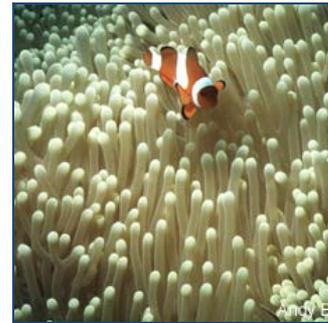




NCRMP Socioeconomic Monitoring For Guam



Presented By: NCRMP Socioeconomic Team

**NOAA Coral Reef Conservation Program
& National Centers for Coastal Ocean Science**

for more information, visit the web-portal at:

<http://www.coris.noaa.gov/monitoring/socioeconomic.html>

June 18, 2018

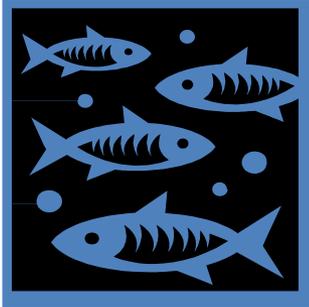


Outline

- Background on the National Coral Reef Monitoring Program's Socioeconomic Component
- Social survey for Guam
 - Methods
 - Results
 - Applications of the data
- Questions and opportunities for input



National Coral Reef Monitoring Plan



Biological
Indicators

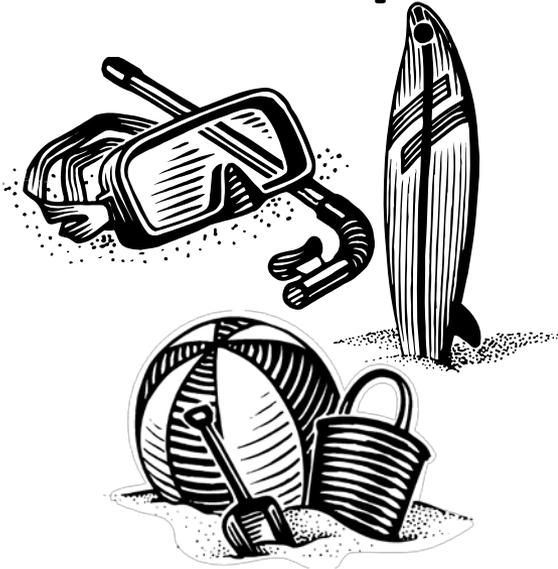
Climate
Indicators



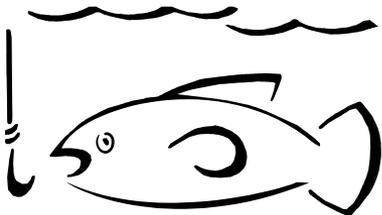
Socioeconomic
Indicators



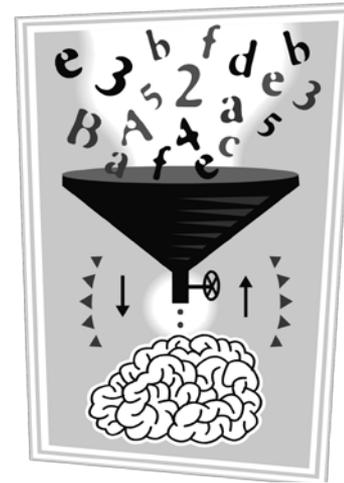
Socioeconomic Component: Examples of the types of data we collect



Use of coral reef resources



Population change



Knowledge, attitudes, &
perceptions of coral reefs
and coral reef management



Socioeconomic Monitoring Approach

- ❖ Data collection occurs through
 - ❖ Surveys of residents in coral reef jurisdictions
 - ❖ Synthesis of existing socioeconomic data
- ❖ Resulting data will feed into several products
 - ❖ Social science database
 - ❖ Data products such as infographics, posters, presentations, and publications
 - ❖ NCRMP report cards



Project Team

- ❖ Peter Edwards
- ❖ Arielle Levine
- ❖ Jarrod Loerzel
- ❖ Matt Gorstein
- ❖ NCCOS social science team
- ❖ Jurisdictional management agencies
- ❖ Key jurisdictional stakeholders
- ❖ CRCP and NMFS management liaisons





NOAA CORAL REEF CONSERVATION PROGRAM



MONITORING METHODS: Survey



Indicators for NCRMP Social Monitoring

- * Participation in reef activities
- * Perceived resource condition
- * Attitudes towards coral reef management strategies and enforcement
- * Awareness and knowledge of coral reefs
- Human population changes near coral reefs
- Economic impact of coral reef fishing to jurisdiction
- Economic impact of dive/snorkel tourism to jurisdiction
- Community well-being
- * Cultural importance of reefs
- * Participation in behaviors that may improve coral reef health
- Physical infrastructure
- * Awareness of coral reef rules and regulations
- Governance



Survey Methodology

- ❖ Core module vs. jurisdiction specific module:
 - ❖ Asking some of the same questions in all areas allows comparisons across jurisdictions
 - ❖ Asking some specific questions for each area allows jurisdictional management and resource issues to be addressed
- ❖ Survey sample:
 - ❖ Random sample of adult residents in the jurisdiction
 - ❖ Representative of population demographics (age, race, sex, income)
- ❖ Survey implementation:
 - ❖ By a contracted entity with experience conducting surveys in the jurisdiction
 - ❖ Dual survey mode for Guam in English, Chamorro, Carolinian, and Tagalog:
 - ❖ Phone (included cell and landline)
 - ❖ Face to face interview by household



Social Monitoring by Geography and Year

Jurisdiction	Geographic scope	Year
American Samoa	Island of Tutuila	2013-14
Florida	Martin, Palm Beach, Broward, Miami-Dade, Monroe Co.	2013-14
Hawai'i	Islands of Kauai, Maui, Moloka'i, O'ahu, Hawai'i, Lana'i	2014-15
Puerto Rico	Islands of Puerto Rico, Vieques, Culebra	2014-15
Guam	Entire island of Guam	2015-16
CNMI	Islands of Saipan, Tinian, Rota	2015-16
USVI	Islands of St. Croix, St. Thomas, St. John	2016-17



NOAA CORAL REEF CONSERVATION PROGRAM



MONITORING RESULTS: Survey





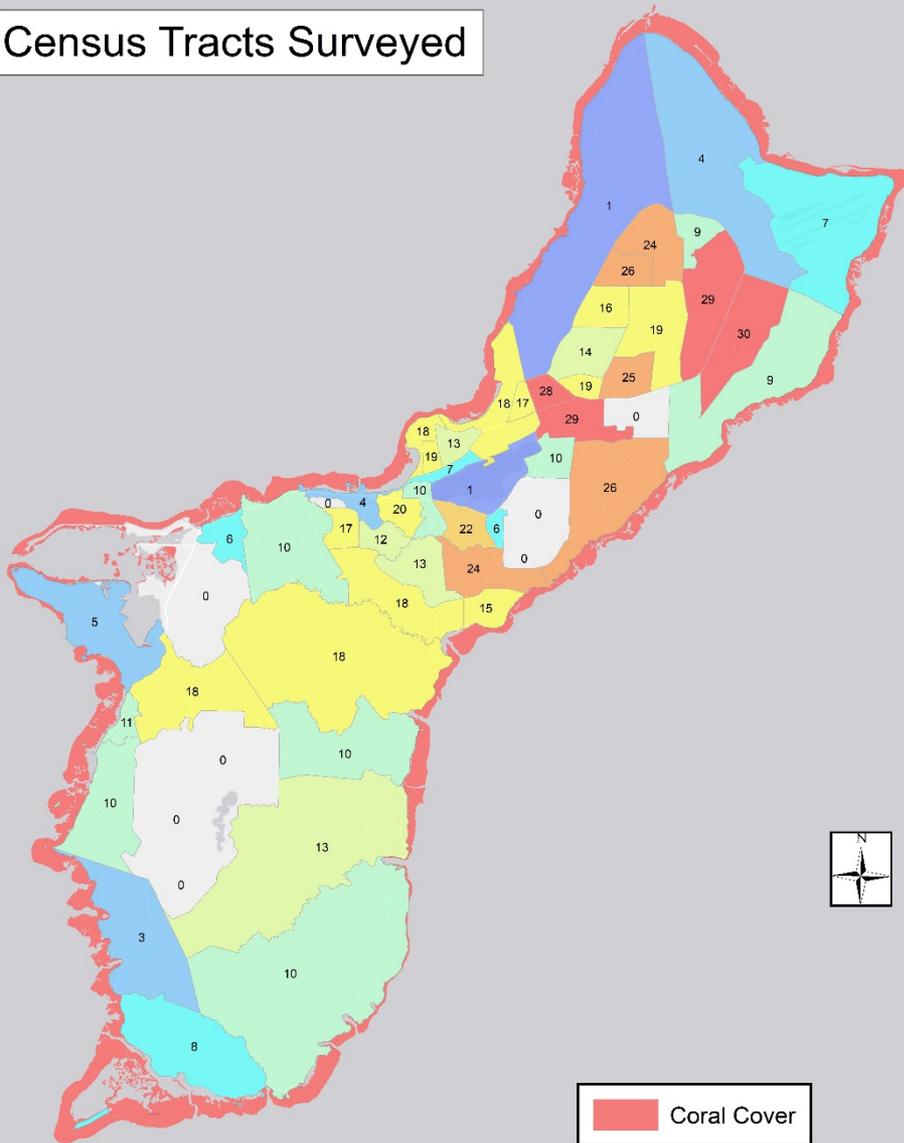
The Sample

Survey Mode	Sample Size	Response Rate
Telephone	130	13%
Face to face interview	582	60%
Total	712	51%

- Total of 712 with a margin of error of +/-5% and a 95% confidence interval
- An overall response rate of 51%.
- Both cell and landline telephone sample frames were used



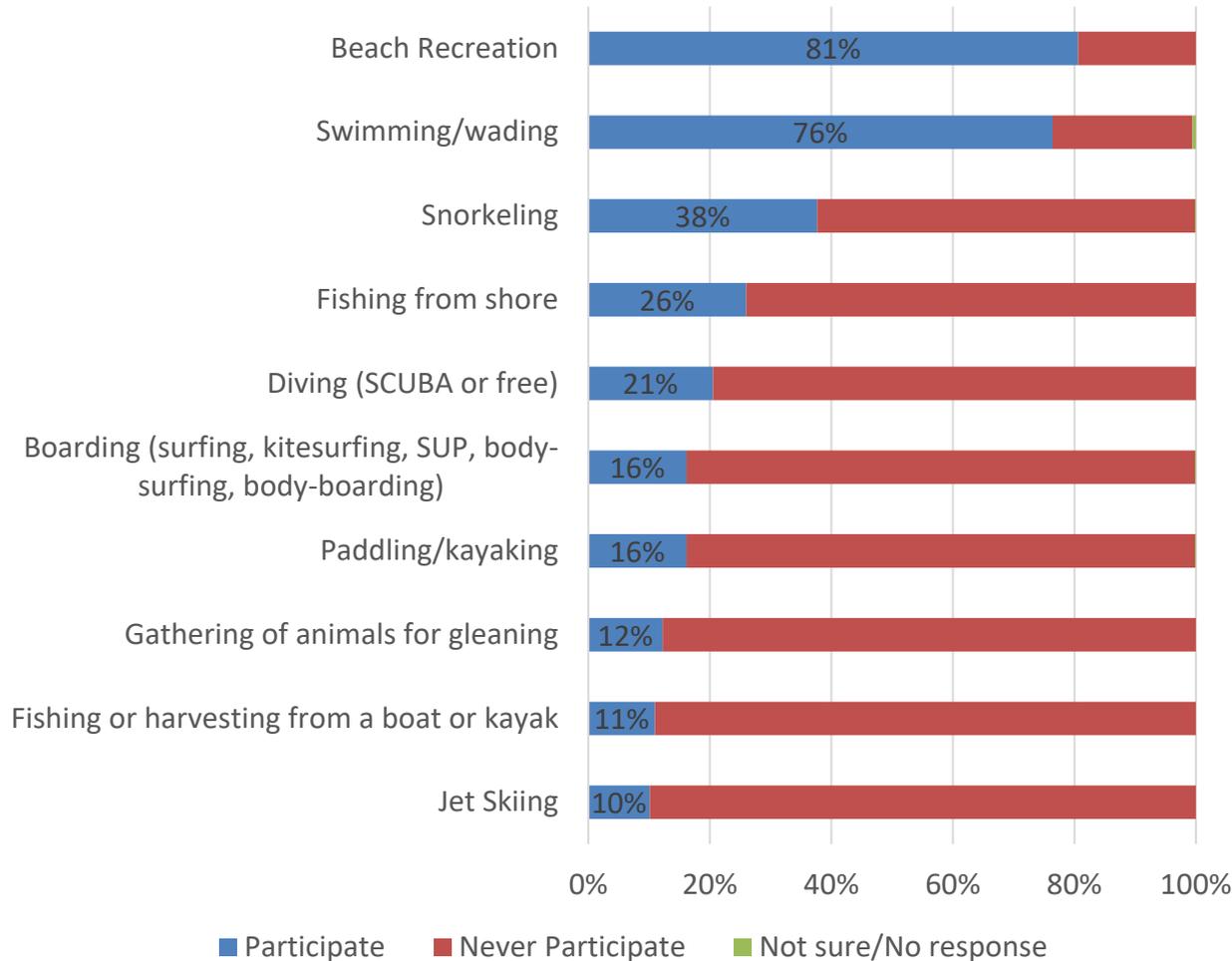
Census Tracts Surveyed



Sampling Strategy:

- Residents aged 18 and over
- 2010 Census data benchmarks established
- Density dependent sampling strategy
 - Based on proportion of population within each tract
- 56 census tracts
 - 45 tracts surveyed
 - 11 tracts removed due to small population density
 - Military bases excluded due to restricted access

Participation in Coral Reef Activities (n = 712)



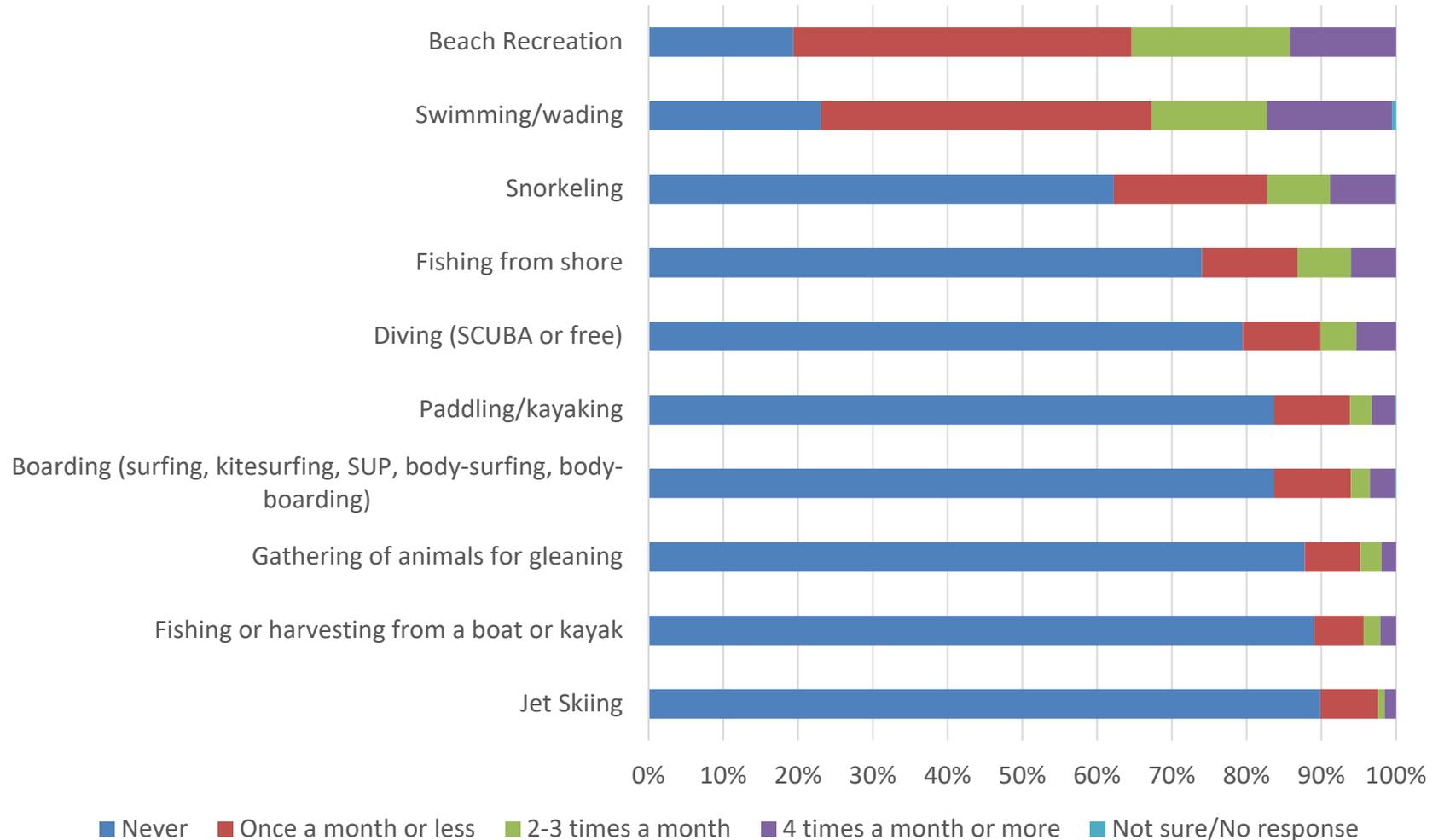
➤ The recreation activities with the highest level of participation were beach recreation (81%) and swimming/wading (76%).

➤ The recreation activities with the greatest proportion of respondents who never participate were jet skiing (90%) and fishing/harvesting from a boat/kayak (91%)

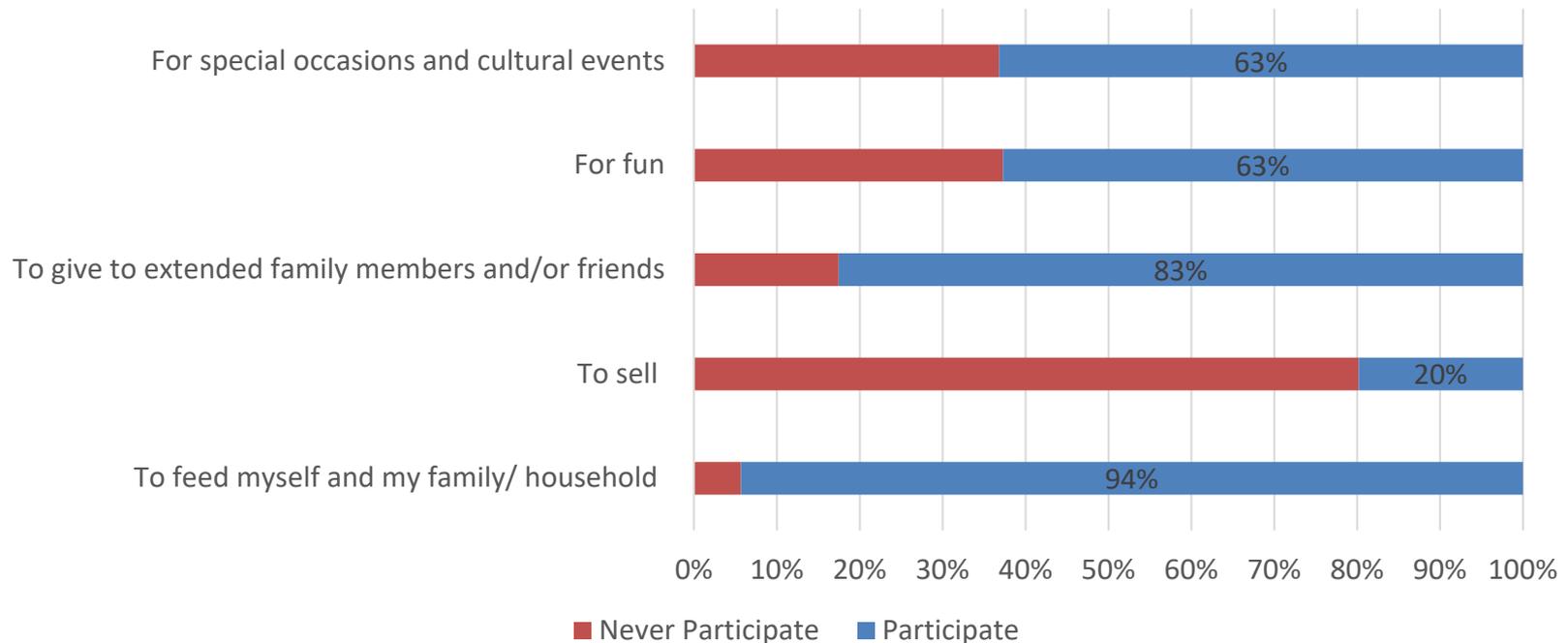
➤ 29% either fish from boat/kayak or shore

➤ 30% extract resources (fishing or gathering)

Participation in Coral Reef Activities (n = 712)



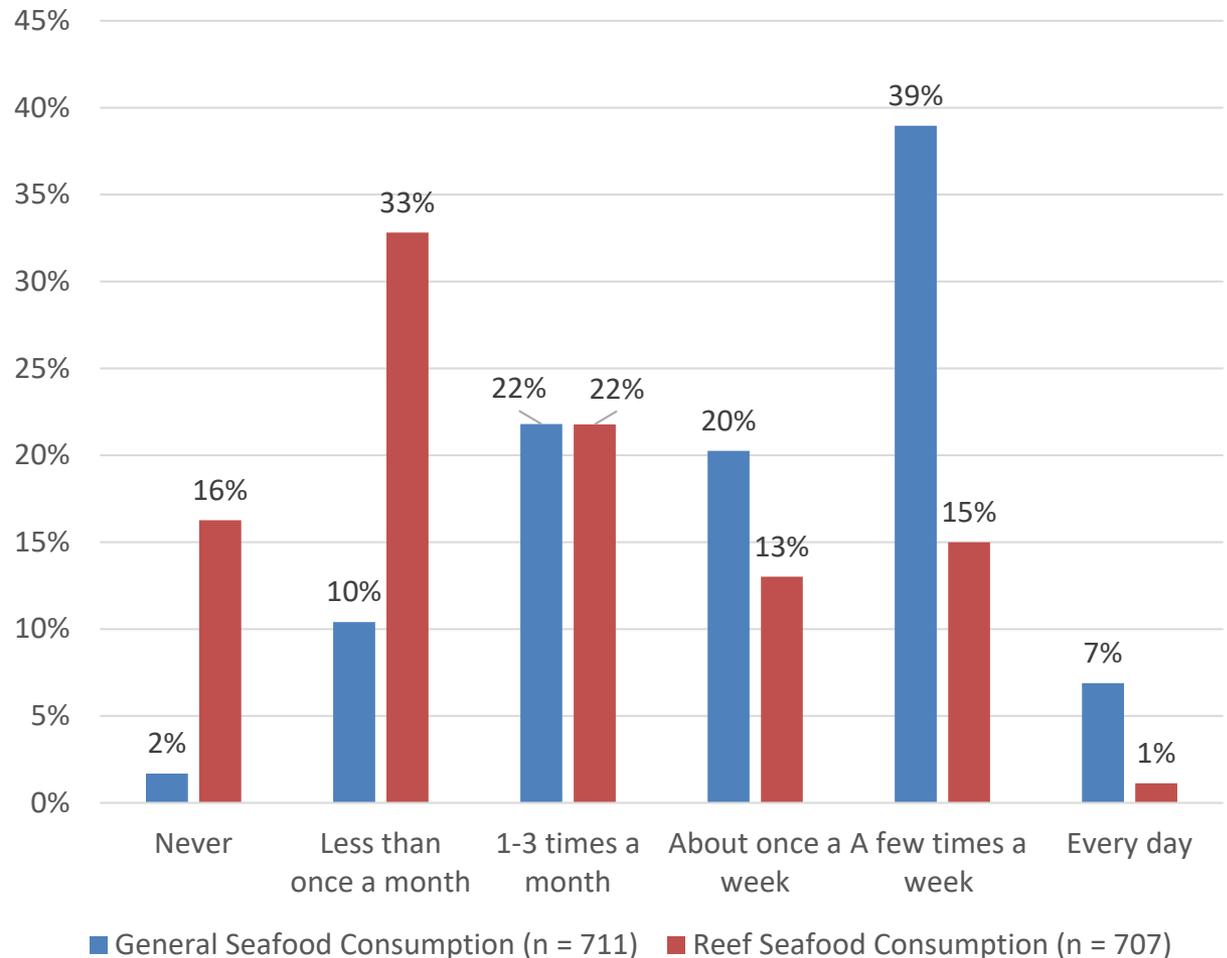
Reasons for participation in fishing or harvesting marine resources (n = 212)



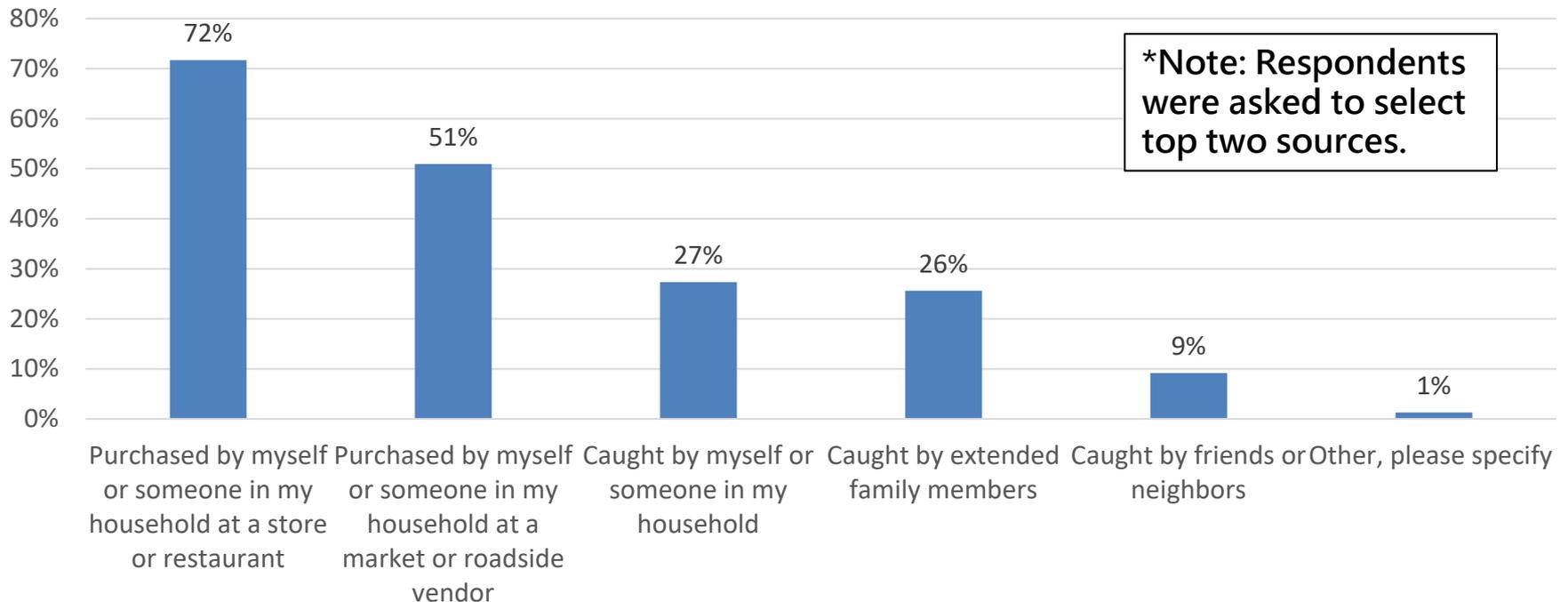
- The reason for fishing or harvesting marine resources with the highest level of participation was “to feed myself and my family/ household” (94%).
- The reason for fishing or harvesting marine resources with the lowest level of participation was “To sell” (80% Never participate).

Frequency of Fish/Seafood Consumption for Respondents and their Household

- The majority of respondents (66%) ate seafood at least once a week.
- 29% ate seafood harvested from coral reefs at least once a week.
- 98% consume seafood overall, and 84% consume reef seafood.

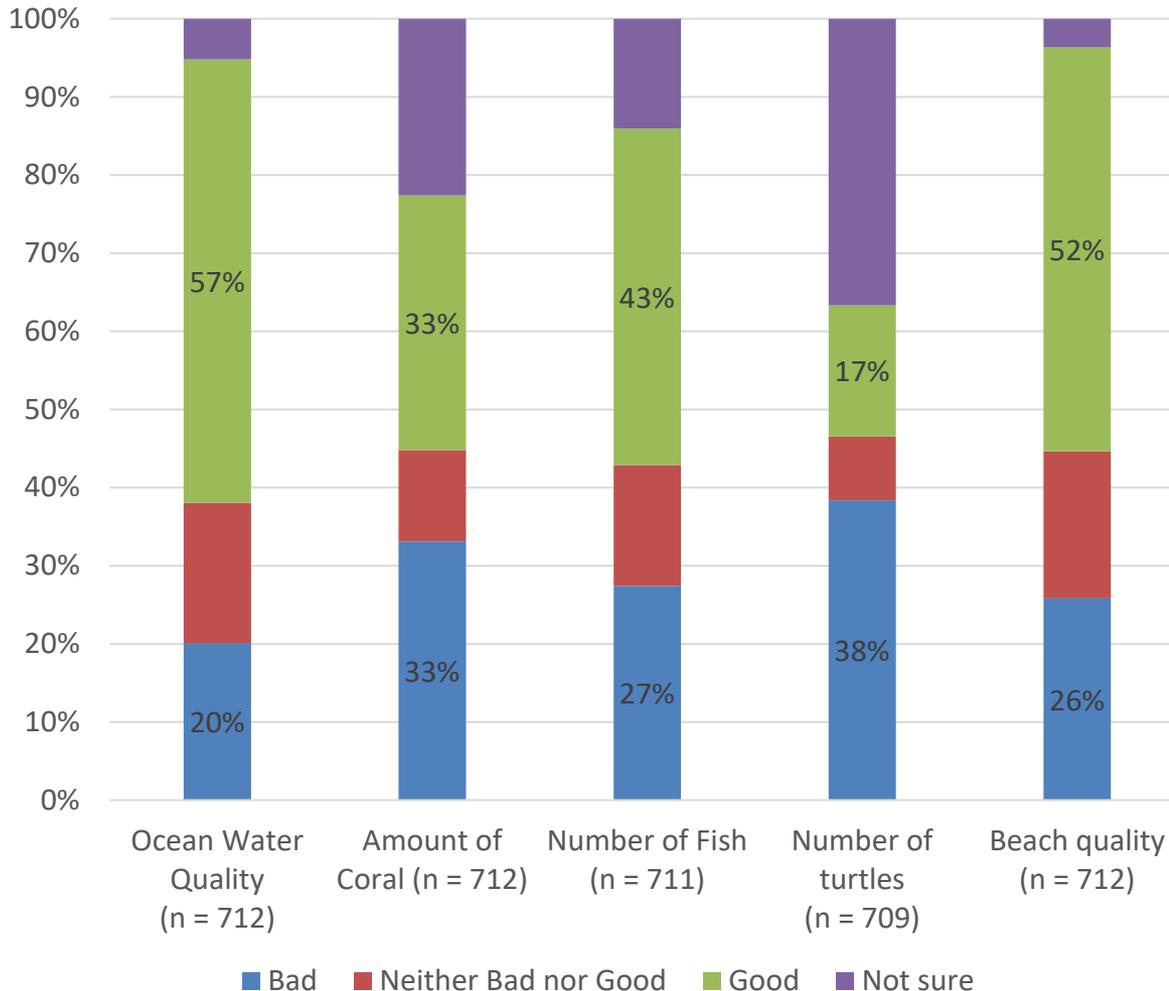


Main Source of Fish and Seafood for Personal and Household Consumption (n = 699)



- The source chosen most as a main source of fish and seafood was “Purchased by myself or someone in my household at a store or restaurant” (72%) followed by “Purchased...at a market or roadside vendor” (51%).
- The source chosen least as a main source of fish and seafood was “Caught by friends or neighbors” (9%).

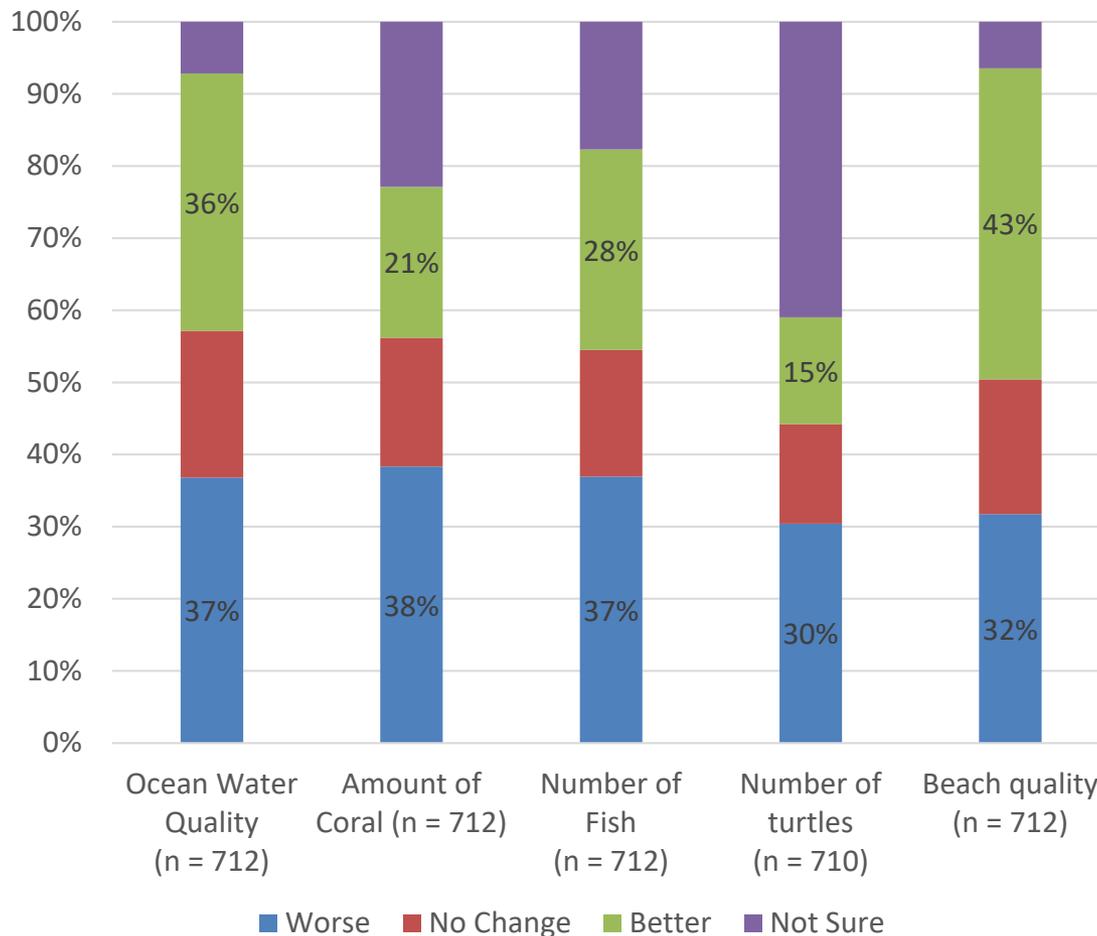
Perceptions of Current Resource Conditions



➤ The resources considered to be in the best condition were ocean water quality (57%) and beach quality (52%)

➤ The resource considered to be in the worst condition was number of turtles (38%), although this is the resource that respondents were the most unsure about as well (37%).

Perceptions of Change in Resource Conditions Over the Last 10 Years

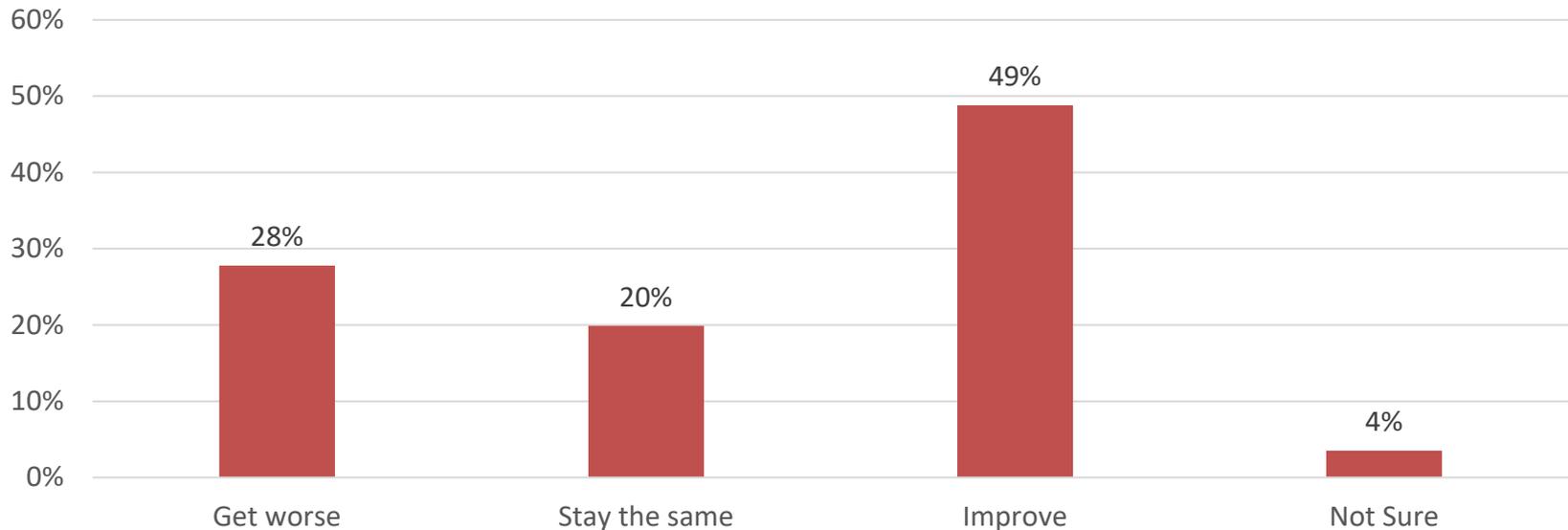


➤ Beach quality (43%) and ocean water quality (36%) were the resources perceived to have done the best over the last 10 years.

➤ Amount of Coral (38%) and number of fish (37%) were perceived to have deteriorated the most over the last 10 years.

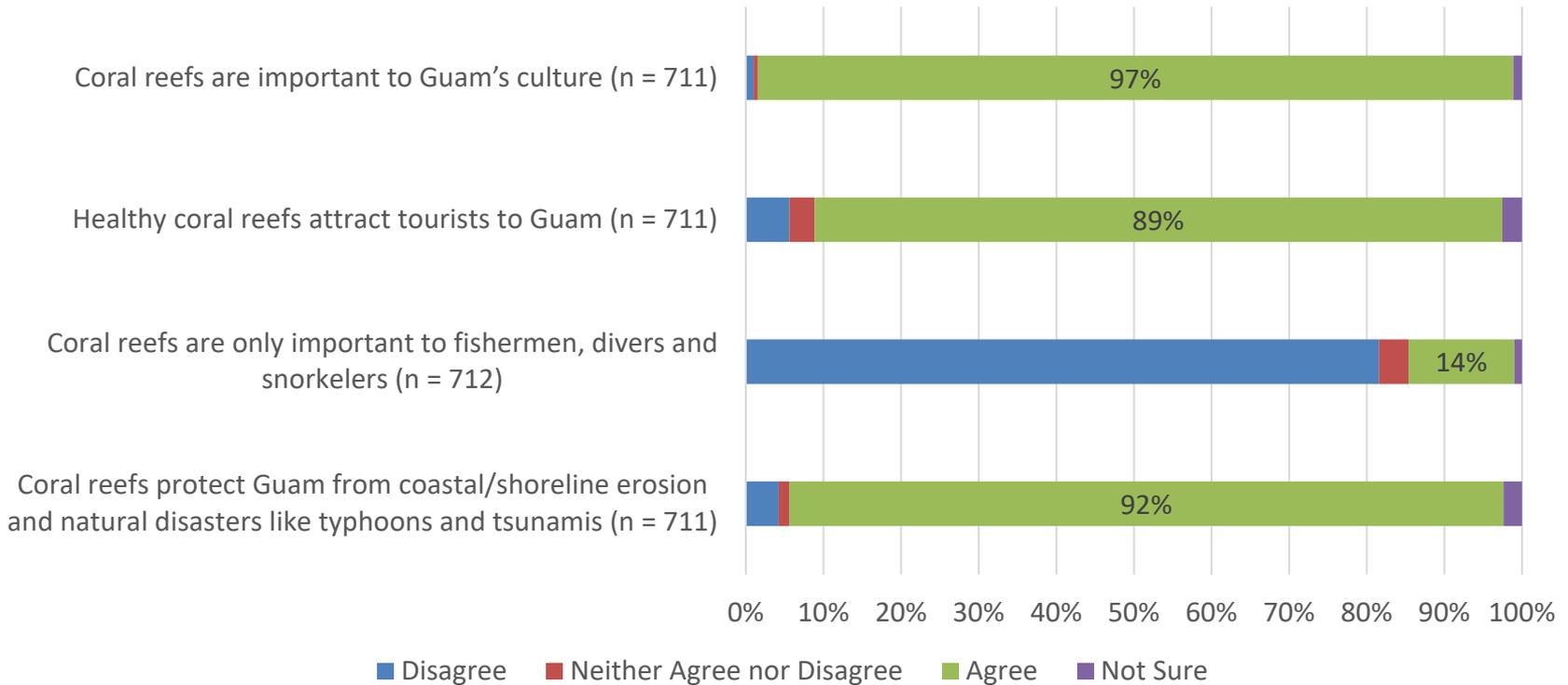
➤ Number of turtles was again the resource that respondents were the most unsure about (41%) in terms of its change in condition

Perceptions of Anticipated Change in Resource Conditions Over the Next 10 Years (n = 709)



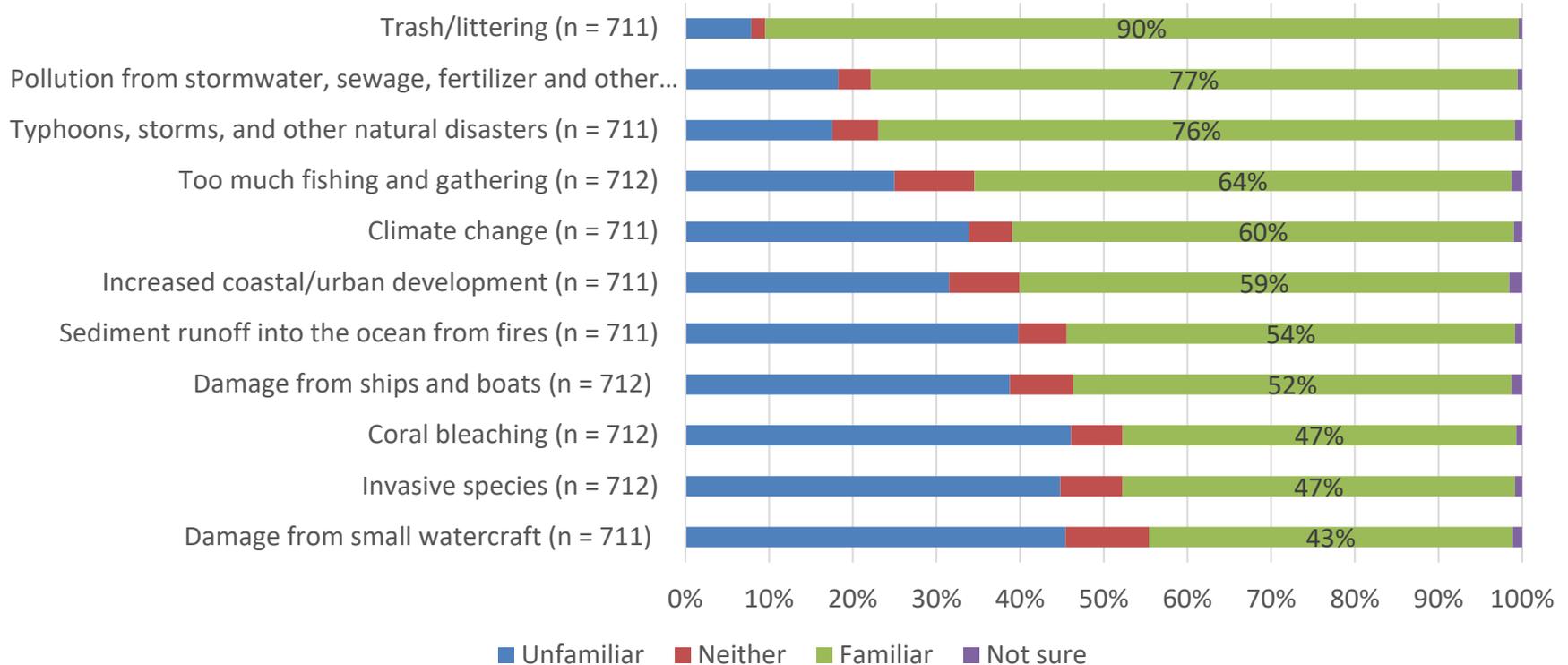
- “Resource” refers to the resources listed in the condition perception questions: ocean water quality, amount of coral, number of fish, number of turtles, and beach quality
- Almost half of the respondents (49%) anticipated the overall resource condition will improve over the next 10 years.
- 28% of respondents anticipated the resource condition will get worse.
- 20% of respondents anticipated the resource condition will stay the same , while 4% were not sure.

Agreement with Statements of Coral Reef Value



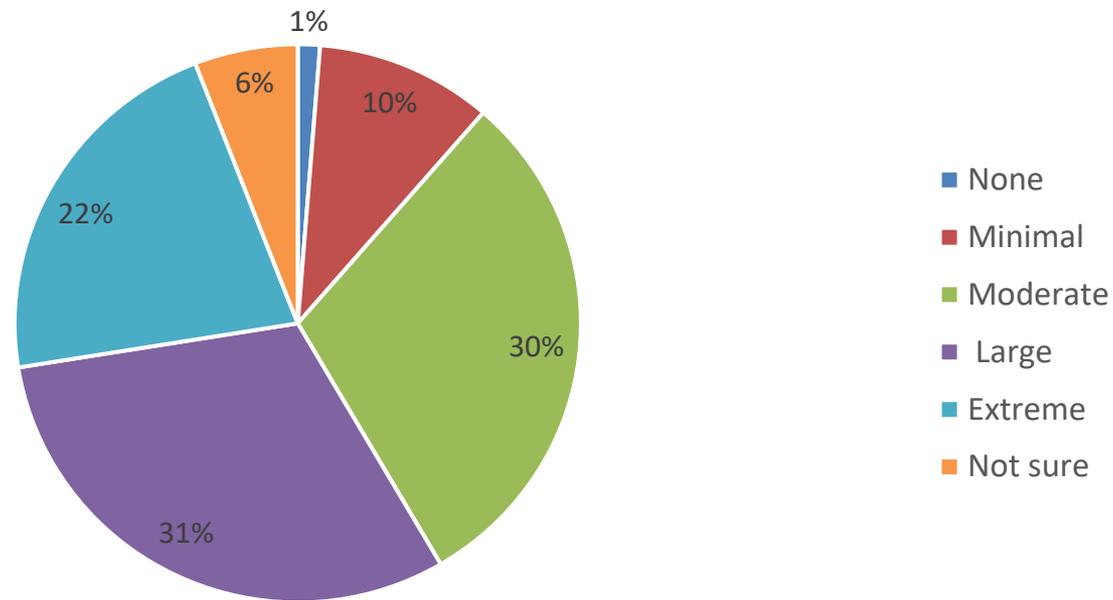
- The statement that respondents agreed the most with was “Coral reefs are important to Guam’s culture” (97%).
- The statement that respondents disagreed the most with was “Coral reefs are only important to fisherman, divers, and snorkelers” (82%).

Familiarity with Threats Facing Coral Reefs



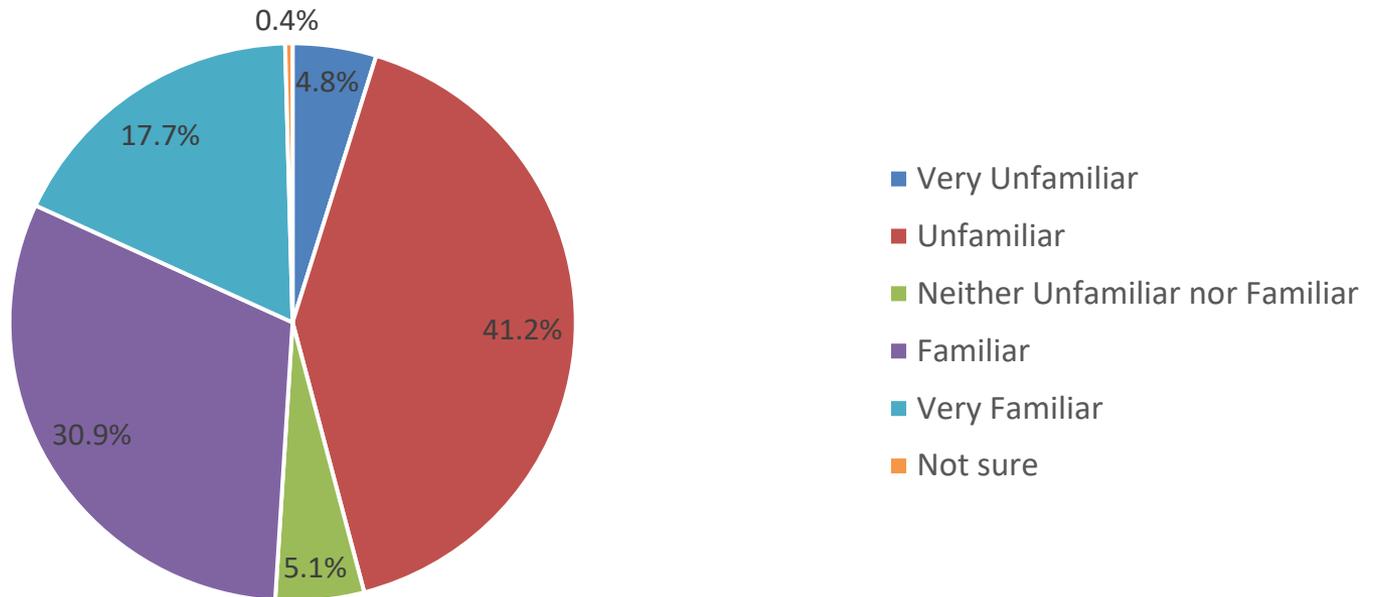
- The majority of respondents (>50%) were familiar with all threats except for coral bleaching, invasive species, and small watercraft damage
- Respondents were most familiar with trash/littering (90%) and runoff from pollution (77%)
- Respondents were the most unfamiliar with small watercraft damage (45%) and invasive species (45%)

Perceptions of the Level of Threat to Coral Reefs (n = 712)



- Over half of respondents (53%) perceived the level of threat to coral reefs as Large or Extreme.
- 30% perceived the level of threat to coral reefs as Moderate
- Only 11% believed threats were minimal or non-existent, and 6% were not sure.

Familiarity with MPAs (n = 712)



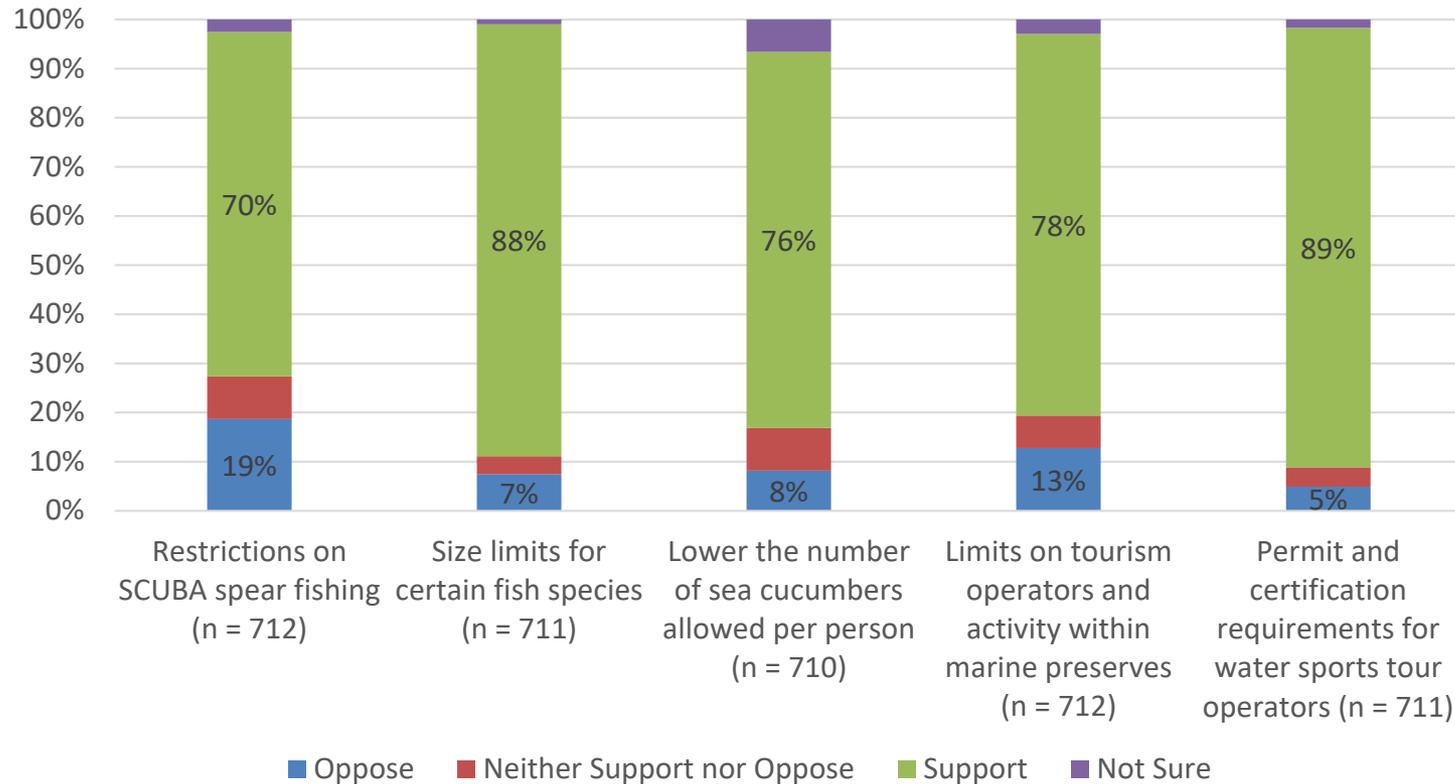
- Just under half (48.6%) of respondents were familiar or very familiar with MPAs
- 45.9% were unfamiliar or very unfamiliar with MPAs

Perceptions of Marine Protected Areas

MPA Statement	Sample Size	Disagree	Neither Agree nor Disagree	Agree	Not Sure
Marine Preserves protect coral reefs	380	4%	1%	94%	<1%
Marine Preserves increase the number of fish	380	4%	2%	93%	1%
There should be fewer Marine Preserves in Guam	378	71%	10%	17%	1%
There should be more Marine Preserves in Guam	379	15%	10%	75%	1%
There has been economic benefit to Guam from the establishment of Marine Preserves	379	7%	8%	79%	6%
Fishermen's livelihoods have been negatively impacted from the establishment of Marine Preserves in Guam	379	38%	13%	42%	6%
Marine Preserves help increase tourism in Guam	379	7%	6%	84%	3%
The establishment of Marine Preserves increases the likelihood that people will vacation in Guam	378	9%	9%	80%	2%
I would support adding new Marine Preserves in Guam if there is evidence that the ones we have are improving Guam's marine resources	380	8%	4%	87%	1%
I generally support the establishment of Marine Preserves	380	4%	3%	92%	1%

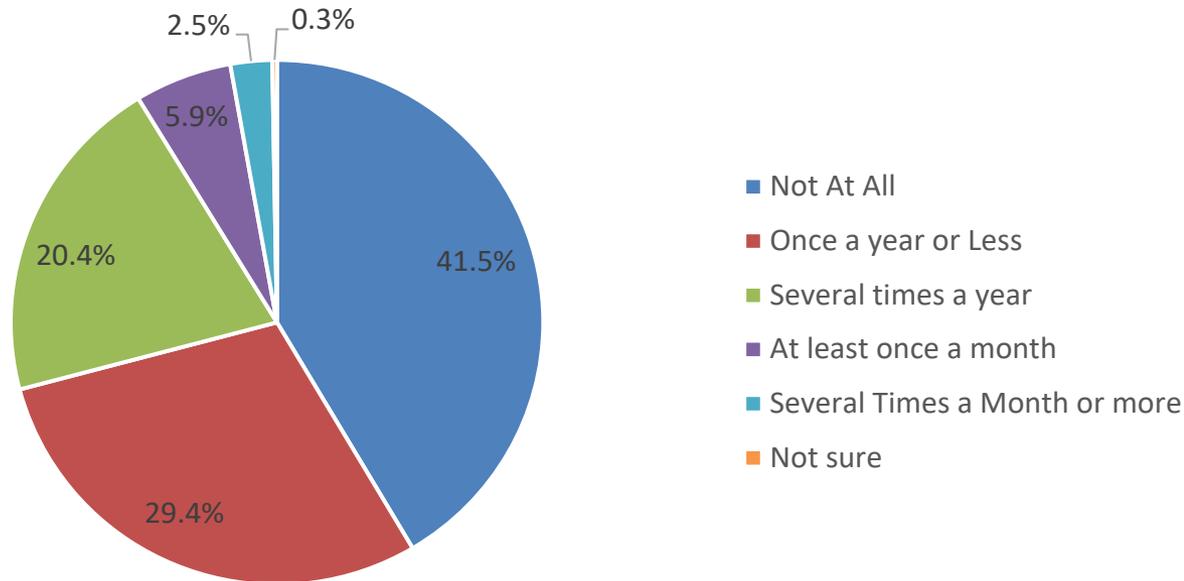
- 75% of respondents agreed that “there should be more marine preserves in Guam” and 94% agreed that “marine preserves protect coral reefs”
 - However, 42% agreed that “Fishermen’s livelihoods have been negatively impacted from the establishment of marine preserves in Guam”

Support for Management Strategies



- At least 70% of respondents agreed with all the presented management strategies.
- Respondents agreed the most with “Permit and certification requirements for water sports tour operators” (89%).
- Respondents disagreed most with “Restrictions on SCUBA spear fishing” (19%).

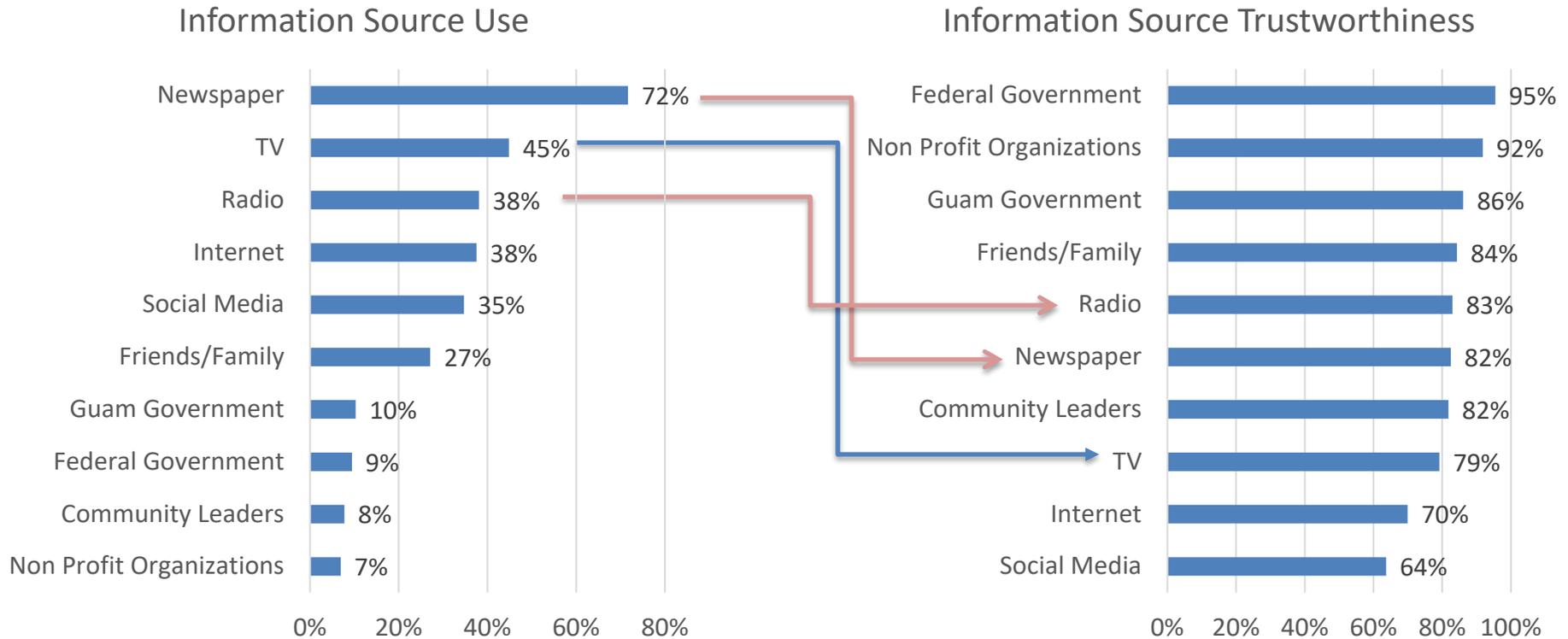
Frequency of Participation in Any Activity to Protect the Environment (n = 711)



- Over half of respondents (58.2%) state that they participate in pro-environmental activities
- 28.8% participate at least several times a year

Respondents' Top Sources for Information about Coral Reefs and the Environment and Source Trust

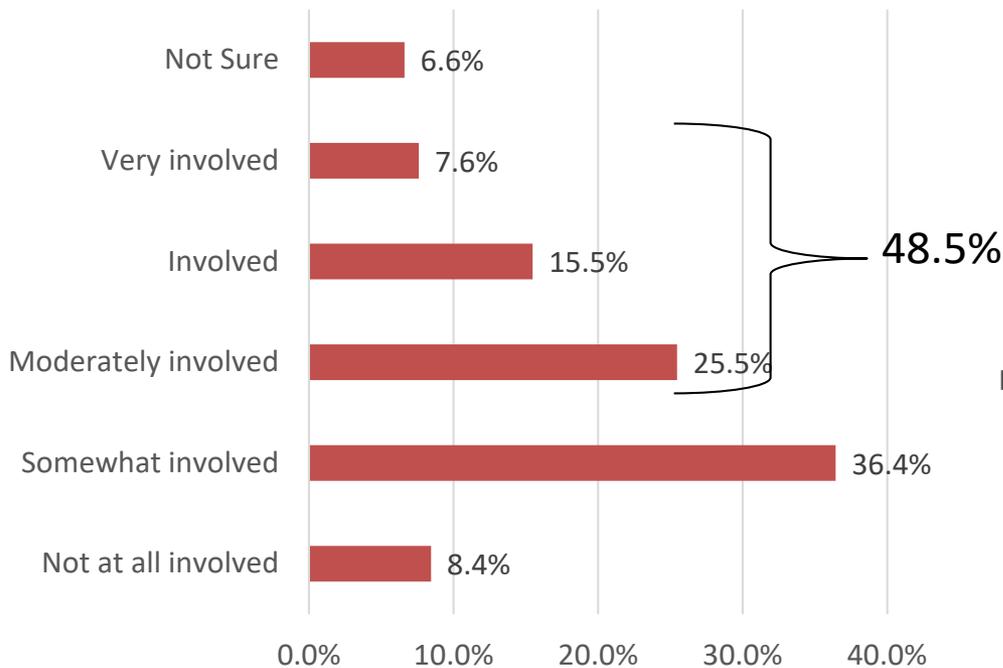
(n = 709)



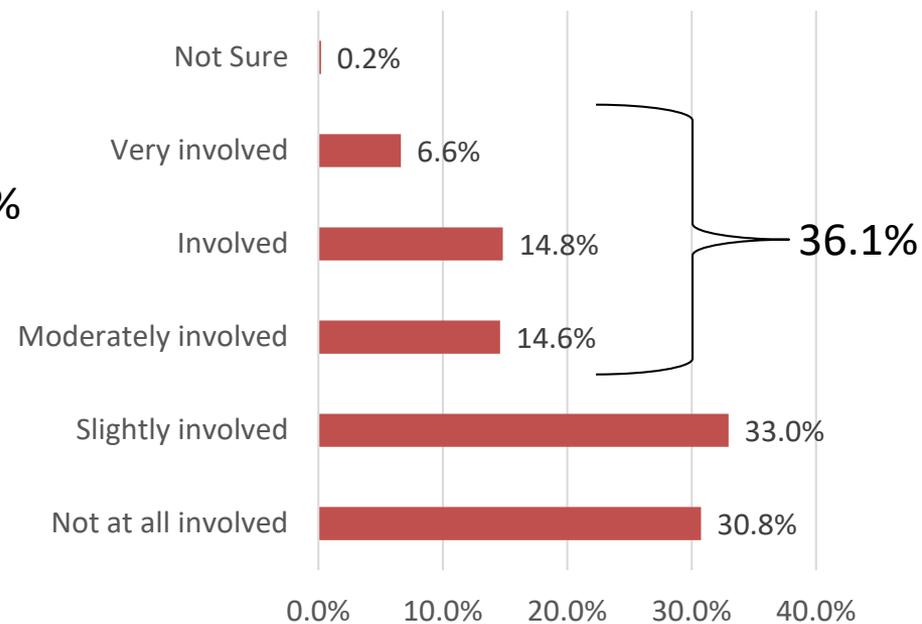
- Newspapers (72%), TV (45%), and the radio (38%) are the top sources of information about coral reefs and the environment.
- However, these top sources are perceived to be less trustworthy than other sources chosen by respondents.

Perceptions of Individual and Community Involvement in Coral Reef Management & Decision Making

How involved is your local community in protecting and managing coral reefs? (n = 711)



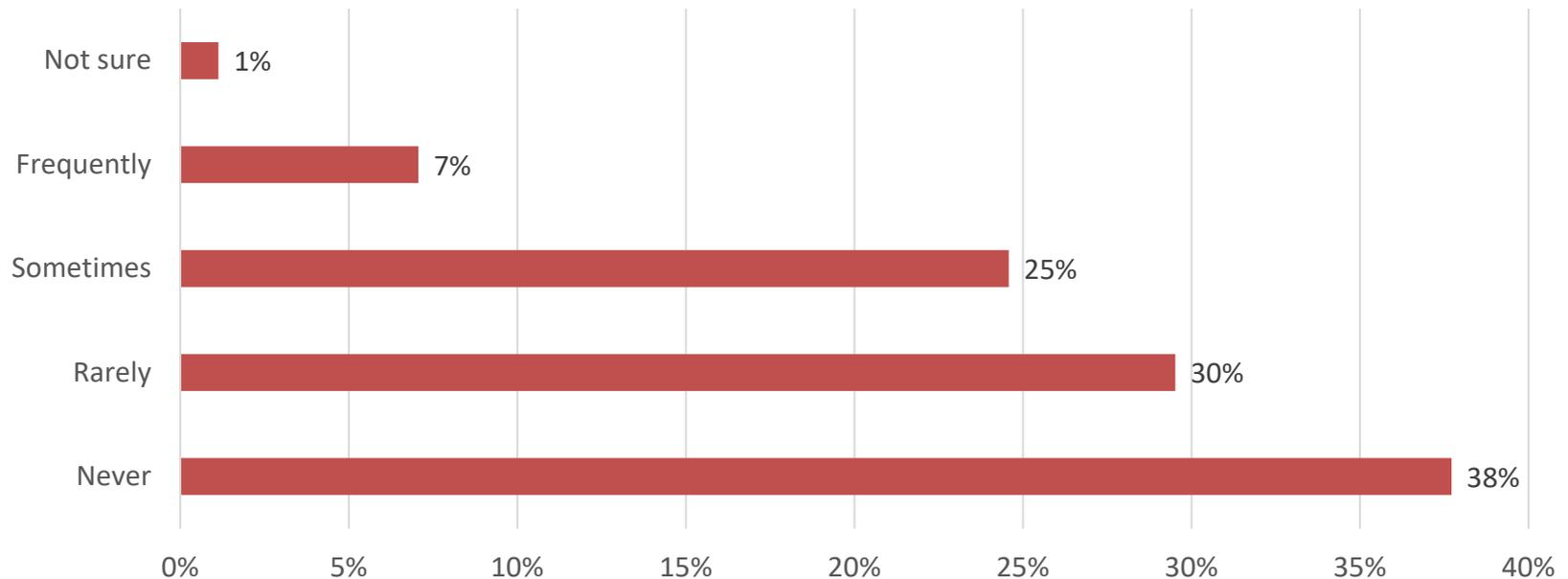
How involved are YOU in making decisions related to the management of coral reefs? (n = 452)



- Only 8% perceive their local communities as not at all involved in protecting and managing coral reefs.
- Almost half (49%) indicate that their local communities are at least “moderately involved” in protecting and managing coral reefs
- Over one third (36%) indicate that they themselves are at least moderately involved in protecting and managing coral reefs

Perceptions Opportunities for Involvement in Coral Reef Management & Decision Making (n = 708)

How often do you feel you are given the opportunity to be involved in making decisions related to the management of coral reefs?



- Over one third (38%) indicate that there are never any opportunities to get involved in coral reef decision making.
- 32% indicate that there are opportunities to get involved at least “sometimes.”

Respondent Demographic Characteristics

Gender	Sample	2010 US Census
Male	55%	51%
Female	45%	49%

Age	Sample	2010 US Census
18-24 year olds	18%	17%
25-34 year olds	22%	20%
35-44 year olds	18%	22%
45-64 year olds	29%	32%
65+ years old	12%	10%
No Response	1%	N/A

Education Level	Sample	2010 US Census
Less than high school	14%	21%
High School Graduate, GED	43%	35%
Some college, community college or AA	22%	26%
College Graduate	18%	13%
Graduate School, Law School, Medical School	2%	4%
No Response	1%	N/A

***2010 US Census results on this and the following slides refer to adult population of Guam**

Respondent Demographic Characteristics

Annual Household Income	Sample	2010 US Census
Under \$10,000	7%	8%
\$10,000 to \$19,999	15%	10%
\$20,000 to \$29,999	18%	11%
\$30,000 to \$39,999	16%	11%
\$40,000 to \$49,999	11%	10%
\$50,000 to \$59,999	9%	9%
\$60,000 to \$99,999	16%	23%
\$100,000 to \$149,999	8%	11%
\$150,000 or More	5%	4%

*Answers of “no response” left absent from analysis of household income due to high rate of occurrence (approx. 36%)

Respondent Demographic Characteristics

Race	Sample	2010 Census
Asian	19.0%	36.5%
Chinese	0.0%	1.9%
Filipino	18.0%	29.4%
Japanese	0.0%	1.8%
Korean	0.0%	2.5%
Taiwanese	0.0%	0.2%
Vietnamese	0.0%	0.3%
Other Asian	1.0%	0.5%
Black/African American	1.0%	1.1%
Native Hawaiian/Other Pacific Islander	70.0%	46.2%
Carolinian	0.0%	0.1%
Chamorro	45.0%	35.8%
Chuukese	12.0%	5.7%
Kosraean	0.0%	0.2%
Marshallese	0.0%	0.2%
Palauan	2.0%	1.7%
Pohnpeian	2.0%	1.2%
Yapese	2.0%	0.7%
Other Native Hawaiian/Pacific Islander	7.0%	0.6%
White	5.0%	8.3%
Hispanic	1.0%	0.9%
Other race	4.0%	0.3%
2 or more races	N/A	6.8%

Respondent Demographic Characteristics

Year(s) of Residence	Sample
1 year or less	2%
2-5 years	6%
6-10 years	5%
More than 10 years (less than all my life)	35%
All my life	49%
No Response	2%

Languages Spoken	Sample
English	99.3%
Chamorro	34.6%
Other	19.2%
Japanese	5.4%
Spanish	2.0%
German	1.3%
French	0.9%
Chinese	0.6%
Korean	0.4%
Hawaiian	0.3%
Carolinian	0.1%

Respondent Demographic Characteristics

Employment Status	Sample
Unemployed	23.5%
Student	7.0%
Employed full-time	31.0%
Homemaker	8.8%
Employed part-time	10.3%
Retired	17.3%
Other	0.4%
No Response	1.7%

Occupation	Sample
Government of Guam	10%
Federal Government	4%
US Military	3%
Private Company	30%
Self Employed	4%
Retired	10%
Unemployed, but looking for a job	7%
Unemployed, but not looking for a job	12%
Student (High school or post secondary)	6%
Other	1%
No Response	14%



NOAA CORAL REEF CONSERVATION PROGRAM



MONITORING APPLICATIONS: Survey



Perception of Resource Condition & Tenure

Guam Resource	Has not lived in Guam their entire life		Has lived in Guam their entire life		Statistical test for difference	
	n	Mean	n	Mean	t	p value
<i>Current Conditions</i>						
Ocean water quality	323	3.63	342	3.24	5.17***	<0.01
Amount of coral	257	3.19	285	2.77	4.62***	<0.01
Number of fish	286	3.30	317	3.08	2.58**	0.01
Number of turtles	188	2.72	254	2.38	3.23***	<0.01
Beach quality (clean, no litter)	332	3.45	343	3.08	4.76***	<0.01
<i>Change in conditions over last 10 years</i>						
Ocean water quality	313	3.18	339	2.79	4.57***	<0.01
Amount of coral	254	2.98	287	2.49	5.40***	<0.01
Number of fish	273	3.06	307	2.70	3.97***	<0.01
Number of turtles	179	2.86	233	2.44	3.94***	<0.01
Beach quality (clean, no litter)	316	3.30	340	2.96	3.97***	<0.01

* = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level

- Higher mean values indicate a more positive perception.
- Respondents who have lived in Guam their entire life had an overall more negative perception as it pertains to the current condition of marine resources as well the change in condition over the last ten years when compared to respondents who have not lived in Guam their entire life.

Who is your audience?

Information Source & Demographics

Information Source										
Demographics	Newspaper	Radio	Television	Internet	Social Media	Friends and Family	Community Leaders	Jurisdictional Government	Federal Government	Non Profits
Older age	✓	✓	✓					✓	✓	
Younger age				✓	✓					
Male							✓		✓	
Female	✓			✓						
More income									✓	✓
Less income		✓								
Completed high school						✓				
Did not complete high school		✓					✓			
Completed college				✓						✓
Did not complete college		✓								
Has lived in Guam their entire life									✓	
Has not lived in Guam their entire life										
White									✓	
Chamorro						✓			✓	
Native Hawaiian					✓			✓		
Palauan							✓			
Marshallese										
Chuukese		✓								
Pohnpeian										
Kosraean										
Yapese								✓		
Chinese				✓	✓					✓
Japanese										
Filipino					✓					

Information Source and Threat Familiarity: Correlation Analysis

- Those that use the federal government for coral reef information are **more** likely to be familiar with:
 - Climate change
 - Coral bleaching
 - Typhoons
 - Pollution
 - Coastal development
 - Sediment runoff
 - Damage from small watercrafts
 - *Those that use the federal government for coral reef information seem to be the most familiar with the various threats faced by coral reefs*
- Those that use the internet for coral reef information are **less** likely to be familiar with:
 - Coral bleaching
 - Too much fishing/gathering
 - *This indicates that education/outreach materials provided via the internet may be less effective, or that the internet may be a means to target individuals who are unfamiliar with coral bleaching and overfishing [additional market research needed]*

Perceptions of Marine Preserves

- An index of “positive marine preserve sentiment” was calculated by summing the values for selected marine preserve questions for each respondent
 - Marine preserves protect coral reefs
 - Marine preserves increase the number of fish
 - There should be more marine preserves in Guam
 - There has been economic benefit to Guam from the establishment of marine preserves
 - I would support adding new marine preserves in Guam if there is evidence that the ones we have are improving Guam’s marine resources
 - I generally support the establishment of marine preserves
- This additive index was then normalized to a 0-100 scale
 - Mean of the sample = 76.7

Perceptions of Marine Preserves

- Considering that the sample mean = 76.7, and that the midpoint of the index (50) would indicate an “average” opinion of neither positive nor negative....
 - This indicates that, on average, there is an overall positive sentiment toward marine preserves and their functions

Threat Familiarity and Human Use

Threats to Coral Reefs in Guam	Does not fish or gather marine resources		Fishes or gathers marine resources		Statistical test for difference	
	n	Mean	n	Mean	t	p value
Climate change	494	3.28	210	3.47	-2.02**	0.04
Coral bleaching	495	2.95	212	3.32	-3.94***	<0.01
Typhoons, storms, and other natural disasters	495	3.70	210	3.80	-1.28	0.20
Pollution from stormwater, sewage, fertilizer and other chemical runoff	497	3.71	211	3.95	-2.99***	<0.01
Trash/littering	496	4.03	212	4.21	-2.65***	<0.01
Increased coastal/urban development	490	3.31	210	3.59	-3.06***	<0.01
Invasive species	494	3.02	212	3.20	-1.95*	0.05
Too much fishing and gathering	491	3.40	212	3.68	-3.41***	<0.01
Damage from ships and boats	493	3.10	210	3.40	-3.34***	<0.01
Sediment runoff into the ocean from fires	494	3.09	211	3.48	-4.36***	<0.01
Damage from small watercraft (windsurfing, kiteboarding, kayaking, paddling, jet skiing)	494	2.95	209	3.13	-2.04**	0.04

* = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level

- Higher mean values indicate more familiarity
- Respondents who fish/gather for marine resources tend to be more familiar with the various threats faced by coral reefs

Participation in Diving and Marine Preserve Perceptions

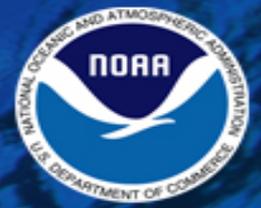
Marine Preserve Statement	Does dive		Does not dive		Statistical test for difference	
	n	Mean	n	Mean	t	p value
Marine preserves protect coral reefs	99	4.18	280	4.19	-0.05	0.96
Marine preserves increase the number of fish	99	4.22	277	4.21	0.16	0.87
There should be fewer marine preserves in Guam	100	2.45	273	2.24	1.74*	0.09
There should be more marine preserves in Guam	99	3.49	278	3.95	-3.45***	<0.01
There has been economic benefit to Guam from the establishment of marine preserves	95	3.84	263	3.98	-1.35	0.18
Fishermen's livelihoods have been negatively impacted from the establishment of marine preserves in Guam	94	3.29	263	2.97	2.36**	0.02
Marine preserves help increase tourism in Guam	97	3.98	270	3.97	0.10	0.92
The establishment of marine preserves increases the likelihood that people will vacation in Guam	97	3.89	274	3.88	0.08	0.94
I would support adding new marine preserves in Guam if there is evidence that the ones we have are improving Guam's marine resources	100	3.83	277	4.11	-2.50**	0.01
I generally support the establishment of marine preserves	100	4.02	278	4.16	-1.77*	0.08

* = significant at the 10% level, ** = significant at the 5% level, *** = significant at the 1% level

- Higher mean values indicate more agreement with the statement.
- Divers tend to have a more negative perception of marine preserves when compared to non-divers



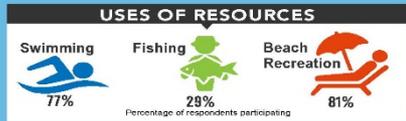
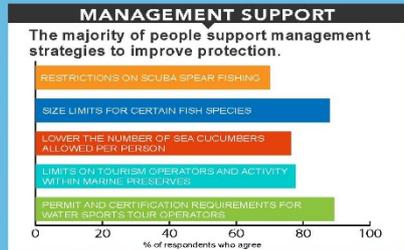
NOAA CORAL REEF CONSERVATION PROGRAM



CONNECTIONS BETWEEN CORAL REEFS & COASTAL COMMUNITIES

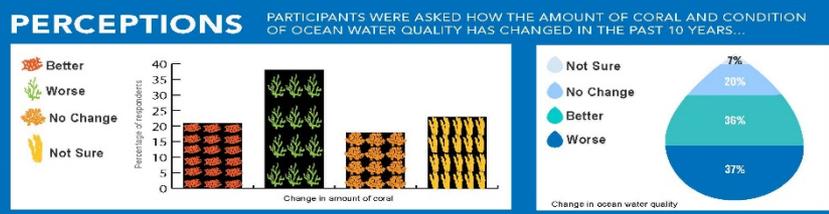
NOAA's Coral Reef Conservation Program monitors the biological, socioeconomic, and climate conditions of US coral reef areas and communities. This includes collection of socioeconomic variables including demographics, human use of coral reef resources, as well as knowledge, attitudes, and perceptions of coral reefs and coral reef management through the use of surveys and existing data. The takeaways below are based on the survey results for Guam.

TAKEAWAYS FROM GUAM



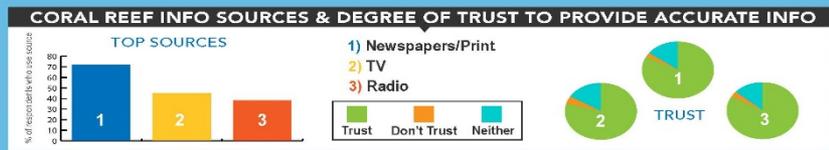
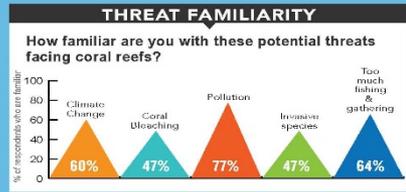
TENURE & CONDITION

Years of residence impact perceptions of marine resource conditions. Residents who have lived in Guam for their whole life are more likely to have a more negative opinion concerning the condition of marine resources.



VALUES & AWARENESS

- Guam residents who agreed that "coral reefs are important to Guam's cultures" were more likely to have a more positive perception concerning the change in condition of marine resources over the last decade.
- Guam residents who agreed that "coral reefs protect Guam from erosion and natural disasters" were more likely to believe that the threat level to coral reefs is "large" or "extreme."



The survey was conducted for a random stratified sample of households on the island of Guam in the year 2016. In comparing the sample to the total population of Guam, the data were determined to be representative and therefore the results are generalizable to the entire population of the jurisdiction. Data were collected through the telephone random digit dial survey method as well as the face-to-face interview method, and the total sample size for this survey was 712. The survey effort is used in conjunction with the collection of existing secondary data to monitor the socioeconomic conditions of the coral jurisdictions over time. For more information, please see the ICRRM Socioeconomics Component project page at <http://www.cora.noaa.gov/monitoring/socioeconomics>.

Products

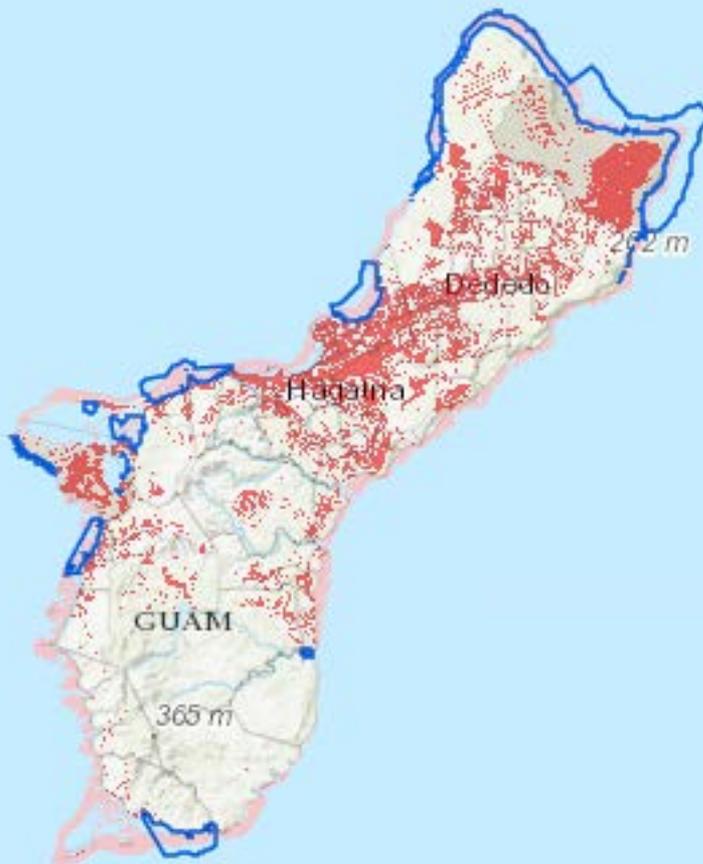
- Infographic highlighting findings for Guam
- Technical report for Guam is coming soon



NOAA CORAL REEF CONSERVATION PROGRAM



 [Click Here to Unlock Map](#)



Legend

Guam Impervious Surfaces



Guam Coral Cover



Guam MPAs



Guam Survey Parcels



❖ **Additional products**

- ❖ Posters, Infographics, Technical Report in development

❖ **Analyses are ongoing**

- ❖ Linkages between biological, climate, and socio data will be explored

❖ **Input needed**

- ❖ Are there results you would like to see further examined?
- ❖ Are there information products that would be especially useful?

❖ **Need more information?**

- ❖ CRCP: Peter Edwards peter.edwards@noaa.gov or Arielle Levine arielle.levine@noaa.gov
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- ❖ Visit <http://www.coris.noaa.gov/monitoring/socioeconomic.html>