8. Marine protected areas and fisheries

Introduction

Various rationales have been developed for protecting marine areas — for territory, for fisheries production, and/or for the protection of biodiversity. A multiple-use model that can provide for full protection of core areas and partial use of other areas can satisfy the needs of all stakeholders. This convergence of interests and methodology is not widely recognised among managers of protected areas nor among managers of capture fisheries and of aquaculture. Nor have the international agencies dealing with biodiversity conservation and fisheries sustainability seized the opportunity to develop truly integrated marine protected area management models.

Some attention has been paid to the conservation needs of high seas fisheries biodiversity, but the broader biodiversity conservation needs of high seas areas have been neglected, and the conservation needs of deep seabed ecosystems have been ignored.

Coastal aquaculture has been notoriously destructive in developing countries. Yet, operated within ecological constraints and set in a supportive management context, there is reason to believe that this industry can be made sustainable and can make an important contribution to world food security.

Governance is a vital element of MPA success. A shift towards MPA co-management by states and communities is improving prospects for MPAs to become truly sustainable in terms of environment, society and economics.

Section 1

Marine protected areas for biodiversity and for fisheries

Many traditional societies adopted measures to prohibit entry to, or the use of, portions of coastal and marine areas. This was sometimes done because of spiritual beliefs. In other cases it arose from a need to rebuild fisheries stocks, or to establish marine buffer zones that differentiated one group's territory from another. Conservation of area and resources was often a consequence of these actions, although it was not necessarily intentional. Some decades ago innovative fisheries managers introduced the concept of "fisheries habitat reserves". Their objective was to boost fisheries production by protecting spawning and nursery sites, and to protect biodiversity. Later, managers of terrestrial protected areas extended the species and ecosystem protection rationale of PAs to coastal waters.

These approaches led to, and continue to shape, ideas and methodology for marine protected areas (MPAs). They have converged at a management model that embraces multiple uses of resources and areas. The overall framework provides for core areas of "no-take" biodiversity protection and a range of carefully managed uses elsewhere within MPAs.

Although MPAs were initially seen as marine equivalents of terrestrial PAs, the ecological rationale for coastal and marine area management differs in many respects. Complex coastal water exchanges between freshwater swamps, estuaries and the sea require different approaches. The dynamics of larval drift, spawning eddies, and larval source-sink relationships are important determinants of marine species distribution. Understanding these factors is critical in determining MPA location and management.

Managing the marine environment

MPAs are now widely promoted as a useful and even essential tool for managing the marine environment, whatever the primary objective:

- ecosystem and habitat protection;
- protection of specific species;
- maintenance, restoration or enhancement of fisheries stocks;
- maintenance of fisheries genetic diversity; or
- provision of control areas for scientific research and as benchmarks against which to measure the impact of fisheries and biodiversity conservation measures.

Fisheries and conservation interests have followed separate paths of evolution towards MPAs, not without friction. It has been difficult to demonstrate unequivocally to fisheries interests that MPAs that prohibit fishing (no-take reserves, or NTRs) improve fisheries in adjacent waters. There is increasing evidence that this is the case, however, and that the benefits can be considerable (Box 1). A notable example of this is the well-studied marine reserve area in the Sumilon and Apo islands, central Philippines.[1]

Box 1. Australia's Great Barrier Reef Marine Park

Australia's Great Barrier Reef Marine Park was established 30 years ago, when there were few fisheries habitat reserves and MPA thinking focused on full protection. It was perhaps the first to associate a range of fisheries and other marine uses with areas of partial and full protection of resources and biodiversity. This MPA model has had marked international influence. It has helped conservationists appreciate the value of a multiple use approach, and encouraged fisheries managers to realise that MPAs can be managed as much more than a simple NTR.

The global marine environment is characterised by declining resources and diminishing biodiversity. Once seen as an infinite resource, needing little management, the marine environment and its supporting coastal land ecosystems are now characterised by the following:

- over-fishing, from whales to krill;
- degradation and infilling of coastal swamp ecosystems, which are critical habitat for some marine species and sources of nutrients for marine ecosystems;
- weakening of marine ecosystems, resource depletion and habitat disturbance;
- eutrophication of coastal waters by sewage and agricultural chemicals;
- sediment burden from deforestation and other land disturbances;
- pollution by an increasing range of chemicals;
- changes arising from global warming, some sudden (such as coral bleaching) and others more gradual; and
- extensive physical changes to shorelines and the coastal ecosystems which link land and sea.

Well chosen and managed MPAs — positioned as key components of integrated coastal zone management plans — are an important tool for easing this degradation and reorienting fisheries management towards sustainability. The conservation needs of more remote marine areas have, however, received little attention. Some areas of surface open sea have been declared protected as “no-take” zones for specific fisheries stocks, and a few examples of seamount ecosystem conservation can be cited. The conservation needs of other marine ecosystems, including the deep seabed have been neglected, however, even though they, too, have been subject to degradation by fishing and research activities.

New approaches

Achievement: Fisheries and biodiversity conservation approaches are merging and are shaping ideas and methods for more effective marine protected areas.

MPA thinking has shifted from simplistic marine species and ecosystem protection measures to multiple resource use management regimes. This has resulted in more benefits (including a more sustained level of target species protection) and fewer resource use conflicts. As with terrestrial PAs, increasing attention is being given to the social element of management.

Fisheries agencies are more interested in the value of MPAs. In the case of tropical waters, MPAs are seen to provide a measure of fisheries resource management in a multi-species and multi-gear situation that has not been appropriate to the stock-specific management approaches developed in temperate areas. With growing ecological understanding of the complex interactions between coral reefs, lagoons and oceans, new insights for the management of fisheries and biodiversity are gained. MPAs have often contributed to increased abundance, size and density of species. Other benefits include the following:

- increased fecundity and reproductive capacity;
- increased species richness and genetic diversity;
- increased fishery yield in the surrounding area; and
- economic benefits.

These effects are poorly understood because of the lack of performance evaluation of MPAs. Monitoring programs that will elucidate and quantify the benefits are needed (Sainsbury 2001).

Achievement: There has been a marked recent increase in the number and size of MPAs.

Increasing numbers of MPAs are being reported in a range of forms. Many, in place for centuries but unrecognised as MPAs, are now being listed, as is the case of those established by Pacific island communities on the basis of their traditional sea tenure systems.

While there are now more than 8,000 terrestrial protected areas, there are far fewer MPAs (around 1,300). There is 1500 times as much terrestrial area designated as "no-take wilderness" in the United States as there is aquatic (Brailovskaya 1998). One quarter of all MPAs are in Australia (Boersma and Parrish 1999). There is much to be done, and much to be gained, in extending the multiple use MPA concept.

Achievement: A number of international structures, programs and legal instruments that support marine area and resources management and protection have been introduced.

Basic to all of them is the innovative United Nations Law of the Sea Convention (UNCLOS), which, to the detriment of marine resource management, some coastal countries have yet to accede.[2] Others include the Ramsar Convention (protecting wetland habitat, including mangroves and coral reefs) and the marine resource allocation and management provisions of the bilateral Torres Strait and Timor Gap treaties that provide for international management of shared marine resources. Other international treaties with marine protection provisions include the Convention on the Conservation of Antarctic Living Marine Resources, and several regional fisheries conventions.

The relevant provisions of the Convention on Biodiversity are now being used in support of marine biodiversity, through The Jakarta Mandate on Marine and Coastal Biological Diversity (2001). A program has been developed with five key elements:

- integrated marine and coastal area management;
- marine and coastal living resources;
- marine and coastal protected areas;
- mariculture; and
- alien species and genotypes.[3]

Recognising marine diversity

Challenge: Though fisheries and biodiversity approaches to MPAs are converging the importance of this development for the future of the world's fisheries resources and for its marine biodiversity is yet to be fully recognised.

The size of the fishery industry has more than doubled in the last 30 years. In 2000, the United Nations Food and Agriculture Organisation (FAO) warned that about one-quarter of the world's marine resources were either overexploited or depleted. About half of marine fishing grounds were classified as "fully exploited," meaning that increased fish production from them was not possible. This means that only about one-quarter of the world's fishing grounds can boost fish production to satisfy the growing global demand for fish.

There is a long history of confrontation between conservationists and the fishing industry. The industry faces a dilemma: since pre-emptive planning for fisheries management has never preceded exploitation, management limits have been recognised only after catch-effort ratios have begun to decline. At that point it is very difficult to relieve fishing pressure through decisions that will reduce employment and retire expensive boats and gear. Conservation interests have had difficulty in appreciating the socio-economic circumstances of the fisheries industry; governments, everywhere, have an abysmal record of decisions in this area. Great effort is needed to develop a truly productive alliance of interests; fisheries managers and biodiversity conservationists must work together to develop meaningful ecosystem-based fisheries management that also protects biodiversity. The multiple-use MPA concept provides an ideal basis for action.

Challenge: The diverse experience in MPA management has yet to be documented or analysed.

Although there is a growing number of reports on MPA experience there have been few attempts to systematically review the full range of MPAs that has emerged. An analysis of experience is needed in order to improve management approaches and methodology.

A novel approach to learning MPA lessons is espoused by a new USA-based non-government organisation, Foundations for Success. It promotes an LMMA learning portfolio, through which members (who are leaders in community-based marine area management in Pacific island countries, the Philippines and Indonesia) share experiences, encourage each other and obtain support funding.

Challenge: Coastal MPAs are threatened by the impact of land-based pollution.

Although pollution from land-based sources has long been a problem, a lack of systematic planning greatly exacerbates this problem marine areas. Only through integrated planning of land-based development activities can this problem be eased. Optimal management of MPAs depends on integrated planning and management of associated land resources and the environment.

Challenge: Some areas of high marine biodiversity value cannot be placed under protective regimes because they are in areas under international dispute.

The islands and coral reefs of the Spratly Islands — claimed by China, Malaysia, Philippines and Vietnam — are one example. Another is the area of spectacular coral reef cliffs at Silabukan, in an area claimed by Indonesia and Eastern Malaysia. Innovative diplomacy, leading to an agreement to "freeze" claims, as was effectively done in Antarctica,[4] could provide the basis for a shared responsibility through some form of international MPA status.

Challenge: National and international inaction allows the threats facing marine ecosystems to continue.

An "out of sight, out of mind" situation prevails. Governments and NGOs must be convinced of the need to establish appropriate conservation policies and to develop appropriate forms of MPAs and other management interventions for remote marine ecosystems.

Section 2
Marine protected areas

Managing for biodiversity

The biodiversity conservation rationale for MPAs is varied. Sometimes it centres on species of special concern, such as marine turtle nesting beaches and adjacent waters. In other cases ecosystems are the focus. In practice, however, most MPA sites have been identified on the basis of an area that can be conveniently defined and mapped, rather than because of ecosystem size or function. This is partly due to the difficulty of understanding the extent of marine ecosystems and the role of water circulation in determining ecosystem limits.

Managing for industrial fisheries

In the early 1990s, Canada's Atlantic cod fishery collapsed. Around the world, many other fisheries approach a similar fate. In the cod fishery's last years complex rules were introduced to try and stabilise the fish population without putting fishers out of work. Limits were imposed on catches, the number of days or weeks of fishing was curbed, and regulations restricted the kind of gear that could be used. These actions constituted a form of temporal MPA, though focused on a single species, and without any reference to the ecological and environmental context of that species. This is reactive, not proactive, management, and it has not been effective.

In areas where fishing has been banned altogether, however, the overall fish population has not only stabilised, but increased. A survey of one hundred "no-take" reserves around the world — where fishing is banned completely — showed average increases of 91 per cent in the number of fish, 31 per cent in the

size of fish and 23 per cent in the number of fish species.[5] These increases occurred within two years of protection. It is noteworthy that the beneficial effects of these restrictions spilled over into adjacent areas where fishing was still permitted. In St. Lucia, for example, a third of the country's fishing grounds were designated NTAs in 1995. Within three years, commercially important fish stocks had doubled in the seas adjacent to those reserves. Fishing bans mean that a more natural age structure and genetic base can be maintained, because individuals are not selectively removed on the basis of age or size. Since breeding opportunities are not modified by harvest, the effects of fishing on biodiversity are greatly reduced.

Managing for local needs

Both the fisheries and the biodiversity motivated approaches to MPAs have been externally driven by scientific rationale and implemented by the state. Many local marine area management initiatives have been in place for centuries, however, and much can be learned from them.

Most coastal Pacific communities long ago developed some form of fisheries management regime. A wealth of local knowledge is often associated with these management systems. In many ways they were analogous to today's MPAs. They reflected social organisation; in coastal Japan and the islands of Micronesia, where feudal lords and paramount chiefs, respectively, were considered to own coastal seas and their contained resources, systems were feudalistic. Elsewhere there were more egalitarian arrangements, as in the clan-based customary marine tenure arrangements that are still in place today in the Solomon Islands and Papua New Guinea. Although traditional fishing rights and associated conservation responsibilities were not restricted to the Pacific, with the general suppression of traditional tenure systems elsewhere in the world it is only in the Pacific islands region that they have survived, though changed. Some of these community-based, participatory land and sea resource management systems are useful models for MPA development. Not the least important of the lessons to be learned is how the systems adapted to changing circumstances.[6] This capacity to adapt has an analogy in the review provisions of PA management plans.

It is a mistake to think of locally-managed MPAs simply as smaller versions of a state MPA managed for biodiversity protection. A locally-managed MPA may be managed with fisheries production as its primary objective. Even though the biodiversity priority might be lower, biodiversity conservation may well be a result.

Managing for coastal aquaculture

The environmental conditions needed for sustainable pond aquaculture are as follows:

- a pond substrate of suitable chemical and physical qualities;
- a reliable supply of clean water of the appropriate salinity;
- natural systems (such as mangrove areas) that can assimilate pond wastes to avoid the pollution of coastal waters; and
- protection from storm seas.

For cage, raft and stake (stick) forms of aquaculture the requirements are as follows:

- good quality seawater;
- current, wave and substrate conditions suited to the target species;
- adequate tidal exchange to disperse wastes; and
- supplies of timber for the structures and fuel needed for drying and processing.

These are the environmental services required for aquaculture to be productive and sustainable. They can be assured through establishing coastal aquaculture in areas where land and marine protected areas provide for zoned uses and some areas of full protection.

Aquaculture has the potential to disrupt adjacent marine ecosystems in various ways:

- waste waters carrying excessive nutrient loads;
- transfer of fish and shellfish diseases;
- escape of competitive introduced species; and
- genetic transfer from introduced species to wild species.

Unfortunately these problems have occurred in many countries and have created widespread opposition to an industry that could, and should, be made sustainable.[8] The FAO Responsible Fisheries Code includes statements of principle regarding aquaculture.[9] There is little on which to build practical arrangements, however,[10] and the code does not mention the contribution that MPAs could make.

The ecosystem approach

Achievement: There is growing interest in an "ecosystem approach" to fisheries. Various forms of MPA could provide the required base for this approach.

The fishing industry and governments have failed to implement management measures that would realistically address the problem of declining catches. Recognition is growing that a holistic approach is necessary, and that it is misguided to focus on a single species in a complex ecosystem. FAO has for some years promoted responsible fisheries and has developed a voluntary code to guide member states (FAO 1996). Although this would seem to imply a comprehensive and integrated approach, the code fails to extend beyond a "fish focus" even where it reaches into coastal zone management. It does not even mention protected areas.

Some broadening of the approach is evident in the FAO-supported 2001 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem, which encourages the development of an ecosystem-based fisheries management (EBFM) approach to long-term sustainability for the fisheries sector. Although the MPA management experience can inform and support this process, this fact was not recognised by the conference, despite a comprehensive presentation on MPAs' contribution to fisheries (Sainsbury 2001).

An example of the shift toward a comprehensive ecological approach to fisheries research is the Australian Institute of Marine Science (AIMS). As part of a Fisheries Habitat Review the institute has identified the following strategic research and development areas as the basis for defining its support research activities:

- define the role of habitats in maintaining healthy fisheries production, ecosystems integrity and biodiversity;
- define major habitats in the coastal and Exclusive Economic Zones;
- define the underlying natural dynamics and environmental variability in major fisheries;
- develop suitable indicators and monitors of ecosystems health and dynamics;
- define the impacts of human activities, such as coastal development, fishing, and aquaculture on fisheries ecosystems; and
- develop mitigation, rehabilitation and management strategies to achieve ecologically sustainable development of coastal and marine resources.

Achievement: Sufficient information and experience is available to demonstrate that ecologically sustainable coastal aquaculture is possible, if it is developed in an integrated way that is consistent with the natural systems of which it is a part, and is linked with marine and terrestrial protected areas.

This requires that aquaculture sites be designed and managed to meet relevant ecological criteria, that all coastal resource uses of the area be zoned and managed, and that the ecosystems and ecological processes that mediate water and nutrients for aquaculture are protected. In this context, protected areas need to become an essential, and productive, feature of the aquacultural landscape.

If aquaculture development is planned without considering the upstream conditions on which it depends, and without appreciating the extent to which aquaculture activities can alter ecosystems and disrupt ecological processes, its success — both environmental and social — is compromised. A managed area approach that employs multiple resource use planning, incorporates sustainable aquaculture practices and resource uses and is supported by terrestrial and marine protected areas will provide economic benefits and environmental services while also supporting biodiversity.

Elements of this approach are being tried on an extensive basis at the Kung Kraben Bay Royal Development Centre in Thailand's Chantaburi Province. Freshwater is obtained from a forested protected area and seaward pond systems are buffered by protected mangrove forest.[11] A comprehensive review of experience with this type of system is needed in order to extend the concept of linking aquaculture systems with protected areas for sustainability. The social dimensions of coastal aquaculture should also be addressed in this context.

Ecosystem-based fisheries management

Challenge: Fisheries sector interest in developing ecosystem-based fisheries management needs to be encouraged and supported.

Although the global fishing industry is starting to recognise the need to adopt an ecosystem approach, some reluctance remains. This may stem from the innate conservatism of the industry, along with continuing suspicion of conservation ideas. A sensitive, understanding approach is needed to support the industry in exploring the ecosystem approach as a basis for multiple use MPAs that will foster the sustainability of fisheries.

Challenge: Multiple use coastal MPAs need to be seen as part of rural development in developing countries.

Development assistance agencies have increasingly supported the establishment of MPAs, often in the context of integrated coastal zone management (ICZM). This focus has often led to community-based resource management projects. There is a growing interest in stakeholder capacity building, community empowerment and decentralised management of resources. Protected areas could be used as the focus for coastal rural development interventions. Community management (with state support) of multiple coastal land and marine resource use should be in place, along with provision for biodiversity and heritage protection.

Challenge: MPA frameworks, that address the conservation needs of ocean seamounts and seabed, need to be developed.

A basic problem in addressing this challenge is the difficulty of convincing people of the relevance of distant, unseen seamounts and the seabed. This is exacerbated by the lack of information about these areas and the difficulty and expense of access to them. Lack of knowledge about these areas has not hindered industrial fishers who discerned commercial potential. Many seamounts have been fished out before any scientific investigation took place.

No assessment has been made of disturbance to seabed ecosystems by the crude bottom-sampling systems of the nineteenth and twentieth centuries. A simple plot of the sampling tracks of all seabed exploration would reveal that the disturbance is considerable, and that it affects ecosystems where ecological processes and species development take an exceptionally long time to recover. Fortunately, remotely controlled submersibles are now making it easier to conduct sampling, which allows the seabed research community to better address conservation needs. An obvious beginning is to work with the deep-sea research community and its sponsors.

Section 3
Management of marine protected areas

Ecological and environmental considerations

Major differences between land and sea environments mean that there are different strategies for protecting biodiversity there.[12] While some of the experience in managing terrestrial PAs can give useful leads for marine area management, it is a mistake to think of marine protected areas as aquatic equivalents of land-based PAs.

There is less experience with marine area management, not least because of the difficulties of direct investigation in the marine environment. Advances are now being made, however, and exciting and unexpected new insights continue to emerge. The recent discovery of paleo-channels under the sea floor, for example, has direct management implications (Stieglitz 2001). These ancient stream channels, long buried under sediment, extend under the seabed from estuaries and carry flows of freshwater. When marine sediment cover erodes, freshwater and mud rise, with concentrations of groundwater nutrients that are higher than that of the surrounding seawater. These eruptions of muddy water are recognised by fishermen in Australia's Great Barrier Reef area as places where fish collect. This points to a need for specific fisheries management measures; concentrations of fish are more easily caught, and therefore more easily overexploited. Pollution is another management issue; not only nutrients that can be channelled in this way, but also land-based pollutants.

The selective removal of marine species through fishing has various impacts on biodiversity, not only in the areas fished, but in neighbouring MPAs. Fishing selection for size, sex and time of spawning causes differences in life history traits within fish populations (Kenchington 2001). Marine ecosystems differ in their responses to fishing. The most sensitive system are those with a few key species, or where the biota provide structural habitats, as is the case with coral reefs (Gislason 2001).

Trawling — which has been likened to forest clear-cutting — poses a major threat to biodiversity and the sustainability of deep-water communities (Wattling and Norse 1998). The negative impacts of trawling on the seabed have been widely reported, but for the most part the damage has been limited to shallow-water communities. It is likely that the effects of trawling will be more severe in deep-water communities, due to lower productivity, the longevity of many deep-sea species, and a high level of endemism.[13]

Care is needed when interpreting shifts in marine species populations. A decline of the Steller sea lion population in the Bering Sea was initially believed to have resulted from a depletion of the seal's preferred prey species by fishing. Subsequent evidence, however, has led to the conclusion that the population shift in fish species was a result of environmental change (Trites 2001).

An appreciation of environmental variability and its ecological consequences is fundamental to MPA management. It is not easy to deal with such variability, expressed at such a variety of scales. The most important variable, global climate change, will pose major challenges for MPA managers. In many areas stony corals are growing in waters at a temperature very close to the upper limit for their survival. Coral species community composition is destined to shift, with resulting changes in the many species associated with it. Episodes of coral bleaching are early signs of this. As seawater temperature changes begin to affect global and regional ocean water circulation, localised changes in water currents are expected to displace spawning areas and alter larval drift. The effects of rises in sea level will first be seen, not in inundation, but in increased coastal erosion from enhanced wave action. This will give rise to increased sediment in coastal waters, and changes in coastal water exchange and hydrology. Considerable uncertainty is being introduced into MPA management even before the fundamentals of management of marine biodiversity are well understood.

Governance and marine protected areas

The word "governance"[14] describes relationships, while "government" refers to actions. Systems of governance are characterised by the parties involved in decision-making and management and the relationships between them. In most countries MPAs have been established under agencies of the state; however, the trend now is towards local management. This sometimes takes the form of co-management between local groups and state agencies. In other cases, local communities have primary management responsibility, with technical and legal support from the state.

Developing countries are home to 95 percent of the world's fishers. They work in artisanal fisheries that catch about half percent of the 125 million metric tons of fish harvested worldwide each year. It is obvious that governments cannot dictate "no-fishing" zones among people who are so dependent on fishing for survival. Co-management of marine resources by governments, private fisheries, and communities has been demonstrated to be effective and sustainable.

Long-established traditional coastal resource management systems still exist in some Pacific islands. These are community-based, participatory systems for the integrated management of areas of land and associated sea. In some islands the state now owns the sea areas, although much land remains under customary tenure. Traditional rights of marine resource use are still recognised (Box 2).

Box 2. Village Fish Reserves in Samoa

In Samoa, community-based co-managed Village Fish Reserves (VFAs) have been established in 38 villages in recent years. These are small, scattered and numerous, and do not neatly fit concepts of ecosystem boundaries, larval dispersal or local fish migration routes, factors that would have been crucial in determining boundaries for a scientifically based MPA. VFA boundaries were determined by communities on the basis of traditional use, coupled with contemporary fishing needs. For non-migratory species, the combined larval production from many small PAs could be greater than that from a smaller number of large areas. It is also possible that a chain of small PAs, separated by only a short distance, improves the chances of linking larval sources and suitable settlement areas. The interconnections between sources and settlement areas are poorly understood, and this hypothesis has yet to be tested (King and Faasili 1998).

Having a network of small areas makes it possible to protect a greater variety of habitats for a given area; this can result in a wider range of species being protected. Moreover, such a network has in a large perimeter, and it is at the perimeters of protected zones that fishermen can haul in the largest catches. In effect it establishes a network of fish refuges throughout the entire country.

The Samoan model may be applicable to other countries where fishing communities have some degree of control over the use of resources in adjacent waters, or where innovative governments are prepared to cede a measure of local responsibility. Results in Samoa have confirmed that, regardless of legislation or enforcement, effective management of marine resources can be achieved only when fishing communities themselves see it as their responsibility, and are supported in their efforts.

Small successful MPAs catalyse the development of larger areas under multiple-use protection by generating interest among adjacent communities. This is a form of incremental conservation. The following conditions are necessary for successful community-based MPAs in the Pacific islands region:

- small size;
- cohesive community;

- strong leadership; and
- the perception of some form of threat to marine resources or their environment (Huber 2001).

An added incentive exists where MPA management is based on customary marine tenure. And in some cases community experience with MPAs translates into a wider appreciation of management of the environment beyond MPA boundaries, both on land and elsewhere in the sea.

A different order of governance applies to remote marine ecosystems. Most seamounts lie well beyond coastal communities and traditional marine resource tenure. In this situation the state assumes primacy.[15] New Zealand and Australia have acted to establish protective management regimes over seamounts in their Exclusive Economic Zones. Of New Zealand's 800 seamounts, 19 have been closed to fishing — before they have been fished. Australia has established a Seamounts Marine Reserve off southern Tasmania, where a high proportion of the species investigated are new to science.[16] A vertical zoning system has been established there: the area below 500 m depth (and into the seabed to a depth of 100 m) is IUCN category 1a (Strict Nature Reserve); in the waters above 500 m longline tuna fishing is permitted (IUCN category 6).

Many of the seamount and seabed features of interest are beyond state jurisdiction in High Seas areas. These are subject to international governance, the prime vehicle being the UN Law of the Sea Convention.

Co-management and community-based management

Achievement: A shift from centralised management to co-management and community based management is proving successful for MPAs.

Co-management of MPAs takes various forms. It may involve more than one level of government or more than one agency. The only durable models are those that involve communities in a meaningful way. The Samoan VFA program (Box 2) is an example of co-management between communities and a national fisheries agency.

There has been increased government acceptance of participation in coastal and marine resource management by local communities. Many community-based MPAs in the Pacific Islands region have been successful in the short term, although their long-term sustainability has not been proven. Indeed, the definition of sustainability in this context has yet to be fully explored. The Marine Stewardship Council has introduced a certification process through a program that promotes sustainability of fisheries by rewarding local communities for sound management practices. The Council is backed by WWF and by Unilever, one of the world largest makers of fish products. A label indicates to consumers that fish products come from fisheries certified as sustainable.

Challenge: There is not enough recognition of, and support for, locally managed marine protected areas.

Most governments do not fully appreciate the utility and relevance of local multiple-use MPAs, which save agency funds and foster sustainable resource use. There is also a tendency to view MPAs' technical and financial support needs in terms of time-specific projects. Yet it is unrealistic to expect that locally managed MPAs will become completely self-sustaining. They need to be linked in with technical and policy guidance, in ways that do not undermine the community's efforts. In some cases co-management can be an intermediate step in the path to full community responsibility.

Challenge: Some coastal marine areas need to be rehabilitated.

MPAs can have an important role in this process. Any disturbance in a protected area has been seen as inconsistent with MPA management objectives because of their focus on unaltered ecosystems (the elusive "pristine" condition). Though most PA managers would consider rehabilitation a valid management

response, it would be seen as a reaction, not a goal. Protection can facilitate the recovery of degraded areas, however. The multiple-use approach to MPAs provides the scope for rehabilitation zones. A specific focus on rehabilitation can be an appropriate part of MPA management.

Section 4
Conclusion

Several essential issues require urgent attention. Foremost among them is the slow recognition by the fisheries industry – despite the innovative ideas and actions of some fisheries scientists and managers – of planning and managing fisheries in an ecosystem context and using MPAs as a management tool. This shift is necessary if fisheries are to be made sustainable. The industry's primary international support agency, the FAO, must be more proactive in this respect.

In spite of the bitter experience of ecosystem degradation and species loss, the world fisheries and conservation communities continue to neglect remote marine ecosystems. These areas experience further degradation from unregulated fishing activity and from scientific exploration of submerged features. Conservation agendas need to be modified, and a greater effort has to be made to engage the fishing industry and oceanographic research interests in addressing these problems.

Coastal aquaculture has great potential to address the protein needs of expanding populations in developing countries. Instead it has wasted resources and created pollution and social deprivation on a large scale, while bringing massive profits to a few people. A fundamental mistake was made: ecological principles and the social context were ignored and a short-term "factory" approach was followed. The argument and methodology for sustainable coastal aquaculture needs to be presented in a practical context that demonstrates how MPAs can contribute. Economic and physical development planning needs to be suitably informed so as to support this.

MPAs also need to be seen as contributing to the rehabilitation and recovery of ecosystems and species in accordance with section 8 (f) of the Convention on Biological Diversity. This requires a broadening of thinking of the role of MPAs.

These issues need to be addressed through improved governance, with governments accepting and acting on their responsibility to ensure that natural resources are used sustainably, while facilitating greater public participation. The trend toward more community management of MPAs is an encouraging sign.

Section 5
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Endnotes

1. Fish catches from fished areas were monitored from 1976 to 2000, and the fishes in reserves and fished areas were censused underwater from 1983 to 1993. Fish abundance, biomass and species richness increased in the reserves when protected but decreased when protection ceased. Fish yields followed the same pattern, indicating export of adult fish from reserves to fished areas (Alcala, 2002).
2. In a major blow to global marine resource management, the U.S., after years of contributing positively to development of the treaty, allowed private enterprise interests to override global needs and remains outside the UNCLOS, in the company of North Korea, Israel, Libya and Niue.
3. Work under this program is to use and draw upon scientific, technical and technological knowledge of local and indigenous communities in keeping with the contents of Article 8 (j) of the Convention as well as community and user-based approaches. In the execution of the program of work, the involvement of relevant stakeholders including indigenous and local people is to be promoted.
4. This was achieved through the Antarctic Treaty, which provided the basis for an international arrangement for exploitation of the area's fisheries resources (Convention on the Conservation of Antarctic Living Marine Resources).
5. National Centre for Ecological Analysis and Synthesis, Santa Barbara, California.
6. Hviding and Baines, 1994, describe this for a community in the western Solomon Islands.
7. Such a strategy was needed to define the size of no-fishing zones in the Channel Islands National Marine Sanctuary near Santa Barbara, California.
8. Serious adverse social impacts have also arisen from coastal aquaculture. The fact that these are not addressed in this chapter must not be taken to suggest that they are unimportant.
9. Section 9.
10. Merely a statement hinting at conservation of marine biodiversity (9.1.3: States should conserve genetic diversity and maintain integrity of aquatic communities and ecosystems by appropriate management).
11. Enriched by additional mangrove plantings. Also, improvements to the ecological elements of brackish water pond culture are being developed at the Fisheries Research Institute, Maros, Sulawesi, Indonesia.
12. These differences are eloquently explained by Norse, 1993.
13. Rogers, 1994; Koslow, 1997.
14. Governance focuses on the interaction between the state, the marketplace, and civil society, and can be defined as the arrangements by which people and government interact to solve societal problems.
15. In the public interest, in some cases the state needs to do more to assert its primacy over dominating fishing interests.
16. Eight new genera have been described to date, and numerous new species.