	13.6%	18.2%	16.2%
Outdoor recreation	Worsened greatly	10.4%	10.3%	4.3%	8.2%
	Worsened somewhat	9.1%	4.1%	7.1%	7.4%
	No change	13.1%	17.9%	22.5%	17.5%
	Improved somewhat	23.6%	24.3%	23.7%	23.8%
	Improved greatly	27.7%	25.9%	22.0%	25.2%
	Not sure	16.1%	17.9%	22.5%	18.0%
Tourism-based industry	Worsened greatly	2.1%	0.0%	4.9%	0.5%
	Worsened somewhat	6.2%	7.4%	28.7%	6.1%
	No change	22.6%	17.4%	21.1%	22.3%
	Improved somewhat	32.7%	51.4%	24.8%	40.6%
	Improved greatly	27.4%	12.0%	9.3%	15.7%
	Not sure	9.0%	11.8%	11.2%	14.9%
Fishery-based industry	Worsened greatly	11.5%	8.0%	6.4%	9.0%
	Worsened somewhat	11.4%	7.4%	6.6%	8.7%
	No change	9.6%	10.9%	18.2%	13.1%
	Improved somewhat	20.9%	18.3%	24.2%	25.1%
	Improved greatly	31.2%	26.4%	24.5%	27.8%
	Not sure	15.4%	29.1%	20.1%	18.7%
Food for coastal communities	Worsened greatly	9.1%	9.8%	3.7%	7.3%
	Worsened somewhat	9.1%	6.4%	6.3%	7.4%
	No change	15.7%	15.5%	19.6%	17.1%
	Improved somewhat	19.8%	23.0%	26.5%	23.0%
	Improved greatly	29.9%	25.6%	23.6%	26.7%
	Not sure	16.5%	19.7%	20.2%	18.5%
Human health	Worsened greatly	9.1%	9.5%	5.2%	7.8%
	Worsened somewhat	7.8%	6.9%	5.0%	6.5%
	No change	11.9%	17.1%	26.5%	18.4%
	Improved somewhat	24.9%	27.8%	18.9%	23.2%
	Improved greatly	28.1%	23.3%	23.5%	25.4%
	Not sure	18.2%	15.4%	20.9%	18.6%
Your livelihood	Worsened greatly	6.7%	5.4%	3.6%	5.4%
	Worsened somewhat	3.2%	3.6%	3.0%	3.2%
	No change	25.5%	23.0%	28.4%	26.0%
	Improved somewhat	22.1%	25.5%	24.4%	23.6%
	Improved greatly	25.8%	25.8%	20.2%	23.7%

	Not sure	16.7%	16.7%	20.4%	18.1%

Table C15: Support for coral reef management strategies by stratum.

Strategy	Support	Coastal north	Coastal south	Inland	Total
Establish new catch limits per person for certain fish species	Strongly oppose	2.0%	3.9%	2.3%	2.5%
	Somewhat oppose	2.3%	0%	1.3%	1.6%
	Neutral	13.7%	13.7%	11.9%	13.0%
	Somewhat support	7.8%	12.8%	13.0%	10.7%
	Strongly support	74.2%	69.6%	71.6%	72.3%
Create new MPAs or natural reserves	Strongly oppose	0.6%	1.9%	1.1%	1.1%
	Somewhat oppose	0.2%	0%	0.2%	0.3%
	Neutral	8.8%	6.5%	5.7%	7.1
	Somewhat support	7.1%	10.3%	12.5%	9.8%
	Strongly support	83.4%	81.3%	80.5%	81.8%
Establish new requirements for improved wastewater treatment	Strongly oppose	1.5%	1.6%	0.4%	1.1%
	Somewhat oppose	0%	0%	0.4%	0.1%
	Neutral	5.1%	5.1%	4.7%	4.9%
	Somewhat support	10.1%	14.6%	10.2%	11.1%
	Strongly support	83.3%	78.7%	84.3%	82.7%
Encourage community participation in the management of natural resources	Strongly oppose	1.2%	1.6%	0.3%	0.9%
	Somewhat oppose	0.4%	0.2%	0%	0.2%
	Neutral	8.8%	9.7%	8.6%	9.0%
	Somewhat support	5.2%	11.8%	13.6%	9.7%
	Strongly support	84.3%	76.7%	77.4%	80.2%
Further restrict sources of pollution for improved water quality	Strongly oppose	0.6%	1.3%	1.0%	0.9%
	Somewhat oppose	0%	0.4%	0.6%	0.3%
	Neutral	4.8%	5.1%	2.8%	4.1%
	Somewhat support	8.3%	8.9%	12.3%	9.9%
	Strongly support	86.2%	84.3%	83.4%	84.8%
Restrict coastal development around MPAs	Strongly oppose	4.2%	5.1%	4.9%	4.6%
	Somewhat oppose	1.1%	1.2%	1.7%	1.3%
	Neutral	9.0%	11.2%	7.9%	9.0%
	Somewhat support	8.8%	10.8%	10.8%	9.9%
	Strongly support	76.9%	71.7%	74.7%	75.2%
Increase law enforcement surveillance efforts	Strongly oppose	0.6%	1.2%	0.8%	0.8%
	Somewhat oppose	0.2%	0.5%	0.4%	0.4%
	Neutral	5.5%	4.6%	4.1%	4.8%
	Somewhat support	7.3%	14.3%	9.3%	9.4%
	Strongly support	86.5%	79.4%	85.4%	84.6%

Table C16: Importance of Puerto Rico residents to engage in activities to protect coral reefs by stratum.

Importance	Coastal north	Coastal south	Inland	Total
Not at all	0.7%	1.6%	0.6%	0.8%
Slightly	2.2%	0.7%	1.7%	1.7%
Somewhat	4.3%	12.2%	7.6%	4.8%
Moderately	5.2%	9.4%	7.6%	6.9%
Extremely	87.6%	76.1%	88.3%	85.7%

Table C17: Participation in routine pro-environmental behaviors by stratum.

Behavior	Coastal north	Coastal south	Inland	Total
Reduce household water use	80.5%	82.2%	82.0%	81.4%
Reduce household electricity use	85.4%	82.4%	87.4%	85.6%
Compost	46.5%	47.8%	52.8%	49.1%
Recycle	74.0%	65.0%	72.5%	71.6%
Use reef-safe forms of sun protection	54.9%	47.1%	50.1%	51.7%
Promote environmentally responsible practices with others	80.7%	68.8%	79.3%	78.0%
Minimize fuel consumption	77.5%	75.3%	78.3%	77.4%
Use fewer single use products (plastic bags or cups, Styrofoam, etc.)	85.0%	79.3%	83.4%	83.4%

Table C18: Reasons for not participating in routine pro-environmental behaviors by stratum.

Behavior	Reason	Coastal north	Coastal south	Inland	Total
Reduce household water use	I don't know how	14.9%	21.6%	18.0%	17.3%
	It is not convenient	23.7%	8.9%	10.4%	16.1%
	It is too expensive	1.4%	0%	0%	1.0%
	I have not had the opportunity to do so	19.0%	19.7%	41.6%	27.6%
	None of these reasons	42.6%	49.7%	38.2%	42.2%
Reduce household electricity use	I don't know how	17.1%	15.5%	19.3%	17.4%
	It is not convenient	18.1%	15.5%	14.7%	16.4%
	It is too expensive	7.5%	1.3%	8.3%	6.3%
	I have not had the opportunity to do so	12.5%	16.3%	36.1%	21.2%
	None of these reasons	55.8%	51.5%	41.1%	49.9%
Compost	I don't know how	29.9%	30.8%	29.0%	29.6%
	It is not convenient	13.7%	5.0%	7.3%	9.7%
	It is too expensive	2.4%	2.7%	0.8%	1.9%
	I have not had the opportunity to do so	31.1%	22.3%	33.7%	30.6%

	None of these reasons	28.7%	42.3%	34.0%	33.1%
Recycle	I don't know how	12.3%	10.6%	4.6%	8.9%
	It is not convenient	14.8%	3.1%	7.9%	9.5%
	It is too expensive	2.7%	6.3%	0%	2.5%
	I have not had the opportunity to do so	25.0%	21.3%	46.2%	32.2%
	None of these reasons	51.9%	58.7%	41.8%	49.5%
Use reef-safe forms of sun protection	I don't know how	20.7%	13.2%	25.5%	21.0%
	It is not convenient	11.9%	6.8%	5.2%	8.2%
	It is too expensive	1.0%	4.8%	1.1%	1.8%
	I have not had the opportunity to do so	26.0%	13.1%	28.9%	24.6%
	None of these reasons	40.9%	66.3%	44.4%	47.5%
Promote environmentally responsible practices with others	I don't know how	8.9%	9.6%	7.8%	8.7%
	It is not convenient	1.8%	12.0%	3.3%	5.0%
	It is too expensive	0%	0%	0%	0.0%
	I have not had the opportunity to do so	49.9%	32.8%	53.7%	46.8%
	None of these reasons	39.5%	46.8%	36.6%	40.4%
Minimize fuel consumption	I don't know how	11.8%	18.0%	7.4%	11.4%
	It is not convenient	1.8%	12.0%	3.3%	15.9%
	It is too expensive	0%	0%	0%	6.0%
	I have not had the opportunity to do so	49.9%	32.8%	53.7%	23.0%
	None of these reasons	39.5%	46.8%	36.6%	46.6%
Use fewer single use products (plastic bags or cups, Styrofoam, etc.)	I don't know how	7.0%	4.6%	13.2%	8.8%
	It is not convenient	14.4%	4.1%	10.9%	10.7%
	It is too expensive	0.5%	7.7%	2.1%	2.8%
	I have not had the opportunity to do so	28.7%	24.8%	38.3%	31.5%
	None of these reasons	53.4%	58.7%	42.8%	50.6%

Table C19: Participation in annual pro-environmental behaviors by stratum.

Behavior	Coastal north	Coastal south	Inland	Total
Donated to an environmental cause	20.4%	19.3%	10.5%	15.9%
Volunteered in a beach clean-up, citizen science effort, or other environmental effort	13.6%	17.4%	17.5%	16.5%
Joined or renewed a membership in a conservation organization	8.9%	9.0%	3.6%	7.0%
Volunteered in environmental restoration activities	19.0%	15.0%	9.9%	14.7%

Participated in environmental education activities (webinars, trainings, etc.)	18.4%	14.9%	15.2%	16.5%

Table C20: Reasons for not participating in annual pro-environmental behaviors by stratum.

Behavior	Reason	Coastal north	Coastal south	Inland	Total
Donated to an environmental cause	I don't know how	11.8%	5.4%	11.6%	12.4%
	It is not convenient	3.6%	2.2%	4.4%	2.5%
	It is too expensive	0%	0%	0%	3.1%
	I have not had the opportunity to do so	48.7%	50.3%	48.6%	45.3%
	None of these reasons	37.9%	44.3%	37.2%	40.0%
Volunteered in a beach clean-up, citizen science effort, or other environmental effort	I don't know how	16.4%	9.0%	9.2%	10.6%
	It is not convenient	2.6%	2.0%	2.6%	3.7%
	It is too expensive	4.0%	0.6%	3.3%	0.2%
	I have not had the opportunity to do so	42.2%	41.7%	50.5%	44.7%
	None of these reasons	38.3%	48.6%	37.8%	39.5%
Joined or renewed a membership in a conservation organization	I don't know how	16.8%	8.8%	13.9%	14.2%
	It is not convenient	3.6%	2.2%	4.4%	2.6%
	It is too expensive	0%	0%	0%	1.7%
	I have not had the opportunity to do so	48.7%	50.3%	48.6%	44.7%
	None of these reasons	37.9%	44.3%	37.2%	39.5%
Volunteered in environmental restoration activities	I don't know how	14.4%	7.2%	11.0%	11.7%
	It is not convenient	1.7%	2.3%	2.5%	2.1%
	It is too expensive	0%	0%	0%	0.0%
	I have not had the opportunity to do so	47.9%	45.3%	53.1%	49.5%
	None of these reasons	37.5%	47.1%	35.7%	38.6%
Participated in environmental education activities (webinars, trainings, etc.)	I don't know how	16.8%	6.1%	14.4%	13.8%
	It is not convenient	2.3%	1.3%	3.0%	2.4%
	It is too expensive	0%	0%	0%	0.2%
	I have not had the opportunity to do so	45.7%	46.8%	51.4%	48.2%
	None of these reasons	37.4%	46.9%	34.1%	37.9%

Table C21: Participation in long-term pro-environmental behaviors by stratum.

Behavior	Coastal north	Coastal south	Inland	Total
Updated the septic or sewer system on my property	22.7%	32.7%	24.7%	25.3%

Installed a water storage system (such as a tank or rain barrel)	48.6%	32.7%	24.7%	48.9%
Installed a solar energy system	19.7%	15.4%	17.1%	17.8%

Table C22: Reasons for not participating in long-term pro-environmental behaviors by stratum.

Behavior	Reason	Coastal north	Coastal south	Inland	Total
Updated the septic or sewer system on my property	I don't know how	13.2%	9.5%	13.4%	12.6%
	It is not convenient	8.9%	4.0%	5.9%	6.9%
	It is too expensive	8.8%	5.3%	8.7%	8.2%
	I have not had the opportunity to do so	17.2%	15.1%	26.9%	20.7%
	I am not allowed to	12.9%	9.2%	13.3%	12.4%
	None of these reasons	42.4%	57.0%	35.2%	42.1%
Installed a water storage system (such as a tank or rain barrel)	I don't know how	12.4%	4.6%	5.2%	8.1%
	It is not convenient	10.1%	2.0%	7.6%	7.5%
	It is too expensive	13.9%	14.9%	8.5%	12.1%
	I have not had the opportunity to do so	23.5%	25.7%	36.9%	29.0%
	I am not allowed to	7.2%	4.0%	6.7%	6.3%
	None of these reasons	35.9%	49.4%	37.2%	39.2%
Installed a solar energy system	I don't know how	8.3%	2.7%	3.4%	5.3%
	It is not convenient	5.9%	4.1%	3.0%	4.4%
	It is too expensive	43.8%	48.6%	41.8%	44.0%
	I have not had the opportunity to do so	17.7%	15.9%	24.2%	19.9%
	I am not allowed to	3.4%	1.1%	5.2%	3.6%
	None of these reasons	25.5%	29.7%	26.8%	3.6%

Table C23: Perceptions of acceptability of regulations to protect coral reefs by stratum.

Behavior	Perception	Coastal north	Coastal south	Inland	Total
Operating a boat in a shallow reef area	Very unacceptable	91.0%	84.9%	91.1%	89.8%
	Somewhat unacceptable	1.5%	5.3%	3.4%	2.9%
	Neutral	5.4%	8.3%	3.1%	5.1%
	Somewhat acceptable	1.5%	0.0%	2.2%	1.5%
	Very acceptable	0.6%	1.5%	0.2%	0.7%
Anchoring a boat on coral	Very unacceptable	91.9%	86.9%	93.5%	91.5%
	Somewhat unacceptable	2.9%	3.2%	1.4%	2.4%

	Neutral	4.0%	8.0%	2.8%	4.3%
	Somewhat acceptable	0.0%	0.0%	1.4%	0.5%
	Very acceptable	1.2%	1.8%	0.9%	1.3%
Touching corals with my hands or feet (including standing)	Very unacceptable	84.3%	78.9%	86.7%	84.1%
	Somewhat unacceptable	8.1%	7.9%	5.1%	6.9%
	Neutral	6.6%	11.3%	5.5%	7.1%
	Somewhat acceptable	0.4%	0.6%	2.4%	1.2%
	Very acceptable	0.6%	1.4%	0.2%	0.7%
Taking seashells or coral from the reef	Very unacceptable	86.7%	73.4%	81.0%	81.9%
	Somewhat unacceptable	3.8%	9.2%	5.0%	5.3%
	Neutral	6.2%	14.8%	11.2%	9.7%
	Somewhat acceptable	3.0%	0.2%	1.5%	1.9%
	Very acceptable	0.3%	2.4%	1.1%	1.1%
Leaving trash on the beach	Very unacceptable	95.8%	89.2%	93.3%	93.5%
	Somewhat unacceptable	1.5%	3.8%	3.4%	2.6%
	Neutral	2.2%	5.6%	1.8%	2.7%
	Somewhat acceptable	0.0%	0.0%	0.8%	0.3%
	Very acceptable	0.5%	1.5%	0.8%	0.9%
Feeding fish, birds, or marine animals	Very unacceptable	53.2%	42.8%	54.0%	51.5%
	Somewhat unacceptable	10.1%	11.0%	5.8%	8.7%
	Neutral	20.6%	28.9%	20.2%	22.0%
	Somewhat acceptable	8.3%	8.3%	13.2%	10.2%
	Very acceptable	7.8%	9.0%	6.8%	7.7%
Fishing in no-take areas	Very unacceptable	89.7%	81.5%	89.2%	87.9%
	Somewhat unacceptable	2.7%	6.3%	4.5%	4.1%
	Neutral	6.0%	7.6%	3.9%	5.5%
	Somewhat acceptable	0.8%	0.7%	2.0%	1.2%
	Very acceptable	0.9%	3.9%	0.4%	1.3%
Discharging pollutants in seawater	Very unacceptable	95.6%	89.7%	93.2%	93.5%
	Somewhat unacceptable	2.2%	4.2%	3.8%	3.2%
	Neutral	1.8%	5.0%	1.8%	2.4%
	Somewhat acceptable	0.1%	0.0%	0.8%	0.4%
	Very acceptable	0.3%	1.2%	0.4%	0.6%

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