Coral Reef Habitat Assessment for U.S. Marine Protected Areas: A National Summary February 2009

Introduction

Seven United States (U.S.) jurisdictions have abundant coral reef ecosystems within their state and territorial waters. These jurisdictions are American Samoa, the Commonwealth of the Northern Mariana Islands, Florida, Guam, Hawai‘i, Puerto Rico, and the U.S. Virgin Islands. The governments of all seven jurisdictions have recognized that to successfully conserve coral reef ecosystems, ecologically important reef areas need to be identified and managed distinctively within the broader marine environment. As a result, each of these jurisdictions has formally acknowledged that marine protected areas (MPAs) are an important coral reef management tool and have taken measures to officially incorporate this tool into their local marine resource management regimes. In this report, MPAs are defined as “any area of the marine environment that has been reserved by federal, state, tribal, territorial, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein” (Executive Order 13158, May 26, 2000). In keeping with this broad definition, the term “MPA,” refers to a range of types of MPAs, from multiple-use areas that allow fishing or other uses, to “no-take reserves” where extractive uses are prohibited.

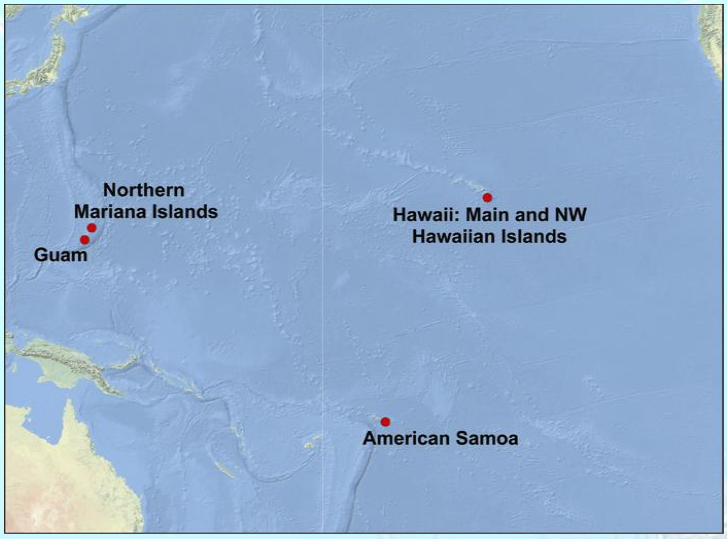

Figure 1. Coral Jurisdictions in the Pacific.

Figure 2. Coral Jurisdictions in the Caribbean.

Purpose

In the National Action Plan to Conserve Coral Reefs (2000) and the National Coral Reef Action Strategy (2002), the United States Coral Reef Task Force (USCRTF) established a key conservation objective of protecting at least 20% of U.S. coral reefs and associated habitat types in no-take marine reserves. NOAA's Coral Reef Conservation Program has been supporting efforts to assess current protection levels of coral reefs within Marine Protected Areas (MPAs) and to quantify the area of U.S. coral reef ecosystems protected in no-take reserves. A significant source of information for these assessments has been the National MPA Center's Inventory of Marine Managed Areas (MMAs) in U.S. ocean and coastal waters. As a part of this inventory, U.S. Federal, State, Territorial and Commonwealth programs have submitted both descriptive information on their MPAs as well as geospatial information in the form of GIS shapefiles and maps. All seven of the U.S. States and Territories on the USCRTF are participating in this inventory and have provided differing levels of information on their MPAs. However, acquiring complete information has become a challenge due to existing data gaps for some MPAs in these jurisdictions as well as a lack of resources and capacity to fill those gaps. The main objectives of this project were:

1. To obtain accurate digital boundaries for MPA sites in the five U.S. Coral Territories, the State of Hawaii, and the State of Florida from the Dry Tortugas to Biscayne Bay.

2. To use this information in conjunction with the digital benthic habitat data that NOAA has created for these locations to perform a quantitative analysis of the amount of coral reef habitat that is protected within the MPAs and more specifically within no-take marine reserves.

Methods

The Coral Reef Habitat Assessment for U.S. Marine Protected Areas was conducted between August 2005 and August 2007 through the following actions:

1. Created a Coral Jurisdiction MPA GIS Database utilizing the U.S. Marine Managed Areas Inventory

The Marine Managed Areas (MMA) Inventory contains information on more than 1,500 sites, and is the only such comprehensive dataset in the nation. The term "marine managed area," which was defined through a public comment process, generally refers broadly to an area of the marine environment with a marine resource conservation purpose. The MMA Inventory data collection is a joint collaboration between the National Oceanic and Atmospheric Administration (NOAA) and the Department of the Interior that began in 2001. Its purpose is to gather and make publicly available comprehensive information on place-based marine conservation efforts under U.S. federal, state, territorial, local, and tribal jurisdiction. For more information on the MMA Inventory visit http://www.mpa.gov/helpful_resources/inventory.html.

2. Identified which MPAs are No-Take Reserves utilizing the MPA Classification System

The National Marine Protected Areas Center has developed a Classification System that provides agencies and stakeholders with a straightforward means to describe MPAs in purely functional terms using five objective characteristics common to most MPAs:

Conservation Focus – legally established goals, conservation objectives and intended purpose(s).
Level of Protection – level and type of legal protections afforded to the site's natural and cultural resources and ecological processes.
Permanence of Protection – length of time protections remain in effect.
Constancy of Protection – year-round, seasonal or rotating.
Ecological Scale of Protection – range from entire ecosystems and their associated biophysical processes, to focal habitats, species, or other resources deemed to be of economic or ecological importance.

For most MPAs in the U.S. and elsewhere, these five functional characteristics provide an accurate picture of why the site was established, what it is intended to protect, how it achieves that protection, and how it may affect local ecosystems and local human uses.

3. Used GIS software to identify area of spatial overlap between benthic habitat data and Coral Jurisdiction MPA boundaries

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service (NOS) initiated a coral reef research program in 1999 to map, assess, inventory, and monitor U.S. coral reef ecosystems (Monaco et al. 2001). These activities were implemented in response to requirements outlined in the Mapping Implementation Plan developed by the Mapping and Information Synthesis Working Group (MISWG) of the Coral Reef Task Force (CRTF) (MISWG 1999). NOS's Biogeography Team was charged with the development and implementation of a plan to produce comprehensive digital coral-reef ecosystem maps for all U.S. States, Territories, and Commonwealths within five to seven years. In response to Executive Order 13089 and the Coral Reef Conservation Act of 2000, NOS is conducting research to digitally map biotic resources and coordinate a long-term monitoring program that can detect and predict change in U.S. coral reefs and their associated habitats and biological communities. For more information on benthic habitat data produced by the NOS Biogeography Team visit http://ccma.nos.noaa.gov/about/biogeography/proj_theme.html.

4. Calculated areal extent of benthic habitat data within Coral Jurisdiction MPA GIS boundaries

Area calculated in Eckert IV WGS84 projection, using polygon area calculation operation in XTools Pro 3.2.0 extension for ArcMap™ 9.1 GIS software.

Results

The charts on this page and the next page (Figures 3–9) display the percent of coral reef ecosystem, out of mapped benthic habitat in each jurisdiction, within all MPAs and No-take MPAs. Coral reef ecosystem is defined as mapped coral, coralline algae, emergent vegetation, macroalgae, seagrass, and turf. In this report, "No-take" MPAs are MPAs that have one of the following "Levels of Protection" under the U.S. MPA Classification System: 1) No Take, 2) No Impact, 3) No Access, or 4) Zoned Multiple-Use With No-Take Area(s). Out of 12 'Zoned Multiple-Use With No-Take Areas' in the U.S. Coral Jurisdictions only 4 had delineated No-take zones and thus were the only sites from this category to be included in the "No-take" calculations: East End Marine Park (VI), Kealakekua Bay MLCD (HI), Lapakahi MLCD (HI), and Molokini Shoal MLCD (HI).

Data limitations on benthic characteristics in the State of Florida precluded the type of analysis that was possible for the other six coral jurisdictions. Accurate data were available for the portion of the Florida reef tract from the Dry Tortugas to Biscayne Bay, and were used in the analysis. Complete data were not available for the Florida Reef tract north of Biscayne Bay, and so the area covered by the Southeast Florida Coral Reef Initiative was excluded from this analysis. A total of 35 MPAs in Florida were not included in this assessment because of data limitations. The results as presented are accurate for the portion of Florida's reefs from the Dry Tortugas to Biscayne Bay.

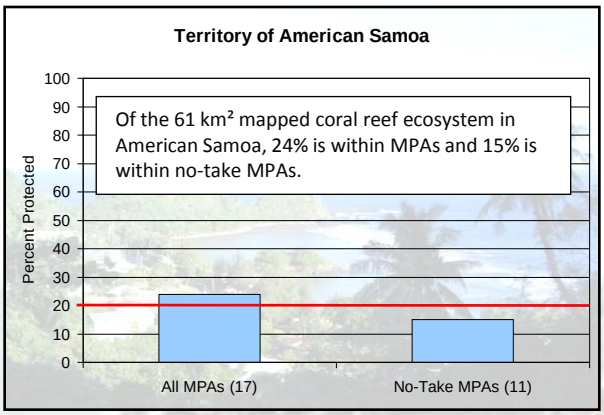

Figure 3. Territory of American Samoa.

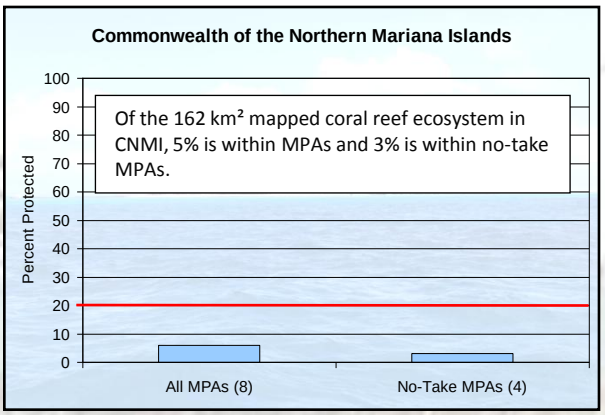

Figure 4. Commonwealth of the Northern Mariana Is.

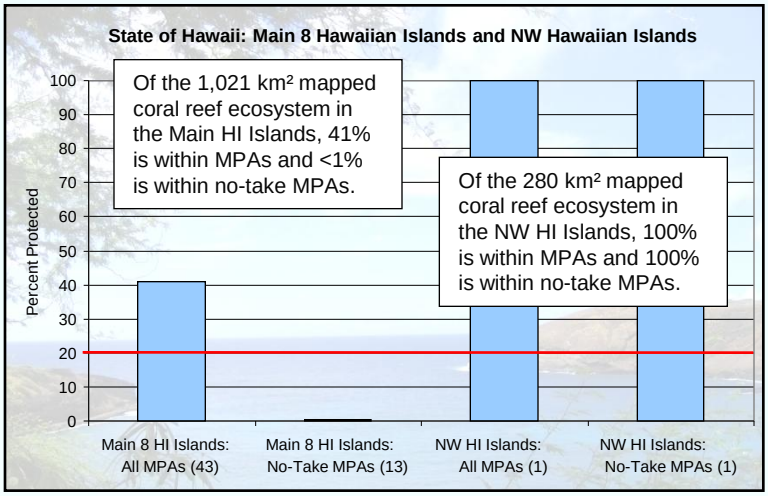

Figure 5. Main 8 Hawaiian Islands and NW Hawaiian Islands.

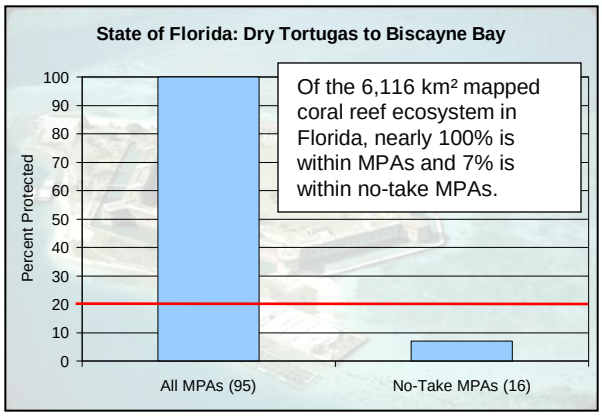

Figure 6. State of Florida: Dry Tortugas to Biscayne Bay.

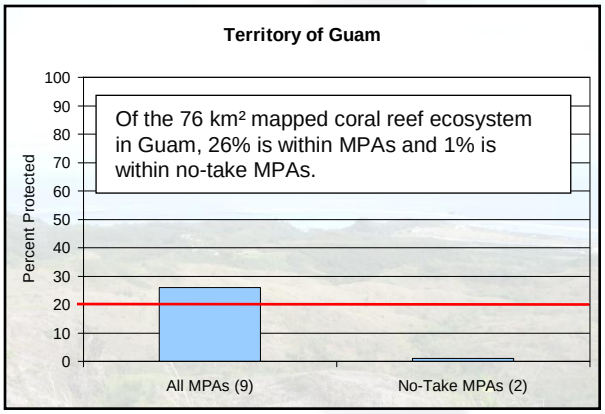

Figure 7. Territory of Guam.

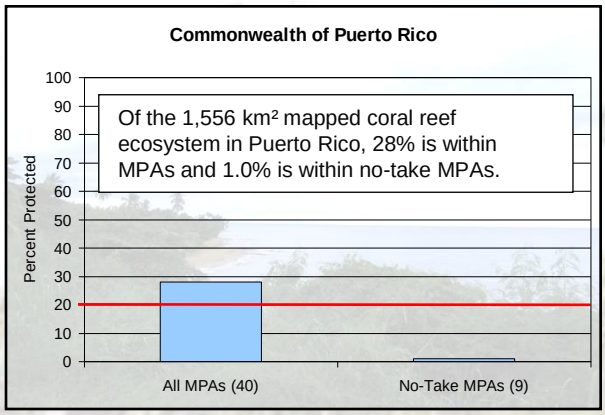

Figure 8. Commonwealth of Puerto Rico.

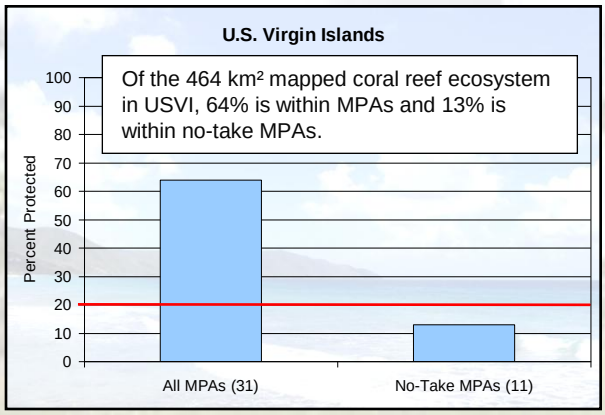

Figure 9. U.S. Virgin Islands.

Coral Jurisdiction	No-Take MPAs	All MPAs	Mapped Benthic Habitat
Territory of American Samoa	9.08 (15%)	14.99 (24%)	61.34
Commonwealth of the Northern Mariana Islands	5.51 (3%)	9.47 (6%)	162.35
State of Florida: Dry Tortugas to Biscayne Bay	447.91 (7%)	6,108.05 (99.9%)	6,115.98
Territory of Guam	2.05 (3%)	21.03 (28%)	76.06
State of Hawaii (Main and Northwestern Islands)	284.41 (22%)	702.83 (54%)	1,301.04
Commonwealth of Puerto Rico	50.15 (3%)	445.64 (29%)	1,556.64
U.S. Virgin Islands	59.36 (13%)	295.54 (64%)	463.84

Table 1. Calculated areal extent (km²) of coral reef ecosystem in No-Take MPAs, all MPAs and mapped benthic habitat for each coral jurisdiction. Area calculated in Eckert IV WGS84 projection using XTools Pro 3.2.0 extension for ArcMap™ 9.1 GIS.

Conclusions

This analysis demonstrates that the percentage of coral reef ecosystem resources in MPAs and no-take MPAs varies dramatically by location. Within the five U.S. Coral Territories, the U.S. Virgin Islands have the largest percentage of their coral reef resources in MPAs (64%). At 15%, American Samoa has protected the largest percentage of any Territory in no-take status. The designation of the Papahānaumokuākea National Marine Monument has had a dramatic effect on the protection status of coral reef ecosystems in the State of Hawaii. The entirety of the Northwestern Hawaiian Islands have been designated as a no-take MPA, but MPAs cover much less of the coral reef ecosystems in the Main Hawaiian Islands. As noted, the analysis cannot be conducted for the entire State of Florida because of data limitations. It should be noted that most of the benthic habitat mapping in Florida was done within MPAs from the Dry Tortugas to Biscayne Bay.

References

Mapping and Information Synthesis Working Group. 1999. Coral Reef Mapping Implementation Plan (2nd Draft). U.S. Coral Reef Task Force. Washington, DC, NOAA, NASA and USGS (Work Group Co-chairs). 17 pp.

Monaco, M.E., J.D. Christensen, and S.O, Rohmann. 2001. Mapping and Monitoring of U.S. Coral Reef Ecosystems. Earth System Monitor. Vol. 12(1):1-16.

NCRAS (National Coral Reef Action Strategy). 2002. A National Coral Reef Action Strategy: Report to Congress on implementation of the Coral Reef Conservation Act of 2002 and the National Action Plan to Conserve Coral Reefs in 2002-2003. NOAA. Silver Spring, Maryland. 120pp. + appendix.

USCRTF (United States Coral Reef Task Force). 2000. The National Action Plan to Conserve Coral Reefs. USCRTF. Washington, D.C. 33pp. + appendices.

Partner Organizations

- American Samoa Department of Commerce
- American Samoa Department of Marine and Wildlife Resources
- American Samoa Department of Parks and Recreation
- American Samoa Governor's Office
- CNMI Coastal Resources Management Office
- CNMI Division of Environmental Quality
- CNMI Division of Fish and Wildlife
- Florida Department of Environmental Protection
- Florida Department of State
- Florida Fish and Wildlife Conservation Commission
- Guam Bureau of Statistics and Plans
- Guam Department of Agriculture
- Guam Division of Aquatic and Wildlife Resources
- Hawaii Department of Land and Natural Resources
- Puerto Rico Conservation Trust
- Puerto Rico Department of Natural and Environmental Resources
- Puerto Rico National Parks Company
- University of the Virgin Islands
- U.S. Department of the Interior
- U.S. Navy
- U.S. Virgin Islands Department of Planning and Natural Resources

NOAA Organizations

- Coral Reef Conservation Program
- Office of Ocean and Coastal Resource Management
  - Coastal Programs Division
  - National Marine Protected Areas Center
- National Centers for Coastal Ocean Science
  - Biogeography Team
- National Estuarine Research Reserve System
- National Marine Fisheries Service
- National Marine Sanctuaries
- Special Projects

Contact Information:

NOAA Coral Reef Conservation Program
1305 East-West Highway, 10th Floor
Silver Spring, MD 20910
coralreef@noaa.gov