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# MARINE AND COASTAL BIODIVERSITY: REVIEW, FURTHER ELABORATION AND REFINEMENT OF THE PROGRAMME OF WORK

***Report of the Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas***

*Note by the Executive Secretary*

## EXECUTIVE SUMMARY

An Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas was established pursuant to programme element 3 of the programme of work on marine and coastal biological diversity (decision IV/5, annex). The purpose of this Group was to assist SBSTTA in its deliberations on the issue of marine and coastal protected areas. The mandate of the Group was elaborated by the Executive Secretary and endorsed by SBSTTA at its fifth meeting in recommendation V/3, as follows:

(a) Identify pilot research and monitoring projects, based on current proposals and ongoing projects aimed at assessing the value and effects of marine and coastal protected areas or similarly managed areas on sustainable use of marine and coastal living resources;

(b) Review the desk-study called for in the operational objective 3.1, activity (c), of the programme of work on marine and coastal biological diversity;

(c) Identify linkages between marine and coastal protected areas and sustainable use of marine and coastal biodiversity;

(d) Prepare recommendations on types of research to be carried out to understand the effects of marine and coastal protected or closed areas on population size and dynamics, subject to national legislation.

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The work of the Group relates to operational objectives 3.1 and 3.2 of the programme of work on marine and coastal biological diversity.

In deliberating the value and effects of MCPAs, the Group recognized the many benefits of that MCPAs can create, relating to both conservation and sustainable use of biological diversity. Such benefits include protecting ecosystem structure, functioning and beauty; allowing recovery from past damage; improving fishery yields; and providing social and economic benefits to local communities and nations. Therefore, MCPAs provide the best available strategy to make integrated marine and coastal area management regimes effective.

However, according to the best currently available data, the present global system of MCPAs is not effective in ensuring conservation and sustainable use of marine and coastal biological diversity. Making a comprehensive assessment of the number and extent of all MCPAs globally is not possible, given the limitations to the existing data. Therefore improving the quality of such data should be made a priority for the future. However, given that a very small portion of marine and coastal biological diversity is currently included in MCPAs, the goal for the future should be the development of an effectively managed, ecologically representative global system of MCPA networks. This goal is set forward in the recommendations to this document, and is consistent with the Plan of Implementation of the World Summit on Sustainable Development (WSSD). Both the Expert Group and WSSD agreed that marine and coastal biological diversity should be maintained both in areas within and beyond national jurisdiction. WSSD set a target date of 2012 for completion of such a global network. This target date could also be adopted for the work of the Convention.

Regarding linkages between MCPAs and sustainable use of marine and coastal biological diversity, the Expert Group identified elements for a framework that would provide for sustainable use of marine and coastal biological diversity. Sustainable use on the national level can be achieved through the area-based management of marine resources, which incorporates both areas where human uses are permitted and areas where extractive uses are prohibited. The area-based protection would be incorporated within a framework of sustainable management practices over the wider marine and coastal environment. By implementing this approach, sustainable fisheries can be ensured, and other benefits, including those relating to tourism and education accommodated for.

Regarding recommendations for future research and identification of pilot projects, the expert group set forward a number of proposals, which are presented in annex III to this document. These proposals are based on identified knowledge gaps.

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## I. BACKGROUND

1. The Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas was established by the Conference of the Parties to the Convention on Biological Diversity in adopting the programme of work on marine and coastal biological diversity at its fourth meeting (decision IV/5, annex). The Expert Group was established to assist the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) in its work on the topic of marine and coastal protected areas.

2. The work of the Group was intended to help implement programme element 3 (Marine and coastal protected areas) of the programme of work on marine and coastal biological diversity. In particular, the work of the Group relates to operational objectives 3.1 and 3.2 of the programme of work, which read as follows:

> "*Operational objective 3.1*: To facilitate research and monitoring activities related to the value and the effects of marine and coastal protected areas or similarly restricted management areas on sustainable use of marine and coastal living resources.
>
> "*Operational objective 3.2*: To develop criteria for the establishment of, and for management aspects of, marine and coastal protected areas."

3. The terms of reference for the Group were endorsed by SBSTTA at its fifth meeting (recommendation V/14) and approved by the Conference of the Parties at its fifth meeting, in paragraph 15 of its decision V/3. The terms of reference requested the Group to:

(a) Identify pilot research and monitoring projects, based on current proposals and ongoing projects aimed at assessing the value and effects of marine and coastal protected areas or similarly managed areas on sustainable use of marine and coastal living resources;

(b) Review the desk-study called for in the operational objective 3.1, activity (c), of the programme of work on marine and coastal biological diversity;

(c) Identify linkages between marine and coastal protected areas and sustainable use of marine and coastal biodiversity;

(d) Prepare recommendations on types of research to be carried out to understand the effects of marine and coastal protected or closed areas on population size and dynamics, subject to national legislation.

4. The Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas held its first meeting in Leigh, New Zealand, from 22 to 26 October 2001. Following inter-sessional work, the Group met for a second time in Marahau, New Zealand, from 20 to 24 May 2002. Both meetings took place at appropriate field locations: The fist one adjacent to the Goat Island Marine Reserve (the first no-take marine reserve in New Zealand) and the second one adjacent to the Abel Tasman National Park. Relatively basic field accommodation was used to both reduce costs and to enhance the scientific and technical nature of the meeting.

5. The members of the expert group were selected from nominations provided by national focal points, in accordance with the *modus operandi* of SBSTTA (decision IV/ 16, annex I). The selection was undertaken by the Executive Secretary, in consultation with the Bureau of the Subsidiary Body. The experts were selected based on their competence in the relevant field of expertise, with due regard to

geographical representation and to the special conditions of least-developed countries and small island developing states. A list of the members of the AHTEG can be found in Annex I to this document.

6. Mr. Murray Hosking (New Zealand) was elected as Chair of the Group, while Ms. Paula Warren acted as Rapporteur. Financial support for the meetings was provided by the Governments of New Zealand and the United States of America, as well as by the IUCN World Commission on Protected Areas. Logistical support was provided by the New Zealand Department of Conservation and the Marahau Beach Lodge.

7. An Informal Advisory Group to the ad hoc technical expert group was formed for the purposes of providing wider input to the core expert group. The Informal Advisory Group operated as a listserv, consisted of an international group of qualified marine protected areas professionals, and provided peer review and valuable comments to several of the working group documents.

8. Section II of the present document addresses item (b) of the terms of reference of the Expert Group by considering the number, extent, distribution, nature and biological representation of marine and coastal protected areas globally, as well as the value and effects of marine and coastal protected areas on marine and coastal biological diversity. The results of the Group's deliberations on item (c) of the terms of reference are presented in section III. Because both items (a) and (d) of the terms of reference relate to research projects, they are considered together in section IV below.

## II. VALUE AND EFFECTS OF MARINE AND COASTAL PROTECTED AREAS

### *A. Characteristics of marine ecosystems*

9. Marine and coastal ecosystems have many unique characteristics, which need to be considered when managing these resources. These characteristics are as follows:

(a) 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;

(b) 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;

(c) 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, but carries the substantial disadvantage that the MCPA is strongly affected by "up-stream" events, e.g. water quality, sedimentation, etc.;

(d) 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 recognized and addressed. It also makes gaining political and public support for measures such as MCPAs more difficult.

10. These characteristics have some important implications for integrated marine and coastal area management and for MCPAs, including:

(a) The uniqueness of marine biodiversity makes marine biodiversity management a critical part of any coastal country's response to the Convention;

(b) 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;

(c) 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;

(d) 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.

### *B. Review of current knowledge*

11. With over 60 per cent of the human population living in the coastal zone, marine and coastal biodiversity is increasingly under pressure from human activities, resulting in:

(a) Over-exploitation of biodiversity;

(b) Impacts of extraction methods (e.g. Bottom trawling, long-lining, mining and dredging) and seismic surveys;

(c) Sedimentation arising from activities on adjacent land;

(d) Infilling of estuaries, alteration of sediment movement by groynes, and other physical changes to the marine environment;

(e) Water pollution;

(f) Impacts of tourists and divers (e.g., on coral reefs);

(g) Climate change;

(h) Alien-species invasions;

(i) Subdivision and development on the coast;

(j) Fragmentation of habitats.

12. As a result, at global, regional and national levels marine and coastal biodiversity is declining or being lost. Habitats are being fragmented, degraded or lost, and species are being affected at community through to the genetic level, with commercial, local or regional extinctions. The Convention requires actions to be taken to conserve biodiversity and to 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 such activities 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 approach 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.

13. In many cases, current marine and coastal management practices (e.g., controls on fishing catch levels and methods, land use regulation) are no longer adequate to deal with the complexity and magnitude of present threats to biodiversity. Many of these methods also rely on their user having a good understanding of marine ecosystems. In most cases, such understanding is lacking. There is therefore a need to take actions that will provide rapid and effective control and removal of such threats.

14. Experience to date has shown that area-based approaches, using MCPAs, are a vital mechanism to address at least some of these threats, and one of the reasons for the loss of marine and coastal biodiversity is the very low level of development of marine and coastal protected areas. MCPAs can be considered an essential element in integrated marine and coastal area management (IMCAM) regimes, if such regimes are to achieve the objectives of the Convention.

15. 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 established. Marine and coastal protected areas 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 square kilometres. of marine protected areas (though including some islands), compared with some 11.6 million square kilometres protected on land. Information on many marine protected areas is not robust, though sites range across all of the world's marine regions.

16. There are significant limitations to our knowledge of the number and distribution of MCPAs; management performance of existing MCPAs; and level of comprehensive biodiversity conservation provided by the present global MCPA system.

17. Currently available data regarding the number and extent of existing MCPAs is summarized in section III of report of the Group, and is mainly based on information available in the protected areas database of the World Conservation Monitoring Centre (WCMC) and the 1997 United Nations List of Protected Areas. There are significant limitations to these data, however, including the lack of geographic coordinates for many protected areas, which limits possibilities for a more complete analysis, affecting decision-making and priority-setting. The last comprehensive global analysis of marine protected areas dates from 1995. However, these limited data indicate that twelve times more terrestrial area is protected than marine area.

18. Although the current global inventory is out of date, it is known that the number of MCPAs has grown over the past 20 years, and that most coastal countries now have at least one. MCPAs have also increasingly become recognized in the policy approaches of countries, as a core element in marine and coastal biodiversity management. This reflects the increasing recognition of the benefits of MCPAs, and of the failure of other methods to provide some of those benefits. However, although the numbers of

MCPAs have increased, in many cases they have not been effective in meeting their objectives. Commonly recurring themes for the failure of marine protected areas to achieve their objectives include:

(a) Insufficient financial and technical resources to develop and implement management plans or lack of trained staff;

(b) Lack of scientific data and information for management decisions, including information on the impacts of resource use and on the status of biological resources;

(c) Lack of public support and unwillingness of users to follow management rules, often because users have not been involved in establishing such rules;

(d) Inadequate commitment to enforcing management rules and regulations;

(e) Unsustainable use of resources occurring within MCPAs;

(f) Impacts from activities in land and sea areas outside the boundaries of MCPAs, including pollution and overexploitation;

(g) Lack of clear organizational responsibilities for management and absence of coordination between agencies with responsibilities relevant to MCPAs;

(h) Problems related to the size and habitat coverage of MCPAs;

(i) Conflicting objectives of the MCPA;

(j) Lack of national or regional networks of MCPAs; and

(k) Lack of understanding and integration of social and economic issues into the establishment and management of MCPAs.

19. A recent comparative study of three MCPAs in the Wider Caribbean suggested that positive social and biological outcomes for those areas were correlated with clear boundaries, well-defined resource-use rights, accessible conflict-resolution mechanisms, and user self-governance rights.

20. Well-managed MCPAs provide the best available tool to make integrated marine and coastal area management (IMCAM) regimes effective. MCPAs can generate a wide range of benefits, including biodiversity conservation, sustainable use of resources, and the enhancement of economic well-being and improvement of the quality of life of communities; including conflict alleviation between resource user groups. This matches the experience with terrestrial protected areas. More specifically, some of the benefits of MCPAs include:

(a) Protecting ecosystem structure, functioning and beauty, and allowing recovery from past damage;

(b) Protecting the genetic variability of exploited species;

(c) Improving fishery yields, including through protecting spawning stocks, enhancing recruitment, reducing over-fishing of vulnerable species, reducing conflicts between users, and protecting essential habitats;

(d) Providing other direct and indirect social and economic benefits, including through benefits to tourism, traditional uses of biodiversity, and preserving reefs and kelp beds which prevent wave erosion of the shore or shelter moorings;

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

(f) 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.

21. 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.

22. In summary, the currently available data indicate that the present global MCPA system is severely deficient. It probably protects only a very small proportion of marine and coastal biodiversity and makes a relatively small contribution to sustainable management of marine and coastal biodiversity. However, well-managed MCPAs provide a large number of benefits to marine and coastal biological diversity, and are a vital part of any integrated marine and coastal area management strategy.

### *C. Future goals*

23. The Ad Hoc Technical Expert Group proposed the following goal for the Convention in relation to MCPAs:

> "The establishment and maintenance in perpetuity of an effectively managed, ecologically representative global system of MCPA networks, where human activities are managed to maintain the structure and functioning of the full range of marine and coastal ecosystems, to provide benefits to both present and future generations."

24. It should be noted that this goal is in agreement with the Plan of Implementation of the World Summit on Sustainable Development, which also called for representative networks of marine protected areas. The World Summit adopted the target date of 2012 for the establishment of such networks, and this target date could also be used in the context of the Convention.

25. This goal presents the best available strategy to address current and future threats to marine and coastal biodiversity, which are increasing in magnitude and complexity. A global representative network of marine and coastal protected areas would provide rapid and significant contributions to the conservation and sustainable use of biodiversity in the face of the rapidly increasing threats. In addition, the global network will be able to provide biodiversity benefits despite our incomplete understanding of marine and coastal ecosystems, and will reduce conflicts over objectives, and increase stakeholder participation and adhesion to objectives.

### *C. Monitoring progress towards the global goal*

26. Progress made towards the global goal can be measured only if comprehensive data on the number, extent and representativeness of marine and coastal protected areas is collected and made

available. In addition, promoting and making decisions in the context of the global goal could be enhanced if more comprehensive and consistent information on MCPAs is gathered from all the regions. While some good regional databases are being developed and existing data are helpful (e.g., the European Commission's database on special areas of conservation being established under the Habitats Directive, inventories held by the IUCN World Commission on Protected Areas (WCPA), lists of wetlands protected under the Convention on Wetlands (Ramsar, Iran, 1971), and the protected areas database of UNEP-WCMC), there is nonetheless a paucity of facts to inform appropriate decisions within the Convention.

27. There is accordingly an immediate need to establish and continually update an effective global inventory of information, in order to make informed decisions to underpin this activity within the framework of the Convention on Biological Diversity, building upon and learning from the successes and failures of previous endeavours.

28. Annex IV sets out a proposed set of simple categories that could be used in a global inventory. Collection of these basic data would be affordable, and provide sufficient information for the key assessments needed at a global level. Such data could be collected by UNEP-WCMC in the context of the United Nations List of Protected Areas and the associated database. Many other organizations have data that could contribute to this.

### *D. Definitions*

29. The Group recognized that there is no currently existing definition for MCPA, and considered that having a clear definition would facilitate work in this area. 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 deliberations apply to coastal areas as well as the sea. The Group also considered that a broad definition, encompassing the full range of protected areas, was desirable. The definition developed by the group is based on the IUCN definition of marine protected area.

30. 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.*

31. 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.

## III. LINKAGES BETWEEN MARINE AND COASTAL PROTECTED AREAS AND SUSTAINABLE USE OF MARINE AND COASTAL BIOLOGICAL DIVERSITY

32. As indicated in the previous section, MCPAs can generate significant benefits directly related to the sustainable use of marine and coastal biodiversity. This is particularly the case in ensuring sustainable fisheries, and, as a result, the livelihoods of coastal communities. The demonstrated values of MCPAs to

sustainable tourism are also well known, and can provide tremendous economic benefits locally and nationally. A well managed system of MCPAs can accommodate a number of uses, including sustainable fisheries, recreational uses (including tourism), and education. Such as system can provide an improvement to quality of life of local communities, including food security and poverty alleviation. The following section discusses how MCPAs can be applied, in the context of integrated marine and coastal area management (IMCAM), to achieve this goal.

### *A. National framework for sustainable management of marine and coastal biological diversity*

33. Sustainable use on the national level can be achieved through the area-based management of marine resources, which incorporates both areas where human uses area permitted, and areas where extractive uses are prohibited. Both types of MCPAs are required to ensure the sustainable use of resources.

34. The question of benefits to the sustainable use of marine living resources from the establishment of MCPAs, particularly in the context of benefits to fisheries management, 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.

35. 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.

36. Such benefits can arise in a number of ways:

(a) Producing fish of exploitable size, which then directly disperse "spill over" into the surrounding area where they become available to fishers;

(b) Producing more offspring (from a greater density of breeding adults within MCPAs), which are then dispersed by currents to eventually recruit into surrounding fisheries;

(c) Providing information that is necessary to make regulatory decisions about controls (e.g. measures of natural mortality, reproduction, maximum size, trophic interactions, etc.);

(d) 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;

(e) Providing insurance by preserving populations that can accelerate stock recovery in cases of recruitment failures from either overfishing or natural disasters;

(f) Protecting key habitats or life-stages from fishery related damage (e.g. protecting critical spawning and nursery habitats, vulnerable juveniles, and spawning adults);

(g) Protecting the genetic potential of populations from detrimental effects of selective fishing.

37. 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".

38. 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.

39. The AHTEG recognized that there are some benefits to marine and coastal biological diversity, which can only be provided with any degree of certainty by highly protected areas, where extractive uses are prevented. These include:

(a) Restoring natural population structures of exploited species (age, size, gender and gene pools);

(b) Protecting biodiversity at all levels, and protecting all taxa;

(c) Eliminating fishing gear impacts and by-catch;

(d) Providing undisturbed spawning conditions, habitats and settling sites;

(e) Providing some essential fisheries management data (particularly natural mortality);

(f) Providing opportunities to enjoy undisturbed/unmodified areas, and to have a truly wilderness experience;

(g) Allowing the public to see and understand the effects humans have, and the benefits of management; and

(h) Providing long term monitoring, benchmarks, control areas, and places where research can be undertaken unaffected by human activities.

40. Such highly protected MCPAs are also unique in allowing benefits to be provided with certainty where there is a poor understanding of the marine environment. As such, they provide insurance against the effects of management mistakes arising from ignorance or uncertainty. In this respect, a highly protected area provides the only available response to the need to take a precautionary approach. Compliance and management are simplified in comparison to other types of management regimes.

41. However, a national system of MCPAs should also contain areas that permit a variety of sustainable human uses. The AHTEG called these areas "ancillary" MCPAs, to distinguish them from the highly protected areas. Such ancillary MCPAs can allow extractive uses, though restrictions on fishing methods may exist. Ancillary MCPA can also provide a large number of benefits, such as the protection of important cultural sites; conservation of some aspects of biodiversity, for example through restriction of destructive activities, such as bottom trawling; maintenance of habitats to meet the requirements of specific species; and providing for traditional interaction with the marine and coastal environment.

42. The benefits provided by these two types of MCPAs may be negated, however, if they are not applied as part of wider integrated marine and coastal area management practices. For example, sedimentation or pollution from a source some distance away from an MCPA can have serious adverse effects to biodiversity contained within the MCPA.

43. In many cases, individual MCPAs can provide significant benefits, but in other cases a network is needed to optimally protect whole ecosystems. The AHTEG defined a network as an appropriate mix of

highly protected areas and ancillary areas, which interact collectively to provide benefits greater than the sum of their individual benefits. The AHTEG also recognized that to achieve the full benefits, this network needs to be representative (meaning that the entire network should include the full range of marine and coastal ecosystems, and that individual MCPAs in the network should reflect the biotic diversity of the ecosystems from which they derive). The network should also contain sufficient area to fulfil its functions and be ecologically viable.

### *B. Elements of the framework*

44. In view of the foregoing, a national framework for ensuring sustainable use of marine and coastal biological diversity should contain the following components, each of which is needed to achieve the desired results:

(a) A primary network of representative highly protected areas, i.e. areas where extractive uses are excluded, and other significant human pressures are removed or minimised, to enable the integrity, structure and functioning of ecosystems to be maintained or recovered;

(b) An ancillary network of MCPAs to contribute to the biodiversity objectives of the representative highly protected areas, where threats are managed for the purpose of biodiversity conservation and/or sustainable use and thus where extractive uses are allowed; and

(c) A framework of sustainable management practices over the wider marine and coastal environment.

45. A more detailed discussion of the three components of this framework is presented in the following sections. The AHTEG recognized that this framework 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.

### *C. Network of highly protected MCPAs*

46. 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, contribute towards marine environmental recovery and as insurance against failures in our management.

47. 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. 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.

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.

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:

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Fogarty M.J., J.A. Bohnsack & P.K. Dayton. 2000. Marine reserves and resource management. In: Sheppard (Ed.). Seas at the Millenium: An Environmental Evaluation, 37 – 392. Pergamon, 2000.
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Willis T.J., D.M. Parsons & R.C. Babcock. 2001. Evidence for long-term site fidelity of snapper (Pagrus auratus) within a marine reserve. New Zealand Journal of Marine and Freshwater Research. 35(3): 581-590.

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PNUE/PAM/PAP 2001. Livre Blanc: Gestion des zones cotières en Mediterranée' Split, Programme d'Actions Prioritaires, 2001.

Pacific Fishery Management Council 2001. Scientific and Statistical Committee report on status of marine reserve proposals for Channel Islands National Marine Sanctuary. Supplemental SSC Reports, Nov. 2001.

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

UNEP, 1989. Directory of Marine and Coastal Protected Areas in the Mediterranean Region 5, part 1; Sites of biological and ecological value. MAP Technical Reports series No 26, Athens.

48. 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.

49. 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).

50. 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.

51. 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.

### *D. The ancillary MCPA network*

52. 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). 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.

53. 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.

### *E. The wider environment*

54. 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.

55. 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:

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

(b) 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 by-catch of species such as albatross, marine mammals and turtles); and

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

### *F. Relative roles of the different elements*

56. No one element by itself can adequately fulfil all three primary objectives of the Convention on Biological Diversity (biodiversity conservation, sustainability, and equitable sharing of benefits). A framework that includes all three elements is required, since each provides a particular contribution to the overall goal.

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

(d) 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, and a place to undertake scientific work to improve our understanding of the marine and coastal environment.

(e) To deliver benefits related to intrinsic, social, cultural, recreation and aesthetic values that require the existence of areas not subject to significant human impacts.

(f) To ensure that management failures in other areas cannot result in irreversible biodiversity loss, by protecting representative examples of all biodiversity.

58. 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).

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

60. The AHTEG recommended that the Conference of the Parties should urge relevant Parties and other Governments to establish effective marine and coastal biodiversity management frameworks, as a matter of high priority and urgency, incorporating these elements, including by establishing new MCPAs and by improving the effectiveness of existing MCPAs. Figure 1 provides a graphic depiction of the framework.

61. Given the importance of national networks of MCPAs for sustainable use of marine and coastal biological diversity, and in the context of operational objective 3.2, the AHTEG developed advice on the creation and management of the national framework described in this section. This guidance will also allow Parties and other Governments to make progress towards the achievement of the global goal defined in section II of this document. A summary of the guidance is available in Annex II to this document.

### *G. Marine and coastal protected areas in areas beyond national jurisdiction – achieving sustainable use in the high seas*

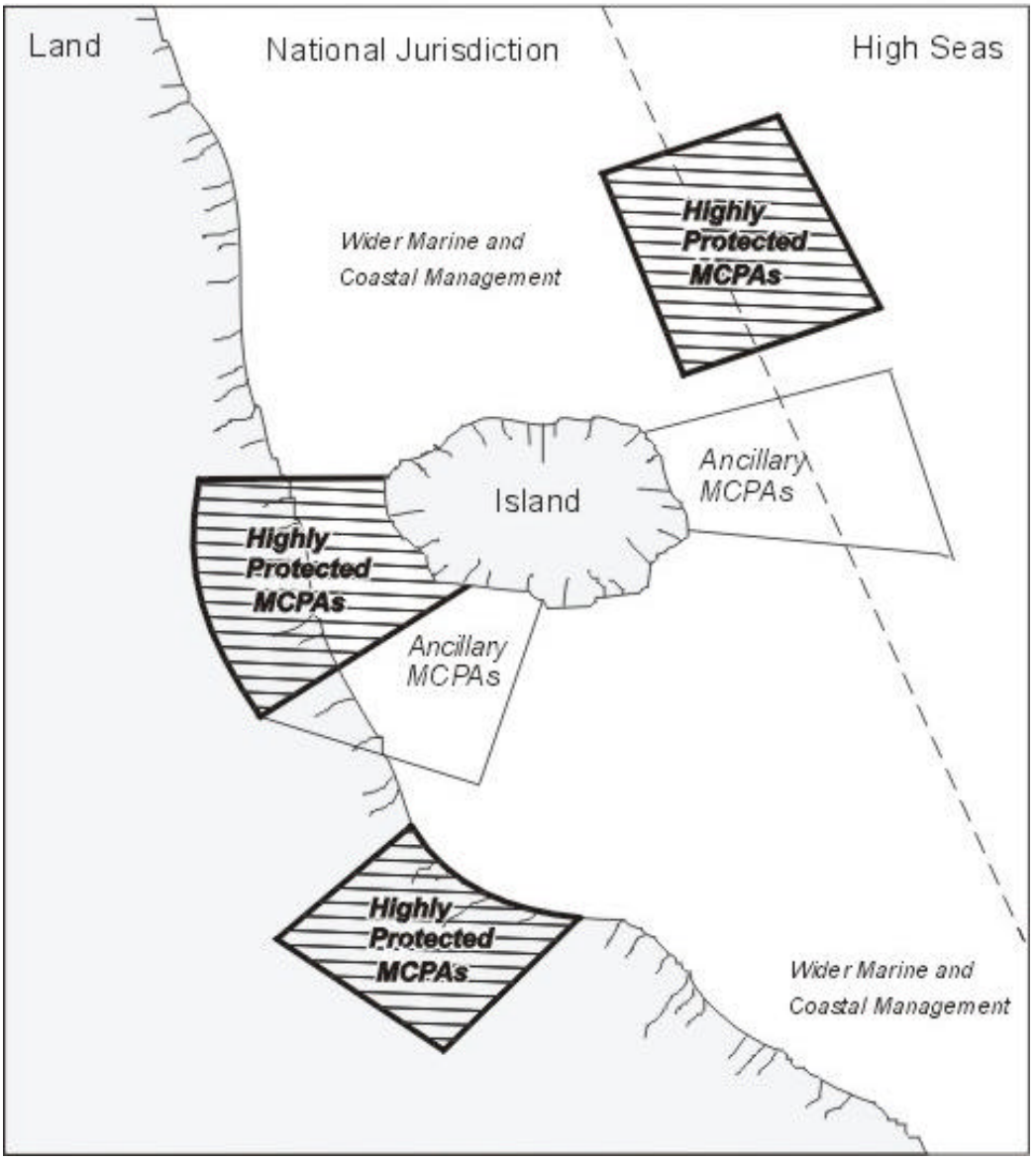
62. The proposed global goal is for an ecologically representative and connected global system of MCPA networks, and many ecosystems are located in areas beyond national jurisdiction (i.e., in areas outside the exclusive economic zone or continental shelf). There are currently no MCPAs outside of national jurisdiction that provide effective protection to a wide range of biodiversity, although there are a few areas which protect specific species or control a particular impacting activity. However, a number of studies have demonstrated that biodiversity in these areas is increasingly threatened. It is therefore necessary for MCPAs to be established in those areas. In addition, in view of the current uncertainty as to the state of the living resources of the high seas, and the extent of uses, a precautionary approach to the exploitation of these resources is critical.

63. The marine environment beyond national jurisdiction is subject to a number of international and regional instruments and processes, which are discussed in more detail in the note by the Executive Secretary on the conservation and sustainable use of the deep seabed genetic resources beyond national jurisdiction (UNEP/CBD/SBTTA/8/9/Add.3). Both this study and the AHTEG agree in that there are currently no clear instruments or experience, and no one body with clear responsibility for addressing this issue. Consultations with relevant bodies could be initiated to identify appropriate mechanisms and responsibilities for this work, as a matter of urgency.

**Figure 1:**

**ELEMENTS OF THE MARINE AND COASTAL**

**BIODIVERSITY MANAGEMENT FRAMEWORK**




## V. PILOT RESEARCH AND MONITORING PROJECTS

64. The Group identified key knowledge gaps and other impediments to the achievement of the proposed global goal, and designed a small number of priority research areas, including potential pilot projects to address these. These projects are set out in annex III below. They are focused on work related to areas within national jurisdiction, including the establishment of national and regional networks.

*Annex I*

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Ms. Kathy Walls (Department of Conservation, New Zealand)
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*Annex II*

# GUIDANCE FOR THE DEVELOPMENT OF A NATIONAL MARINE AND COASTAL BIODIVERSITY MANAGEMENT FRAMEWORK

## *1. DESIGN ASPECTS*

### *A. Networks and connectivity*

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

2. 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.

3. 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). 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:

(a) Isolated reserves have many benefits but will only be able to protect a limited fractions of marine biodiversity;

(b) Large numbers of marine species have open water dispersal phases and can potentially be transported long distances from where they were spawned;

(c) 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;

(d) 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.

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.

### *B. Priorities*

4. A strategic planning approach should be adopted at the national and regional levels when developing an ecologically viable framework for MCPA development. 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.

5. 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.

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

(a) Improve effectiveness of existing MCPAs;

(b) Address the most significant gaps in terms of representativeness, addressing urgent threats, and providing benefits to all communities;

(c) Begin to develop local, national or regional networks; and

(d) Achieve an improved balance between the three framework elements.

### *C. Establishing objectives*

7. It is vital to clearly establish the objectives of each MCPA and MCPA networks. These objectives should then influence:

(a) *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,), 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;

(b) *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;

(c) *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;

(d) *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.

(e) *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.

### *D. Ecological considerations*

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

9. 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.

10. 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.

11. Connectivity issues that are important in the marine environment include:

(a) Allowing species to continue to access their required range of food sources, whether these vary on a diurnal, seasonal or age-related pattern;

(b) 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);

(c) Maintaining metapopulation complexes.

12. 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.

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

(a) 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

(b) The connectivity between MCPAs is maintained or lost.

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

### *E. Choosing a cost-effective approach*

15. 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 minimize (as far as practical) the costs and maximize the benefits of MCPAs and networks. To do this will require an assessment of those costs and benefits.

16. 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.

17. 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.

18. 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.

19. 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.

### *F. Design principles for highly protected MCPAs*

20. 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.

### *G. Principles for individual highly protected MCPAs*

***Principle 1: Minimizing human disturbance on all biodiversity***

20. 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).

21. 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.

22. 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***

23. 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

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***

24. 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.

25. 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***

26. 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.

### *H. Principles for a network of highly protected MCPAs*

***Principle 1: Representative***

27. 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***

28. 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.

***Principle 3: Viability***

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

***Principle 4: Precautionary design***

30. In designing the network, a precautionary approach should be taken wherever there is uncertainty (e.g. regarding habitat diversity, species habitat needs, 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.

### *I. Principles for the Broader Network of All MCPAs (highly protected and ancillary)*

***Principle 1: Design the network***

31. A network design should be prepared for each national or regional area. The network should incorporate ancillary MCPAs as support for a primary network of highly protected MCPAs

***Principle 2: Maximize connections***

32. Potential connections between MCPAs should be maximized.

### *J. Representativeness*

33. 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.

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

35. 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.

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

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

37. 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.

## *2. MANAGING MCPAs*

### *A. General issues*

38. 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:

(a) Having clear rules and boundaries;

(b) Ensuring adequate enforcement;

(c) Undertaking active restoration work where necessary to help an area recover from past damage;

(d) Provision of goods and services for users (e.g. visitor facilities);

(e) Gathering information to assess the achievement of the objectives and support management decisions;

(f) Undertaking activities to facilitate stakeholder understanding and support, and to allow stakeholder participation;

(g) Undertaking activities to ensure appropriate benefits are generated and equitably shared (e.g. allocation of resource usage);

(h) Controlling activities within or affecting the area to prevent additional damage occurring;

(i) Preventing entry of or eradicating/controlling alien species.

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

### *B. Who manages*

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

41. 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.

### *C. Setting the rules*

42. 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.

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

(a) Allowing activities that support the objectives, with clear conditions/restrictions to ensure that such activities will be appropriate;

(b) Prohibition of activities that would likely preclude achieving the objectives of the MCPA;

(c) Providing a decision-making process for activities that do not clearly fall into either of the above categories, i.e. discretionary activities. In general, the number of discretionary activities should be minimized, in order to reduce the potential for inappropriate decisions that may conflict with the primary requirement to protect biodiversity;

### *D. Compliance and enforcement*

44. 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 a critical 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.

45. 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.

46. 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.

47. 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.

48. An effective enforcement regime should have the following elements.

(a) *Optimal enforcement capacity*:

(i) 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;

(ii) Good cooperation and coordination should exist between enforcement bodies (which may include in the case of transboundary MCPAs, authorities in different countries);

(iii) The enforcement authorities must have the necessary resources to undertake the various tasks (e.g. financial resources, equipment, lifting awareness and training);

(iv) Enforcement authorities must have well trained personnel who are able to operate in an appropriate manner to maximize compliance and community support;

(v) The enforcement body must have the necessary legal or customary powers for executing their task, including recognition of their role by the community;

(b) *Appropriate penalties and associated legal provisions*:

(i) 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);

(ii) Legal provisions should facilitate achieving successful prosecutions;

(iii) 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;

(iv) The judiciary or other bodies imposing the penalties may need to be sensitised to the environmental consequences and seriousness of various offences;

(v) It is advantageous to provide alternatives to judicial channels to allow immediate application of penalties (e.g. instant fines, compounding of offences).

### *E. Making decisions on discretionary activities*

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

(a) Who will take the ultimate decision;

(b) What factors will be considered in making various types of decisions, e.g. the criteria that will determine the outcome of the decision;

(c) 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).

50. 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.

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

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

### *F. Controlling outside activities that affect the MCPA*

52. 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.

### *G. Management planning*

53. 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.

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

### *H. Sustainable financing*

55. 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.

56. Protected areas in developing countries receive an average of less than 30 per cent 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 programmes.

57. Potential alternative sources of finance or practical support include:

(a) 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);

(b) Contributions from non-governmental organizations (e.g. "Friends of" groups), corporate sponsors or other independent groups;

(c) Contributions from local communities and users (e.g. funding from fund-raising events, and contribution of free labour for enforcement, area cleanups and public awareness work).

## *I. Evaluating and improving effectiveness*

***Why evaluate?***

58. 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?***

59. 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.

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

(a) Socio-economic benefits:

(i) Stakeholders perceptions of value;

(ii) Economic benefits to communities;

(iii) Effects on employment opportunities, living conditions and population movements;

(iv) Level of conflict between users;

(v) Trends of public use;

(b) *Management*:

(i) Effectiveness of management in preventing unwanted human impacts;

(ii) Financial sustainability (willingness of funders to support management, willingness of visitors/users to pay);

(iii) Changes in activities within the area to alternative uses which are more appropriate given the objectives of the area;

(iv) Governance of the area;

(c) *Biodiversity*:

(i) Changes in habitats;

(ii) Changes in species populations;

(iii) Changes in fecundity and size range;

(iv) Productivity levels;

(v) Levels of fragmentation of habitat types;

(vi) Changes in ecosystem function;

(vii) Species diversity and composition;

(d) *Knowledge and understanding*:

(i) Use of the area for education and research purposes;

(ii) Levels of awareness in the local community;

(iii) Levels of understanding of the marine environment derived from research in the area;

(iv) Levels of knowledge on matters that affect MCPA and network effectiveness and viability;

(e) *Network issues*:

(i) Representativeness of the network;

(ii) Ability for one part of the network to support the objectives of other parts.

### *J. How to undertake evaluations*

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

62. 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.

63. 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.

64. Among the broad tools which can be used for evaluation are:

(a) Holding workshops or other consultative processes;

(b) Undertaking surveys of stakeholders and employees;

(c) Assessing available data (e.g. census information and economic information collected for other purposes);

(d) Compliance monitoring and testing;

(e) Biological monitoring;

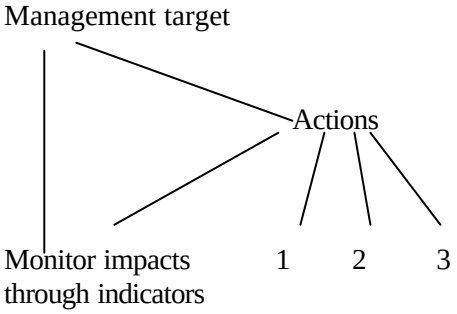
(f) Measuring levels of physical impact (e.g. pollution, sedimentation).

65. Stakeholder participation in the evaluation process~~es~~ is often invaluable (see the section on participation above).

### *K. Adaptive management*

66. 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. 1/ Adaptive management can be distinguished from less effective trial-and-error management in that several alternatives are tested simultaneously instead of sequentially.

67. 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.

1/ See principle 9 of the Principles of the Ecosystem Approach annexed to decision V/6 of the Conference of the Parties to the Convention on Biological Diversity, i.e., “Management must recognize that change is inevitable”.

### *L. Monitoring*

68. 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:

(a) The scale of monitoring should match the scale of management, but should not ignore "downstream" effects of management; 2/

(b) The cost of monitoring should be internalized (the resource user should contribute significantly) to ensure the maintenance of monitoring programmes; 3/

(c) Resource users should participate in the design and implementation of the monitoring system; 4/

(d) 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); 5/

(e) Monitoring systems should be appropriate, cost-effective and achievable; 6/

(f) Monitoring systems and the evaluation of the results of monitoring should involve a transparent and consultative process; 7/

(g) The integrity of monitoring systems can be enhanced by measures for long-term data warehousing.

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

(a) 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);

(b) 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);

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2/ See principle 3 of the Principles of the Ecosystem Approach.

3/ See principle 4 of the Principles of the Ecosystem Approach.

4/ See principle 2 of the Principles of the Ecosystem Approach.

5/ See principle 11 of the Principles of the Ecosystem Approach.

6/ See principle 12 of the Principles of the Ecosystem Approach.

7/ See principle 11 of the Principles of the Ecosystem Approach.

(c) 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).

70. 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).

71. 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.

72. 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.

73. 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.

## *3. PEOPLE AND MCPAs*

### *A. Participation*

***The importance of stakeholder participation***

74. 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:

(a) Allow decisions to be made in an inclusive and transparent way;

(b) Facilitate the involvement in decision-making and management of a wide range of players, increasing the likelihood of success;

(c) Facilitate the monitoring of biodiversity in MCPAs;

(d) Recognize traditional rights and customs, and other interests of stakeholders;

(e) Allow decisions and management to be undertaken at the appropriate level (i.e. decentralization).

***Identifying stakeholders***

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

(a) 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;

(b) They have a decision-making role, formally or informally (e.g. they may be influential members of the community;

(c) They represent a community of interest (e.g. environmental NGOs, industry);

(d) Their activities will affect the success of the MCPA project;

(e) They represent the future generations of stakeholders.

76. 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.

77. 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:

(a) The ecological character of the area (generally the most important factor);

(b) How accessible it is to stakeholders and users;

(c) The way the area is managed.

***Participation process***

78. It is recognized 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.

79. Principles underlying participation include:

(a) Giving stakeholders access to relevant information in a form they can understand;

(b) Giving stakeholders sufficient time to be able to prepare and participate;

(c) Giving the stakeholder the chance to participate in monitoring programme;

(d) Making the method of consultation appropriate to the stakeholder group involved;

(e) Taking into account the results of the participation process, i.e., consultation should be genuine and meaningful.

80. It is important to incorporate and recognize 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.

81. 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).

82. 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.

83. Approaches that may be used to promote stakeholder participation include:

(a) Recognition of tradition, custom and rights;

(b) Using the media and other mechanisms for the provision of information;

(c) Workshops, public meetings, public hearings;

(d) Employment of community interest advocates;

(e) Individual interviews, surveys, questionnaires;

(f) Advisory panels, working groups, task forces;

(g) Demonstration projects;

(h) Formal consultation processes;

(i) Identifying incentives or compensatory actions;

(j) Transferring functions to stakeholders.

### *B. Traditional uses and rights*

84. 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".

85. "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 specialized uses and techniques for local biodiversity.

86. 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.

87. 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 below 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:

(a) Facilitates adequate participation of the affected users and right-holders;

(b) Balances those rights equitably with the interests of other stakeholders and the need to achieve the objectives of the Convention; and

(c) Provides adequate compensation or alternative rights, to ensure that there is an equitable sharing of the cost of biodiversity management across the community.

***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 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.*

### *C. Public awareness*

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

(a) MCPAs can be important tools for education and awareness building about marine and coastal biodiversity;

(b) 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.

89. 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).

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

(a) 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);

(b) Managers (those actively involved in management including employees of the management agencies who contribute to management;

(c) Beneficiaries of the MCPA (including potential future stakeholders) for whom the flow of benefits will be increased by improved awareness or understanding.

91. 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.

92. Some approaches that might be considered include:

(a) Enhancing existing technical and sub-technical training in MCPA management;

(b) 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);

(c) 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, and forming a "friends of the MCPA" group);

(d) Developing an information strategy and associated action plan to impart information to stakeholders, relating to sustainable management practices, MCPA benefits, etc.

93. 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.

*Annex III*

## RESEARCH PRIORITIES, INCLUDING PILOT RESEARCH AND MONITORING PROJECTS

The following research priorities and pilot projects were identified by the AHTEG in response to paragraphs (a) and (d) of the terms of reference. Each is designed to both explore and enhance the linkages between marine and coastal protected areas and the sustainable use of marine and coastal living resources. Achieving the goal of sustainable use of living resources is dependent on the social, economic and cultural context of each MCPA, and therefore a number of the research priorities focus on this aspect of MCPAs. The effects of MCPAs on population size and dynamics (paragraph (d) of the terms of reference) are investigated through priority 2.1 (connectivity and proportionality), priority 2.3 (d) (climate change), priority 3.1 (MCPA size and location vs. species & habitat dynamics), and priority 3.6 (b) (percentage of protection required vs. size and dynamics of local population).

### *A. Establishing a global network of MCPAs*

**Priority 1.1**: Developing and implementing national, regional and global strategies towards establishing networks of MCPAs.

*Pilot project:*

(a) Draft action-oriented strategies for establishing MCPA networks, and implement those strategies, for example by holding regional workshops.

### *B. Inventory and assessment of MCPAs and the global system*

**Priority 2.1:** Assessing the representativeness, connectivity and proportionality of the existing MCPA system.

*Pilot projects:*

(a) Undertake initiatives to map ecosystems and habitats within regions and biogeographic areas, and determine the minimum level of broad habitat categories required for assessing representativeness of MCPA networks. Use this as basis for assessing representativenes of the existing MCPA network. This work should use a high level framework that is compatible with the basis for global inventory work. One possible approach to this work is to hold regional workshops.

(b) Assess connectivity to determine bioregions, and apply this information for evaluation of the existing MCPA network as well as for identifying priority areas for the future.

(c) Assess the effectiveness of the current MCPA network regionally and globally for the conservation and sustainable use of migratory species

**Priority 2.2:** Developing appropriate databases at the national level to allow for an assessment of MCPA frameworks at a larger (regional/global) scale. Using these data to identify patterns among MCPAs to generate priority needs for future research and approaches for adaptive management.

*Pilot projects*:

(a) Develop the high level framework for the global inventory (see annex IV below), and related advice to national managers on national inventories.

(b) Develop national databases for assessment of selected existing national/regional networks, selecting examples from the range of political, economic and biogeographic situations.

(c) Undertake a global review of the current state of knowledge of MCPAs by region. Provide output in a format understandable for managers and policy-makers.

**Priority 2.3:** Identifying the best indicators for assessing management effectiveness at various scales within an overall system.

*Pilot projects:*

(a) Develop and test a suite of effective assessment measures, including indicators, on a number of existing sites (biological, socio-economic and governance – based indicators). Selected pilot sites must cover the range of cold, temperate and tropical regions.

(b) Develop methods for evaluating effectiveness of entire MCPA networks.

(c) Develop methods for adapting MCPA management in response to possible changing species and habitat distribution patterns, which may result from climate change.

### *C. Improving MCPA networks*

**Priority 3.1:** Generating consensus and support for adequate protection of biodiversity through area-specific approaches.

*Pilot project:*

(a) Demonstrate the long-term benefits (for example species changes, habitat changes and ecosystem changes) of protecting large- enough/significant – enough critical habitats and ecosystems, by developing case studies.

**Priority 3.2:** Establishing criteria for choosing MCPAs in countries that lack such criteria.

*Pilot project:*

(a) Provide a conceptual model and best practice examples of criteria for selecting MCPAs, by undertaking linked work in a small number of selected countries.

Priority 3.3: Enhancing social and economic effects of MCPAs, particularly in terms of poverty alleviation.

*Pilot projects*:

(a) Develop of culturally sensitive MCPA development/management approaches to achieve effective involvement of stakeholders.

(b) Develop adaptive approaches to MCPA establishment and management. This could be done by collection and dissemination of case studies of both best and worst-case examples of the degree to which an understanding of how target communities operate (socially/culturally) and "do business" can affect the success of MCPA establishment and management.

**Priority 3.4:** Developing effective "learning networks"—networking among MCPAs at the national/international level. Develop and test such networks in a range of test countries / regions.

*Pilot projects:*

(a) Develop networks of communities/stakeholders of MCPAs to enable them to share and learn from experiences.

(b) Compile information on existing learning networks, and develop guidance for the operation of such networks based on these experiences.

**Priority 3.5**: Developing effective methods for integrating traditional knowledge into MCPA establishment and management.

*Pilot project:*

(a) Develop guidelines for integration of traditional knowledge into MCPA establishment and management, and support these by compiling and disseminating case studies on a wide range of examples from places where such initiatives have been undertaken (for example, New Zealand, Chile, the Wider Caribbean).

**Priority 3.6**: Developing strategies for integrating MCPAs and network development into long-term national and regional planning.

*Pilot projects:*

(a) Develop strategies based on past experience and future needs for the range of geographical regions.

(b) Develop methods for estimating the percentage of non-extractive protection required, in conjunction with national monitoring programmes, depending on the size and dynamics of local populations.

(c) Incorporate considerations of sedimentation and water quality into planning and management processes.

*Annex IV*

## IMPROVEMENT OF AVAILABLE DATA FOR ASSESSMENT OF PROGRESS TOWARDS THE GLOBAL GOAL

1. Since 1981, UNEP-WCMC has developed and maintained a global database on protected areas. The importance of this database, which is managed in collaboration with the IUCN World Commission on Protected Areas, has been broadly recognised. Within the database is a subset of clearly identified marine and coastal protected areas.

2. The AHTEG examined available information, consulted UNEP-WCMC (and indirectly WWF-International), and concluded that global data on MCPAs should be improved and/or gathered in the following critical categories:

(a) **Location** (physical co-ordinates and country or political unit, including the names of neighbouring country/countries where the MCPA is trans-boundary).

(b) **Total size** of the protected area, the relative size of the marine and coastal component and, where trans-boundary, the total area under country jurisdiction.

(c) **Temporal aspects** e.g. permanency or seasonality of protection or management.

(d) **Type of protection and management** proposed or being implemented, using a simple three-tier system:

(i) Part of the primary network of representative highly protected areas

(ii) Part of the ancillary network of MCPAs

(iii) Sustainable management practice in the wider coastal and marine environment

(e) **Effectiveness of protection and management** gauged against the regime being proposed or being implemented, using a simple three-tier system

(i) Currently fully effective – no significant problems known

(ii) Currently partially effective – some deficiencies

(iii) Currently ineffective – significant implementation problems

(f) **Nationally designated names** for type of protection and management e.g. Marine Park, marine and coastal nature reserve, etc.

(g) **Habitats protected and managed** (3D not just benthic**).**

(h) **Species protected and managed** (3D not just benthic)**.**

(i) **Habitats and species specifically excluded from protection/management within the MCPA** (i.e. that have no legal protection).

(j) **Nature of threats to habitats/species –** see table 1**.**

(k) **Name and contact details** of person(s) providing the above information and date on which this was done.

3. These data categories are a core set, which would provide the key information needed to evaluate progress, and success. They consist of sufficiently few categories to make data collection rapid, easy and hopefully achievable. They would not only underpin the actions of the Convention in the marine and coastal environments but are also considered to be of value to the wider conservation community at global, regional and national levels.

4. The collection of information on habitats being protected and managed would need to be structured from a standard list. This would speed up and standardize data collection. This would need to consist of no more than 15 categories and would need to take a very high level approach. Such an approach needs to be developed but could use terms such as "coral, sea grass, mangrove, estuary, seamounts, etc.". A similar approach would need to be taken over high-level categories to collect information on threats. Some first thoughts on such categories are provided in table 1. In both cases a decision at the time of data collection would need to be made on which categories were relevant. Whilst this may cause difficulty on occasions 'fitting' a site into this proposed management framework, any errors would be insignificant at the network, regional and global scale.

5. Data in other fields currently held within the world database on protected area of proven value to a wider audience, such as the IUCN management categories and GIS boundary data, could also be gathered but are not considered to be as important. IUCN category information will be collected for all sites on the United Nations list and so could be integrated into the above 'global' categories.

6. It is also important, in the context of the Convention on Biological Diversity that additional contextual information be gathered for each signatory country on the nature of their marine and coastal environment. This would provide benchmarks against which data return would be analysed, progress tracked and future Convention policy determined. This information should include:

(a) *Total area of seas under country jurisdiction in km*$^2$ (e.g., the area of the exclusive economic zone or area of territorial waters, etc.) and the criteria against which this measurement was made (e.g. high water to seaward limit of jurisdiction, low water to seaward limit); and

(b) *Habitat and species inventories.* In order to assess whether adequate action is being taken, habitat and species inventories to establish global extent and distribution will be required.

7. The former would enable coverage of the marine and coastal protected area network being established under the Convention on Biological Diversity at local, regional and global scales to be tracked, whilst the latter would provide a reference point against which to set future priorities for action under the Convention to address deficiencies. Both are essential for assessing achievement of the proposed global goal.

8. UNEP-WCMC and the IUCN World Commission on Protected Areas (WCPA), working in collaboration with UNEP regional seas offices and other relevant bodies, provides a vehicle by which such a consolidation and updating of global data on MCPAs could be achieved. The United States National Oceanographic and Atmospheric Administration currently hosts the chair of WCPA marine programme, and is interested in using its resources and experience of marine and coastal issues to help develop the information base for making decisions on MCPAs.

9. The advent of Internet-based tools will greatly ease data-gathering and increase the accessibility of the information and its analysis to advise on local, regional and global progress and trends. Internet-

based initiatives, and the predominate use of drop-down menus when gathering data from managers and practitioners, will also reduce data entry time and provide major advantages over the consistency and coherency, and ultimately reliability, of the dataset that needs to be gathered.

*Table 1.*

*Examples of six possible high-level categories that could be used globally to structure collection of information on the nature of the principal threats to habitats/species within MCPAs**

| ***High level category*** | ***Sub-categories*** |
|---|---|
| Physical loss | • Removal (e.g. harvesting, draining to create dry land)<br>• Smothering (e.g. by artificial structures, disposal of dredge spoil) |
| Physical damage | • Siltation (e.g. run-off, dredging, outfalls)<br>• Abrasion (e.g. boating, anchoring, trampling)<br>• Selective extraction (e.g. aggregate dredging, entanglement, turf cutting) |
| Non-physical disturbance | • Noise (e.g. boat activity)<br>• Visual (e.g. recreational activity) |
| Toxic contamination | • Introduction of synthetic compounds (e.g. pesticides, antifoulants, PCBs)<br>• Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)<br>• Introduction of radio nuclides |
| Non-toxic contamination | • Nutrient enrichment (e.g. agricultural run-off, outfalls)<br>• Organic enrichment (e.g. mariculture, outfalls)<br>• Changes in thermal regime (e.g. outfalls, power stations)<br>• Changes in turbidity (e.g. run-off, dredging)<br>• Changes in salinity (e.g. water abstraction, outfalls) |
| Biological disturbance | • Introduction of microbial pathogens<br>• Introduction of non-native species and translocations<br>• Selective extraction of species (e.g. bait collection, wildfowling, commercial & recreational fishing) |

*Note:* one MCPA could qualify for a number of high-level categories.

*Annex V*

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