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TECHNICAL ADVICE ON THE ESTABLISHMENT AND MANAGEMENT OF A NATIONAL SYSTEM OF MARINE AND COASTAL PROTECTED AREAS

Paper prepared by the Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas

Note by the Executive Secretary

1. The Executive Secretary is circulating herewith, for the information of participants in the eighth meeting of the Subsidiary Body of Scientific, Technical and Technological Advice of the Convention on Biological Diversity, technical advice on the establishment and management of a national system of marine and coastal protected areas compiled by the Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas. The members of the Ad Hoc Technical Expert Group are listed in the annex to this document.

2. The contents of the document have been peer-reviewed, and the text is reproduced in the form and language in which it was received by the Secretariat.

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BACKGROUND

The Convention on Biological Diversity entered into force in 1993, and currently has 184 Parties. The objectives of the Convention are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. The Convention includes an article (Article 8) relating to *in situ* conservation, which among other things requires Parties (as far as possible and as appropriate) to:

> (a) Establish a system of protected areas of areas where special measures need to be taken to conserve biological diversity; and
> (d) Promote the protection of ecosystems, natural habitats and the maintenance of viable population of species in natural surroundings.

At its first meeting, the Conference of the Parties of the Convention (COP) identified marine and coastal biodiversity as an early priority. This was reflected in the issuance of the Jakarta Mandate on Marine and Coastal Biological Diversity in Jakarta, Indonesia, in 1995, in conjunction with the second meeting of the COP. The Jakarta Mandate is a global consensus on the importance of marine and coastal biological diversity, and is a part of the Ministerial Statement on the implementation of the Convention. The Ministerial statement from COP II affirmed the critical need to address the conservation and sustainable use of marine and coastal biodiversity, and urged Parties to initiate immediate action to implement COP decisions on this issue. COP IV adopted a work programme and made other decisions. That work programme included a programme element on marine and coastal protected areas (MCPAs).

As part of its ongoing work to provide advice to Parties on marine and coastal biodiversity, COP V decided to establish an Ad Hoc Technical Expert Group (AHTEG) to consider issues relating to MCPAs. The terms of reference for the group are set out in Annex 1.

The group was formed in accordance with the modus operandi of the Convention. Members of the group are set out in Annex 2.

This document is the main product from the AHTEG.

SCOPE AND PURPOSE

Areas set aside for protection in the marine environment range enormously in size, location and purpose. They also provide a highly variable degree of protection to biodiversity, which was not necessarily the prime purpose for which the areas were set aside. Reserves can be only a few hectares in size or encompass hundreds of thousands of square kilometres (e.g. the Great Barrier Reef Marine Park). In 1996 the World Conservation Monitoring Centre (WCMC) recorded about 1.5 million sq.km. of marine protected areas (though including some islands), compared with some 11.6 million sq.km protected on land. Information on many marine protected areas is not robust, though sites range across all of the world's marine regions.

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In some parts of the world the commonly used term 'marine protected area' is taken not to include coastal areas or cross the land/sea interface, and omit important parts of the overall marine environment such as estuaries, marine salt marsh. The AHTEG used the term Marine and Coastal Protected Area, not necessarily to argue for a change in terminology for all purposes, but rather to make it quite clear that its advice to the Parties to the Convention on biodiversity protection applies to coastal areas as well as the sea. MCPAs are considered to include not only the wider salt water marine environment in all its dimensions, but also areas of coastline which influence, and are in turn influenced by the marine environment.

The AHTEG adopted the following definition of MCPA:

Marine and Coastal Protected Area' means any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna, and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings.

Areas within the total marine environment include permanent shallow marine waters; sea bays; straits; lagoons; estuaries; subtidal aquatic areas (kelp forests, sea-grass meadows); coral reefs; intertidal mud, sand or marine salt flats and marshes; seamounts, deep water corals, deep water vents, and open ocean habitats.

This report seeks to provide a summary of current scientific understanding and best practice approaches to MCPAs, together with references to key literature that can provide further details.

In undertaking this task, the AHTEG were conscious of the fact that the scientific understanding on some key issues is poor or contradictory (e.g. the effects of MCPAs on fisheries outside the MCPA). They have responded to this problem by presenting either their consensus view of issues, or identifying a cautionary approach to deal with uncertainty and risk.

This report is designed to provide advice to decision-makers – policy makers within government, MCPA and other marine and coastal managers, users and communities.

References:
CBD Secretariat. 2001. 'Value and Effects of Marine and Coastal Protected Areas (MCPAs) On Marine and Coastal Biodiversity: A Review of Available Information.' Paper for AHTEG First Meeting October 2001. UNEP/CBD/AHTEG-MCPA/1/2

WHY HAVE MCPAS?

INTRODUCTION

This section is designed to provide policy makers and managers with a summary of:

- The obligations of Parties under the Convention on Biological Diversity;
- The benefits of MCPAs; and
- The importance of MCPAs for an effective coastal and marine biodiversity management system

MCPAs are not cost-less instruments. Their creation and ongoing management will require substantial investments from governments or communities, and most MCPAs have impacts on existing users of the marine and coastal environment. These costs need to be offset by the benefits that MCPAs provide.

THE CONVENTION ON BIOLOGICAL DIVERSITY

The Convention on Biodiversity calls on countries, *inter alia,* to (as far as possible and appropriate):

a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, *inter alia*, the measures set out in the Convention relevant to the Party concerned.

b) Integrate the conservation and sustainable use of biodiversity into the sectoral and cross-sectoral plans, programmes and policies.

c) Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity.

d) Develop guidelines for the selection, establishment and management of such areas.

e) Regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use.

f) Promote the protection of ecosystems, natural habitats and maintenance of viable populations of species in natural surroundings.

g) Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas.

h) Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, *inter alia*, through the development and implementation of plans or other management strategies.

i) Adopt measures relating to the use of biological resources to avoid or minimise adverse impacts on biological diversity.

(from articles 6, 8 and 10)

These responsibilities arise because of the value of biodiversity, both as a contribution to human social and economic development, and also for its own sake. The first preambular clause of the Convention refers to "the intrinsic value of biological diversity" and also "the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values". MCPAs are relevant to all these values, and the full range of values should be considered when designing a MCPA network.

These values include provision of construction materials, medicines, biochemical and genetic information for pharmaceuticals, wild genes for domestic plants and animals, tourism and recreation, maintaining hydrological cycles, cleansing water and air, maintaining the gaseous composition of the atmosphere, regulating climate, storing and cycling essential nutrients, absorbing and detoxifying pollutants of human origin, satisfying spiritual and cultural needs, providing sources of beauty and inspiration and providing opportunities for research.

References: The text of the Convention, and other material relating to the Convention (e.g. decisions) can be found on the Convention web site: www.biodiv.org.

MCPAs therefore have several potential roles in implementation of the Convention in the coastal and marine area:

1. The Convention sees the establishment and maintenance of protected areas as an essential element in the management of biological diversity. For coastal countries, MCPAs are essential to provide a complete protected area network covering all ecosystems.
2. The Convention requires Parties to protect or restore ecosystems, natural habitats and species populations. MCPAs represent one method to provide that protection, or to allow natural recovery of degraded resources. As discussed below, they provide the only method to maintain marine ecosystems in a truly natural state.
3. The Convention requires Parties to ensure that, in using biological resources, adverse impacts on biological diversity are avoided or remedied. As discussed further below, protected areas can provide a simple and effective means to minimise the potential adverse effects of activities such as fishing in the marine and coastal environment.

ACTIVITY REGULATION OR AREA PROTECTION?

Healthy and well-functioning marine and coastal ecosystems and the biodiversity they contain are increasingly threatened by human activities, resulting in:

- over-exploitation of biodiversity
- impacts of extraction methods (e.g. bottom trawling, long-lining, mining and dredging) and seismic surveys
- sedimentation arising from activities on adjacent land
- infilling of estuaries, alteration of sediment movement by groynes, and other physical changes to the marine environment
- water pollution
- impacts of tourists and divers (e.g. on coral reefs)
- climate change
- alien species invasions
- subdivision and development on the coast
- fragmentation of habitats
- changes in genetic composition
- biomass reassignment

As outlined above, the Convention requires actions to be taken to conserve biodiversity and prevent its unsustainable use. There are two broad approaches to achieving this. One is to regulate activities that

might threaten biodiversity. In the marine environment this might include controlling sand dredging, prohibiting the collection of live corals, or establishing exploitation limits and controlling fishing methods and applying this to the entire stock of a fishery. The other is to establish protected areas, in which most or all damaging activities are prevented or strongly controlled, while allowing greater levels of use and impact outside those areas. These two approaches are, of course, able to be used together, as complementary strategies.

Regretfully, in many cases current marine and coastal management practices (e.g. controls on fishing catch levels and methods, land use regulation) appear inadequate to deal with the complexity and magnitude of present threats to biodiversity. The inadequacy arises because we are trying to manage through inadequate knowledge and through managing systems that are not necessarily stable. Management is also compromised ecologically (by loss of big fish and long-lived, slow growing biota), financially (perverse incentives and financial pressures) and cognitively ('the sea looks okay to me'). There is therefore a need to take actions that will provide rapid and effective control and removal of such threats.

In addition, many of our current methods rely on having a comprehensive understanding of marine ecosystems. In most cases, this is lacking.

In order to increase such understanding of the marine environment, we need to maintain areas where human interventions are excluded. For example, to measure natural mortality of coral reefs, fish stocks, marine turtles, etc. information that is needed to assess the impacts of human exploitation, highly protected MCPAs are essential. (This issue is explored further below.)

References:
Conover, David O. and Stephan B Munch. 2002. Sustaining fisheries yields over evolutionary time scales. *Science* 297: 94-96 examines the potential for fishing pressure to generate evolutionary changes in fish populations.

Angel, M.V.1987 ‘Criteria for protected areas and other conservation measures in the Antarctic region’ Environmental Internatonal 13: 105-14

Experience to date has shown that using an area-based approach, i.e. creating MCPAs, is an essential element in integrated marine and coastal area management (IMCAM) regimes, if these are to be able to achieve the objectives of the Convention.

References:

Agardy, M.T. 1994. 'Advances in marine conservation: the role of marine protected areas.' Trends in Ecology and Evolution 9:267-270

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Kelleher, G. 1999 'Guidelines for Marine Protected Areas.' Best Practice Protected Areas Guidelines, Series No. 3. IUCN Gland, Switzerland and Cambridge, UK

In any particular IMCAM regime, the proportion of the area which should be set aside in protected areas will depend to some extent on the effectiveness of non-area based regulatory measures. The less effective the activity controls are, or the less certain we are of their effectiveness, the more functions the protected area component of IMCAM will need to fulfil and therefore the greater coverage needed within the MCPA network.

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BENEFITS OF HIGHLY PROTECTED MCPAS

MCPAs that incorporate prohibition of extractive uses can generate a wide range of benefits. These include:

- protecting ecosystem structure, functioning and beauty, allowing recovery from past damage, and serving as stepping stones for migratory/dispersive species.
- protecting the genetic variability of exploited species
- improving fishery yields, including through protecting spawning stocks, enhancing recruitment, reducing over-fishing of vulnerable species, reducing conflicts between users, and protecting essential habitats

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- providing other direct and indirect social and economic benefits, such as attractions for tourists, by providing benefits to traditional users of biodiversity, or preserving reefs or kelp beds which prevent wave erosion of the shore or shelter moorings

- increasing our understanding of marine biodiversity and systems, including by providing a baseline benchmark for identifying human-induced changes, allowing measurement of natural conditions including mortality, and providing areas for research where experiments are not affected by uncontrolled human activities

- providing opportunities for the public to enjoy natural or relatively natural marine environments, and opportunities for public education and to allow the public to develop an understanding of the effects of humans on the marine environment.

References:

Agardy, M.T. 1994. 'Advances in marine conservation: the role of marine protected areas'. Trends in Ecology and Evolution 9:267-270

Ballantine, W.J. 1997a. 'No-take' marine reserve networks support fisheries. Pages 702-706 in 'Developing and Sustaining World Fisheries Resources: The State and Management', D.A. Hancock, D.C. Smith, A. Grant, and J.P. Beumer (eds.). 2nd World Fisheries Congress, Brisbane, Australia, 797 p.

Ballantine, W.J. 1997b. Design principles for systems of 'no-take' marine reserves. Paper for workshop: The Design and Monitoring of Marine Reserves at Fisheries Center, University of British Columbia, Vancouver, Feb 1997.

Bohnsack, J.A. 1998. Application of marine reserves to reef fisheries management. Aust. J. Sci. 23: 298-304.

Murray et al. 1999 'No-take reserve networks: sustaining fishery populations and marine ecosystems'. Fisheries 24:11:11-25.

Thorne-Millert, B & Carena, J. 1991 'The living ocean. Understanding and protecting marine biodiversity.' Washington DC, Island Press.

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BENEFITS TO FISHERIES MANAGEMENT

The question of benefits to the sustainable use of marine living resources from the establishment of MCPAs has been particularly controversial. It is also a particularly important issue for decision-makers, given that fishers are often one of the parties most strongly affected by MCPA establishment and management.

There is extensive literature addressing this issue. While this literature does not provide a clear and simple answer to the question "do MCPAs benefit fisheries outside them", they do provide increasing evidence that the answer is yes, although many of the benefits arise most readily where the MCPAs contain heavy constraints on extraction of biota or are 'highly protected MCPAs.

Such benefits can arise in a number of ways:

- Producing fish of exploitable size, which then directly disperse "spill over" into the surrounding area where they become available to fishers.
- Producing more offspring (from a greater density of breeding adults within MCPAs) which are then dispersed by currents to eventually recruit into surrounding fisheries.
- Providing information that is necessary to make regulatory decisions about controls (e.g. measures of natural mortality, reproduction, maximum size, trophic interactions, etc.).
- Providing insurance against resource management mistakes outside of MCPAs by providing a refuge from the collection of organisms (e.g., corals, sponges, aquarium fish), and from fishing and making overfishing more difficult.
- Providing insurance by preserving populations that can accelerate stock recovery in cases of recruitment failures from either overfishing or natural disasters.
- Protecting key habitats or life-stages from fishery related damage (e.g. protecting critical spawning and nursery habitats, vulnerable juveniles, and spawning adults).
- Protecting the genetic potential of populations from detrimental effects of selective fishing.
- Helping to develop biodiversity indicators for good ecological quality.

Some forms of MCPAs may also play a role in allocation of fisheries. For example, areas in only certain traditional harvest methods may be used might have biodiversity benefits and also act to allocate fisheries to local communities that are able to use sustainable methods. Or MCPAs may have a direct allocation purpose, as is the case with many "artisanal fisheries reserves".

Anticipated benefits to fisheries can have a significant effect on community support for existing and future MCPAs. Allocation effects of MCPAs can have a significant poverty alleviation benefit.

References:

Ward, Trevor J., Dennis Heinemann and Nathan Evans. 2001. The role of marine reserves as fisheries management tools: a review of concepts, evidence and international experience. Bureau of Rural Sciences, Canberra, Australia. 192pp. This publication reviews the literature and experience internationally to determine the extent to which MCPAs in which fishing is prohibited have been used to provide effective support for fisheries management. It uses a conceptual model to identify key elements and processes that might be affected by fishing and such MCPAs.

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Plan Development Team. 1990. The potential of marine fishery reserves for reef fish management in the U.S. southern Atlantic. Snapper-Grouper Plan Development Team Report for the South Atlantic Fishery Management Council. NOAA Technical Memorandum NMFS-SEFC-261. 45 p.

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Pauly, D., Christensen, V., Guenette, S., Pitcher, T.J. Sumaila, U.R., Walters, C.J., Watson, R., and Zeller, D. (2002) 'Towards sustainability in world fisheries'. Nature Vol. 418, Aug 2002, 689-695.

THE NEED FOR HIGHLY PROTECTED MCPAS

Some of the benefits of MCPAs can only be provided with a high degree of certainty by highly protected MCPAs, in which extractive uses are prevented. Examples of such benefits are:

- restoring natural population structures of exploited species (age, size, gender and gene pools)
- protecting all biodiversity and biodiversity at all levels
- eliminating fishing gear impacts and bycatch within the area
- providing undisturbed spawning conditions, habitats, settling sites and stepping stones
- providing some essential fisheries management data including estimates of natural mortality
- providing opportunities to enjoy relatively undisturbed/unmodified areas, and experience wilderness
- allowing the public to see and understand the effects humans can have, and the benefits of management
- providing long term monitoring, benchmark, control areas, and places where research projects can be conducted unaffected by human activities

Such areas are also unique in allowing benefits to be provided with a high level of certainty where there is poor understanding of the marine environment. They can provide insurance against the effects of management mistakes arising from ignorance or uncertainty. Compliance and management is simplified in comparison to other types of MCPAs or sustainable use regimes.

Single highly protected MCPAs can provide some of the benefits. But in other cases, a network of areas is likely to be required. For example, only a network can potentially protect the range of biodiversity in a region. A recent development is the World Summit on Sustainable Development (WSSD), South Africa 2002. One of the key outcomes of this meeting was a fishing accord in which, *inter alia*, a timeframe for the establishment of a global network of representative marine protected areas was set for 2012. Refer http://www.johannesburgsummit.org

References:

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CHANGING PERSPECTIVES ON MCPAS

Over the last twenty years the number of MCPAs has grown, and now almost every coastal country has at least one. They have also increasingly become recognised in the policy approaches of countries, as a core element in marine biodiversity management. This reflects the increasing recognition of their benefits, and of the failure of other methods to provide some of those benefits.

Experience in relation to many individual MCPAs has also been positive. There is increasing evidence in the literature of significant changes in marine biodiversity and ecosystems within highly protected MCPAs, changes which were often not predicted, and which have provided valuable new understanding of marine ecosystems. While there is not yet sufficient experience for definitive statements to be made on most important issues, there is enough to justify expectations of significant benefits (see the section below) from MCPA establishment. Many of these benefits are so obvious that even members of the public who initially opposed the creation of the MCPA have come to value the areas. For example in New Zealand, surveys of stakeholders in relation to two highly protected MCPAs showed that in a relatively short period (10 years in one case) stakeholders which had strongly opposed the creation of the MCPAs had become strong supporters of their continuance.

References:

Kocklin, C. and Flood, S. 1992 ‘ The socio-economic implications of establishing marine reserves.’ Report to the Department of Conservation, N.Z. Department of Geography, University of Auckland, New Zealand.

Kocklin, C., M. Craw, and I. McAuley. 1998. Marine reserves in New Zealand – use rights, public attitudes and social impacts. Coastal Management 26: 213-231.

Halpern, Benjamin S. and Robert R Warner. 2002. Marine reserves have rapid and lasting effects. *Ecology Letters* 5: 361-366. This report evaluated 112 measures of biodiversity change in 80 MCPAs in which fishing is prohibited, to assess biological change within the MCPAs.

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THE CONTEXT FOR MCPAS: THE MARINE ENVIRONMENT AND INTEGRATED MANAGEMENT (IMCAM)

CHARACTERISTICS OF MARINE ECOSYSTEMS

Key aspects of the marine and coastal environment that are relevant to MCPAs are:

- Ocean and coastal environments cover most of the earth, and contain all of marine biodiversity. All of the 29 known Phyla of free living, multicellular animals are known to have occurred in the ocean and 14 are only known from the oceans.
- Most marine organisms in offshore waters are very sensitive to "unknown" disturbances and pollution, especially as they are physiologically "open systems", not well protected against external harmful agents.
- They are three dimensional and highly dynamic in space and time. Primary productivity is often accomplished by small, mobile organisms. Marine food webs are in general more complex than terrestrial food webs. There are strong linkages between the pelagic and benthic components, as well as between the land and nearshore waters. All of these characteristics make the understanding of marine biodiversity, and its management, more complex and difficult.
- Most marine organisms have at least one free-swimming or floating stage in the life cycle, enabling wide dispersal. It is not possible to physically enclose the marine portion of MCPAs. This has the advantage of allowing dispersal from the MCPAs to enhance biodiversity in the surrounding areas ("stepping stone" function), but carries the substantial disadvantage that the MCPA is strongly affected by "up-stream" events, e.g. water quality, sedimentation, etc.
- Human exploration of these areas is difficult, so that we cannot easily observe and measure what is happening. Our knowledge of marine biodiversity is poor (e.g. new species are constantly being discovered), as is our knowledge of the way in which marine ecosystems and processes operate. Acquisition of new information is generally a good deal more expensive and requiring more sophisticated equipment than terrestrial equivalents. Environmental degradation is less easily observed by both scientists and others than that on land, making it more likely that degradation will need to reach a catastrophic level before it is recognised and addressed. It also makes gaining political and public support for measures such as MCPAs more difficult.

References:

Vallega A. 1999, 'Fundamentals of integrated coastal management.' Dordrecht, Netherlands; Kluwer Academic Publishers.

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These characteristics have some important implications for marine management and MCPAs, including:

- The uniqueness of marine biodiversity makes marine biodiversity management a critical part of any coastal country's response to the CBD.

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- The complexity of the marine environment, combined with our lack of understanding of marine biodiversity, and the problems of detecting what is happening in time to take corrective action, means that good management will need to rely on simple, certain methods, which are precautionary in nature. As discussed above, protected areas that exclude most human interventions can provide that simplicity and certainty.
- If we are to have long term, effective and sustainable management of marine biodiversity, we will need to greatly increase our knowledge, and our ability to observe changes. Highly protected MCPAs are important sources of information about the natural functioning of marine ecosystems, and also provide vital controls to allow us to better detect the effects of management decisions.
- The relative absence of physical limits, the presence of mobile reproductive stages, and strong interactions across long distances for many wide-ranging species means that a network approach to MCPAs will be essential. It also increases both the potential for detrimental impacts within MCPAs from outside activities, and conversely, the potential for recovery within MCPAs to benefit areas outside their boundaries.

A FRAMEWORK FOR ACHIEVING INTEGRATED COASTAL AND MARINE MANAGEMENT (IMCAM)

IMCAM

COP II encouraged the use of integrated marine and coastal area management (IMCAM) as the most suitable framework for addressing human impacts on marine and coastal biological diversity, and for implementing the principles of the ecosystem approach in promoting conservation and sustainable use of this biodiversity. The decision did not define IMCAM, and COP V identified the need for further guidance on IMCAM.

The AHTEG addressed the issue by looking at the marine and coastal environment in spatial terms, and identifying the type of management that might be applied in different parts of the overall marine and coastal area, and the way these would interact.

They recognised that a framework for IMCAM needed to be able to fulfil the three principal objectives of the Convention, namely conservation of biodiversity, sustainable use of biodiversity, and the equitable sharing of the benefits derived from use of genetic resources. Given past degradation (e.g. the serious overfishing of many fish stocks, and destruction of inshore ecosystems by infilling, sedimentation and enclosure for marine farming), the framework needed to allow for recovery as well as preventing future losses of biodiversity.

The framework also needed to be precautionary in nature, given our limited knowledge of the marine and coastal environment, and our limited ability to control and measure human impacts.

It should address:

- All coastal and marine areas.
- All elements of biodiversity (including at the genetic, species, seascape and ecosystem levels).
- All values included in the Convention preamble (including intrinsic, ecological, economic, cultural, scientific, aesthetic).

Given the dynamic, open and interactive nature of the marine and coastal environment (see section above), the framework also needs to take a networking approach, to ensure that interactions between spatially-defined management regimes would result in the desired performance of the overall system.

Elements of the Framework

The AHTEG concluded that a national framework that would deliver IMCAM should comprise the following three elements representing, respectively, high, intermediate, and low levels of resource protection for biodiversity:

- A representative network of highly protected areas where extractive uses are prevented, and other significant human pressures are removed (or at least minimised) to enable the integrity, structure, functioning, and exchange processes of and between ecosystems to be maintained or recovered;

- An ancillary network of areas that support the biodiversity objectives of the highly protected network, where specific perceived threats are managed in a sustainable manner for the purposes of biodiversity conservation and sustainable use; and

- Sustainable management practices over the wider coastal and marine environment.

Network of Highly Protected MCPAs

This network of areas would be managed to maintain their integrity, structure, functioning, resilience, persistence and beauty, or to take restorative or rehabilitative steps for biodiversity. They would encompass a full range of marine and coastal ecosystems (including both representative areas and those that are unique or special), and be protected from human impacts and, where possible, the effects of alien species. The key purpose of this network would be to provide for intrinsic values, to allow us to better understand the marine and coastal environment, to provide ecological coherence and contribute towards marine environmental recovery and as insurance against failures in our management.

The AHTEG considered that there was no simple formula for identifying whether a network is representative, as this will depend on local circumstances (e.g. variability in habitats). Nevertheless, experience in terrestrial protected areas, the work on MCPAs to date, and the literature, all indicate that a viable and representative network will not be provided by a few small MCPAs. A number of papers have attempted to provide guidance on the minimum area needed. Recommendations in those papers vary, ranging from 10 to 75% of the marine area. At least five governing entities or initiatives (the Bahamas, the U.S. Coral Reef Task Force, the Galapagos Islands, the Great Barrier Reef and Guam) have set targets of 20% for the primary network.

How Big Should the Highly Protected Network Be?

There are recommendations in the literature for how much area should be set aside in no-take marine reserves. This will depend on the ecological effectiveness of measures outside the highly protected network, but Ballantine (1991) suggested a number of reasons for protecting at least 10% of the New Zealand coastal marine area, including, having a goal to aim for and implementation of the precautionary approach. Fogarty et al. (2000) reviewed a number of studies which suggested a range of 35% to 75% of

the area must be protected by a marine reserve to optimise yield or exploitation of fisheries outside the reserves.

Bohnsack et al. (in press) consider that a minimum of 20 – 30% full protection is required to conserve coral reef ecosystems. Factors used to support their view were: reproductive theory, degree of vulnerability of reef species to harvesting, analysis of fisheries failures and empirical and modelling studies of marine reserves.

Consideration of the required size of no-take marine reserve was applied to the Channel Islands National Marine Sanctuary, off the United States Pacific coast. (hereafter termed "CINMS"). Scientists recommended that a reserve should comprise 30 – 50% of CINMS waters (SSC, 2001). The recommendations were made in relation to two goals for the CINMS: (i) to protect representative and unique marine habitats, ecological processes and populations of interest (termed "the biodiversity goal"); and, (ii) to achieve sustainable fisheries by integrating marine reserves into fisheries management. Factors used to arrive at the recommendation included a default harvest rate policy; dispersal rates of macro-algae, invertebrates and fish; issues related to emerging fisheries; and, a general review of marine reserves literature. Most studies cited indicated a minimum of 10 – 40% of marine habitats would need to be protected to conserve ecosystem biodiversity, while 20 – 50% of fishing grounds would require protection for fishing sustainability. The central tendency of the two distributions was 30 – 50% that became the panel's recommendation after consideration of all the factors.

In New Zealand, Davidson et al. (2002) suggested that marine reserves of more than 10 km coastline would be more desirable than reserves of smaller coastlines to protect rocklobster. This recommendation was based on studies of rocklobster densities, sizes and sex ratios at the Tonga Island Marine Reserve, Abel Tasman National Park. Willis et al. (2001) investigated snapper (*Pagrus auratus*) at the Cape Rodney – Okakari Point Marine Reserve at Leigh, Northland and concluded that a proportion of the population of this species of fish exhibited site fidelity to relatively small areas within a 518 ha reserve.

For open North Sea habitats, Rachor & Guenther proposed to also consider sizes of hydrological structures like eddies and transportation by residual currents for effective protection within a MCPA and arrived at minimum necessary sizes of 100 to 200 km^2 in the German Bight.

Halpern (2002) (cited above) reviewed 89 separate studies on marine reserves and concluded that nearly any marine habitat can benefit from protection. The results suggested that the effects of marine reserves increase directly rather than proportionally with the size of a reserve, however, larger reserves nearly always showed greater absolute differences in biological measures than smaller marine reserves.

Sala and others (2002) describe an algorithmic modelling approach to establish marine reserve networks, maximising conservation benefits and reducing social conflicts. They describe a network covering 40% of rocky reef habitats in the Gulf of California.

From the discussion above, it is clear there are different opinions on the subject of how much area is required to be protected in no-take marine reserves. However, the area is likely to vary according to what is to be protected and the purpose of protection.

Additional References:

Ballantine W.J. 1991. Marine reserves for New Zealand. Leigh Laboratory Bulletin No.25, University of Auckland, Auckland.

Bohnsack J.A., B.Causey, M.P. Crosby, R.B. Griffis, M.A. Hixon, T.F. Hourigan, K.H. Koltes, J.E. Maragos, A. Simons & J.T. Tilmant (in press). A rational for minimum 20 – 30% no-take protection. 9th International Coral Reef Symposium, Bali, Indonesia. Oct. 2000.

Davidson R.J., E. Villouta, R.G. Cole & R.G.F. Barrier. (2002). Effects of marine reserve protection on spiny lobster (*Jasus edwardsii*) abundance and size at Tonga Island Marine Reserve, New Zealand. Aquatic Conservation: Marine and Freshwater Ecosystems. 12:213-227.

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Anonyme, 1997. Les aires protégée de la Mediterranee. DeGeneve 1982 a Barcelona 1995.' PNUE/PAM/RACSP

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Department of Environmental Afairs and Tourism 1998. 'Coastal Policy Green Paper.- Towards Sustainable Coastal Development in South Africa' Coastal Management Policy programme, South Africa.

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Rachor, E. and Guenther, C.-P.. 2001. Concepts for offshore nature reserves in the southeastern North Sea. Senckenbergiana maritima 31: 353-361.

Sala, S., Aburto-Oropeza, O.,Paredes, G., Parra, I., Barrera, J.C., and Dayton, P.K., 2002, 'A general model for designing networks of marine reserves' Science Vol 298 6 Dec 2002 pp.1991-1993

Protection from human impacts would mean that any removal of indigenous biota would be prevented except to the extent necessary to allow essential scientific research and education (i.e. no-take reserves). Also, other practices which significantly impact on biodiversity (e.g. substrate alteration, changes in sediment movements, pollution, visitor disturbance of sensitive species) would need to be prevented or controlled.

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The highly protected MCPA network would need to be viable in perpetuity, in the face of changing threats and long-term environmental change (e.g. climate change). These MCPAs would be permanent. Viability might depend on matters such as the nature of the legal protection, the presence of replicates, the design of the individual MCPAs, and the connectivity between MCPAs (directly or using the ancillary network as stepping stones).

Although public access may be encouraged in order to generate educational and enjoyment benefits, these benefits would be treated as secondary to the primary purposes listed above and public access may need to be controlled to prevent unacceptable impacts.

Networks would need to be geographically dispersed across biogeographic regions and would need to be ecosystem-based, rather than efforts directed at protecting a single species to the detriment of other parts of the ecosystem, as is seen in some current efforts.

The Ancillary MCPA Network

The ancillary MCPA network offers an intermediate level of protection that would contain areas that are subject to site-specific controls with either an explicit biodiversity objective or at least a recognised biodiversity effect, but also other primary objectives that support sustainable use (e.g. economic or social objectives). In such areas uses are managed with the aim of sustainability with the most damaging uses prohibited. Examples of such controls include controls on fishing methods (e.g. restricting bottom trawling), controls on the removal of certain species (e.g. habitat forming species), rotational closures, and controls on pollution and sedimentation.

Important biodiversity protection roles for ancillary MCPAs are to maintain connectivity across the overall network, and also buffer highly protected areas from intensive human activities.

The Wider Environment

The MCPA network of highly protected and ancillary MCPAs should sit within a framework of sustainable management practices over the wider marine and coastal environment including spatial planning and wise/proper spatial "ordering" of human uses ("Raumordnung" in German).

Sustainable management practices over the wider coastal and marine environment should include general restrictions that would apply to the entire area (e.g. environmental constraints on mining, bans on certain destructive fishing methods such as dynamite and cyanide fishing), as well as site-specific restrictions imposed for non-biodiversity purposes (e.g. trawling restrictions to protect cables, restricted areas for defence purposes). These practices can contribute to biodiversity protection in a number of ways, including:

- Providing direct benefits to biodiversity (e.g. restrictions on trawling to prevent cable damage can also protect sensitive biodiversity such as corals and sponges);

- Protecting wide-ranging marine and coastal biodiversity values which are difficult to address through site-specific measures (e.g. restrictions on fishing practices that cause a bycatch of species such as albatross, marine mammals and turtles); and

- Reducing negative impacts on the connective processes operating between MCPAs, e.g. by allowing the movement of larvae between MCPAs.

Relative Roles of the Different Elements

No one element by itself can adequately fulfil all three primary CBD objectives (biodiversity conservation, sustainability, and equity). A framework that includes all three elements is required, since each provides a particular contribution to the overall goal.

The section above on benefits outlines the benefits that can only be provided by highly protected MCPAs. The key roles of the network of highly protected MCPAs are:

- To provide areas in which natural processes are able to operate, to act as a baseline for identifying the effects of human interventions in other areas (see monitoring), and a place to undertake scientific work to improve our understanding of the marine and coastal environment.
- To deliver benefits related to intrinsic, social, cultural, recreation and aesthetic values that require the existence of areas not subject to significant human impacts.
- To ensure that management failures in other areas cannot result in irreversible biodiversity loss, by protecting representative examples of all biodiversity.

The ancillary network's primary roles for biodiversity protection are:

- To protect or augment values or processes which cannot be achieved adequately within the highly protected network, in order to prevent cross-boundary impacts on the highly protected MCPAs.
- To support sustainable use of biodiversity, for example by protecting vulnerable life cycle stages of exploited biota, or providing refugia for by-catch species.
- Potentially provide resource allocation to enhance the equitable sharing of benefits (e.g. artisanal fishing reserves).

The wider marine and coastal environment will be the site of most sustainable use activities.

CREATING AND DESIGNING MCPAS AND NETWORKS

NETWORKS AND CONNECTIVITY

The aim of the MCPA network should be to create a coherent whole, with emergent properties and values, not simply a collection of individual MCPAs and regulatory controls.

Connectivity between MCPAs is critical, given the presence of mobile life stages in most organisms (see context section above). This means that the viability of one area may be dependent on what happens elsewhere (e.g. in the area where spawning occurs). There is also strong connectivity between marine and terrestrial processes, particularly in relation to movement of water, sediments, seabirds and all other organisms that use both environments.

In general, creating a large number of small reserves will provide greater connectivity benefits than fewer larger ones, but smaller reserves may be less effective in achieving settlement of dispersing organisms (Roberts and Hawkins, 2000. See also Rachor & Guenther, 2001, who consider sizes and distances of MPAs). It has been suggested that the more critical issue is the proportion of marine space protected: with increasing levels of connectivity achieved as the proportion increases. Roberts and Hawkins note that the great variability in dispersal abilities among species necessitates high levels of connectivity (achieved by reserve networks) for assuring persistence of the full spectrum of biodiversity. The authors summarise the importance of a network of marine reserves (highly protected marine areas) based on the following:

- Isolated reserves have many benefits but will only be able to protect a limited fractions of marine biodiversity
- Large numbers of marine species have open water dispersal phases and can potentially be transported long distances from where they were spawned
- Individual reserves may be able to sustain self-recruiting populations of species that disperse short distances, but networks will be necessary to protect many species that disperse long distances
- Reserves in networks need to be close enough for protected populations to interact through dispersal

References:

Roberts,C.M. and Hawkins, J.P. 1999. 'Extinction risk at sea.' Trends in Ecology and Evolution. 14:6:241-246

Roberts, C.M. and J.P. Hawkins. 2000. Fully-protected marine reserves: a guide. World Wildlife Fund, Washington, D.C. p 131.

Warner, R.R., S.E. Swearer, and J.E. Caselle. 2000. Larval accumulation and retention: Implications for the design of marine reserves and essential fish habitat. Bull. Mar. Sci. 66(3): 821-830.

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Botsford, L.W., A. Hastings, and S.D. Gaines. 2001. Dependence of sustainability on the configuration of marine reserves and larval dispersal distance. Ecol. Lett. 4: 144-150.

Some other aspects re.distances and sizes of MCPAs are treated in Rachor, E. and Guenther, C.-P.. 2001. Concepts for offshore nature reserves in the southeastern North Sea. Senckenbergiana maritima 31: 353-361

PRIORITIES

A strategic planning approach, embracing sustainable use and ecosystem-based management, to enable the implementation of an ecologically viable framework for MCPA development, should be adopted at the national and regional levels. This should enable future MCPA development to be based on important aspects such as past experience in effective management, large scale factors affecting MCPA viability and long term goals.

For a country with no or very few MCPAs, the priority would be to establish some. These first MCPAs should have objectives relating to increasing the community's understanding and acceptance of MCPAs as a tool for marine and coastal biodiversity management. The location of these may be dictated largely by where it is easiest to establish the MCPA in terms of community acceptance, feasibility of establishment and management and similar considerations, or where the MCPA will provide the greatest flow of benefits to the community. The process should also establish appropriate governance arrangements that will facilitate future MCPA creation.

For a country that already has a significant number of MCPAs, the priorities would be to:

1. improve effectiveness of existing MCPAs;
2. address the most significant gaps in terms of representativeness, addressing urgent threats, and providing benefits to all communities;
3. begin to develop local, national or regional networks; and
4. achieve an improved balance between the three framework elements.

If offshore MPAs are lacking, the creation of such reserves should be encouraged.

ESTABLISHING OBJECTIVES

It is vital to clearly establish the objectives of each MCPA and MCPA networks. For 'highly protected' MCPAs the prime objective should be to protect marine and coastal biodiversity, including the principle of full representation and with a short-term priority of attention towards rare, threatened, declining or degraded habitats or species. These objectives should then influence:

1. The choice of where to establish the MCPA. For example, if the primary objective of the MCPA is to protect a particular value (e.g. a seabird-nesting colony, or the occurrence of an important, but rare offshore habitat), then the location of that value will dictate the location of the MCPA. But if the primary objective is to provide an educational resource, then proximity to an educational lodge may be the important consideration, regardless of the diversity of marine environment present there.

2. The choice of how to establish the MCPA. For example, if a primary objective is to improve community acceptance and understanding of MCPAs, then development through a careful participatory approach will be essential, even if this delays establishment. But if the primary objective is to address an urgent threat, then a faster and less participatory approach may be unavoidable.
3. The choice of type of MCPA. If the primary objective is to provide a basis for research into the normal functioning of an ecosystem, then a highly protected MCPA with no extractive uses will be necessary. If the primary objective is to protect a marine mammal population, then restrictions on certain fishing methods and protection from harassment and exploitation may be all that is required.
4. The type of management regime. This would include consideration of who should be involved in management, the type of enforcement approaches that would be used, and the priorities for management effort. For example, if a key objective of the MCPA is to increase community support for the establishment of an MCPA network, then increasing community involvement in management may be particularly important even if this was more costly or would take longer to produce a fully effective regime.
5. The methods of evaluating success. As discussed in the section below, evaluation of success would be done in terms how well the MCPA or network met the objectives.
6. There should be considered an additional "objective": to establish a protected area as a compensation measure for destructive human activities on neighbouring marine areas (e.g. as a result of an environmental impacts assessment for a permission of a destructive/disturbing use).

ECOLOGICAL CONSIDERATIONS

The context section above addressed the key characteristics of marine environments and their implications for MCPAs.

MCPAs, particularly highly protected MCPAs, will in effect become islands in the same way that natural vegetation remnants on land behave like islands. This occurs especially if the pressures on the surrounding areas lead to ecosystems losing species critical to sustaining functionality and biodiversity. Work to address fragmentation issues in terrestrial ecosystems may, therefore, help to inform our thinking about MCPAs.

Ideally, MCPAs should be large enough to encompass all the key processes that affect the ecology of the area. Such processes might include sediment movements, spawning and recruitment, food webs and natural dynamic patterns. Where this is not possible, providing protection for the cross-boundary processes (e.g. through establishment of an ancillary MCPA, through networking between MCPAs, or through regulatory controls) will be essential if the MCPA is to be viable in the long term.

Connectivity issues that are important in the marine environment include:

- Allowing species to continue to access their required range of food sources, whether these vary on a diurnal, seasonal or age-related pattern.
- Allowing species to continue to access their required range of habitats during their life cycle (e.g. spawning, juvenile feeding and dispersal, settlement, adult migration habitats).
- Maintaining metapopulation complexes.

Vulnerability to invasion by alien species may also be an important ecological issue. Identifying vulnerability will require a knowledge of likely entry points (e.g. ports), and natural dispersal patterns from those points.

As on land, the marine areas that lie between MCPA 'islands' will determine the extent to which:

1. there are impacts from the general marine area directly on the MCPA (e.g. pollution, invasion of alien species, loss of biomass as a result of spillover, changes in natural sediment movement); and
2. the connectivity between MCPAs is maintained or lost.

Therefore management of the wider marine and coastal environment needs to be designed to address these key ecological issues for the MCPA networks.

CHOOSING A COST-EFFECTIVE APPROACH

Decisions on alternative approaches to marine biodiversity management, or alternative designs/locations for MCPAs, will need to consider both costs and benefits. The approach chosen needs to be effective in meeting its objective, but it is also clearly desirable to minimise (as far as practical) the costs and maximise the benefits of MCPAs and networks. To do this will require an assessment of those costs and benefits.

The direct costs of establishing and maintaining MCPAs may include infrastructure, equipment, administration, demarcation, monitoring and assessment. Indirect costs also need to be considered, and these may include economic impacts on traditional livelihoods, and socio-cultural impacts of increased tourism-related activities on coastal communities. Benefits will include ecological benefits, but may also include protection of cultural values, provision of a more diversified economy from new sources of income to local communities (e.g. from tourism operations or servicing scientific centres), knowledge to support resource management, and support for fisheries in surrounding areas. Costs and benefits may be short or long term, and must be adequately defined if there is to be a complete assessment.

In most cases, costs and benefits of MCPAs have not been assessed in detail, and have not been looked at over the full range of protection levels.

An assessment of alternative biodiversity and economic development strategies may well result in identification of highly protected MCPAs as the most cost-effective means of sustainable marine and coastal resource management. One of the reasons for this is that they are the only mechanism that can provide some benefits with any certainty (see the section above). Another is that the rules associated with them tend to be simple, and administration costs are therefore likely to be lower.

Similarly, the benefits of facilitating effective participation by stakeholders have often been underestimated, in comparison to the direct costs (financial and human resources, and delays in decisions). A fuller assessment of costs and benefits would be likely to show the long term net benefit of such participation, including through reduced compliance costs, greater effectiveness, reduced social impacts, and improved design.

DESIGN PRINCIPLES FOR HIGHLY PROTECTED MCPAs

These principles draw on material provided by Dr W. J Ballantine to the first meeting of the AHTEG. The material in relation to individual principles was elaborated by AHTEG from reference to the relevant literature.

References:

Ballantine, W.J. 1997a. 'No-take' marine reserve networks support fisheries. Pages702-706 in 'Developing and Sustaining World Fisheries Resources: The State and Management', D.A. Hancock, D.C. Smith, A. Grant, and J.P. Beumer (eds.). 2nd World Fisheries Congress, Brisbane, Australia, 797 p.

Ballantine, W.J. 1997b. Design principles for systems of 'no-take' marine reserves. Paper for workshop: The Design and Monitoring of Marine Reserves at Fisheries Center, University of British Columbia, Vancouver, Feb 1997.

Murray et al. 1999. 'No-take reserve networks: sustaining fishery populations and marine ecosystems.' Fisheries 24:11:11-25.

Principles for Individual Highly Protected MCPAs

Principle 1: Minimising human disturbance on all biodiversity.
By definition, a highly protected MCPA is one in which human disturbances are minimised. This will require control of extractive activities (e.g. fishing, mining, sand extraction); activities which change natural processes (e.g. changes to sediment, salinity, wave action through structures, pollution or changes to sediment and water inputs from the land); any other human disturbance (e.g. from recreational uses, fish feeding).

All species within highly protected MCPAs should be protected, because ecological interactions are complex and mostly unknown. Allowing any fishing jeopardises goals of maintaining ecological structure and function and confounds the scientific ability to achieve understanding.

A key role for highly protected MCPAs is to allow scientific research and increase public understanding of marine biodiversity. Both scientific research and public education may require some extraction or deliberate disturbance. Extraction should only be allowed where it is necessary to support essential scientific research and public education, and should be limited and controlled through a permit system.

Principle 2: Permanence
The protection of the MCPA should be permanent, based on their selection as areas of critical habitat, highly productive ecosystems, source areas for eggs and larvae, key areas for biodiversity protection, or prime examples of naturally functioning systems. Long term changes cannot be effectively measured if highly protected areas are temporary. Since the establishment of two highly protected marine reserves in New Zealand there have been significant changes in fish, invertebrates and kelp forest cover. The overall change to community structure and function was not apparent until over 20 years after reserve establishment. Fisheries benefits may not accrue for several years and resources can be overfished and habitats damaged very rapidly.

Reference:

Babcock , R.C., Kelly, S., Shears, N.T., Walker, J.W. and Willis, T.J. 1999. ‘Changes in community structure in temperate marine reserves’ Marine Ecology Progress Series, Vol. 189, November 1999.

Principle 3: Viability
The MCPA should be ecologically viable. This will require it to be large enough so that most ecological processes will be able to operate within the area.

The MCPA should also be legally and socially viable, so that the rules established are observed in practice. Ideally, boundaries should be simple to identify and enforce.

Principle 4: Human Enjoyment

As with national parks, a key role for highly protected MCPAs is to allow people to experience and appreciate the resulting natural state. Appropriate non-extractive use should facilitated, and information provided to allow people to better understand the MCPA and the marine and coastal environment. The one exception to this would be where such access jeopardises biodiversity protection objectives. Minor impacts on the biodiversity in highly protected MCPAs are acceptable if it allows public understanding and support to be built. Under these circumstances, such impacts should best be confined to a part of the MCPA thereby enabling the impacts to be managed.

Principles for a Network of Highly Protected MCPAs

Principle 1: Representative

All biogeographic regions should be represented. Within each region, all major habitats should be represented. Conservative and widely accepted definitions should be used when identifying regions and habitats. The section below provides further guidance on identifying representative networks.

Principle 2: Replication

All the habitats in each region should be replicated within the network, and these should be spatially separate, to safeguard against unexpected failures or collapse of populations. Where replication is not possible then other design principles may need to be reconsidered, such as size and number.

Principle 3: Viability

The ultimate objective is to create a network of geographically dispersed sites that are self-sustaining, independent (as far as possible) of what happens in the surrounding area (Murray et al 1999). The network should be ecologically viable with MCPAs achieving viability collectively and avoiding (genetic) isolation.

Principle 4: Precautionary Design

In designing the network, a precautionary approach should be taken wherever there is uncertainty (e.g. regarding habitat diversity, species habitat needs, threats by human activities, connectivity processes, etc). The precautionary approach in this circumstance is to use best available information to make decisions rather than delaying to await more and better information. Where there is uncertainty, the precautionary approach would favour erring on the side of biodiversity protection. While it is important to maintain as natural an IMCAM as possible, the network of MCPAs should ideally be designed so that complete failure of the management regime in the IMCAM will not significantly affect the viability of the MCPA network.

Reference: Lauck, T., C.W. Clark, M. Mangel, G.R> Munro. 1998. Implementing the precautionary principle in fisheries management through marine reserves. Ecol. Appl. 8(1): Supplement: S72-S78.

Principles for the Broader Network of All MCPAs (highly protected and ancillary)

Principle 1: Design the Network

A network design should be prepared for each national or regional area, including the exclusive economic zones and the High Seas. The network should incorporate ancillary MCPAs as support for a primary network of highly protected MCPAs

Principle 2: Maximise connections

Potential connections between MCPAs should be maximised.

REPRESENTATIVENESS

A key principle identified above is the need for the network of highly protected MCPAs to be representative of the full range of biodiversity. A representative network will include protected areas incorporating all habitat types, with the amount of each habitat type being sufficient to cover the variability within it, and to provide duplicates (as a minimum), so as to maximise potential connectivity and minimise the risk of impact from large-scale effects.

To assess representativeness it is necessary to be able to classify habitat (or ecosystem) types.

In general, detailed data on biodiversity distribution will not be available, but classifying habitats using physical factors, which are more readily measured, may provide an alternative basis for developing an initial MCPA network.

In addition to available biological information, the following are the key factors which should be used to undertake a high level classification of habitats:

- Benthic or pelagic
- Abyssal/slope/shelf/intertidal
- Sediment or hard rock/stony substrate
- Salinity (marine/estuarine)
- Presence of habitat forming organisms (e.g. coral reefs)

The classification of habitats should be undertaken within a broad biogeographic zoning system. There are existing systems which, while somewhat crude, should be adequate for the immediate task of establishing representative MCPAs

References:

Sulivan Sealey, K. and G. Bustamante. 1999. Setting geographic priorities for marine conservation in Latin America and the Caribbean. The Nature Conservancy, Arlington, VA. USA. p. 125.

Murray et al ANZECC, TFMPA. 1999. 'Strategic Plan of Action for the National Representative System of Marine Protected Areas: A Guide for Action by Australian Governments. Environment Australia, Canberra.

MANAGING MCPAS

GENERAL ISSUES

The purpose of management is to ensure that the MCPA or network is able to achieve the intended objectives. Key elements of management may include:

- Having clear rules and boundaries
- Ensuring adequate enforcement
- Undertaking active restoration work where necessary to help an area recover from past damage
- Provision of goods and services for users (e.g. visitor facilities)
- Gathering information to assess the achievement of the objectives and support management decisions
- Undertaking activities to facilitate stakeholder understanding and support, and to allow stakeholder participation
- Undertaking activities to ensure appropriate benefits are generated and equitably shared (e.g. allocation of resource usage)
- Controlling activities within or affecting the area to prevent additional damage occurring.
- Preventing entry of or eradicating/controlling alien species

Management regimes should be adjusted over time in light of experience and increased knowledge (see below).

WHO MANAGES

There should be a management structure which clearly defines the responsibility, authority and capacity for core management work.

There should also be community/stakeholder involvement for the following reasons (see also the section on participation above):

- To provide economic, social, and cultural benefits to communities
- To take advantage of the knowledge and resources that communities and other stakeholders can contribute to management efforts
- To respect traditional rights and uses (see the section above)
- To enhance community skills, pride, and sense of ownership of the MCPA
- To promote equitable sharing of benefits, restore social accord, and reinforce the creative potentials of individuals and communities.

SETTING THE RULES

The rules applying within the MCPA need to be set at the time of creation (or adjusted through an appropriate process subsequently). They should be designed to ensure that the objectives of the MCPA

can be met. They should be clear, and embodied in an appropriate legal or customary framework that will allow their enforcement.

The rules should be able to fit into one of three basic categories:

- Allowing activities that support the objectives, with clear conditions/restrictions to ensure that such activities will be appropriate.
- Prohibition of activities that would likely preclude achieving the objectives of the MCPA.
- Providing a decision-making process for activities that do not clearly fall into either (1) or (2), i.e. discretionary activities. In general, the number of discretionary activities should be minimised, in order to reduce the potential for inappropriate decisions that may conflict with the primary requirement to protect biodiversity.

COMPLIANCE AND ENFORCEMENT

MCPAs represent special places, containing special qualities. The value of an MCPA will be likely to increase over time, as a result of recovery of the ecosystem, and scientific research at the site. Enforcement needs to recognise the time it takes for an MCPA to reach a high value and reflect its importance to regional biodiversity. Enforcement is therefore an essential component in the successful management of MCPAs. There are many approaches used in MCPA enforcement globally. Successful management rests on a foundation of community consensus around the MCPA's goals, objectives, measures and benefits.

The ideal is full compliance with the rules without active enforcement being necessary. This would require communities that support the rules, and self-manage themselves to achieve compliance (either individuals comply voluntarily, or comply because of peer pressure from other members of the community). While this ideal is probably not often achievable, high levels of voluntary compliance and community support have been achieved in many MCPAs.

But in most cases there will always be some users who will not willingly follow rules. An enforcement regime is usually necessary to effectively control such users, both to ensure that the objectives of the MCPA can be met, and that these individuals do not unfairly benefit at the expense of the rest of the community.

Enforcement should be managed as an integral part of management, and in a way that facilitates and encourages voluntary compliance. Involving the community in enforcement processes (e.g. providing information, warning/educating first time offenders, and acting as voluntary wardens) can be a useful way to increase compliance and the effectiveness of enforcement.

An effective enforcement regime should have the following elements.

Optimal enforcement capacity.

- Enforcement responsibilities must be clearly assigned. If they are assigned to more than one body, then the relative roles of each body should be clear.
- Good cooperation and coordination should exist between enforcement bodies (which may include in the case of transboundary MCPAs, authorities in different countries).

- The enforcement authorities must have the necessary resources to undertake the various tasks (e.g. financial resources, equipment, lifting awareness and training).
- Enforcement authorities must have well trained personnel who are able to operate in an appropriate manner to maximize compliance and community support.
- The enforcement body must have the necessary legal or customary powers for executing their task, including recognition of their role by the community.

Appropriate Penalties and Associated Legal Provisions

- Penalties should exist at a level that sends the right signal to the community, resource users, and the judicial system to illustrate the seriousness of the infringement and should provide a disincentive for non-compliance. The level of penalty should not be such that it provides a disincentive for prosecution (e.g. where the penalty appears so low that it discourages prosecution, or seems excessive).
- Legal provisions should facilitate achieving successful prosecutions.
- Where the penalty is a fine, some component should be made available to the enforcement or management authority, to help sustain the system. This can provide an incentive for enforcement and also assist capacity, and may also increase support by communities involved in compliance work.
- The judiciary or other bodies imposing the penalties may need to be sensitised to the environmental consequences and seriousness of various offences.
- It is advantageous to provide alternatives to judicial channels to allow immediate application of penalties (e.g. instant fines, compounding of offences).

MAKING DECISIONS ON DISCRETIONARY ACTIVITIES

The way in which decisions are to be made should be clear. This should allow for the law or formal rule system specifying:

- Who will take the ultimate decision
- What factors will be considered in making various types of decisions, e.g. the criteria that will determine the outcome of the decision
- The process that will be used, e.g., whether an Environmental Impact Assessment (EIA) must be prepared and who can be involved (e.g. who has the right to make submissions)

The law may allow the decision-maker to refuse to process an application for an activity until a strategic planning process had considered wider implications of the proposal, and of other similar or related proposals that may arise as a result of the activity.

EIAs and strategic assessments can be useful tools for assisting in decision-making processes. The Convention on Biological Diversity has established guidelines for EIAs.

References:

IUCN, WWF, UNEP & WB 1993, Marine Biological Diversity, Elliott Norse (ed).

CONTROLLING OUTSIDE ACTIVITIES THAT AFFECT THE MCPA

In most cases, where the body controlling activities within the MCPA does not have jurisdiction or authority to control activities occurring outside the MCPA, it is desirable to have legislation or other mechanisms in place to ensure that such external activities will be adequately considered and controlled. This may include providing an avenue for the MCPA manager to be included in the broader coastal zone and national policy and management planning.

MANAGEMENT PLANNING

Management planning is a useful tool for generating clear short and long term management objectives and associated programmes. This approach can also offer a valuable mechanism for involving the community in longer term/broader planning, increasing the level of community consensus on both the day-to-day and longer-term operations of the MCPA and the community's level of confidence in area management.

Management plans also provide a means to determine longer term budgets, and provide a sound basis for seeking financial support.

SUSTAINABLE FINANCING

Traditionally, protected areas have been managed by government agencies and have thus tended to rely almost exclusively on government financing. In certain cases, however, these arrangements are changing, and new models are emerging. Novel institutional arrangements are being created to provide greater flexibility and more innovative means of securing financial resources from public and private sources.

Protected areas in developing countries receive an average of less than 30 percent of the funding necessary for basic conservation management (James et al., 1999). Over the past decade, many governments of developing countries have substantially cut their budgets for protected areas as a result of financial and political crises (Dublin et al., 1995). International aid for biodiversity conservation has also been on the decline since the 1992 Earth Summit in Rio de Janeiro (James et al., 1999). As a result, many protected areas in developing countries remain or have become mere "paper parks" lacking sufficient funds to pay for staff salaries, patrol vehicles, or wildlife conservation programs.

Potential alternative sources of finance or practical support include:

- Income from fees charged for conducting commercial activities within the MCPA (e.g. tourist operations) or user fees (e.g. the fee for entering the Galapagos Islands goes in part to the marine reserve; the fees for diving, snorkelling and yacht mooring in the Soufriere Marine Management Area in Saint Lucia all go directly back into area management).
- Contributions from NGOs (e.g. "Friends of" groups), corporate sponsors or other independent groups.
- Contributions from local communities and users (e.g. funding from fundraising events, and contribution of free labour for enforcement, area cleanups and public awareness work)

EVALUATING AND IMPROVING EFFECTIVENESS

EVALUATING EFFECTIVENESS

Why Evaluate?

Evaluating the effectiveness of MCPAs is vital for improving management over time. It is also important for demonstrating the benefits of the MCPA to stakeholders and funders.

What are the Measures of Effectiveness?

Effectiveness must be assessed in relation to the objectives of the MCPA. Where there are multiple objectives, those that are most important may be given a greater focus in terms of evaluation.

Possible factors that may be measured to assess effectiveness include the following:

Socio-economic Benefits

- Stakeholders perceptions of value
- Economic benefits to communities
- Effects on employment opportunities, living conditions and population movements
- Level of conflict between users
- Reduction in catch variability, dampening 'boom-bust' cycles
- Trends of public use

Management

- Effectiveness of management in preventing unwanted human impacts
- Financial sustainability (willingness of funders to support management, willingness of visitors/users to pay)
- Changes in activities within the area to alternative uses which are more appropriate given the objectives of the area
- Governance of the area

Biodiversity

- Changes in habitats
- Changes in species populations
- Changes in fecundity and size range
- Productivity levels
- Levels of fragmentation of habitat types
- Changes in ecosystem function
- Species diversity and composition

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Knowledge and Understanding

- Use of the area for education and research purposes
- Baseline areas for monitoring
- Levels of awareness in the local community
- Levels of understanding of the marine environment derived from research in the area
- Levels of knowledge on matters that affect MCPA and network effectiveness and viability

Network Issues

- Representativeness of the network
- Ability for one part of the network to support the objectives of other parts

How to Undertake Evaluations

There is a wide range of methodologies available for evaluation. Part 5 of this report provides some key literature and case studies.

For each evaluation, an appropriate and affordable technique should be designed. There is not currently any clear best practice for any aspect of evaluation, nor is there likely to be in the near future.

Evaluation may be undertaken for individual MCPAs, or for the network. Where the country or region has a number of MCPAs, it is desirable to carry out the evaluations of individual MCPAs in ways that can feed into national or regional assessments across the networks.

Among the broad tools which can be used for evaluation are:
- Holding workshops or other consultative processes
- Undertaking surveys of stakeholders and employees
- Assessing available data (e.g. census information and economic information collected for other purposes)
- Compliance monitoring and testing
- Biological monitoring
- Measuring levels of physical impact (e.g. pollution, sedimentation)

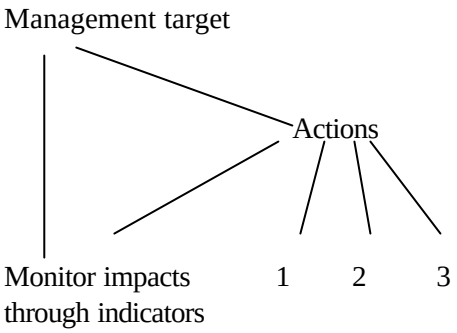
Stakeholder participation in the evaluation processes is often invaluable (see the section on participation above).

ADAPTIVE MANAGEMENT

Adaptive management, as schematically presented below in its simplest form, has been identified as the most appropriate approach toward the management of biological resources because of its ability to deal with uncertainty and natural variation (more flexible than other systems), its iterative nature (acquires information on the biological resource through the management cycle), and its feedback mechanisms (see

Decision V/6: Ecosystem Approach Principle 9 i.e. 'Management must recognise that change is inevitable'). Adaptive management can be distinguished from less effective trial-and-error management in that several alternatives are tested simultaneously instead of sequentially.

Adaptive management can be applied at each component of biological diversity, and the appropriateness of each component will be defined by the scale of the management programme and its potential impacts. Adaptive management systems should operate within the context of a higher order of policy objective concerning the use of biological resources, and should strive to integrate diverse or conflicting objectives into a single target for management action.



References:

Walters, C.J. 1986. Adaptive management of renewable resources. McMillan Publishing Co., N.Y. USA. p 374.

Walters, C.J. 1997. Challenges in adaptive management of riparian and coastal ecosystems. Conserv. Ecol. 1(2): 1.

MONITORING

Successful application of adaptive management is strongly dependent on monitoring. Uncertainty about the appropriateness of monitoring techniques, limited skills and resources for monitoring, and the long-term sustainability of monitoring programmes can be regarded as constraints. Ecosystem-based management of biological resources will also require the commitment of additional resources for monitoring. The monitoring component in adaptive management systems should therefore be designed and refined to ensure that these constraints are addressed. Some initial observations in this regard are that:

- the scale of monitoring should match the scale of management, but should not ignore 'downstream' effects of management (see Ecosystem Approach Principle 3);
- the cost of monitoring should be internalised (the resource user should contribute significantly) to ensure the maintenance of monitoring programmes (see Ecosystem Approach Principle 4);
- resource users should participate in the design and implementation of the monitoring system (see Ecosystem Approach Principle 2);
- local and traditional knowledge of resources should be incorporated into monitoring systems, (and the use of such local and traditional knowledge in the management of biological resources may promote the maintenance of local and traditional knowledge systems, e.g. in the mapping of resources by communities) (see Ecosystem Approach Principle 11);

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- monitoring systems should be appropriate, cost-effective and achievable (see Ecosystem Approach Principle 12);
- monitoring systems and the evaluation of the results of monitoring should involve a transparent and consultative process (see Ecosystem Approach Principle 11);
- the integrity of monitoring systems can be enhanced by measures for long-term data warehousing.

It is often advisable that monitoring be conducted at three levels, i.e.:

- monitoring the status of the component of biological diversity that is the focus of the management programme (in order to obtain information about its status independently from any harvest programme);
- monitoring the take (in order to obtain detailed information about the biological characteristics of the component harvested, and trends in characteristics such as age and sex distribution and fecundity);
- monitoring fishing effort and other forms of extractive take (in order to determine changes in the yield per unit effort as an index of the impact of the management programme, taking into account improvements in technology relating to the efficiency of harvesting).

Monitoring at these three levels need not be conducted at the same frequency, by the same agencies and following the same methodologies, but the combination of monitoring at these three levels may result in a greater probability that use-related impacts will be detected and that monitoring systems will be maintained in the long-term. Monitoring at multiple levels is particularly important in cases where limited information is available about the current status of the component of biological diversity that is being used, or to avoid bias resulting from information derived as the result of harvesting (harvesting is most often targeted at specific components only).

It is also important to consider other impacts on a resource (e.g. illegal takes), and to use all other relevant sources of information to generate conclusions about the trends in resource status and recommendations concerning its management.

Monitoring should be conducted within all components of the marine management system (highly protected MCPAs, ancillary MCPAs and within IMCAM), in order to fully assess the effectiveness of the various components of the overall system.

Monitoring needs to go beyond simply focusing on exploited species, as if extraction of these species is the sole or principal impact. As is often the case unexpected changes result from a combination of factors. Therefore, monitoring the health of ecosystems is also important, with the choice of reliable indicators essential. Research efforts are needed for the development of such indicators. Coral reef monitoring programmes such as Reef Check and the Global Coral Reef Monitoring Network are good examples of well-established programmes to monitor the health of an ecosystem around the globe.

Reference:
Wilkinson, C. 2000. Status of coral reefs of the World: 2000. Australian Institute of Marine Science. 363pp.

PEOPLE AND MCPAS

PARTICIPATION

The Importance of Stakeholder Participation

Stakeholder participation is essential for the establishment and maintenance of individual MCPAs and regional networks. Stakeholder participation would be particularly important in achieving the equitable sharing of benefits accruing from the creation of MCPAs. In addition stakeholder participation would:

1. allow decisions to be made in an inclusive and transparent way;
2. facilitate the involvement in decision-making and management of a wide range of players, increasing the likelihood of success;
3. facilitate the monitoring of biodiversity in MCPAs
4. recognise traditional rights and customs, and other interests of stakeholders;
5. allow decisions and management to be undertaken at the appropriate level (i.e. decentralisation).

Identifying Stakeholders

Stakeholders are those who have an interest in the issue. This interest may arise because:

- Their livelihoods are potentially directly affected by the project. That effect may change their livelihood in a way perceived as beneficial or detrimental, or a mix of the two.
- They have a decision-making role, formally or informally (e.g. they may be influential members of the community.
- They represent a community of interest (e.g. environmental NGOs, industry).
- Their activities will affect the success of the MCPA project.
- They represent the future generations of stakeholders.

As well as identifying stakeholders, it will be useful to identify the nature of their interest, and their capacity to participate, and tailor the participation process to that interest and capacity.

Different types of protected areas may cater to different sets of stakeholders or beneficiaries, depending on the types of goods and services offered by the protected area. The array of benefits flowing from a protected area, and the stakeholders they benefit, will be determined by a range of factors including:

- the ecological character of the area (generally the most important factor)
- how accessible it is to stakeholders and users
- the way the area is managed.

Participation Process

It is recognised that the type and extent of participation will depend on local circumstances, including issues such as custom and tradition, available mechanisms and governance approaches, and the degree of interest of stakeholders.

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Principles underlying participation include:

- giving stakeholders access to relevant information in a form they can understand
- giving stakeholders sufficient time to be able to prepare and participate
- giving the stakeholder the chance to participate in monitoring programme
- making the method of consultation appropriate to the stakeholder group involved
- taking into account the results of the participation process, i.e. consultation should be genuine and meaningful.

It is important to incorporate and recognise traditional knowledge in the establishment of MCPAs. Indigenous and traditional communities have a wealth of knowledge about biodiversity and often have developed a sense of respect for nature that must be enhanced and sometimes rescued. The concept of sanctuaries, or "untouchable places", is present among indigenous populations of many different ethnic groups.

In designing participation, it is important to consider the effect that this may have on accountability and authority of managers. It is essential to be clear about the matters that are relevant to the decision and their relative importance. This will help define the weight that participant's views will have in the decision-making processes (which may range from being a minor matter to consider, to being in effect a veto).

Where participation in management is being provided, by transferring certain management functions to stakeholders (e.g. allowing community members to become rangers), the stakeholders must be given sufficient authority and resources (e.g. training, equipment) to allow them to fulfil those functions effectively. There must be clear accountability arrangements to ensure that their activities are not detrimental to the interests of other stakeholders or the biodiversity management objectives.

Approaches that may be used to promote stakeholder participation include:

- recognition of tradition, custom and rights
- using the media and other mechanisms for the provision of information
- workshops, public meetings, public hearings
- employment of community interest advocates
- individual interviews, surveys, questionnaires
- advisory panels, working groups, task forces
- demonstration projects
- formal consultation processes
- identifying incentives or compensatory actions
- transferring functions to stakeholders.

There is a considerable body of literature available on methods for facilitating stakeholder participation. Part 5 provides references to some that are particularly relevant to MCPAs.

TRADITIONAL USES AND RIGHTS

The Convention recognises the importance of traditional knowledge in several of its provisions, which stress the right for indigenous and local communities to share in the benefits derived from ideas and innovations they have developed that prove useful to others. The Convention calls upon Parties to respect, protect and encourage customary use of biological resources. Central to these commitments is Article 8(j), which provides that Parties should: "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holder of such knowledge, innovations and practices and encourages the equitable sharing of the benefits arising from the utilisation of such knowledge, innovations and practices";

"Indigenous and local communities" covers a wide range of groups, including indigenous people who occupied areas subsequently colonised by ex-patriot settlers, and local farming communities who have developed specialised uses and techniques for local biodiversity.

It cannot be assumed that traditional uses and practices are necessarily sustainable, particularly given changes in human population sizes, social and economic practices (e.g. the introduction of a cash economy or loss of migratory lifestyles). New exploitation techniques (e.g. introduction of new types of boats), or changes in the environment (e.g. where alien species or sedimentation have resulted in additional stress for exploited species) may affect sustainability. Nor will sustainable traditional practices have been developed for all resources or locations.

MCPAs can be a tool for preserving traditional uses and rights. They can also be a tool for allowing traditional users to alter their practices to take advantage of new opportunities (e.g. ecotourism, markets for new biodiversity products). Part 5 contains case studies relating to subsistence/artisanal fishers efforts to establish no-take areas. The recognition of traditional uses and rights does not, *per se*, require them to be preserved. But any restriction or change to those uses and rights should be done through a process that:

- facilitates adequate participation of the affected users and right-holders;
- balances those rights equitably with the interests of other stakeholders and the need to achieve the objectives of the Convention; and
- provides adequate compensation or alternative rights, to ensure that there is an equitable sharing of the cost of biodiversity management across the community.

Box 1

Northern Tanzania

In Tanga region fishing villages have grouped together to establish collaborative fisheries management plans ('collaborative' because this is done with the support of the local government authorities) within which destructive forms of fishing are outlawed and various other regulatory measures implemented. In addition, within each fishery management area, a few reefs have been closed to fishing by the villages themselves. Initially this was for a period of just a few years, but the participatory monitoring programme that is being carried out, involving the fishers themselves, has shown that reef health and fish abundance has increased. This has led to the villages extending the 'life' of the NTAs. In the Comoros, a similar initiative has taken place in the newly established Moheli Marine Park, which is collaboratively managed by the government and the 10 villages surrounding the park. Each village has identified and is in the process of implementing an

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NTA within the park.

Reference: Salm, RV, J Clark and E Siirila. 2000 Marine and Coastal Protected Areas: a guide for planners and managers. IUCN

Brazil

In Brazil a new law establishing categories of protected areas has been recently approved. Under the new system, there are 12 different categories of fully protected and sustainable use Protected Areas. In Brazil, the sea is a common property, but in two categories of sustainable use MCPAs the use is granted only to the traditional populations. The Extractive Reserves (RESEX) are created after analysing the demand of traditional populations who have been exploiting the natural resources in an area for a long period. The Environmental Protection Areas (APA) also has this potential, as shown by a new experience that is under trial in Northeast Brazil in the Coral Coast MPA. In this multiple use area of just over 400 thousand ha., which includes coral reefs, mangroves and sea grass beds, the right of fishing has been restricted according to fishing tradition, determined by an elected council who will also be involved in the zoning plan. Smaller no-take zones have been established in accordance with the fisherman and local environmental councils and the results have been monitored by research agencies and presented to the community. In both cases The traditional users have rights and obligations and in many cases they decide themselves to create no-take areas inside the MPAs. Other management measures have been implemented after discussion, such as banning of predatory fishing practices, seasonal closures, etc.

Reference: Ferreira, B. P. and M. Maida 2001. Fishing and the Future of Brazil´s Northeastern Reefs.InterCoast 38:22-23

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New Zealand

The maori people in New Zealand have been empowered over the last several decades by recognition of both traditional rights and those guaranteed by treaty, of access to coastal fisheries and fish resources. Some maori tribes are antagonistic towards what they consider to be the imposition of 'no-take' marine reserves through a process managed by a government agency under the Marine Reserves Act. They see such reserves as an alienation of access rights and regard such reserves as a last resort.

At least two coastal tribes have seen beyond the short-term closure of areas to fishing access and have either applied for, or supported marine reserves proposals in their areas for the sake of the demonstrated spill over benefits available in the longer term. One of the tribes, as applicant, has successfully argued the case against opposition from commercial and recreational fishers and has gained approval for the most recently established marine reserve (November 2002) on the New Zealand coast, Te Tapuae o Rongokako. The maori people of that tribe are now the reserve's strongest advocates and best managers to deal with poaching. In addition, some tribes are pursuing reserves under the Fisheries Act, set up specifically to provide for maori participation in the management and regulation of controlled fishing, and there is discussion of the potential value of such mataitai reserves associated with 'no-take' marine reserves on coastal reef systems.

New Zealand is now developing a public relations strategy which intends to generate wide debate

within any region over the placement of marine reserves so that local views are not only taken into account but are instrumental in the definition of locations to be protected.

PUBLIC AWARENESS

Education and public awareness are significant issues for MCPA managers for two key reasons:

1. MCPAs can be important tools for education and awareness building about marine and coastal biodiversity.
2. Improved public understanding of marine and coastal biodiversity, the need for biodiversity management, and the particular role played by MCPAs is likely to be an essential component of the establishment and maintenance of effective MCPAs and networks.

The objective should be to achieve increases in understanding and awareness that change behaviour – reduce unsustainable activities, increase engagement in biodiversity management, increase active support for MCPAs and networks, etc. Increasing public awareness can be a critical element in facilitating participation (see the section above).

In developing education and awareness strategies, the following key target groups should be considered:

- Current stakeholders who will be participants in establishment or management decisions and those whose activities within the area have a direct impact on it (e.g. fishers),
- Managers (those actively involved in management including employees of the management agencies who contribute to management,
- Beneficiaries of the MCPA (including potential future stakeholders) for whom the flow of benefits will be increased by improved awareness or understanding.

Methods for education and public awareness can range from formal training/education courses to the use of popular theatre and the provision of simple signs or brochures.

Some approaches that might be considered include:

- Enhancing existing technical and sub-technical training in MCPA management.
- Development and implementation of a code of conduct to reduce the impact of common activities (e.g. for recreational fishing methods, shell collecting, firewood or dead seaweed collection from beaches).
- Providing opportunities for stakeholders to become involved in management activities, with appropriate training provided (e.g. honorary warden systems, volunteer biodiversity monitoring work, beach clean-ups, water quality measurement).
- Developing an information strategy and associated action plan to impart information to stakeholders, relating to sustainable management practices, MCPA benefits, etc.

In designing and executing a public awareness programme, there should be clear links with participation processes. Involving stakeholders in public awareness work is highly desirable.

LITERATURE AND EXPERIENCE

KEY PUBLICATIONS

The following have been selected as key publications that provide an overview of a wide range of issues relating to MCPAs. References on specific matters are incorporated into the text.

Salm, RV, J Clark and E Siirila. 2000 Marine and Coastal Protected Areas: a guide for planners and managers. IUCN

Roberts, C and JP Hawkins. 2000 Fully Protected Marine Reserves: a guide. WWF

National Academy of Sciences. 2001. Marine and Coastal Protected Areas: tools for sustaining ocean ecosystems. National Academy Press, Washington DC.

Crosby MP , KS Geenen and R Bohne. 2000. Alternative Access Management Strategies for marine and Coastal Protected Areas: a reference manual for their development and assessment. US MAB program, USA.

COUNTRY EXPERIENCE

The AHTEG identified the following countries as having experience which might be of particular value to other countries, and that have expressed a willingness to share their experience.

- New Zealand has a small and growing network of highly protected MCPAs, and has undertaken significant scientific monitoring work to look at the effectiveness of these MCPAs. They also have experience in involving local communities and indigenous people in the creation and management of these areas.
- Chile has extensive experience in establishing artisanal fishing reserves, and some recent experience in assessing their effectiveness.
- Australia has had long experience of management of the very large Great Barrier Reef Marine Park, and of a range of federal and State MCPAs for a variety of purposes and degrees of protection for biodiversity. It also has had the recent distinction of setting aside the world's largest 'no take' marine reserve in the Australian subantarctic.
- Philippines and ASEAN in general have experience with transboundary considerations
- USA has well studied models in the Tortugas (Florida) and the Channel Islands (California)
- Germany has a network of Reserves and National Parcs along its North Sea and Baltic Sea coasts and at Helgoland Island. Currently, the creation of first really offshore Reserves (within the European NATURA 2000 network, see “Habitats Directive” of the EU Commission) is in its planning stage
- Many regional seas conventions and action plans are central to implementing regional approaches to the establishment and management of marine and coastal protected areas. Examples include, but are not limited to, OSPAR (NE Atlantic), the SPA Protocol of the Mediterranean Action Plan,

The SPAW Protocol of the Cartagena Convention (Wider Caribbean Region), and HELCOM (the Baltic Sea).

Annex

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