

2. NEW INITIATIVES IN CORAL REEF MONITORING, RESEARCH, MANAGEMENT AND CONSERVATION

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INTRODUCTION

In parallel with the increasing rates of coral reef damage and degradation due predominantly to human activities, there have been major increases in human initiatives to arrest the decline in reefs. These initiatives are a response to the clear evidence of coral reef decline and the knowledge that coral reefs are critical to the livelihoods of approximately 500 million people around the world. The principal role of the International Coral Reef Initiative is to catalyse initiatives in response to assessments made about the status of the world's coral reefs by the GCRMN and its partners. This chapter summarises some new initiatives that have been undertaken in the last few years, with the goals of conserving coral reefs. The list is not complete, but reflects the responses from agencies to requests from the GCRMN.

The major initiative in coral reef management was the increase in high protection from 5% to 33% of the Great Barrier Reef (GBR). The re-zoning followed recognition that a level of 5% as no-take zones was insufficient to conserve the full range of biodiversity on the GBR, particularly in light of evidence that threats from global climate change induced coral bleaching and disease, and the presence of increasing populations of coral predators. The re-zoning process is described elsewhere (Boxes p 13 and 325 and Chapter 11). There are key lessons from the processes used to achieve this high level of protection. The best available scientific advice and information was used during a 48 month consultation process, which involved three phases. The first phase was an informal period of consultation between GBRMPA, scientists and key stakeholders to produce the bioregions and key conservation targets. This was followed by two iterative phases involving input from all interested parties, including the general public. The result was high level of protection, and future assessments of the new management plan will be observed closely by marine resource management agencies around the world. The process and the level of protection of 33% of the GBR may prove to be the benchmark for the future, although the mechanisms may not necessarily be transferred to other countries and regions without careful investigation.

Individuals and agencies around the world have provided the following descriptions of **New Initiatives**. These brief reports have been broadly classified into a number of themes. However, many of the new initiatives include more than one theme. Other New Initiatives are described elsewhere in this Status report. The themes are:

- **Assessment and Monitoring**
- **Coral Reef Research for Management**
- **Coordination and Cooperation**
- **Funding and Support**

ASSESSMENT AND MONITORING – NEW INITIATIVES

Several major international NGOs, recognised that using ‘standard’ scientific surveys to gather the necessary data to select the best sites for MPA designation was too slow and costly, particularly when there is rapid degradation of coral reefs. The Nature Conservancy (TNC) and Conservation International (CI), along with other international NGOs, such as World Wide Fund for Nature (WWF) and the Wildlife Conservation Society (WCS), have developed and applied rapid assessment techniques to measure the biodiversity of key coral reef components, such as corals, fishes, molluscs and sea cucumbers. Similarly they have used such techniques to assess reef health and current and future stresses. The assessments also include a strong component of local community involvement and consultation. These rapid assessments have been critical in defining the ‘hot spots’ of biodiversity, especially in the ‘coral triangle’ of Southeast Asia and the Western Pacific.

Rapid Ecological Assessments: Finding the best location for an MPA

MPAs are valuable tools to conserve habitats and their biodiversity. Therefore if new MPAs are to be established, then selecting good habitat and sites with rich biodiversity should be a priority. The problem is that thorough biodiversity assessment and habitat mapping is time consuming (it can take years) and very expensive. Rapid Ecological Assessments (REAs) provide a solution. Two major NGOs, The Nature Conservancy and Conservation International have both developed REAs and applied them within the global centre of coral reef biodiversity; the area with the most coral and fish species ie Eastern Indonesia, the Philippines and the adjacent islands of the West Pacific (Papua New Guinea, Solomon Islands and Palau). There are summaries of specific REAs in Chapter 10 on South East Asia and Chapter 12 on the Southwest Pacific.

The REAs were applied to determine the conservation value of areas in terms of marine biodiversity, which is often expressed as the numbers of hard coral species and reef fish species found during a survey. REAs also provide an initial impression of the threat status and level of resource use (especially fishing) on a reef. The goal is to obtain a rapid, reliable assessment in a 2 to 3 week period of intensive work, by using the best available biodiversity expertise. The surveys are usually conducted from a ship moving around a region, which has already been identified by local experts, such as dive tour operators, to be a likely candidate area. The REA team also needs to involve local experts in order to increase their level of expertise and to ensure that the survey results are disseminated to the pertinent communities and governments.

REAs have been conducted to support the TNC Southeast Asia Center for Marine Protected Areas in Raja Ampat (West Papua), Wakatobi (Southeast Sulawesi), Sangihe-Talaud (North Sulawesi) and the Banda islands (Maluku). In Kimbe Bay in PNG and the Solomon Islands REAs were undertaken to develop site conservation plans and ecoregional conservation

assessments. From: Alison Green, The Nature Conservancy, Townsville, Australia and Sheila McKenna, Conservation International, Washington D.C. USA, s.mckenna@conservation.org.

Marine Rapid Assessment Program at Conservation International (CI)

The Marine RAP is a joint program of the Center for Applied Biodiversity Science and the Marine Programs Division at CI. The process assembles a multi-disciplinary team of marine scientists and coastal resource experts (local and international) to quickly assess the biodiversity and conservation opportunities of coral reefs considered to be a high priority for conservation. The rapid surveys provide data to be used by local communities and decision-makers for the creation and management of MPAs. Most of the surveys involve underwater visual transects to collect data on the structure of the reefs, threats to the reefs, biodiversity of key organisms such as corals and fishes, and commercially important species such as sea cucumbers and giant clams. Socio-economic studies are included, with a community outreach component conducted in parallel with the ecological surveys to ensure that local stakeholders are engaged in discussions early and assist in data collection about concerns and attitudes and patterns of use of the marine resources. Researchers or students from government, universities and NGOs are usually involved in the assessments as in-country experts and participants. Recommendations for conservation are based on an analysis of the biological data within the context of the socio-economic information. Recommendations are aimed at establishing a realistic range and level of activities for the area that will ensure protection of biodiversity. Results and recommendations from the surveys are reported to all local stakeholders using brochures and on-site visits, and published in both English and a local language within a year in the *RAP Bulletin*. Contact: Sheila McKenna, Conservation International, 1919 M St. NW, Washington, DC, USA, www.biodiversityscience.org and www.conservation.org, s.mckenna@conservation.org

Rapid and Permanent Monitoring of Coral Reefs of the Remote U.S. Pacific

Access to remote reefs in the Pacific is often hazardous, subject to dive safety and time constraints, and involves the high cost of ship-based expeditions. Monitoring of the remote U.S. Pacific islands by joint FWS and NOAA expeditions is limited to a maximum of one visit per year, one hour per dive, three dives per day and a maximum depth of 15-20 m per dive. Monitoring requires a balance between *spatial monitoring* which minimizes temporal variability and *temporal monitoring* which minimises spatial heterogeneity. Rapid spatial and temporal (time-series) survey protocols were developed to accommodate both these dimensions: broad-scale towed-diver and rapid ecological assessments (REAs) over brief time intervals for spatial monitoring; and repeated surveys at permanently marked sites for temporal monitoring. Several strategies were needed to locate previously established transects and ensure sufficient data collection in an hour: use of non-corroding stainless steel pins hammered into reef and glued down with double-barrelled epoxy; placing stakes at 5 m intervals to ease observations; marking the start of each transect with two stakes; taking thorough notes of landmarks, GPS coordinates and depth and keeping transects along a precise depth contour; using digital cameras and a 2 sq. metre photo-quadrat frames to record corals and macro-invertebrates along a 50 m transect line; and using a calibrated survey tape to accurately position quadrats at metre intervals along the line. Data collected from the quadrat photos included visual and computed estimates of live coral cover, generic coral diversity, mean coral diameter, mean frequency, and size class distribution (based on long diameters of each coral with its centre within the 1 m wide swath of the transect line). To date, 91 transects have been established with some already surveyed 4 times since 2000. More than 90% of transects were located and resurveyed during subsequent annual visits. From: Jim Maragos, U.S. Fish and Wildlife Service, Honolulu, Jim_Maragos@r1.fws.gov

ATLANTIC AND GULF RAPID REEF ASSESSMENT (AGRRA) ANALYSES FOR 1998-2003

The AGRRA program is a multinational collaboration developed at the University of Miami by a group lead by Robert Ginsburg. Small teams of trained observers use a standardised methodology to quickly collect quantitative data to assess the condition of coral reefs in the wider Caribbean. They work at multiple scales and focus on stony corals, fishes and algae; the key structural and functional elements of coral reefs. Survey sites are selected in habitats of maximum reef development (typically shallow reef crests and intermediate-depth front reefs), and are preferably representative of the local area. The results presented below are for 313 front reefs (FR) sites at 5-15 m in the 15 assessment locations, each having between 10 and 45 separate surveys performed between 1998 and 2003.

Live coral cover in the front reef sites varied over the Caribbean, and ranged from 8 ± 4 % ($n=73$ transects/12 sites) in southern Florida (Biscayne Bay and the Florida Keys) in 2003, to 32 ± 10 % ($n=157$ transects/26 sites) off the Caribbean coast of Panamá (western Kuna Yala and Bocas del Toro) in 2002. Thus the regional differences were independent of the year of survey. Nevertheless, coral cover at some of the early survey sites has showed a considerable decline from bleaching and/or disease following the 1998 El Niño event that particularly affected the Andros reef tract, Bahamas and Akumal, México.

The total number of bleached coral colonies larger than 25 cm in diameter, was 6 times higher in 1998-1999 ($12.8 \pm 11.0\%$, 136 sites at 8 locations and more than 11000 colonies measured), than in 2000-2003 ($2.1 \pm 1.4\%$, 177 sites at 7 locations and almost 8000 coral colonies measured). Nevertheless, not all regions were affected by the 1998 El Niño event. The prevalence of diseases was clearly correlated with bleaching, regardless of year, varying between 2000-2003 during below average bleaching years (13,012 corals in 222 sites at 9 locations); and $7.9 \pm 6.4\%$ in 1998-1999 during above average bleaching (6482 corals in 91 sites at 6 locations). The most commonly reported diseases were 'white plague' and 'black-band' in 1998-1999; when bleaching was also highest. Recent partial mortality of the outer surfaces of coral was also greater in the 6 locations with more bleaching ($7.0 \pm 7.5\%$), than in the 9 locations that were below the average ($2.7 \pm 1.9\%$).

Coralline algae were relatively more abundant than benthic macro-algae in 3 large areas (windward Netherlands Antilles; Turks and Caicos Islands; Lighthouse Atoll, Belize), and densities of the important algal grazing sea urchin, *Diadema antillarum*, were very low ($<0.1/m^2$) on most reefs; but the populations appeared to be rebounding in some areas, especially Jamaica.

The biomass of algal grazing fishes (parrotfish and surgeonfish) longer than 5 cm varied on the front reef sites between $1,061 \pm 394$ g/100 m² off the North, West and Southwest of Jamaica and $7,427$ g/100 m² in the Windward Netherlands Antilles (Saba, Saba Bank, St. Eustatius, St. Maarten). Biomass estimates of the commercially important predator fishes (groupers and snappers) ranged from 163 ± 250 g/100 m² in Jamaica to $2,853 \pm 2,289$ g/100 m² off southern Cuba (Archipiélago Jardines de la Reina); this is difference of 17 times on reefs in adjacent islands.

The ranking using the 8 AGRRA indicators of coral reef health (live coral cover, % diseased corals, total (recent + old) partial mortality, macroalgal index, coralline algal abundance, *Diadema* density, herbivorous fish biomass, carnivorous fish biomass) from the 'best reefs' to the 'worst reefs' produced the following order: Windward Netherlands Antilles > Grand

Cayman + Little Cayman > Golfo de Batabanó, Southwest Cuba > Turks and Caicos Islands > Lighthouse Atoll, Belize = other parts of Belize ~ Jardines de la Reina, South central Cuba > Virgin Islands ~ Biscayne Bay + Florida Keys, Florida > Andros, Bahamas, > Archipiélago Sabana-Camagüey, North Central Cuba ~ Quintana Roo, Mexico > Panamá > Jamaica. [> , better than; = , equal; and ~ , about the same]. This ranking has a strong affinity with the level of human pressures on coral reefs; with particularly heavy pressures on Mexican and Jamaican reefs compared to much lower pressures in the Netherlands Antilles and the Cayman Islands. From: Judith Lang, Kenneth Marks Ocean Research and Education Foundation and Rosenstiel School of Marine and Atmospheric Science, University of Miami, USA, JandL@rivnet.net

Scientific Monitoring to Support Management of the Marine Aquarium Trade

Sustainable management of the marine aquarium trade requires regular monitoring of both collection areas and control sites. A partnership between Marine Aquarium Council (MAC), the Global Coral Reef Monitoring Network (GCRMN) and Reef Check developed a set of scientific monitoring protocols to measure reef health, fishing levels, impacts on stocks, and success of no-take reserves in collection areas. The Marine Aquarium Trade Coral Reef Monitoring Protocol (MAQTRAC) is based on Reef Check methods and designed to provide managers with species-level data to assess the effects of collecting fish and invertebrates on the health of coral reefs. MAQTRAC was successfully field tested in 2002 and 2003 in many Asia-Pacific locations. MAQTRAC is now a prerequisite for gaining international certification under the MAC Ecosystem and Fisheries Management Standard.

MAQTRAC starts with a wide-area survey using manta tow to select the site, followed by belt transects and timed swims to count fish and invertebrates and estimate size classes. Line transects are used to assess the living and dead coral cover. A typical survey includes 3 to 5 sites in a collection area with 3 to 5 surveys at each site, making 9 to 25 surveys per area. The methods can be modified to suit each country or collection area, but a core set of standard methods is retained. The protocols include assessing 'control' sites where there is no collection. The land and water areas of the location are recorded for the future reference, using still photos and videotapes. Monitoring also includes measures of harvest levels, catch per unit effort (CPUE) for each collection method, collection mortality levels, and any damage caused to the habitat during collection. These data are used to develop fishery management recommendations. However, there are some limitations: the surveys may not produce sufficient data for fish stock assessment models in areas with low numbers of target species; other types of fishing may confound the results; and using size classes as a proxy for age is problematic for fish that stop growing once they reach a certain size. The intention is to collect and analyse regular, high quality data so that clear trends above natural variation in each fishery can be detected and used to inform resource management decisions, such as total allowable catch limits for communities. MAQTRAC results have already been applied to fishery management in the Philippines. For example, a yield-per-recruit analysis showed that a striped damselfish (*Dascyllus aruanus*) was being over-fished in one area, whereas many other species were fished at sustainable levels. MAQTRAC results are being used to develop zoning, including no-take reserves as required by the MAC Certification process, and can inform decision-making about gear restrictions and access limits. MAQTRAC is a practical tool to detect changes in aquarium species and will be used to monitor coral reefs where MAC Certification is requested. From: Marine Aquarium Council, info@aquariumcouncil.org, www.aquariumcouncil.org and Reef Check, rcheck@ucla.edu, www.reefcheck.org

CORAL REEF RESEARCH FOR MANAGEMENT - NEW INITIATIVES

Targeted Research and Capacity Building

The Coral Reef Targeted Research and Capacity Building (TR) program has been established to address fundamental information gaps in our understanding of coral reef ecosystems, so that management options and policy interventions can be strengthened globally. Although opinions abound as to the causes of coral reef degradation, the cumulative and interactive effects of different stresses on coral reefs and the implications for long-term sustainability of these ecosystems are simply unknown. While resource managers struggle to maintain a balance between use and conservation in deciding among complex tradeoffs, we do not know enough about the fundamental factors affecting coral reefs in many areas to make practical management decisions. Moreover, we are not adequately equipped with the understanding and the tools needed to manage and plan for changes brought about by the transformation of these ecosystems; especially over the past 30 years.

The collective efforts of many of the world's leading coral reef scientists will be coordinated for the first time to address outstanding questions about the health and resilience of coral reefs. The Program, supported by the Global Environment Facility, the World Bank, The University of Queensland, the Intergovernmental Oceanographic Commission of UNESCO, the United States National Oceanic and Atmospheric Administration (NOAA) and research institutions in Mexico, the Philippines, and Tanzania, aims to: A) address key gaps in knowledge and technology required for ecosystem-based management of coral reefs; B) promote learning and capacity building in countries where coral reefs are found; and C) effectively link science to management and policy. The TR program will be implemented in phases over 15 years, with an initial focus in four coral reef regions: Mesoamerica; Southeast Asia; Eastern Africa; and Australasia, to establish and strengthen Centres of Excellence for science based management in these regions.

To address key knowledge gaps, the TR Program will support targeted investigations carried out by scientific working groups comprised of developed and developing country researchers. The working groups will be coordinated around 6 key themes:

1. Coral Bleaching and Local Ecological Responses
2. Connectivity and Large-Scale Ecological Processes
3. Coral Diseases
4. Coral Restoration and Remediation
5. Remote Sensing
6. Modelling and Decision Support

A Synthesis Panel of scientists and other professionals will be responsible for the overall quality and direction of the research. They will ensure that the research is responsive to management, is integrated across themes and regions, and that the results are linked to other disciplines, such as economics, sociology and law to inform policies and governance arrangements at the local, national and regional scales. The research objectives of the 6 working groups are summarised below:

1. Bleaching and Local Ecological Responses

Corals bleach in response to a range of environmental stress, from localised, anthropogenic stress (like declining water quality, sediment and nutrient runoff, changes in salinity and

pH) to climate change-related stress. While it is known that corals bleach when sea surface temperatures exceed their thermal tolerance levels, the mechanism is poorly understood. Understanding the physiology of bleaching in corals and the differential tolerance of algal symbionts to heat and other forms of stress may explain why some corals bleach more readily than others. It may also shed light on questions of adaptation and whether corals may develop resistance to environmental change through changes in the relative proportion of strains of heat-tolerant zooxanthellae that colonize them. Unravelling these relationships is essential to understanding current changes in patterns of coral diversity and reef community structure and to predicting changes that will occur in the future, under various scenarios of global change. The goal is to help reef managers: refine early warning systems for bleaching; stimulate development of bio-indicators of different kinds of stress; and refine projections of future change on coral reefs and the implications to society.

2. Connectivity

Coral reefs are patchily distributed in the oceans and connected by currents that move in complex and variable ways, particularly in coastal waters and in atoll chains. These currents transport the following: coastal sediment and pollutant run-off; nutrients; and especially the pelagic larvae of most reef species. Connectivity measures the flux of these items between locations. Coral reef managers must understand how nutrients, sediments, pollutants, and larvae arrive at and leave their coral reef areas. Most of the transfer of non-living materials is determined by local and regional hydrodynamics. The transfer of organisms is more complex since there are two components: the passive transport by currents; and additional movements due to the sensory and behavioural responses of the larvae. The most important component in larval recruitment is ensuring that there are upstream breeding populations.

A knowledge of connectivity patterns among coral reef organisms is essential to carry out site-based management of these and associated ecosystems, and to improving the design and implementation of networks of MPAs. Most MPA design and implementation uses 'educated guesses' to select the appropriate size and location, but there is little information to determine whether these guesses are correct. Pressures on reefs will continue to increase with growing coastal populations, and more direct exploitation of reef resources, therefore it is increasingly important that the establishment of MPAs be designed using well determined patterns of connectivity between target populations. Explicit data on demographic connectivity are essential to develop models of recovery rates from broad-scale disturbances, such as massive bleaching events, severe hurricanes, outbreaks of disease or chronic over-fishing. Thus, the Connectivity Working Group will assess the sources of larvae, the transport and dispersal patterns, and finally the successful recruitment processes into the receiving population.

3. Disease

There has been an unprecedented increase in coral disease over the last 20 years, which has contributed significantly to major coral losses. Disease outbreaks cause not only coral loss, but also cause significant changes in community structure, species diversity and abundance of reef organisms. While disease-related damage of coral reefs has been well documented in the Caribbean, the status of disease throughout the Indo-Pacific is largely unknown. Preliminary surveys in Australia, the Philippines, and East Africa reveal significant and damaging new diseases in all locations surveyed. What has prompted this rapid emergence of coral disease? Current research indicates that there is a connection between climate warming and increased incidence of disease, and disease outbreaks are threshold phenomena associated with warming

environments in many ecosystems. Coral reefs appear to be among the most susceptible due to a very narrow thermal threshold for coral health. The coral bleaching during the 1998 El Niño was the most massive and devastating ever recorded, and it is probable that much of the mortality was due to opportunistic pathogens, which accelerated the death of bleached corals.

It is probable that deteriorating environmental conditions influence disease by altering host-pathogen interactions. For example, warmer waters could affect basic biological and physiological properties of corals, and change the balance between opportunistic pathogens and the natural ability in corals to resist them. Other stresses include nutrient loading, which could enhance pathogen growth, and sedimentation, which could decrease coral resistance. Little is known about the organisms that cause disease in corals. Of the 18 or so disease symptoms described, the infectious agent is known for only 5, and reservoirs have only been identified for black band disease and aspergillosis. Exploring even basic questions is hampered by: A. the global nature of the problem; B. an overall lack of resources; and C. a lack of expertise and technology in developing countries. In response, the Coral Disease Working Group will: a) identify major coral diseases; b) assess the impact of coral disease on coral reef biodiversity and community structure; c) explore prevalence of disease in stressed environments and the role of chronic stress in the incidence of disease; d) assess the range of known coral pathogens; and e) evaluate effectiveness of various antimicrobial agents in controlling the spread of disease.

4. Restoration and Remediation

Recent degradation of coral reefs has stimulated greater attention to remediation and restoration mechanisms for reefs that have been damaged, especially through human pressures. The early initiatives focused more on creating artificial reefs, or more accurately, 'fish-aggregating devices' in areas without existing coral structures to enhance fisheries production or promote dive tourism. While these initiatives are still being expanded, more recent attention has been directed towards restoring degraded coral reefs through a wide range of remediation and restoration mechanisms. These include habitat modification, coral transplantation, species re-introduction, and recruitment potential enhancement. Some interventions involve large-scale structures designed to facilitate natural colonization of reef species, while others use simpler and cheaper approaches. Reef remediation and restoration will continue to have a more important role in reef recovery in the future, but the technologies are still being developed, and not ready to implement at large spatial scales.

The underlying principle of the Restoration and Remediation Working Group is that removing the source of stress is the first priority toward restoration. However, if large areas of reefs have been degraded and natural recovery is not predicted in the short-term, it may be essential to enhance recovery through artificial means. The Group is examining the efficacy and cost effectiveness of restoration and remediation techniques, including the following: the scientific protocols necessary to design and implement restoration strategies; baseline data for developing effective criteria; the efficacy and feasibility of restoration and remediation techniques; prospects for enhancing natural recovery; and opportunities to combine reef remediation with small and micro-enterprise at the local level.

5. Remote Sensing

Most remote sensing of coral reefs has been conducted on an *ad-hoc* basis with little consistency or recognition of the limitations for wide scale application. For example, some aspects of coral reef health can be resolved on shallow reefs in French Polynesia, but it is not known whether

these can be applied in Jamaica, where the reefs have different organisms, are in deeper water, and where there is more suspended sediment in the water column. Without an assessment of the limitation of coral reef remote sensing, the technology may be oversold or deployed for unrealistic management objectives, resulting in an inappropriate use of financial resources.

The Remote Sensing Working Group will measure the limitations of coral reef remote sensing by combining modelling and field experiments. Models will predict the ability of a remote sensing instrument to detect the slight differences in bottom reflectance that distinguish corals from macro-algae. The challenge is to combine knowledge of the physics of light passing through the water, with the interaction of light between complex mixtures of reef organisms. The methods developed in the computer graphic industry are used to divide coral structures into thousands of individual patches, each of which has a particular reflecting surface. Sunlight is reflected and scattered in predictable directions on the reef and it is possible to calculate the signal recorded by the sensor of the net light that reflected back through the water and atmosphere. Computer models will be refined and tested in the laboratory and the field conditions in a large-scale remote sensing experiment.

The group will provide tools to identify various coral reef habitats and possibly predict the cover of corals and algae on a reef, using high resolution imagery and direct field surveys. There is a wealth of satellite and photographic data for reefs, with some from World War II. The group will try to improve methods for detecting changes in reef condition indirectly using remote sensing to assist managers quantify the rate of change in coral reef habitats over large spatial scales at different time intervals.

Recent remote sensing research has improved the detail of reef maps, but the interpretation of these maps for management and assessing biodiversity has received little attention. The Targeted Research project will improve taxonomic capacity within the Centres of Excellence to allow scientists to prepare habitat maps for priority areas in the region and to provide technical assistance to the other scientific working groups. This Working Group will compile many oceanographic and atmospheric remote sensing products in an International Oceanographic Atlas and make them available for coral reef and coastal management within a single website.

6. Modelling and Decision Support

The Modelling and Decision Support Working Group aims to create an integrated model of the human-based coral reef ecosystem at each site. The group will assist decision makers and local reef users understand the dynamics of the whole system; both the biophysical and the socio-economic components, of which they are a part. The task is multi-disciplinary, multi-scaled and highly spatial. It deals with the complexity of biophysical coral reef system drivers, together with the equally complex human socio-economic aspects. The research is within the new discipline of complex systems science that started in the 1980s and is an area of active research in analytical and modelling techniques. There are many institutes, major government research initiatives and university centres and consortia around the world promoting this approach; some will be involved in this component. Not all the effort is directed at sustainability issues, but also at breaking down stress-response relationships to identify cause and effect of coral reef decline. Complex systems are rarely predictable, and modelling them will require constructing a series of clusters of sub-models to help understand dynamics between sub-components of the system, which can serve as building blocks in the construction of the whole. Clusters of models are particularly effective when several disciplines are involved, or when the questions posed are

evolving. In some traditional 'unified' model domains, such as oceanography or meteorology, where the range of disciplines is restricted and the questions clear, clustering is becoming the strategy of choice.

This exploration can become an integral part of the policy development process in an ongoing iteration between scientists and decision makers. Using visualization techniques involving maps and other spatially explicit media will help engage different classes of users and help them to understand the tradeoffs of different coral reef use options. Through modelling, it is possible for decision-makers, not only see the consequences of their policies, but also identify synergies across sectors, which can reinforce sustainable outcomes for coral reefs. Faced with alternative scenarios, coral reef managers are in a better position to optimise environmental, social or economic objectives and to select the most cost-effective interventions to mitigate unwanted impacts. More information is on: www.gefcoral.org.

ROLE OF MANGROVES AS NURSERY HABITAT FOR CARIBBEAN REEF FISH

Studies in the western Caribbean on 4 atolls and on the Belize Barrier Reef showed that mangrove forests could influence fish populations on nearby coral reefs. The principal conclusions were:

- most reef fish species have no functional dependency on mangrove nurseries with the possible exception of the largest herbivore in the Caribbean, the rainbow parrotfish (*Scarus guacamaia*);
- mangroves can strongly influence the community structure of fishes, even though most species do not depend on the extent of mangroves near the reefs, and some fish species which never use mangroves as nurseries can be influenced indirectly because they interact with other species that benefit from mangroves;
- the standing stock of fishes using mangrove nurseries is often considerably greater when there is a reef close to the mangroves. An example is the biomass of bluestriped grunt (*Haemulon sciurus*), which was 2000% greater on patch reefs, 650% greater on shallow fore-reefs and 55% greater on outer *Montastraea* reefs at 10 m depth. Other species of haemulids, snappers and parrotfish also benefited from the extent of nearby mangroves.

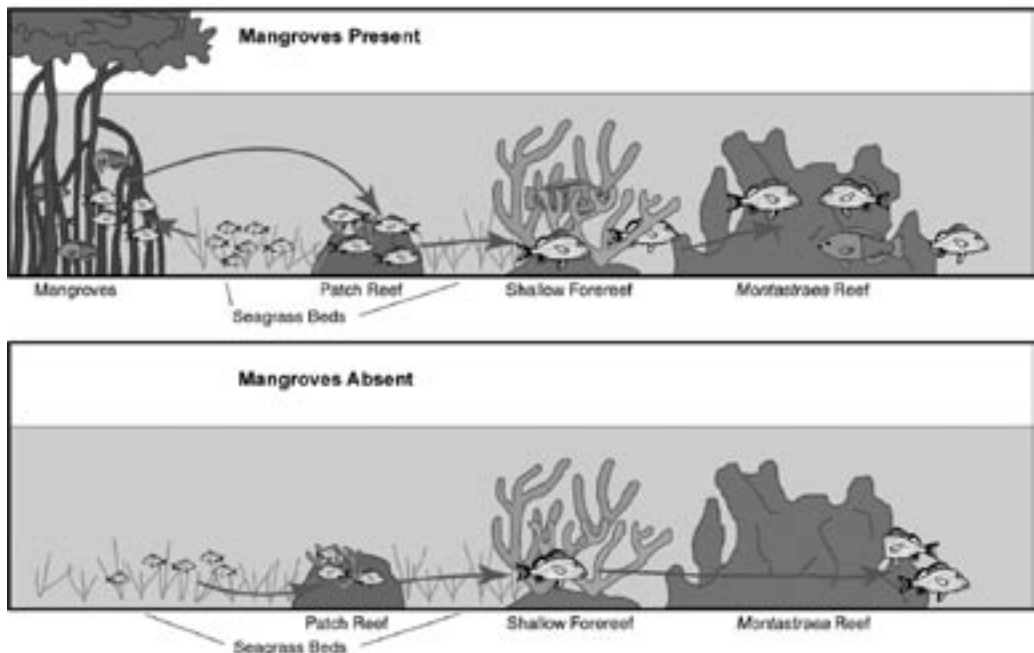
It is not clear why some species migrate from the lagoon to the fore-reef. They may seek food sources that are more abundant on the reefs, larger fish may outgrow the shelter provided in nursery habitats, or the fish may need greater access to ocean currents to disperse their larvae after spawning. Many species, including the bluestriped grunt live in seagrasses until they are around 6 cm long, then move to the mangroves. However, they appear to move to the seagrasses at night to feed, because 63.5% of the gut contents of juveniles consisted of tanaid shrimp, which are more prevalent in the zooplankton and sediment of seagrass beds. After growing in the mangrove nurseries, which provide a more plentiful food supply and refuge from predators, the fish migrate to the patch reefs. In the case of reefs with no nearby mangroves, the bluestriped grunt move directly from seagrasses to patch reefs, but at a much smaller size and lower density (260 per hectare compared to 3,925 per ha in mangrove-rich areas). As the biomass of predators is often greater on reefs than mangroves (30 tonnes km⁻² versus 18 t km⁻²), the chances of small grunt surviving may be lower if they migrate directly to reefs. The biomass of bluestriped grunt is significantly greater on patch reefs, shallow fore-reefs and *Montastraea* reefs when there are mangroves nearby. The case is clearer for the

rainbow parrotfish (*S. guacamaia*) because it has a functional dependency on mangroves and is rarely seen on reefs when there are no mangroves nearby. From Peter Mumby, University of Exeter UK; p.j.mumby@ex.ac.uk; full report on www.ex.ac.uk/msel

Coral Reef Research by the Wildlife Conservation Society (WCS)

The WCS has maintained scientific programs in coral reef conservation since 1991. Their programs are focused in 3 major regions of study: the western Indian Ocean, with most projects focused on the fringing reefs of Kenya; the Meso-American Barrier Reef, with projects focused on reef atolls of Belize; and the high diversity reefs in Indonesia and Papua New Guinea. A program in Madagascar is commencing as part of the western Indian Ocean program. The society has a coral research laboratory at the Osborne Aquarium and Columbia University in New York City. The major objectives of the programs are to:

- determine the effects of marine parks, global climate change, fishing, and indigenous management on fisheries catches, species diversity and reef ecology;
- develop methods to restore coral reefs that have been degraded by over-fishing, pollution or coral bleaching;
- assist the organisation of relevant government agencies and social organisations in developing sustainable resource use for coral reefs;



Where mangroves are present, the bluestriped grunt (*Haemulon sciurus*) moves from the seagrass beds to the mangroves where they continue to grow in a relatively safe environment, before moving to the ‘riskier’ adult habitat of coral reefs. In the absence of mangroves, the grunt move directly from the seagrass beds to the reefs at a smaller, more vulnerable size, which may explain the smaller populations of several reef fish including grunts, snappers and parrotfish on reefs with no adjacent mangroves. The large rainbow parrotfish (*Scarus guacamaia*) is less likely to occur where there are no nearby mangroves.

- foster the professional development and training of marine scientists in coral reef ecology and management practices; and
- contribute to the coordination and general development of coral reef conservation and science in the tropics.

Depending on the major threats and needs for conservation science in each region, these themes differ slightly between study sites and over time.

From: Tim McClanahan, Wildlife Conservation Society, Kenya, tmccclanahan@wcs.org.

ReefBase: A Global Database on Coral Reefs

ReefBase is a global information system on coral reefs that was developed by The WorldFish Center and the International Coral Reef Action Network (ICRAN). This online database (www.reefbase.org) stores quality information on the location, status, threats, and management of coral reefs in nearly 100 coral reef countries and territories. ReefBase serves as the central database for the GCRMN, and provides valuable information services to managers, policy-makers, researchers, conservationists, educators and students around the world. Some of the most popular features of ReefBase include: a vast collection of coral reef related literature (currently over 21,000 references, with some 3,000 publications available for download); and an interactive mapping system (GIS) with maps and reef-related datasets that can be downloaded via the Internet and edited. ReefBase continues to expand and develop as the world's leading information system on coral reefs. In 2005, there will be a particularly strong thematic focus on coral reef fisheries and socio-economic data. As a first step in a new, modular strategy, ReefBase will open a new field office in the Pacific, where ReefBase staff will collaborate with local partners to develop an extensive knowledge base on coral reefs catering to the needs of Pacific Island communities. More information is on ReefBase at: www.reefbase.org, contact: Marco Noordeloos, ReefBase Project, The WorldFish Center, Penang, m.noordeloos@cgiar.org.

People and Coral Reefs: A Partnership for Prosperity and Coral Reef Health

The International Coral Reef Action Network (ICRAN) is a global partnership to assist developing countries by working with user communities to ensure that activities on coral reefs are sustainable. The main goal is to reverse the trend of serious degradation of coral reefs. ICRAN focuses on strengthening the capacity of local communities to manage their own marine and coastal resources through monitoring and communication, and recognising that coral reef decline can be reversed. ICRAN was established through a grant from the UN Foundation to carry out the ICRI agenda to conserve the coral reefs of the world. The partnership consists of CORAL - the Coral Reef Alliance, GCRMN, ICRI Secretariat, Marine Aquarium Council, Reef Check, South Pacific Regional Environment Program, The Nature Conservancy, UNEP and the UNEP Regional Seas Program, UNEP-World Conservation Monitoring Centre, The WorldFish Center, World Resources Institute and WWF, which bring together a strategic alliance of experts with scientific and conservation experience in coral reefs.

The ICRAN action plan recognises the importance of scientific, traditional, cultural, and economic aspects of conservation. The goal is to implement these aspects through direct on-the-ground action throughout the world's major coral reef regions through a network of sites (see Special Sites at the end of regional chapters), as well as at regional and international levels, by means of a strategy that includes alternative livelihoods, training, capacity-building and the exchange of scientific, economic, traditional and social information. This emphasises the notion that the overall success depends significantly on dialogue and the development of

a consensus between all local and national stakeholders. Private sector engagement is critical for any successful coral reef initiative, thus the ICRAN partnership has placed emphasis on building bridges with industry.

ICRAN's current mission is based on three key interlinked components:

- **Reef management** – ICRAN assists local communities and coral reef managers by providing support and resources to enhance management capacity and build on successful techniques. In addition to support at a local level, ICRAN offers a forum to exchange community experiences and knowledge with other coral reef managers and policy makers worldwide;
- **Global coral reef monitoring and assessment** – building on new and existing scientific data, learning from traditional local knowledge and the lessons of practical experiences – GCRMN and Reef Check are critical partners to this component; and
- **Communications and knowledge dissemination** – the ICRAN assessment and information dissemination activities are designed to produce, and make available the knowledge needed to empower stakeholders, decision-makers, scientists and educators for the sustainable management of coral reefs.

Contact: Kristian Teleki, icran@icran.org, www.icran.org

FOUR MAJOR NGOs FORM A LEARNING PARTNERSHIP ON MPA NETWORKS

The Johannesburg World Summit on Sustainable Development in 2002, the World Parks Congress in 2003, and the Convention on Biological Diversity in 2004 all called for networks of MPAs to conserve biodiversity and habitats. Four major NGOs (Conservation International - CI, The Nature Conservancy - TNC, the Wildlife Conservation Society - WCS, and the World Wildlife Fund – WWF) have responded by forming a new learning partnership to exchange information and ideas on creating and sustaining MPA networks.

MPAs are recognised as valuable tools for coastal and marine habitat protection and biodiversity conservation. The international community is calling for the creation of ecologically- and socially-coherent networks of MPAs that are resilient and representative. However, there are major challenges to effectively manage and sustain individual MPAs. Moreover, there is also much to learn beyond these challenges about designing, adaptively managing, monitoring, and financing MPA networks. In response, these 4 NGOs decided to combine their efforts and provide a focused learning program among institutions across sites and countries around the world.

The partnership has defined two broad learning questions:

1. what will it take to design effective MPA networks? and
2. what does it take to create and maintain a positive enabling environment to support the establishment and sustainability of effectively-managed, representative networks of MPAs?

The partnership is founded on the belief that the process is most effective when the participants come together to identify strategies and lessons so that they can learn from each other, and focus on the specific questions and activities that will add most value to their work. A small group of field staff from the NGOs and their local partners in each of 6-10 key MPA networks around the world will promote learning among group members and conduct joint activities addressing specific learning questions from their programs. Contact: Roger McManus CI - r.mcmanus@conservation.org; Scott Smith, TNC - ssmith@tnc.org; Liz Lauck WCS - llauck@wcs.org; Kate Newman WWF - kate.newman@wwfus.org.

HELPING MPA MANAGERS COPE WITH CORAL BLEACHING: REEF RESILIENCE TOOLKIT

When the 1998 global coral bleaching event hit, many reef managers were unprepared and confused. Well-managed areas were being devastated while some areas outside their protection had survived; there seemed to be no pattern or logic. This event stimulated a major shift in planning of MPAs, with the concept of putting emphasis on managing coral reefs that are **resistant** (do not bleach when others nearby may) or **resilient** (bounce back quickly afterwards) to bleaching. The Nature Conservancy and partners have developed the R²- Reef Resilience Toolkit to help MPA managers and policymakers respond to the threats from global climate change by enhancing their planning and management strategies. The multimedia, CD-ROM Toolkit outlines the steps necessary to select, protect and monitor coral reef communities that are likely to be resistant or resilient to bleaching and/or be sites with fish spawning aggregations.

The R² Toolkit aims to help managers build resilience into coral reef conservation so that the systems can survive the anticipated global changes and continue to provide goods and services for the local communities. It is now predicted that bleaching and other global threats will increase, and this has prompted a recommendation to focus on protecting resistant or resilient coral reefs as one counter to the potentially devastating future threats. Another important consideration is to focus on economically important areas, like tourist reefs and fish spawning aggregations.

The resilience strategy has 3 critical components: Application; Training; and Science.

- Application is to apply the concepts and tools to MPA network design and management, while building capacity for coral reef conservation and facilitating information exchange.
- Training is essential to share the resilience concepts and management strategies at global scales and improve integration of the principles into coral reef management to improve tropical marine conservation.
- Science provides the underpinnings of the Toolkit by defining and improving the resilience principles through field testing and tracking the evolving science.

These tools will assist reef managers play a larger role in preparing for and responding to a mass bleaching. But many reef managers work in remote areas and lack the resources and skills to respond to emerging global threats. Moreover they do not have access to scientific advice and evidence to guide their responses to a bleaching event. Therefore, the R² Toolkit includes the science underlying the resilience principles and is presented so that it can be used in remote areas. TNC now seeks mechanisms to deliver the Toolkit into the hands of as many managers as possible and then use this network of managers to field test and refine the Toolkit. This Toolkit will be provided to all reef managers, if requested. To order a copy, contact TNC Marine Initiative at resilience@tnc.org.

WEB-BASED REEF ADVISORY SYSTEM (WRAS) FROM REEF CHECK

The new WRAS system was created to give all Reef Check team members and registered users instant access to monitoring results and interpretation. WRAS has five components: a searchable GIS database, a charting function to view the results of any given survey, a scorecard for each indicator, a statistical function that allows comparison of one site or region with any other, and an advisory system that provides basic information on problems detected and possible solutions. In practice, teams can submit their data via webform or email and then start using WRAS to compare e.g. their site with the nearest site or with all sites in their country -- from that year or previous years. WRAS is a major step forward in providing rapid information on coral reef health to coral reef managers. WRAS is a joint project of Reef Check, ReefBase, University of Southern California and Rhode Island Coastal Resources Center. It can be accessed from www.ReefCheck.org.

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THE IMPORTANCE OF THE PRIVATE SECTOR IN CORAL REEF CONSERVATION

An essential component for the effective management of coral reef MPAs is to build working partnerships between local park managers and other key stakeholders. Studies have shown that MPA managers need the support and involvement of local resource users if they are to achieve their conservation objectives. A primary reason for engaging private sector members, like local dive operators, as partners in coral reef protection is because these business owners are quite powerful in their communities. A healthy economy is important for policymakers in their efforts to develop sound economic policy for communities.

Destinations with MPAs and reserves tend to have healthier marine ecosystems with higher fish biomass, density and larger predatory fish. They usually have more invertebrates and higher biodiversity than unprotected areas. Therefore, marine recreation providers, such as the dive industry, are natural allies of park managers for conservation because their business success depends on having a healthy coral reef to attract customers. Tourists will repeatedly visit these reefs and create sustainable revenue and livelihoods for the community. There are successful partnerships between marine park managers and the private sector in tourist venues like Bonaire, Bunaken, and Palau where enlightened self-interest and tourism dollars have supported coral reef conservation.

The Coral Reef Alliance (CORAL) has developed a 'Sustainable Marine Recreation' training program to build conservation alliances among park managers, marine tourism operators and community groups. They conduct workshops and facilitate discussions over a variety of

topics, including coral reef ecology, solutions to coral reef degradation, and sustainable business practices. The workshops provide a forum for stakeholders to meet, voice their concerns, and collaborate to create relevant local solutions to current reef problems. In August 2003, CORAL held a two-day workshop in Bali, Indonesia for more than 40 participants from 20 dive businesses and several NGOs. These participants identified anchors as a primary cause of damage to local reefs, and first steps towards developing a mooring buoy plan were initiated. Less than one year later through their hard work and dedication, the Bali dive community successfully installed 49 mooring buoys to protect some of the most popular and beautiful coral reefs. One dive operator commented, "Until this course, I never realised the full implications of what we do as dive operators when it comes to saving coral reefs... nor how big a part the dive community can play." CORAL held several workshops in Fiji, Palau, and the Federated States of Micronesia in 2003, and all have resulted in substantial increases in community support for coral reef conservation and MPAs. These mutually beneficial public-private partnerships enable all stakeholders to capitalise on their shared interests and work together to keep their coral reefs healthy. From: Sherry Flumerfelt, The Coral Reef Alliance, San Francisco, sflumerfelt@coral.org.

REEFS AND POVERTY: FROM POLICY TO PRACTICE

Coral reefs occur in more than 100 countries and underpin the livelihoods of many millions of people in developing countries. In some areas, particularly small island developing states (SIDS), the dependence is extremely high, and many people depend on reef resources as a safety net to alleviate poverty. Other people regularly depend upon reef resources at certain times of the year as a **key-stone resource** to ensure that they escape the worst poverty. The number of reef dependent people is increasing, due to natural growth, migration to coastal areas and a loss of land-based opportunities. These people are extremely vulnerable to reef degradation and many are becoming poorer as reefs are threatened by the effects of:

- climate change on the coast;
- habitat destruction, sedimentation and pollution from multiple sources including coastal development, tourism and agriculture and forestry; and
- over-exploitation of fishery resources and destructive fishing practices.

Coral reef degradation has been a major international issue and the focus of many international agencies and their partners in governments, multi-lateral agencies and NGOs for many years. There is also a growing recognition of the interrelationships between poverty and the sustainable use of the natural environment. This has emerged in numerous policy frameworks such as Agenda 21, CBD, the Durban Accord, WSSD and the Millennium Development Goals (MDG). The MDG, which are the central guiding policy framework for many international development agencies, place specific emphasis on both the eradication of extreme poverty and hunger, and ensuring environmental sustainability.

Closely linked to this emerging policy consensus, is a growing call for more practical guidelines to put pro-poor conservation policy into practice. For example, the recent ICRI meeting in Okinawa discussed how the Code of Conduct for Responsible Fisheries could be more explicitly translated into practical guidance for the equitable and sustainable use of coral reefs. The demand for such guidance is likely to increase, especially to address specific issues such as the need to create alternative livelihoods for the ever-increasing number of reef users. From: Jock Campbell and Emma Whittingham, IMM Ltd, Exeter, UK, www.ex.ac.uk/imm/

COORDINATION AND COOPERATION - NEW INITIATIVES

IUCN: Ensuring Survival of Coral Reef Species

The IUCN Species Survival Commission is accelerating efforts to identify fish and other species that are threatened with extinction, as fisheries and other pressures increase and damage habitats. The Commission has developed a network of marine experts and a marine program of work, with some components pertinent to coral reefs. The coral reef-related Specialist groups focus on marine turtles, sharks, groupers and wrasses, and coral reef and Caribbean fishes. Threatened marine species, identified by these and additional SSC experts, are included in the IUCN Red List of Threatened Species, the world's most authoritative and comprehensive list of species at risk of extinction. There is an urgent need to expand this to identify species in need of conservation, and evaluate the current and potential future threat of coral bleaching and other stresses on coral reef species and ecosystems.

Extinction Vulnerability in Coral Reef Fishes: Over-exploited coral reef fish species are vulnerable to population depletion, and possibly to extinction. The IUCN- Species Survival Commission recognised the urgent need to raise awareness and concern about the real survival risks for coral reef fishes, and to translate this into proactive management. The IUCN Coral Reef Fishes Specialist Group is developing a collaborative, multi-institutional project, the Global Assessment of Reef Fishes, to determine the IUCN Red List, or threatened, status of several thousand species. This will include the creation, maintenance and use of a database on life history, ecological and behavioural characteristics, exploitation levels and threats, and other variables for use in making assessments. The Assessment will map species distributions, which will be essential for making Red List assessments.

Sharks and Coral Reefs: Shark and ray populations are rapidly being depleted for the lucrative shark-fin trade. The IUCN Shark Specialist Group was established in 1991 to interact with international conventions like CITES, and organisations such as FAO to provide leadership for the conservation and management of sharks. They are preparing Red List assessments and providing technical, scientific and policy advice. A major concern is shark finning and the group is working to promote regional and international cooperation to regulate this practice. Reef sharks have become an important focus, as they are top predators, vital to maintain a healthy balance of reef ecosystems, and are major features for ecotourism (www.flmnh.ufl.edu/fish/organizations/ssg/ssg.htm).

Groupers and Wrasses – Vulnerable Coral Reef Fishes: The IUCN Specialist Group for Groupers and Wrasses was established in 1998 to focus on these two particularly vulnerable and economically valuable reef fish families (approximately 1,000 species). More than 20 species are considered threatened, and Group members are active in species assessments and biological research on more vulnerable species. They work with the Society for the Conservation of Reef Fish Aggregations to document the current status and exploitation history of spawning aggregations, in order to strengthen the case for protection of aggregations and aggregating species. The Group is running an awareness campaign for the humphead wrasse and assisted in developing of Standards of Good Practice for the trade (www.hku.hk/ecology/GroupersWrasses/iucnsg/, www.scrfa.org).

Marine Turtles and Coral Reef Ecosystems: The IUCN Marine Turtle Specialist Group was founded in 1966 in response to a growing recognition of the endangered status of marine turtles. The mission is to develop and support strategies, set priorities, and provide tools to promote and guide the conservation of marine turtles, their ecological roles and habitats. The group will investigate the integration of sustainable use protocols into conservation, and determine recovery criteria for distinct populations. The group membership assesses population status and assists with the design and implementation of management and conservation activities, often relying on a mixture of traditional and current scientific knowledge and the latest technical advancements (www.iucn-mts.org/).

Contact: Kristin Sherwood, IUCN Global Marine Program, Washington DC, ksherwood@iucn.org, or Amie Brautigam, IUCN-SSC Marine, thomsen.brautigam@prodigy.net.

CORDIO (CORAL REEF DEGRADATION IN THE INDIAN OCEAN) REFUNDED

CORDIO was initiated 1999 as a response to the massive mortality of corals in the Indian Ocean during the 1998 global coral bleaching event. Coral reefs support a considerable proportion of the populations and economies of countries in the Western and Central Indian Ocean, through fisheries, tourism and large-scale investments. Using funding provided by the Swedish International Development Co-operation Agency (SIDA) and other donors including IUCN, WWF and the Government of Finland, CORDIO supports 45 monitoring and research projects, conducted by more than 50 scientists at local institutions in 11 countries throughout the Indian Ocean. CORDIO is a locally driven, regional initiative, designed to build the necessary capacity to enable scientists and managers of the Indian Ocean to obtain valuable data to improve the management of their coral reef resources in a more sustainable manner. The CORDIO program addresses several sustainable development issues: food security; alternative livelihoods; poverty reduction; and contributes to global activities addressing climate change and biodiversity conservation. The activities of CORDIO are designed around these themes:

- **Ecological monitoring:** using existing national monitoring programs or through the establishment of new programs, scientists and management agencies in the countries involved in CORDIO are assessing the condition of their coral reefs and associated habitats in order to make informed management decisions and evaluate the success of existing management plans. The data generated by these monitoring programs contribute to global coral reef initiatives such as GCRMN and ReefBase;
- **Socio-economic monitoring:** the short and long-term impacts of coral reef degradation on households, industries and national economies can be assessed through socio-economic monitoring programs. These help the search for options to mitigate the impacts;
- **Targeted research:** scientists and institutions involved with CORDIO are doing specific research to address aspects of climate change related coral bleaching, its damage, resilience and recovery in corals, options for restoration and management, and sustainable use of coral reefs and their resources; and
- **Alternative livelihoods:** pilot projects have been successfully implemented in some countries to alleviate pressure on coral reef resources by developing alternative sources of income for families dependent on those resources.

The activities of CORDIO are co-ordinated through 3 regional Nodes in Colombo, Sri Lanka, Mombasa, Kenya and Victoria, Seychelles and one central node in Kalmar, Sweden. Program

Co-ordinators: Olof Lindén, olof.linden@cordio.org; David Souter, david.souter@cordio.org; David Obura, david.obura@cordio.org; Jerker Tamelander, jet@iucnsl.org; Rolph Payet, ps@env.gov.sc

THE 2010 TARGET OF THE CONVENTION ON BIOLOGICAL DIVERSITY

2010 is the deadline set by the 188 member countries to the Convention on Biological Diversity, to achieve a significant reduction in the rate of biodiversity loss by an effective and coherent implementation of the Convention on Biological Diversity. The 2010 target is critical to turning the tide of species loss and resource depletion and ensuring the continued development and survival of life on Earth, including the human species. Collective and sustainable use of resources will result in the alleviation of poverty and the improvement of life on Earth.

The GCRMN, through the Status of Coral Reefs of the World Reports, is the main data and information provider for measuring progress towards the CBD 2010 targets as it applies to coral reefs. Each report will provide an update of progress made towards the target.

Progress made towards the 2010 target in 2004: Coral reefs and their associated biodiversity continue to decline. Most coral reefs around the world are being damaged by over-exploitation, land-based pollution and sedimentation. Climate change is predicted to cause massive destruction of coral reefs in the next decades. If 'business as usual' continues, the 2010 target for coral reefs will not be reached. Instead, there will be a loss of coral reef diversity.

Actions that need to be taken now to reach 2010 target: Action to reverse the trend of coral reef decline would require development of new, well-managed MPAs, reduction of fishing pressure, halting destructive fishing practices, and increased community involvement in monitoring and management of reef resources. On a global level, the reduction in greenhouse gas emissions that are driving global climate change are required.

THE CBD COP-7: RESULTS OF RELEVANCE TO

MARINE AND COASTAL PROTECTED AREAS AND CORAL REEFS

The 7th meeting of the Conference of the Parties (COP) to the Convention on Biological Diversity was held in Kuala Lumpur, Malaysia, 9 - 20 February 2004. Representatives from 162 countries, international organisations, indigenous and local community organisations and NGOs, attended the meeting. They adopted 36 decisions, which are available on: www.biodiv.org/decisions/.

Amongst the important results of COP 7 was decision VII/5 on Marine and Coastal Biological Diversity. This decision adopted the elaborated program of work on marine and coastal biological diversity, which includes new material on marine and coastal protected areas, mariculture, high seas biodiversity, and coral bleaching. In addition, relevant activities from the Plan of Implementation of the World Summit on Sustainable Development (WSSD) have been incorporated into the program of work.

Marine and coastal protected areas (MCPAs) created substantive discussion and resulted in recommendations on national systems of MCPAs and guidance on how countries could develop such systems. The COP noted the low level of development of MCPAs and agreed that

the goal for work related to MCPAs under the Convention should be the establishment and maintenance of MCPAs that are: effectively managed; ecologically based; and contribute to a global network of MCPAs, building on national and regional systems, and including a range of levels of protection. The decision VII/5 on marine and coastal biological diversity and the decision VII/28 on protected areas, adopted targets for developing such MCPA systems by the year 2012, echoing the commitment made in the WSSD Plan of Implementation. The COP agreed on the establishment of a national framework of MCPAs consisting of areas allowing sustainable uses and areas where extractive uses are excluded.

The COP also underlined that there is an urgent need for international cooperation and action to improve conservation and sustainable use of biodiversity in marine areas beyond the limits of national jurisdiction, including the establishment of MCPAs consistent with international law and based on scientific information. Seamounts, hydrothermal vents, cold water corals and other vulnerable ecosystems were identified in paragraph 59 of decision VII/5 as threatened areas in need of rapid action to address those threats in the context of the precautionary approach and the ecosystem approach. As one of the next steps in the process, the Convention's Ad Hoc Open-Ended Working Group on Protected Areas will consider this issue in 2005.

The CBD work plan on coral bleaching was also updated by COP-7, and is contained in Appendix 1 of the elaborated program of work (decision VII/5, Annex I). The aim of this updated work plan is to be increasingly action-oriented in undertaking management actions and strategies to support reef resilience, rehabilitation and recovery. The amendments recognise the need to manage coral reefs for resistance and resilience to episodes of raised sea temperatures and/or coral bleaching, and including these in MPA network design. The new elaborations to the CBD work plan on marine and coastal biological diversity represent a major step forward in developing strategies for reducing biodiversity loss in oceans and coastal areas.

FUNDING AND SUPPORT - NEW INITIATIVES

France Launches CRISP - Coral Reefs Initiative for the South Pacific, 2005

This project aims to reduce the local and global threats to Pacific coral reefs and the peoples who depend on them for their livelihood by offering a more sustainable future. CRISP was designed as 3 year units starting in January 2005 with a contribution of EUR 5 million (USD 6 million) from the French Agence Française de Développement and French GEF (French Fund for World Environment), supplemented by a matching amount from Conservation International (CI), United Nations Foundation (UNF), World Wide Fund for Nature (WWF) and the French Ministry of Foreign Affairs (MAE). CRISP is developing strategies and projects to preserve the biodiversity of Pacific coral reefs to ensure that their economic and environmental services are sustained for local and global communities. The initiative will strengthen regional integration between the developed and developing countries, with the major partners being: SPREP (South Pacific Regional Environmental Program); University of South Pacific; Secretariat of the Pacific Community; WorldFish Center; International Coral Reef Action Network; and French research institutes, Institute of Research for Development, International Research Center for Agronomy and Development, the Ecole Pratique des Hautes Etudes through the Moorea laboratory (CRIOBE) and the French universities of New Caledonia and French Polynesia. About 15 Pacific countries are included, including 3 French overseas territories (New Caledonia, Wallis and Futuna, French Polynesia), operating within the French Initiative for Coral Reef (IFRECOR).

The specific objectives of CRISP are to:

- improve the understanding of the biodiversity, status and functioning of coral reefs;
- implement actions for large-scale protection and management of coral reefs;
- develop the economic potential of coral reef use and biodiversity values; and
- disseminate information and knowledge, strengthen capacity and organisation of local, national and international networks throughout the Pacific.

To meet these objectives, CRISP will combine: i) cross-cutting network activities with conservation and economic development field projects; ii) research, planning and development; iii) contributions from different disciplines, including biology, ecology, economics, sociology, law and anthropology. Simultaneously, the project will target terrestrial and marine factors influencing coral reef function, including watershed management and wastewater treatment. Rather than create new structures, CRISP will strengthen existing partners willing to cooperate actively in the region.

Specific CRISP Components are:

- integrating Marine and Coastal Protected Area development and watershed management;
- integrating the extension of coral reef research, identification of potentially active marine substances, networking of reef monitoring and restoration; and
- coordinating knowledge management and project management.

The principal expected outcomes are: improved knowledge of coral reefs, including the effects of global change, to assist cross-disciplinary interactions for decision makers and planners; the protection and sustainable co-management of significant areas of coral reefs that comply with defined scientific and social criteria; the consolidation of the economic potential of coral reefs, demonstrated by examples of sustainable fishing and aquaculture, tourism, biodiversity development, etc; and strengthened collaborative networks of people of the French overseas territories, developed countries and the small island states of the Pacific. From Dominique Rojat - www.afd.fr, and rojatd@afd.fr.

REEF CHECK RESPONSIBLE CORPORATE PARTNERS

The major goal of Reef Check is to directly involve corporations in marine conservation. Reef Check works with corporate partners on projects that allow them to apply their skills and expertise to conservation problems. Reef Check has developed key partnerships with environmentally responsible corporations that share our vision of marine conservation. Since 2000, Quiksilver, the lifestyle boardriding company has provided a berth for a Reef Check scientist on their global 5-year expedition, 'The Crossing'. As a result, Reef Check had been able to survey remote sites throughout the Indo-Pacific and Caribbean that would otherwise be unreachable. Reef Check has partnered with Body Glove on the Kona Classic event, that combines underwater photography with coral reef education for kids, and are designing additional educational outreach programs. Body Glove and Tusa, the dive equipment manufacturer, have provided substantial donations of wetsuits and dive gear respectively for Reef Check teams. Finally, Reef Check partnered with MacGillivray Freeman Films in the development of 'The Coral Reef Adventure', an award-winning IMAX film. The large interactive lobby displays for this film have been donated to Visitor Centres at several marine protected areas around the world. From: Gregor Hodgson, Reef Check Los Angeles, USA, gregorh@reefcheck.org.

