NATIONAL SUMMARY

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The National Summary assesses and compares the condition of coral reef ecosystems across all 15 jurisdictions in the United States and Pacific Freely Associated States using a common framework and provides a broad measure of ecosystem status and response. Since there are no standardized monitoring programs, methods or data sets that can be used to compare the state of coral reef ecosystems across all jurisdictions, the contents of this summary chapter are instead based on the knowledge and expert opinion of coastal managers and scientists who are responsible for monitoring and managing coral reef ecosystems within each jurisdiction. Consequently, data used for the National Summary represent the evaluations of those who are most knowledgeable about the condition of coral reef ecosystem resources in each jurisdiction, threats posed to those resources and the data available to quantify coral reef ecosystem condition.

Standardized information was collected using a multiple-choice questionnaire that was completed by each jurisdiction's report coordinator and/or writing team. A review of the individual chapters in this report resulted in the identification of four key resources and ten commonly addressed threats and the incorporation of these topics in the questionnaire (Table 17.1). These 14 topics represent important aspects of coral reef ecosystem condition, function, dynamics and resilience. In the questionnaire, respondents evaluated the present condition, short-term trend, long-term trend, and their ability to monitor these threats and resources within their entire jurisdiction, not just in the locations that have been intensively studied.

The questionnaire and instructions for completion can be found in Appendix A and are briefly described here. Respondents were asked to describe the present level of impact from each of the ten threats using the following categories: absent, low, medium, high or unknown. Present resource conditions were described as poor, fair, good, excellent and unknown. Temporal trends in resources and threats were described as increasing, about the same, decreasing, not applicable and unknown. Trends were described for two time scales respectively: over the last three years (i.e., since the 2005 Coral Report) and over the last 10-25 years. The ability to monitor each threat and resource was indicated using the categories: poor, fair, good, excellent and unknown. Appendix B contains the responses received from each jurisdiction.

Questionnaire responses were mapped to show spatial patterns in resource condition and high threats among jurisdictions (Figures 17.1 and 17.2). Preliminary evaluation of the responses revealed a regional difference between the Pacific and Caribbean/Atlantic/Gulf of Mexico in threat levels and resource conditions. Responses were therefore tallied separately within these regions (Tables 17.2 and 17.3) and averaged to determine the regional condition of each resource and threat. In contrast, there was generally no difference between the Pacific and Caribbean/Atlantic/Gulf of Mexico regions in terms of the trends observed over time or their ability to monitor threats or resources. Therefore, responses to these questions were tallied across all 15 jurisdictions and then averaged to determine the overall trend (Table 17.4 and 17.5) and U.S. monitoring ability (Table 17.6), respectively.

Table 17.1. Key resources and threats identified for use in the national summary questionnaire completed by each jurisdiction's report coordinator and/or writing team.

Key Resources
- Water Quality
- Living Coral Cover
- Reef Fish Populations
- Harvested Reef Fish and Macroinvertebrates

Commonly Addressed Threats
- Climate Change and Coral Bleaching
- Coral Disease
- Tropical Storms
- Coastal Development
- Tourism and Recreation
- Commercial Fishing
- Subsistence and Recreational Fishing
- Vessel Damage
- Marine Debris
- Aquatic Invasive Species

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The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008
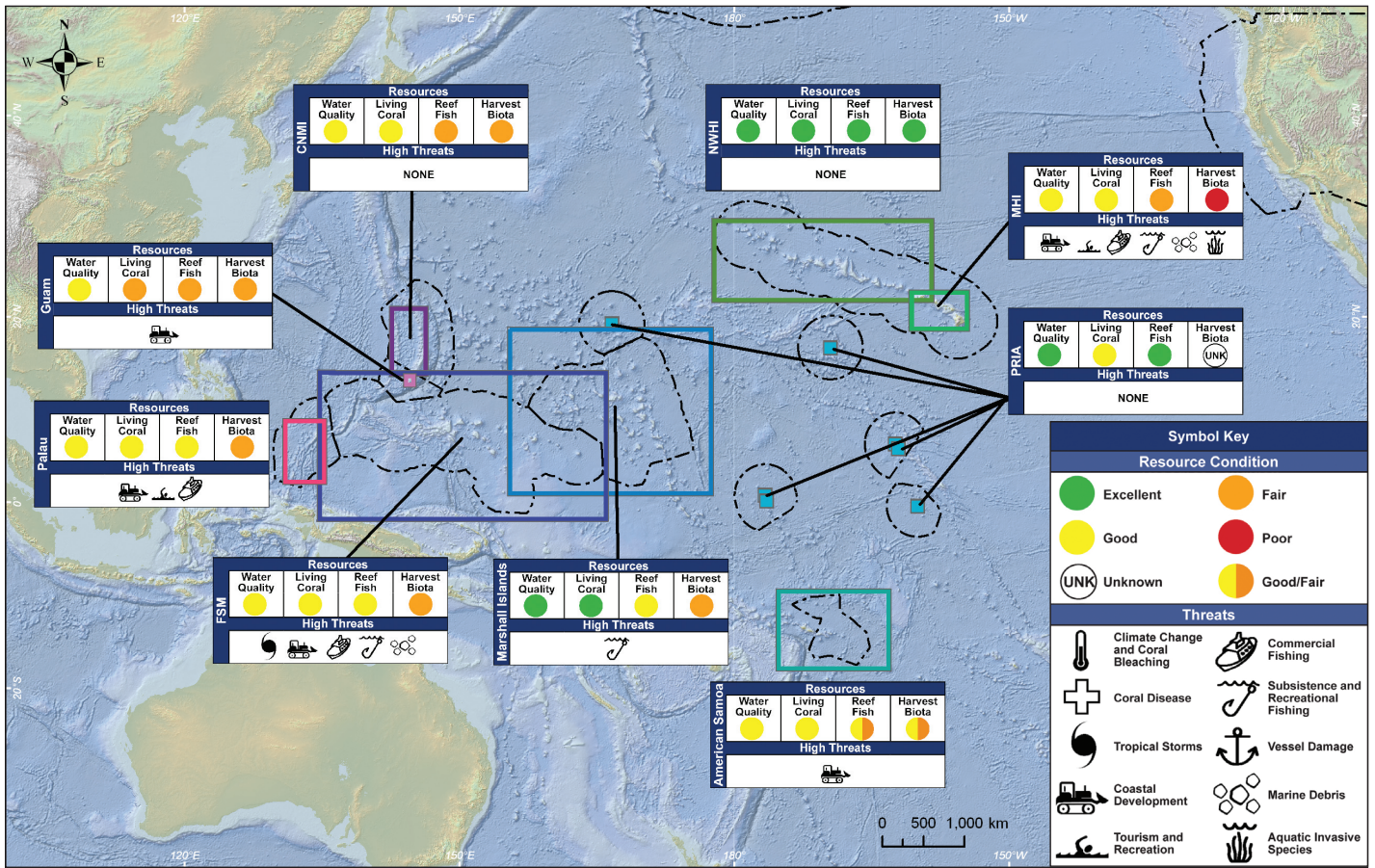

Figure 17.1. Survey results describing the present condition of four key resources and indicating the threats ranked as "high" in the Pacific region. Results are displayed in a map format to elucidate regional differences among jurisdictions. Map: C. Menza and S. Hile.
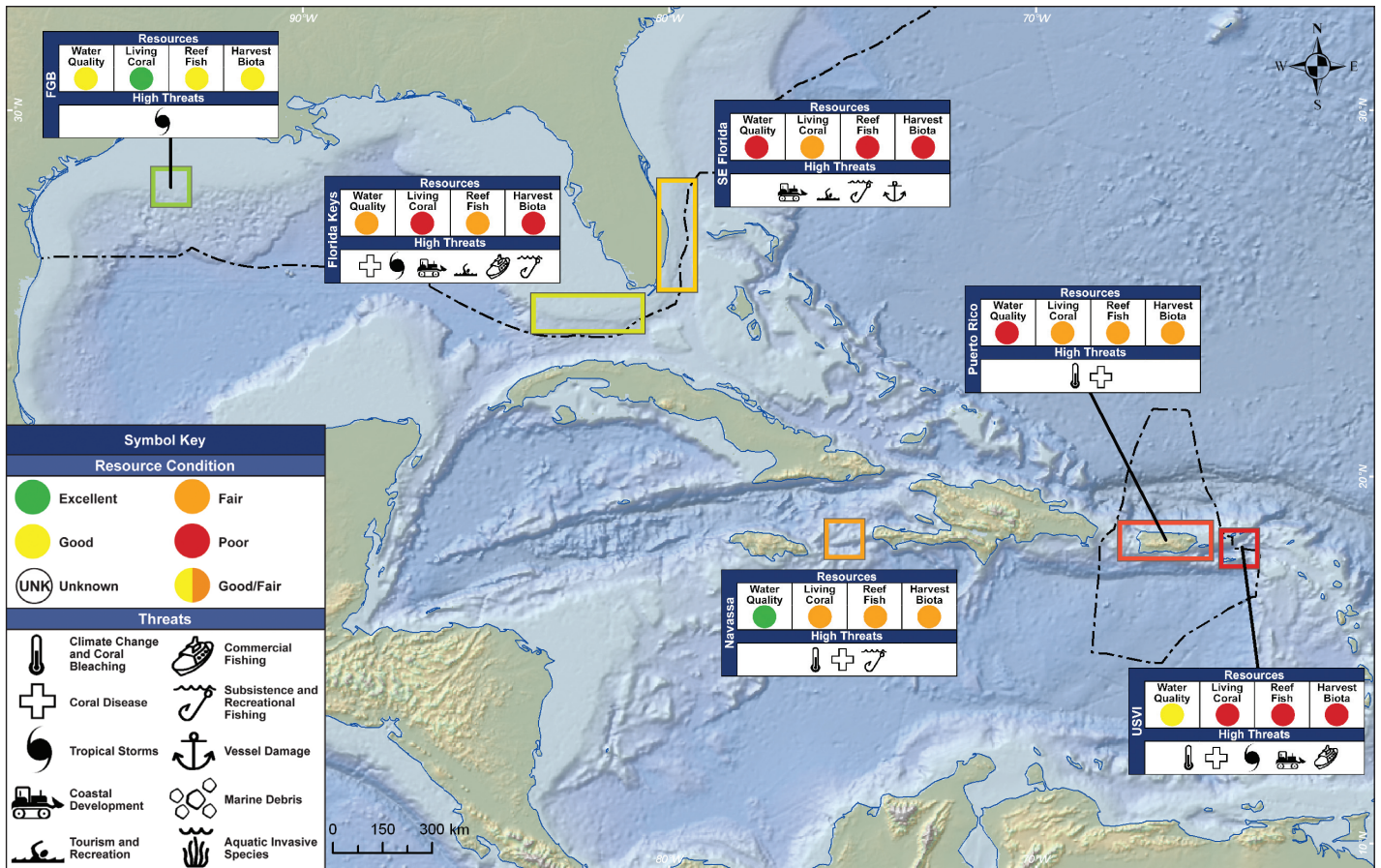

Figure 17.2. Survey results describing the present condition of four key resources and indicating the threats ranked as "high" in the Atlantic region. Results are displayed in a map format to elucidate regional differences among jurisdictions. Map: C. Menza and S. Hile.

Table 17.2. Number of the nine Pacific jurisdictions reporting overall resource and threat condition in each category summarized across jurisdictions. Overall conditions were determined by averaging the responses in each row, based on the values poor or high=0, fair and medium=1, good and low=2, and excellent and absent=3. Unknown responses were not included in the average.

		UNKNOWN	POOR	FAIR	GOOD	EXCELLENT	OVERALL
Resources	Water Quality	0	0	0	6	3	GOOD
	Living Coral Cover	0	0	1	6	2	GOOD
	Reef Fish Populations	0	0	3	4	2	GOOD
	Harvested Reef Fish and Macroinvertebrates	1	1	5	1	1	FAIR

		UNKNOWN	HIGH	MED	LOW	ABSENT	OVERALL
Threats	Climate Change and Coral Bleaching	0	0	8	1	0	MED
	Coral Disease	0	0	3	6	0	LOW
	Tropical Storms	0	1	3	5	0	MED
	Coastal Development	0	5	2	2	0	MED
	Tourism and Recreation	0	2	3	4	0	MED
	Commercial Fishing	0	3	3	3	0	MED
	Subsistence and Recreational Fishing	0	3	3	3	0	MED
	Vessel Damage	0	0	4	5	0	LOW
	Marine Debris	0	2	6	1	0	MED
	Aquatic Invasive Species	0	1	3	5	0	MED

Table 17.3. Number of the six Caribbean/Atlantic/Gulf of Mexico jurisdictions reporting overall resource and threat condition in each category summarized across jurisdictions. Overall conditions were determined by averaging the responses in each row, based on the values poor or high=0, fair and medium=1, good and low=2, and excellent and absent=3. Unknown responses were not included in the average.

		UNKNOWN	POOR	FAIR	GOOD	EXCELLENT	OVERALL
Resources	Water Quality	0	2	1	2	1	FAIR
	Living Coral Cover	0	2	3	0	1	FAIR
	Reef Fish Populations	0	2	3	1	0	FAIR
	Harvested Reef Fish and Macroinvertebrates	0	3	2	1	0	FAIR

		UNKNOWN	HIGH	MED	LOW	ABSENT	OVERALL
Threats	Climate Change and Coral Bleaching	0	3	1	2	0	MED
	Coral Disease	0	4	0	2	0	MED
	Tropical Storms	0	3	2	1	0	MED
	Coastal Development	0	3	1	1	1	MED
	Tourism and Recreation	1	3	1	2	0	MED
	Commercial Fishing	2	2	2	0	0	HIGH
	Subsistence and Recreational Fishing	1	2	2	0	0	HIGH
	Vessel Damage	0	3	2	2	1	MED
	Marine Debris	0	1	4	2	0	MED
	Aquatic Invasive Species	0	0	2	4	0	LOW

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Present Condition of Resources and Status of Threats

Responses indicated that resource conditions in the Pacific were better than in the Caribbean/Atlantic/Gulf of Mexico (Figure 17.3). The majority of resources in the Caribbean/Atlantic/Gulf of Mexico region were listed as poor or fair condition. Only six of the 24 responses (25%) reported that conditions were good or excellent. These exceptions included water quality in Navassa and the USVI, and live coral cover, reef fish populations, and harvested fish and invertebrate populations in the Flower Garden Banks (FGB). The fact that FGB had the best condition of resources, generally speaking, and is the most remote jurisdiction in the region should not be overlooked.

In contrast to the Caribbean/Atlantic/Gulf of Mexico region, the majority (69%) of resources in the Pacific region were listed as in good or excellent condition. The condition of harvested reef fish and macroinvertebrates was the only metric to be classified by the majority of Pacific jurisdictions as fair and the only metric to be listed in poor condition (Main Hawaiian Islands).

Threats were considered slightly greater in the Caribbean/Atlantic/Gulf of Mexico relative to values reported in the Pacific (Figure 17.3). More threats were ranked as high in the Caribbean region (average of 3.5 per jurisdiction) than in the Pacific region (average of 1.89 per jurisdiction). Although the majority of overall threat levels were medium in both regions, the Caribbean/Atlantic/Gulf of Mexico had two threats with overall high levels (both associated with fishing), whereas there were no overall threat levels listed as high for the Pacific. In fact, no Pacific jurisdiction indicated that coral disease or vessel grounding posed a high threat to coral reef ecosystems, and the majority considered both of these threats to be present at a low level.
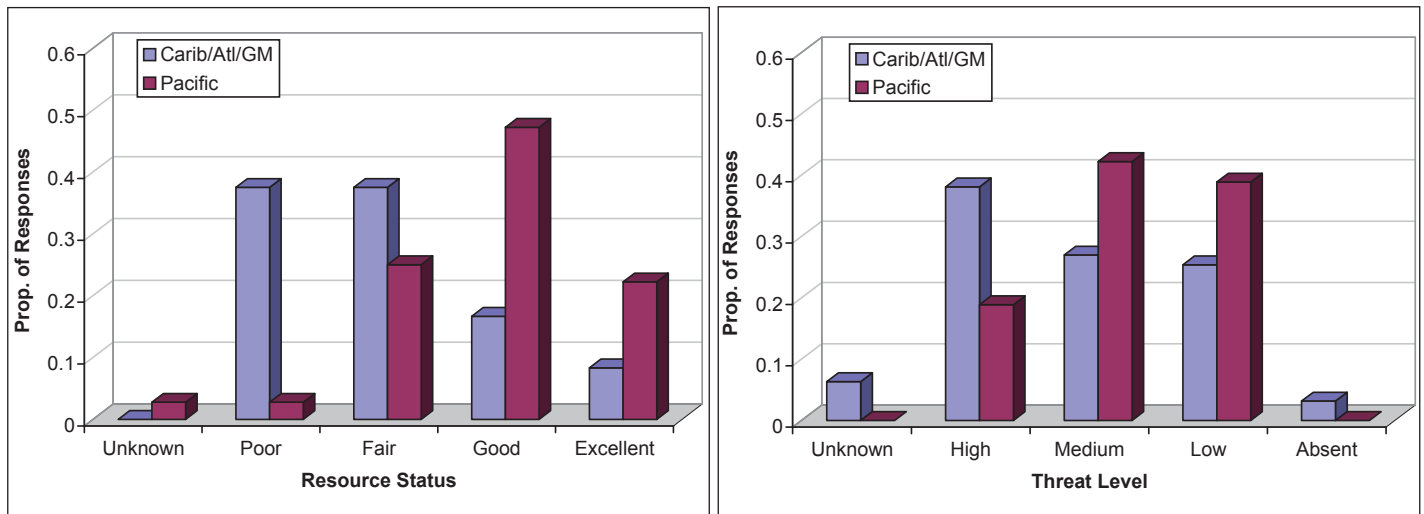

Figure 17.3. The left panel shows the distribution of responses used to describe the present status of the four key resources in the Pacific and Caribbean/Atlantic/Gulf of Mexico regions. The right panel illustrates the ranking of the threat level that each of the 10 common threats poses to the jurisdictions in both regions. See Appendix B for jurisdiction-specific responses. Graphs: C. Menza.

Trends in Resource Condition and Threat Level

Since the last reporting effort (2005), the condition of resources declined, while threats in the majority of jurisdictions have been increasing (Table 17.4). For about half of the jurisdictions, threats such as climate change/coral bleaching, coral disease, and tourism and recreation have not changed significantly over the last three years, but have increased over the past 10-25 years (Table 17.5). Few jurisdictions described any threats as decreasing. Similarly, although the average condition of most resources declined over both the short- and long-term time periods, more jurisdictions reported a declining trend over 10-25 years than over the past 3 years. The majority of jurisdictions that reported no long-term change in coral cover, reef fish populations, and harvested reef fish and macroinvertebrates were located in the Pacific.

Table 17.4. Number of the 15 jurisdictions reporting a trend in the condition of resources or threats over the past 3 years. Overall trends were determined by averaging the responses in each row, based on the values decreasing=-1, about the same=0, increasing=1. Average values between -0.2 and 0.2 were considered about the same. Unknown responses were not included in the average.

Resources		DECREASING	ABOUT THE SAME	INCREASING	UNKNOWN	OVERALL
	Water Quality	5	8	1	1	Decreasing
	Living Coral Cover	5	8	2	0	Same
	Reef Fish Populations	5	10	0	0	Decreasing
	Harvested Reef Fish and Macroinvertebrates	5	8	0	0	Decreasing

Threats		INCREASING	ABOUT THE SAME	DECREASING	UNKNOWN	OVERALL
	Climate Change and Coral Bleaching	8	6	0	1	Increasing
	Coral Disease	7	7	0	1	Increasing
	Tropical Storms	3	12	0	0	Same
	Coastal Development	8	2	4	0	Increasing
	Tourism and Recreation	8	6	0	1	Increasing
	Commercial Fishing	5	7	1	2	Increasing
	Subsistence and Recreational Fishing	8	5	0	2	Increasing
	Vessel Damage	3	11	0	0	Increasing
	Marine Debris	5	9	0	1	Increasing
	Aquatic Invasive Species	8	7	0	0	Increasing

Table 17.4. Number of the 15 jurisdictions reporting a trend in the condition of resources or threats over the past 10-25 years. Overall trends were determined by averaging the responses in each row, based on the values decreasing=-1, about the same=0, increasing=1. Average values between -0.2 and 0.2 were considered about the same. Unknown responses were not included in the average.

Resources		DECREASING	ABOUT THE SAME	INCREASING	UNKNOWN	OVERALL
	Water Quality	8	4	0	3	Decreasing
	Living Coral Cover	10	3	1	1	Decreasing
	Reef Fish Populations	8	6	0	1	Decreasing
	Harvested Reef Fish and Macroinvertebrates	10	3	0	1	Decreasing

Threats		INCREASING	ABOUT THE SAME	DECREASING	UNKNOWN	OVERALL
	Climate Change and Coral Bleaching	13	0	0	2	Increasing
	Coral Disease	11	1	0	3	Increasing
	Tropical Storms	4	11	0	0	Increasing
	Coastal Development	9	3	2	0	Increasing
	Tourism and Recreation	12	1	1	1	Increasing
	Commercial Fishing	5	5	3	2	Same
	Subsistence and Recreational Fishing	11	1	1	2	Increasing
	Vessel Damage	6	7	1	0	Increasing
	Marine Debris	11	2	0	2	Increasing
	Aquatic Invasive Species	8	4	0	3	Increasing

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Ability to Monitor

Many jurisdictions indicated that their ability to monitor their key resources and threats to them was fair (Figure 17.4; Table 7.6). Across all resources and threats, 17% of the responses indicated a poor ability to monitor, 49% were fair, 30% were good and only 3% reported an excellent ability to monitor. Of the four key resources in the questionnaire, only the ability to monitor living coral cover was considered to be good by most of the jurisdictions. Similarly, of the 10 key threats in the questionnaire, the ability to monitor only two of them, climate change/coral bleaching and tropical storms (both of which are issues local managers can do nothing to mitigate) was considered good on average. Also of note, the ability to monitor three of the key threats, commercial fishing, subsistence and recreational fishing and aquatic invasive species, was considered poor by nearly half of the jurisdictions.
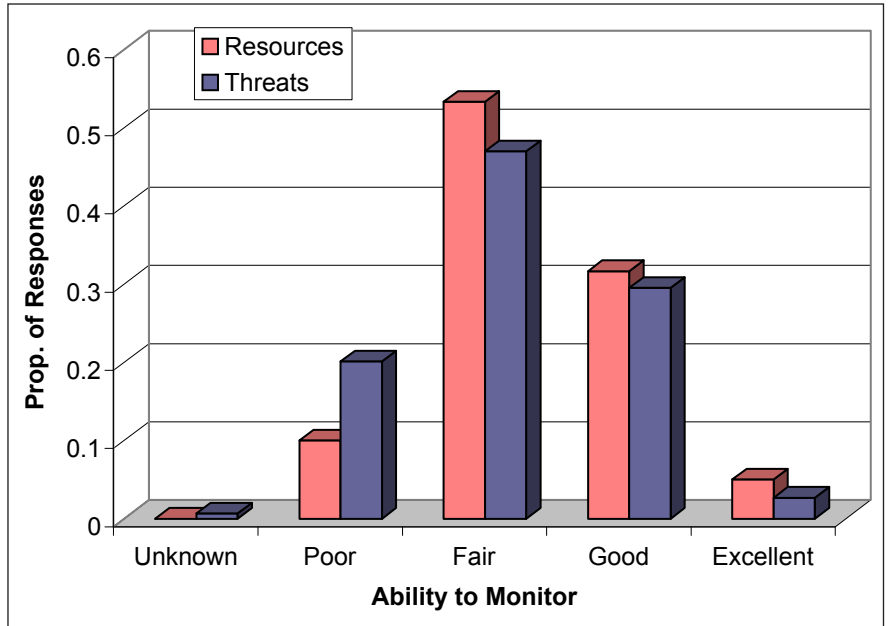

Figure 17.4. Many jurisdicitons in both the Pacific and Caribbean/Atlantic/Gulf of Mexico rated their ability to monitor resources and threats posed to them as "fair". Graph: C. Menza.

Table 17.6. Number of jurisdictions reporting their present ability to monitor each primary resource or key threat summarized across all jurisdictions. Overall ability to monitor was determined by averaging the responses in each row, based on the values poor=0, fair=1, good=2, and excellent=3. Unknown responses were not included in the average.

Resources		UNKNOWN	POOR	FAIR	GOOD	EXCELLENT	OVERALL
	Water Quality	0	3	8	4	0	FAIR
	Living Coral Cover	0	0	5	9	1	GOOD
	Reef Fish Populations	0	0	11	3	1	FAIR
	Harvested Reef Fish and Macroinvertebrates	0	3	8	3	1	FAIR

Threats		UNKNOWN	POOR	FAIR	GOOD	EXCELLENT	OVERALL
	Climate Change and Coral Bleaching	0	0	7	8	0	GOOD
	Coral Disease	0	1	9	4	1	FAIR
	Tropical Storms	0	1	4	10	0	GOOD
	Coastal Development	0	2	4	6	2	FAIR
	Tourism and Recreation	0	2	10	3	0	FAIR
	Commercial Fishing	0	7	6	2	0	FAIR
	Subsistence and Recreational Fishing	0	7	5	3	0	FAIR
	Vessel Damage	0	0	10	4	1	FAIR
	Marine Debris	0	3	9	3	0	FAIR
	Aquatic Invasive Species	1	7	6	1	0	FAIR

Conclusions

The least impacted reef ecosystems tend to be those in the most remote locations as indicated by the good resource condition in many of the Pacific jurisdictions relative to the Caribbean/Atlantic/Gulf of Mexico. Similarly, the reefs in poorest condition are located adjacent to areas with large resident and visitor populations that access and exploit reef resources for recreation and profit. It must be noted, however, that even the most remote reefs are exhibiting signs of decline and none can be considered pristine. A conservative take-home message from this assessment is that nearly half of coral reefs of the U.S. and Pacific Freely Associated States are not in good condition and are continuing steadily on a long-term decline.

Another primary conclusion drawn from survey results is that current monitoring activities and the present resources allocated to conducting them are inadequate to provide the information needed by management for decision-making at local and national levels. Although this is the third cycle of reporting on U.S. reef ecosystems since 2002, for many jurisdictions, there is still a critical need to develop robust monitoring strategies, allocate resources and implement field studies. NOAA is presently reviewing the elements of the existing coral monitoring portfolio to determine the most expedient way of generating data to better support management. It is important to recognize that monitoring has come a long way since the creation of the U.S. Coral Reef Task Force in 1998. The yearly dissemination of federal funds to the jurisdictions to support monitoring and development of the chapters in this report series has increased from $0.4 million to $1.1 million since 2002. These steps, while impressive, are apparently insufficient given the magnitude of the task at hand.

It is important to acknowledge that the results of this questionnaire are not based solely on the scientific data presented in the chapters and are subject to biases of the respondents. Until standardized monitoring protocols can be implemented in all jurisdictions at appropriate and consistent temporal and spatial scales, the ability to provide strictly quantitative comparisons across all jurisdictions is limited. This limiting factor is a direct result of the varied evolution of U.S. coral reef monitoring efforts at each jurisdiction. In addition, monitoring capacity, level of taxonomic expertise, management needs and other factors differ widely among jurisdictions. Consequently, no consistently collected metrics exist by which all the jurisdictions can be equally measured and compared. Few data sets are available that span multiple jurisdictions and none span all. Such consistency in measurement and reporting of metrics is needed across all 15 U.S. jurisdictions.

Any attempt to characterize the condition of a resource, especially one based partly on opinion, must acknowledge the problem of shifting baselines. Few, if any, places on earth have escaped impact from human activities and although this report includes uninhabited and remote locations, all sites are subject to global threats, such as climate change. Much of the ecosystem change likely occurred prior to quantitative baseline characterization and lies outside the experience of respondents' paradigms. This affects respondents' perceptions of what a pristine ecosystem should look like and can cause them to judge their resources to be in a less-altered or better condition than they actually are.

Also of note, this summary downplays the many unique but important issues and potential threats to individual jurisdictions. For example, active offshore oil and gas exploration, security training activities and ecological disturbances such as COTS are limited to a few jurisdictions. These issues are reported in detail within corresponding jurisdiction chapters. It is important to recognize that survey responses are not a self-criticism of the effort or ability of the scientists and managers working in each jurisdiction. Resources such as reef fish or coral cover may fluctuate for a number of reasons, including natural variability and anthropogenic impacts. Resource declines can occur despite the diligent efforts of scientists and managers. For example, the passage of a major storm system may alter benthic community composition on a reef, reducing key ecosystem resources despite the diligent efforts of scientists and managers. Similarly, the loss of live coral cover from threats such as coral bleaching and subsequent disease is associated with perturbations of global climate patterns. Global climate change presents urgent challenges for coral reef ecosystem management at the broadest spatial and longest temporal scales. Remedies for global climate change are far beyond measures that can be implemented by local management and require bold actions on an international scale to affect change.

The results of the National Summary clearly indicate that coral reef ecosystem resources continue to be beset by significant threats, many of which have increased and intensified. The present level of action to abate resource declines has not resulted in a positive change in the trajectory of threats to coral reef ecosystems. Without implementation of comprehensive protections for reef ecosystems, reef resources can be expected to continue to decline.

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