

# **Building a National Network of Marine Protected Areas for Coral Reefs**

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### **SUMMARY**

One of the most powerful actions to protect and enhance coral reefs in U.S. waters, as outlined in Executive Order 13089, is to develop a comprehensive system of marine protected areas for coral reefs (MPA-CR), including incorporation of existing and designation of new MPAs. Currently, MPAs in general, and MPA-CRs in particular, are managed by various local, territorial, state, regional and federal levels of government with little coordination among areas or assessment of their biological importance to the larger ecosystem. The amount and representativeness of reef types, and the type of protection afforded coral reefs in existing MPA-CRs, appears to be inadequate for ensuring the long-term sustainable use and conservation of coral reef ecosystems within the U.S. There is a clear need for better coordination of management strategies among existing MPA-CRs, and for adding MPA-CRs that represent coral reef habitat types not currently under MPA management strategies. This document lays out the strategy for building a nationally linked and coordinated network of MPA-CRs, for reefs under the jurisdiction of the United States, and for encouraging steps in this direction in the Freely Associated States (FAS) of the Republic of Palau, Federated States of Micronesia and the Republic of the Marshall Islands.

Key recommendations include ensuring representation of major reef habitat types and communities in a national network of marine protected areas for coral reefs (MPA-CRs); employing zones ranging from sustainable use (e.g., regulated take) to complete no-take; a minimum goal of 20% of representative coral reef and associated habitats designated as no-take areas by the year 2010; protecting major spawning aggregation sites; exploiting opportunities for establishing new protected areas on remote atolls under Federal jurisdiction and fostering dialogue with the Freely Associated States to assist them to develop a complementary system. The review of existing MPAs and development of proposals for new MPAs should proceed with the full involvement of all constituencies, and take into account existing legislative and regulatory authorities.

### **PRINCIPLES AND GOALS**

Coral reefs are one of the earth's most biologically complex ecosystems and are highly vulnerable to human activities. Because of their inherent complexity, the impacts of human activities on coral reefs are poorly understood. Continued degradation and loss of coral reefs is a real threat.

The Coral Reef Task Force recognizes that:

- coral reefs are one of the Earth's most complex ecosystems
- coral reef health consists of the biodiversity, structure, function and aesthetic value
- coral reefs are declining worldwide
- coral reef structure and dynamics are poorly understood
- coral reefs are highly vulnerable to detrimental impacts from human activities
- effects of human activities on coral reefs are poorly understood
- humans are an integral part of marine ecosystems
- human uses are not confined to extractive exploitation
- different human uses of coral reefs often conflict
- human activities must be within sustainable limits determined by the ecosystem
- coral reefs are a shared human heritage
- sustained yield requires preservation of the health of the entire ecosystem
- coral reefs are living museums of the world's tropical marine biodiversity
- coral reefs need increased protection worldwide
- the current system of marine protected areas is inadequate to ensure long-term protection

The primary goal of the Coral Reef Task Force is to ensure that coral reefs persist for future generations. This can be achieved only by:

- applying principles of ecosystem-based management
- applying the precautionary approach to coral reef management
- affirming that representative coral reefs should be allowed a continued existence free from extractive activities in all regions
- managing to ensure the continued health of the entire coral reef ecosystem
- affirming a right to continued use of coral reefs, but ensuring that human activities are within sustainable limits determined by the ecosystem
- recognizing the value of non-extractive uses of coral reef resources
- adopting wilderness concepts for coral reef environments
- increasing the use of marine protected areas as a management tool
- accepting that no-take marine reserves are an essential form of coral reef protection
- agreeing that sufficient science exists to support the use of establishing no-take reserves
- agreeing that no-take marine reserves should be permanent, replicated and networked with a goal of being self-sustaining despite conditions in adjacent exploited areas
- increasing public education, understanding and awareness

- supporting active scientific monitoring and research, particularly on the effectiveness of zoning as a management tool
- addressing land-based influences on MPA-CRs

Therefore, the Ecosystem Science and Conservation Working Group recommends that:

- A network of marine protected areas for coral reefs (MPA-CRs) be created that includes comprehensive representation of all coral reefs and associated habitats in U.S. waters, including the territories and freely associated states
- MPA-CRs may contain management zones ranging from complete no-take to sustainable use where fishing is allowed
- Unless scientific information clearly indicates some other amount needed to ensure preservation, a precautionary approach be adopted and a minimum of 20% of each coral reef and associated habitat type be designated "no-take areas" and protected from all extractive uses by the year 2010
- All major spawning aggregation sites be protected as no-take at least during the spawning season
- jurisdictional issues be resolved to improve management
- new protected areas be established as soon as possible at remote Pacific atolls and islands under federal jurisdiction
- dialogue with the FAS be initiated to determine their interest and priorities in establishing MPA-CRs in their nations, particularly at uninhabited islands and atolls; and as appropriate, incentives to FAS to assist in the establishment of new MPA-CRs be provided through the Compact of Free Association re-negotiation process.
- the development of proposals for new MPA-CRs or enhanced protection of existing areas proceed with the involvement of all constituencies and taking into account existing legislative and regulatory authorities

## **INTRODUCTION**

The United States contains an estimated 17,000 km<sup>2</sup> of coral reef habitat (Miller and Crosby 1998). The Freely Associated States (FAS) of the Republic of Palau, the Federated States of Micronesia and the Republic of the Marshall Islands contain as many as 81,500 km<sup>2</sup> of coral reef habitat (Holthus et al., 1993a; Maragos and Holthus, 1999). Among the most diverse and biologically complex ecosystems on earth, coral reefs protect nearshore areas from waves and storms, build new land masses, serve as the habitat for numerous species, provide a source of recreation and enjoyment, support the fabric of many coastal communities, contain an array of potential pharmaceuticals, and support U.S. tourism and fishing industries worth billions of dollars. Coral reefs under U.S. and FAS jurisdiction also provide essential habitat for many rare, depleted, threatened, and endangered marine species, including seabirds, sea turtles, the Hawaiian Monk Seal, finfish, shellfish, and corals. Now under threat from multiple stressors, coral reefs are a symbol of the vital economic, ecological and cultural importance of coastal

ecosystems, and of the rapid loss of marine biodiversity and resources around the world. The continued use and enjoyment of coral reef resources depend on developing effective means for managing, protecting and preserving these ecosystems.

The most powerful tool for conservation of coral reef and other marine ecosystems is the establishment and effective management of a representative network of marine protected areas for coral reefs (MPA-CR). Widely used in the terrestrial environment, the principle of setting aside fully representative examples of all ecosystem and habitat types to ensure conservation of biodiversity has been adopted only recently for the marine environment. MPAs in general constitute a broad spectrum of areas which are afforded some level of protection for the purpose of managing resources for sustainable use, safeguarding ecosystem function and biodiversity, and/or providing a framework for supporting uses of resources and space with a minimum of conflict (Eichbaum et al., 1996; Murray et al., 1999). They can range from small closed areas or harvest refugia (e.g., no-take areas) designated to protect a specific resource or habitat type, to extensive areas that integrate the management of many species, habitats, and uses in a single, comprehensive plan (Agardy, 1998). Like their terrestrial counterparts, today's MPAs provide for the protection of critical habitats and endangered species and serve important roles in public education and outreach on the social, economic and ecological benefits of marine resource protection. By employing a framework for the application of "adaptive management," MPAs can establish and maintain feedback loops between science and policy. Finally, multiple-use MPAs address the differing sets of objectives of a wide variety of stakeholders, thereby providing a framework for resolving conflict among the users of marine and coastal ecosystem services. The International Group of Experts on Marine and Coastal Protected Areas (Crosby et al. 1997) agreed that MPAs:

- have a critical role in the management for long-term conservation and sustainable use of marine and coastal biological diversity;
- function as focal points for development of governance for coastal and ocean systems; and
- provide for local community education and training in the importance of conserving marine and coastal biodiversity.

MPA-CRs in the United States are administered at the local, territorial, state, regional and federal levels of government (see Appendix I). This fragmented set of MPA-CRs often results in under-representation of the amount and biogeographic types of reefs, inadequate protection of reef resources, competing or conflicting resource objectives, and lack of coordination among management agencies. Under the current system, long-term conservation and sustainable use of coral reef resources are difficult to achieve. If humans are to continue to be able to utilize coral reef resources in perpetuity, a nationally and internationally coordinated network of representative coral reef ecosystems must be designated to limit fragmentation and build a robust network for sustainable use and conservation of coral reef ecosystems.

This document sets out actions or strategies for building a national network of MPA-CRs. Characteristics of a “network”, as opposed to the current ad hoc collection of MPA-CRs, include:

- management of large portions of the coral reef ecosystem with different geographic areas or components zoned to reduce conflicts among competing uses;
- active communication among the variety of management authorities responsible that promotes adaptive management among MPA-CRs within the larger biogeographic region, as well as within each individual component;
- representative no-take areas i.e., protected components, that include replicated, self-sustaining areas that are representative of each of the coral reef and associated habitats and biological communities within a particular biogeographic zone;
- protection for critical ecological functions, e.g., both sources and sinks of larvae within the larger ecosystem;
- active monitoring of different components (both extractive and non-extractive zones) using sets of comparable methods.

## **BACKGROUND**

MPA-CRs have existed in the U.S. for almost a century (e.g., the Hawaiian Islands National Wildlife Refuge was established in 1909), although the majority were established within the past few decades (Appendix I). Despite the longevity, number and variety of designated areas, and in contrast to many terrestrial parks that have been set aside and protected from exploitation, most MPA-CRs in existence today provide little actual protection of coral reef resources. For example, surveillance and enforcement of existing regulations for coral reefs and fisheries protection is minimal in the Hawaiian Islands National Wildlife Refuge, the largest of our MPA-CRs. Most of the MPA-CRs in the National Parks are subjected to various levels of fisheries exploitation, with six of the nine designated parks allowing commercial fishing. Among the National Marine Sanctuaries, only the Florida Keys has protected a small portion (2-3% of the total area) of its coral reef resources from all extractive uses. There are currently no atolls protected in Micronesia and only one permanently designated protected area (the Rock Islands of Palau) in the entire FAS.

To enhance protection for coral reef fisheries and improve ecosystem management, managers are increasingly turning to the use of no-take marine reserves. Guam, for example, recently designated 11% of its coastline as no-take. No-take areas differ from other MPAs in that they permanently protect all species and habitat in specific areas from fishing and other forms of extraction. They are intended to protect ecosystem structure and function while supporting sustainable fisheries and non-consumptive human activities, such as ecotourism, education, recreation, and general appreciation and understanding of marine ecosystems. A large and rapidly growing number of studies, conducted primarily in coral reef environments, are demonstrating the benefits of no-take

protection both to the fisheries and to the ecosystems that maintain them (PDT, 1990; Roberts and Polunin, 1991; Dugan and Davis, 1993; Rowley, 1994; Russ and Alcala, 1996; Bohnsack, 1996). These benefits include increased abundance and size of individual fish within the no-take area; emigration of target species to adjacent fishing grounds; increased production of eggs and larvae and export of these to adjacent fisheries; increased fertilization success due to density effects; and protection of habitat for spawning and settlement of eggs and larvae (Domeier and Colin, 1997; Wells, 1998). The National Research Council is currently conducting a study on "Evaluation, Design, and Monitoring of Marine Reserves and Protected Areas in the United States," which will be completed in the summer of 2000.

Undisturbed representative coral reefs are also essential for scientific assessment of human impacts on marine resources. No-take protected areas act as scientific control sites to assess impacts of human use on coral reef ecosystems. They offer support for ecosystem-based management because they provide the basis for understanding ecosystem structure and function and evaluating ecosystem performance under human usage. No-take areas are also necessary for increased human knowledge, understanding, and appreciation of coral reef ecosystems. Marine reserves are especially important for determining the impacts of fishing and other extractive human activities on the marine ecosystem and for distinguishing between natural and human induced changes. The most important use of no-take coral reef reserves remains that of ecosystem protection and management to ensure the persistence of coral reef ecosystems.

Given the benefits, it is remarkable that the majority of U.S. MPA-CRs offer little protection from fishing and other extractive uses. How much of our coral reef habitat needs to be fully protected from any extractive use to ensure the preservation of reef diversity and individual reef structure, function and biodiversity is still at issue. Current estimates have been developed largely from fisheries science. Ballantine (1991; 1995) has long recommended 10% closure of the seas around New Zealand while the Reef Fishery Plan Development Team (PDT, 1990) recommended closing 20% of the shelf area of the southeastern U.S to fishing. More recently, Jane Lubchenco, past president of the American Association for the Advancement of Science, called for 20% of the world's seas to be declared no-take by the year 2010. No-take protection of 20% is intended to maintain populations in the face of exploitation pressures in exploited areas (see Appendix II for a detailed discussion). The 20% figure is based primarily on the precautionary principle of leaving some areas free from extractive use until we have a complete understanding of its impacts. While fishing is important, it is also important that fishing not occur everywhere. Equally important is regulation of certain species throughout the conservation area, as well as the use of other conservation strategies such as catch and release fishing. Regulated fisheries are also important to projecting more widely ranging and migratory species.

The U.S. also has a responsibility via the Executive Order to promote protection of coral reefs in international waters, especially to its former Trust Territories in Micronesia, the FAS. In these important reef areas, the U.S. should encourage and support development of a comparable network of MPA-CRs that in many cases could be linked and integrated

with U.S. counterparts. Collectively, these three countries possess approximately 15 uninhabited islands and atolls with coral reefs worthy of protection (for example, see Holthus et al. 1993b; Maragos 1994; Maragos and Cook 1995; and Maragos, 1999), as well as many more areas on populated islands that could benefit from this approach. Designation of such areas as MPA-CRs would contribute both to protection of biodiversity and cultural values, and would pose fewer potential issues, compared to MPA-CR designation in populated areas with multiple jurisdictions and conflicts. The re-negotiation of the Compact of Free Association between the U.S. and the FAS could include economic incentives to encourage the FAS to support MPA designation.

## **BUILDING A NATIONAL NETWORK OF MPA-CRs**

Building a national network of MPA-CRs should begin with two types of assessments: 1) a comprehensive assessment of the representativeness of reef types currently included within MPA-CRs, and 2) an assessment of the adequacy of coral reef protection in those areas currently in state, territorial or federal MPA-CRs.

**Representative Reef Types** - A comprehensive assessment of the representativeness of reef types currently receiving protection and a determination of additional sites needed to insure long-term sustainability of our nation's coral reef biodiversity, will require an extensive compilation of ecological, biological and socio-economic data on all United States and Territorial coral reef areas known to exist. All criteria to be used in the identification and selection of additional MPA-CRs should be included in this assessment. As part of a related initiative, the Ecological Society of America and National Marine Fisheries Service are sponsoring a workshop in Marathon, Florida in late October 1999 to "identify and map marine and estuarine communities, characterize the condition of key habitat types in terms of their biological integrity, and identify gaps in their conservation". This effort will contribute to the evaluation needed to determine an adequate coordinated network of MPA-CRs.

Once gaps have been identified in the existing system of MPA-CRs, selection of additional sites should be based on priorities established regionally and nationally. Priority sites should be selected on a set of criteria such as those identified by the International Group of Experts on

Marine and Coastal Protected Areas (Crosby et. al. 1997; Appendices III and IV). A systematic approach to the selection of biogeographically representative sites should result in the development of an integrated network of MPA-CRs which maintains and enhances the links among sites. To the extent possible, the approach should be developed with a global perspective, taking account of the different local, national and regional needs and opportunities in different areas. Consideration should be given to protecting those areas that are:

- representative regionally (e.g, atolls in Micronesia)

- representative politically (e.g., the FAS)
- representative as a major reef form (fringing reef, barrier reef, atoll)
- representative of a reef habitat or ecosystem type (seagrass beds, lagoons, reef flat, patch reefs, etc.)
- representative of unusual oceanographic or climatic zones (subtropical, upwelling, raised atoll, etc.)
- critical habitat for endangered and threatened species
- essential habitat (such as spawning aggregation sites) for candidate and depleted species
- threatened by development or other human activity
- politically and socially feasible
- economically feasible
- opportunity to serve as “flagship” sites in the network
- condition and/or feasibility of restoration
- potential for multiple use and self sustainability
- size and degree completeness
- ease of surveillance and enforcement

Level of Protection Provided to MPAs - A successful national network of MPA-CRs depends on effective management and level of protection. Management policies and practices should include sufficient levels of protection, from multi-use to no use or no-take, to ensure long-term sustainability. Because coral reefs are shallow-water systems, they are subject to land-based influences, particularly in areas adjacent to human populations. Accordingly, management of these areas must account for impacts from the coastal zone and be integrated with broader coastal zone management.

To determine whether the current level of management and protection is adequate, an assessment of the current MPAs basic legislative authorities, regulations in force, management capabilities and coordination with other MPAs needs to be completed. Recommendations should then be formulated to bring the overall protection provided our nation’s coral reef MPAs up to a level that will insure sustainability of the natural biodiversity of their coral reef resources. This assessment should include the following information as a minimum:

- legislative authorities and/or constraints
- geographical size of area of designation
- kinds of coral reef resources included
- level/type of protection afforded
- nomenclature being used (for designation and for any management zones within the MPA-CR)
- threats or concerns perceived for the resource
- level and type of use ongoing within the MPA-CR
- list of potential external impacts to the MPAs resources (e.g. coastal development & ocean uses)
- MPA-CRs funding sources and amounts
- staffing level and expertise

- level of resource knowledge
- ongoing monitoring programs

A second report in this series "Coral Reef Protected Areas: A Guide for Management" provides suggestions and guidance to park managers to address the above needs.

## **SPECIFIC ACTIONS AND TIMELINE FOR BUILDING A NATIONAL NETWORK OF MPA-CRs**

Year 1:

- Develop an initial inventory of all coral reef habitats in the U.S. in a geo-spatially referenced data base (see CRFT Mapping and Information Synthesis Working Group report; it is important to note, however, that complete, detailed maps and GISs are not necessary to implement MPA-CRs.)
- Compile and document information on reef areas currently in designated protected status including descriptions of reef types, activities occurring, socio-economic conditions, management capabilities, legislated authorities and level of protection provide. (A preliminary listing of areas to be included is shown in Appendix I; Comments and corrections are also currently being solicited from the applicable management authorities.)
- Conduct a "gap analysis" to determine important coral reef habitat types and unique features missing from current MPA-CR protected status. Use of selection criteria for designating new MPA-CRs, such as those outlined in Appendices II and III, will be used during evaluation of candidate areas.
- Assess the degree of protection at existing MPA-CRs and formulate recommendations for additional protection and use appropriate for sustainable management in a national network.
- Set national and regional priorities for establishing additional new MPA-CRs in the Agaps@ identified, and for improving existing management policies.
- Assess any immediate opportunities to establish new coral reef protected areas and strengthen existing areas in the remote atolls and islands under federal jurisdiction in the Pacific (see Appendix V, an evaluation of several specific sites, using the criteria in Appendix III)
- Initiate dialogue with the FAS to determine their interest and priorities in establishing MPA-CRs in their nations, particularly at uninhabited islands and atolls, and as appropriate, propose incentives to FAS to assist in the establishment of new MPA-CRs through the Compacts of Free Association re-negotiation process.

Year 2:

- Implement prioritization process for candidate sites leading to ranking of sites for inclusion in a nationally coordinated MPA-CRs network.
- Develop specific proposals for establishing new MPA-CRs where needed to eliminate gaps and ensure conservation of biodiversity.
- Develop specific proposals for additional protection or changes in management regulations at existing MPA-CRs.
- Initiate budgetary and public processes for establishing new MPA-CRs and strengthening existing MPA-CRs.

Year 3:

- Initiate public hearing processes, regulatory revisions, and if necessary, legislative actions.
- Develop and implement a performance assessment system (e.g., monitoring, health indicators, fisheries stocks, etc.) for evaluating objectives of long-term sustainability and conservation of biological diversity.
- Develop cooperative agreements between the U.S. and FAS to establish new MPA-CRs and coordinate management strategies through a regional network of MPA-CRs.

**Recommended Agency Participation:**

Federal (Department of the Interior; National Oceanic and Atmospheric Administration)  
State (Hawaii; Florida)

Insular Area Governments (Commonwealth of the Northern Mariana Islands; Guam;  
American Samoa;  
U.S. Virgin Islands; Puerto Rico)

Freely Associated States (Republic of Palau, Federated States of Micronesia, Republic of  
the Marshall Islands)

Non-governmental organizations (e.g., The Nature Conservancy, Packard Foundation,  
Center for Marine Conservation, World Wildlife Fund, Sierra Club, Audubon Society,  
World Resources Institute, and others)

Regional Fishery Management Councils

Universities