A Synopsis of Information Relating to Marine Protected Areas in the Pacific Islands Region

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July 2001
Table 1. IUCN Protected Area Categories (IUCN 1994)

Table 2. Conditions favouring central and local management, based upon an analysis of 37 MPA projects in the Indo-Pacific (from Parks & Salafsky, in prep.)

Table 3. Indicators that communities perceive fisheries benefits from MPAs in Pacific Islands Countries.

Figure 1. Spectrum of MPA management models (From Kenchington, 1999).

1. Introduction and overview

The Strategic Action Programme for International Waters of the Pacific Islands Region (IWP) is a five-year project to build regional capacity for the management and sustainable use of marine resources. The IWP is funded by the Global Environment Facility (GEF), with parallel contributions by the Secretariat of the South Pacific Community (SPC), Forum Fisheries Agency (FFA), and South Pacific Regional Environment Programme (SPREP). It is being implemented by the United Nations Development Programme (UNDP) and executed by SPREP.

Among the high priority areas of activity identified by the IWP is the development of effective Marine Protected Areas (MPAs), which is of direct relevance to addressing two of the three overarching transboundary concerns identified in the IWP: the degradation of critical habitats and unsustainable resource use. Marine protected areas (MPAs) are widely promoted as a useful and even essential (e.g. Allison et al., 1998; Kelleher, 1999) tool for managing the marine environment, and there are a growing number of MPA initiatives in the Pacific Island region. Proponents of MPAs claim a range of benefits including conservation of fisheries stocks and species, maintenance of genetic diversity, protection of habitats and spawning stocks, reduction of growth overfishing, improved recruitment to fished stocks, simplified environmental management (e.g. reduced data collection needs in multi-species fisheries) and enforcement, insurance against management failure, enhancement of recovery from disturbance, provision of control areas for scientific research and assessment, and maintenance of genetic diversity and the genetic characteristics of fisheries stocks (Agardy, 2000; Lauck et al., 1998; Palumbi, 2001a; Roberts and Hawkins, 2000; Roberts & Polunin, 1993a; Salm et al., 2000; Traxler & Travis, 2000).

This report was commissioned by SPREP to review available information about MPAs, emphasising the fourteen Pacific Island Countries (PICs) participating in the IWP. Information included in the report includes the nature of and international experience with MPAs,

Cook Islands, Federated States of Micronesia (FSM), Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea (PNG), Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.
identification and status of MPAs in the participating countries, and general lessons learned about factors in the success and failure of MPA initiatives. Case studies from Polynesia, Micronesia, and Melanesia are presented, and resources available to those interested in the development of MPAs in the Pacific are identified. Finally, various types of project activities that could be undertaken under the IWP are outlined.

This report focuses on community-based and locally managed MPA initiatives in the Pacific. Community participation in coastal resource management and conservation, widely accepted as essential to the success of MPAs (Gubbay, 1995a; Kelleher, 1999; Salm et al., 2000; Wells & White, 1995; White et al., 1994), is a more important factor in the capacity to manage MPAs than a country’s development status (Ticco, 1995). It is particularly important in PICs because of the high degree of local control over marine and coastal resources (see section 2). The report does not attempt to repeat recent literature reviews of MPAs (NRC, 2001; Palumbi, 2001a; Polunin, in press; Rowley, 1994) or manuals for practitioners (Gubbay, 1995a; Kelleher, 1999; King & Lambeth, 2000; Roberts and Hawkins, 2000; Salm et al., 2000), which readers may consult for additional detail.

2. The Pacific Islands regional context for MPAs

The Pacific Islands context for environmental management and sustainable development has been reviewed elsewhere (e.g., SPREP, 1992; RoundTable, 1998; UNEP, 1999). Several aspects are directly relevant to the development of effective community-based MPAs.

The region’s 370 high islands and more than 2200 low and atoll islands (Wright, 1993a), scattered over an area of some 30 million km², are geographically remote not only from the rest of the world but also from each other, making transportation and communications difficult and expensive. The small land mass and on the small islands poor agricultural soils create a very high dependence upon marine resources, to the extent that the use of marine resources often represents essentially the only real alternative both to meet subsistence needs and for economic development. Dependence upon marine resources is highest on the small atoll islands of Micronesia (Preston, 1997). Even in the relatively land-rich countries of Polynesia and Melanesia, however, coastal communities often have a high dependence upon marine resources because (1) even in these countries many coastal villages are on small islands and (2) even on the large islands fishing communities may lack access to good agricultural land (Dalzell et al., 1996).

There is a high reliance on subsistence lifestyles, especially in rural areas. About 80% of the total inshore fisheries catch in the region is used for subsistence, and the proportion is higher on smaller and more remote islands (Dalzell, 1993; Dalzell et al., 1996). The much smaller commercial inshore catch is almost entirely by artisanal fishers, for whom fishing often represents the only opportunity to participate in the cash economy. Except for bêche-de-mer and a few other invertebrate species harvested for their shells (trochus, green snail, and pearl shell) artisanal fisheries are also predominantly for domestic consumption. The importance of subsistence and artisanal coastal fisheries is magnified by the high nutritional value of local
seafood relative to available imported foods, and many Pacific Island governments actively encourage people to eat more fish (King & Lambeth, 2000; Preston, 1997).

In urban areas there are more and more diverse opportunities for formal employment and participation in the cash economy. There usually remains a portion of the population dependent upon subsistence fishing at least as a supplement. Artisanal inshore fisheries are typically more intense near urban markets, often resulting in overexploitation (Johannes, 1998a; Wright, 1993b). Commonly there are user conflicts between traditional inhabitants of the area and outsiders who have moved to the city. Some of the latter are often unable to find satisfactory unemployment and are forced to resort to fishing to as a supplemental or sole livelihood. Broad-scale threats such as pollution, watershed degradation, coastal construction, and shipping activity also tend to be more serious, with the result that environmental degradation is often worst around urban centres.

Countries in the region have experienced high population growth averaging 2.2% annually; only Niue has had negative population growth (UNEP, 1999). Economic growth has not kept pace, so that GDP per capita is generally declining and there is evidence of declining standards of living as indicated by conventional measures (UNEP, 1999). Nonetheless, the availability of marine and other natural resources and traditional resource management and social support systems still allow rural Pacific Islanders to enjoy a high degree of “subsistence affluence” (Preston, 1997).

There is increasing concern, however, that this subsistence affluence is under threat. Population growth, the advent of the cash economy, and the introduction of more efficient modern fishing gears all place increased pressure on living marine resources. Destructive fishing methods (Veitayaki et al., 1995), reef and beach mining, mangrove deforestation, solid waste dumping, and other practices degrade both habitats and fisheries. Land-based activities that increase sedimentation, nutrient input, and other forms of pollution are also a concern at both the governmental and village levels. Priority threats to coastal habitats and resources identified in recent regional assessments (RoundTable, 1998; UNEP, 1999) include:

- over-exploitation of inshore fisheries
- destructive fishing methods
- loss of mangroves and seagrass beds due to deforestation, reclamation, and other activities
- destruction of fringing reefs and beaches from sand and gravel mining, dredging, coastal construction, blasting of reef passages, and ship groundings
- eutrophication from sewage and agricultural fertilisers
- sedimentation resulting from deforestation and other causes
- solid waste dumping, especially in urban areas
- chemical pollution from mines and industrial facilities

Although PIC governments recognise these problems, the incorporation of coastal management and planning processes and issues into national development planning is generally weak. Where it exists it tends not to be implemented because of a lack of mechanisms for communication.
among government departments, political decision-makers, institutions and organizations outside the public sector, and communities. Furthermore, the combination of high population growth and low economic growth makes it difficult for Pacific Islands governments to keep up with basic human development needs such as health and education. As a result, the human and financial resources available to fisheries, environment, and related agencies are severely constrained, and in the case of fisheries agencies the available resources are usually concentrated on oceanic fisheries and a few inshore fisheries with high export potential almost to the exclusion of subsistence and artisanal fisheries (Dalzell et al., 1996; Preston, 1997).

Pacific reef fisheries exploit a very large number of finfish species with a wide variety of gears (Dalzell et al., 1996; Johannes, 1998a; Wright, 1993b; Wright & Richards, 1985), characteristics that make them inherently difficult to manage (Munro & Fakahau, 1993a). Large predatory species, especially groupers, snappers, and emperors, are prone to depletion because of their high catchability and the fact that fishers can maintain satisfactory catch rates of other species when these species have been depleted (Munro & Fakahau, 1993b; Russ, 1991). Overfishing is also a problem in export fisheries for sedentary invertebrates, primarily trochus, bêche-de-mer, green snail, pearl shell, and giant clam (Dalzell et al., 1996). Large predatory reef fishes tend to be site-attached, as of course are sedentary invertebrates, a characteristic which increases the prospects for their protection within small fishery reserves (see section 4).

The low capacity of government agencies, emphasis on offshore fisheries in government policies, high number of fishers in highly dispersed locations, the multi-species, multi-use nature of the fisheries, increasing populations, and commercialisation and commoditisation of inshore fisheries have resulted in the general failure of conventional, centralised fisheries management in the Pacific (Adams, 1998; Dalzell et al., 1996; Johannes, 1998b; MacKay, unpubl.; MRAG, 1999). This does not mean that coastal fisheries have gone unmanaged (Douman, 1993; Johannes, 1998a, b; Ruddle, 1998). Rather, coastal resources are under the legally recognised or de facto local control of local communities. Most places have a history of traditional resource management systems based upon the private, group ownership of marine areas under customary marine tenure (CMT). The implications of traditional systems and CMT for marine resource management and conservation in the Pacific have been discussed extensively elsewhere (e.g., Adams, 1998; Baines, 1989, 1995; Douman, 1993; Hviding & Ruddle, 1991; Johannes, 1978, 1982a, 1989, 1998; MRAG, 1999; Polumin, 1984; Ruddle, 1994, 1998; Wright, 1985) and are diverse, complex, and highly site-dependent, too much so to review here. Several points of particular relevance to MPA development, however, may be made.

Although traditional management systems in the Pacific have been weakened (Johannes, 1978; Ruddle, 1993; Chatterton, 1999), in most places they continue to function at some level and are the root realistic basis for managing marine resources. Traditional tabus on fishing in certain areas create temporary reserves, and as such are the traditional measure of most direct relevance to MPAs. However, traditional systems employ a range of other measures (Johannes, 1978; MRAG, 1999) that when applied to a defined area represent a form of community-based MPA management. Most recently established community-based MPAs are based on traditional systems and often combine a core tabu area within the larger customary fishing area that is under
other management rules.

The private ownership of marine areas and the resources they contain under CMT, whether recognised in law or not, makes the customary holdings of individual villages or groups the natural units for management and MPAs establishment. These holdings are often fairly small, and the high dependence upon marine resources means that communities will often be able to set aside only a small portion of their fishing grounds as no-take areas. Thus, community-based MPAs in the Pacific Islands will generally be quite small, on the order of a few km² or less. There are, of course, exceptions. In Palau communities have declared entire atolls as fisheries reserves (Smith et al., 2001), and communities in, for example, Vansatu (Johannes, 1994, 1998a) and Cook Islands (I. Evans, pers. comm.) have declared tabus over their entire customary fishing grounds. This will generally be possible only when a community can gain access to areas held by other communities, which is more likely for subsistence than artisanal fishing (e.g., Cooke & Moce, 1995). It may also disproportionately affect some members of the community. King & Fa'asili (1999a) note, for example, that placing a large proportion of a community's fishing area in a reserve would prevent women from gleaning reef flats while young men could access offshore grounds.

Various authors have noted that CMT may serve political rather than conservation functions, namely resolving resource access disputes between competing groups, that preventing access by outsiders is a common motivation for communities to establish MPAs, that modern assertions of CMT may be made opportunistically in the expectation of future benefits such as commercial royalties, and that disputes over CMT boundaries are a common reason for the failure of community-based MPAs (Aswani, 1997; Hviding, 1998; Lokani & Seeto, in prep.; Mancle, in prep., MRAG, 1999; Polunin, 1984; Ruddle, 1998; Smith et al., 2001; Whyte, et al., 1998). Clearly, CMT is a central issue for the future of MPAs in the Pacific.

3. Marine Protected Areas: definitions and objectives

Different authors and organisations use a variety of poorly and inconsistently defined terms to refer to the assorted types of MPAs (Agardy, 2000). One widely used definition is that of the IUCN, which defines an MPA as "Any area of intertidal or subtidal terrain, together with its overlying waters and associated flora, fauna, historical and cultural features, which has been reserved by legislation or other effective means to protect part of all of the enclosed **[this is a placeholder for the definition]**" (Kelleher, 1999). Under this broad definition any defined marine area subject to some form of resource management intervention might be considered an MPA. This broad definition has limited utility for the specific purposes of fisheries management, because under the broad IUCN definition any fishing ground subject to any form of fisheries management might be considered a form of MPA. In fisheries management the core debate relative to MPAs centres on evaluating the desirability of a specific type of MPA, namely harvest refugia or "no-take reserves" (NTRs), i.e. areas where the harvest of one or more species is entirely prohibited.

In the open literature the term "traditional fisheries management" is often used to refer to
as an alternative to conventional fisheries management. Thus, the fisheries management literature explicitly or implicitly tends to reserve the term “marine protected area” to refer to NTRs, among the most restrictive form of MPA. At the same time, there has been opposition in some circles to recognizing NTRs established for fishery management as MPAs (Kelleher, 1999), which is difficult to justify not only in general but particularly in the Pacific where fisheries enhancement is usually the primary local motivation for establishing an MPA.

In this report we use the terms “marine protected area” (MPA) in the broadest sense of the IUCN definition, except that fishing grounds subject only to conventional fisheries management and no other specifically area-based conservation or resource management regimes are not treated as MPAs. We use the term “No-take reserve” (NTR) to refer to areas where the extractive use of marine resources is banned. Unless specifically stated otherwise, the ban on extractive use is assumed to apply to all living marine resources. MPAs in which some fishing and other uses are allowed are usually called “multiple use MPAs”.

3.1 Objectives of MPAs

MPAs have been established in various parts of the world for reasons that range from providing recreational areas for the general public to totally protecting pristine environments from human influence. The design of MPAs depends critically on their objectives, and they are often categorised accordingly. IUCN defines six categories of protected area based upon the objectives of management (Table 1), although these may not encompass some forms of MPA, for example small networks of community-based fisheries reserves (King & Fa’aasili, 1998, 1999a, 1999b). In practice, most MPAs are established for one of two reasons: to restore, maintain, or enhance fisheries production or to conserve biological diversity and ecosystem function (Kelleher, 1999). Palumbi (2001a) recognised a third general objective, that of protecting some special feature of particular ecological or cultural importance, but in most cases this constitutes a subset of the biological conservation objective.

The two objectives of fisheries enhancement and nature conservation are sometimes viewed as conflicting, in particular biodiversity MPAs are often opposed on the grounds that they will reduce fisheries yields. The two goals are not, however, inherently contradictory. The maintenance of healthy habitats is generally beneficial to fisheries and maintaining healthy stocks of target species will generally have ecological benefits.

Nonetheless, the benefits of an MPA will be enhanced if it can achieve multiple objectives. This the suite of measures such as minimum sizes and gear, harvest, or effort restrictions that have been widely used by fisheries management agencies. We refer to such measures as Aconventional fisheries management@ and reserve the term “traditional fisheries management” to refer to practices such as those described by Johannes (1978) that have long been used in indigenous Pacific Islands societies to control access to or the harvest of living marine resources.
is in fact the case for many community-based MPAs in the Pacific Islands region, which often have the dual objectives of enhancing local fisheries while conserving biodiversity and ecosystem integrity. These objectives, however, may have different relative importance to the various parties involved. The communities themselves, and where they are involved fisheries management authorities, are usually interested in MPAs primarily as a means to improve fisheries, though they often recognise the ecological benefits provided by healthy habitats. Non-governmental organisations, international donors, and environment agencies often place more emphasis on biodiversity and ecosystem conservation, while recognising the contributions of healthy coastal fisheries to sustainable development. Similarly, communities are most interested in local benefits while outside organisations have a tendency to focus on national, regional, or global benefits. For example, the assessment of "conservation value", a common criterion for project site selection, is usually made on the basis of national, regional, or global patterns of biodiversity or species population status, considerations that are largely irrelevant to local communities.

There is, unquestionably, sufficient common ground to allow productive partnerships between communities and supporting organisations. External players should, however, both make their objectives transparent to communities and recognise that long-term success depends on meeting community objectives (White et al., 1994; Whyte et al., 1998)

The objectives of MPAs also vary depending on whether benefits are expected inside or outside the protected area (Palumbi, 2001a). NTRs established for fisheries management have the primary objective of improving catches outside the reserve, since any increases in the size or abundance of target species within the reserve are by definition unavailable to the fishery. Unlike fisheries reserves, the objectives of ecosystem MPAs may relate to benefits either inside or outside MPA boundaries. Examples of benefits that might be derived within MPAs include protecting or critical habitat or enhancing attractiveness to tourists. Benefits that might accrue outside MPA boundaries, often referred to as "regional benefits", include maintaining regional biodiversity and broad-scale ecosystem functions.

For Pacific Island communities the direct environmental benefits of setting up MPAs, and NTRs in particular, are most likely to result from enhancing surrounding fisheries or tourism. Communities may, however, have motives for establishing MPAs other than the expected environmental benefits (MRAG, 1999). Other motives may include conflict reduction, social benefits of reinstating custom and traditional authority, exclusion of outsiders and reinforcement of local control, and expectations that goods and services will be attached to MPA establishment (Aswani, 1997; King & Fa'asili, 1999b; Lokani & Scoet, in prep.; Polunin, 1984; Smith et al., 2001; Whyte et al., 1998). Establishing an MPA may conserve resources regardless of the community's motivation, but this is not automatically so (MRAG, 1999; Polunin, 1984).

3.2 General Models of MPA Management

No two MPAs are exactly alike in the details of how they are managed, but there are three general models of MPA management. Centralised management involves a "top-down" approach where a central authority, usually a government agency, is responsible for MPA planning,
management, and enforcement. Community-based management is a "bottom up" approach where local communities set the objectives, establish the MPA, and manage it. Collaborative or co-management lies somewhere in between, with communities taking responsibility for some aspects of management while other aspects are the responsibility of government agencies or other external organisations. Co-management and community-based management can be considered together as "local management" (Parks et al., in prep.)

These three general models represent a spectrum of management approaches rather than discrete categories (Fig. 1). Public consultation is almost universally recognised as necessary to the success of even centrally managed MPAs (Gubday, 1995b; Kelleher, 1999; Salm et al. 2000; Wells & White, 1995). The spectrum of management models varies not just in the extent to which communities are consulted or informed, but more importantly in how much actual authority and responsibility they have for managing an area.

Table 2 shows the conditions that favour central or local management, based on an analysis of 37 MPA projects in the Asia-Pacific region (Parks & Salafsky, in prep.). Generally similar conclusions have been reached by other authors (e.g., Wells & White, 1995; White et al., 1994). Conditions in the Pacific Islands region clearly favour local management, and community-based approaches have been increasingly recognised as appropriate for marine resource management and conservation in Pacific Islands countries (e.g., Adams, 1998; Adams & Ledua, 1997; Doulman, 1993; Johannes, 1998a; King & Lambeth, 2000; Munro & Fakahua, 1993a). The overwhelming experience in the region is that local management approaches are essential to the success of conservation efforts in general and protected areas in particular in the Pacific Islands region. This has been formally endorsed by Pacific Islands governments in the Action Strategy for Nature Conservation in the Pacific Islands region for both 1994-1998 and 1998-2002 (SPREP, 1994; RoundTable, 1998) and in the IWP. This report therefore focuses on locally managed MPAs.

Community participation and ownership are central to all forms of local management (Beltran, 2000; Kelleher, 1999; King & Lambeth, 2000), but the appropriate roles and responsibilities of central government and other external agencies, i.e. the degree of co-management, will vary depending upon similar considerations to those shown in Table 2. In general, fully community-based MPAs work best where communities are small (Pollnac, in prep.) and cohesive and have a close dependence upon marine resources, and where the MPA itself is small and the environmental threats direct and internal (Wells & White, 1995), for example overexploitation and the use of destructive fishing methods by members of the community. The need for government and other external involvement increase with increasing community size and diversity, with increasing size and complexity of the MPA and the ecological processes being protected, and with increasing importance of threats from outside the community.

As described below, Pacific Island communities usually need support to establish and maintain effective MPAs. Governmental and/or other external agencies have a service role in providing information, advice, resources, and other assistance even in fully community-based MPAs where all responsibility and authority for planning, implementation, and enforcement rests with the
community (Johannes, 1999a; King & Lambeth, 2000; MRAG, 1999; Parks et al., in prep.)

4. MPAs in theory and practice

As noted above, MPAs are claimed to produce a variety of benefits. Theory and circumstantial evidence provide considerable support for these claims, but they have not been rigorously tested (Palumbi, 2001a). Of the well over 1000 MPAs that have been established, Crowder et al. (2000) found only 28 whose biological effects have been scientifically evaluated in peer-reviewed literature; Halpern (in press.), who included grey literature, found 69 quantitative studies. None provides unequivocal evidence that an MPA enhanced adjacent fisheries yields. Some studies have not collected baseline data prior to MPA establishment, many have not monitored biological changes outside the MPA, few have estimated fisheries yields, and we know of none that have monitored sites outside the expected sphere of influence of the MPA to control for broad-scale effects such as climate or recruitment variability. Rigorous testing of MPA effects is logistically difficult and requires sophisticated experimental designs (Halpern, in press; Palumbi, 2001a), and is rarely a priority objective of MPA management.

MPAs also have certain disadvantages (NRC, 2001). The establishment of an MPA may create inequities by displacing some users with little impact upon others. This is a particular concern in the Pacific because restricting the use of any given area is likely to principally affect its customary owners and because different sectors of a group, e.g. women, old people, young men, may use different areas within the group’s customary fishing area. Even if the effects of MPAs are beneficial in the long term their establishment will involve short-term losses to resource users. Restricting uses within an MPA may divert pressure to areas outside the MPA, intensifying impacts there. This is a common objection to the creation of NTRs for fisheries management. To protect some species reserves would have to be impractically large. Finally, in general the effectiveness of MPAs usually relies upon complementary management measures taken outside the protected area. While this is not necessarily a bad thing it can be argued that if such complementary measures could be made effective MPAs would not be necessary.

4.1 No-take reserves and fisheries management

Although other forms of MPA have potential to enhance fisheries, for example by maintaining critical habitat, it is NTRs that are of most interest to fisheries managers. Like conventional fisheries management measures the objective of NTRs is to release a portion of the target population from fishing mortality. NTRs are of little direct benefit to fisheries unless stocks are overexploited (Holland & Brazee, 1996; Sladek Nowlis & Roberts, 1997; Sladek Nowlis, 2000) - by definition underexploited or optimally exploited stocks do not require management intervention to reduce fishing mortality - although there may be indirect benefits such as the protection of habitat or ecological processes (see 4.2).

The one effect of MPAs that is widely supported by scientific data, both from the Pacific (Evans in prep., Lincoln Smith et al., 2001; MacKay, unpubl.; MRAG, 1999; Pontia et al., 1999; Smith
et al., 2001; Tawake & Aaltersberg, in prep.; Wantiez, et al. 1997) and elsewhere (Halpern, in press; NRC, 2001; Palumbi, 2001a; Polunin, in press; Roberts & Hawkins, 2000), is an increase in the size, abundance, and to a lesser extent species richness of exploited species within NTRs. Abundance within NTRs may increase by as much as 15 times (Stone & Ray, 1996) and typically at least doubles (Roberts & Hawkins, 2000). On average, mean size increases by about 30%, biomass by 250%, and species richness by 30% (Roberts & Hawkins, 2000). Site-attached and heavily exploited species, in particular large, predatory reef fishes (especially groupers, snappers, and emperors) and sedentary invertebrates, are most likely to exhibit such increases. Such increases are commonly observed even in small reserves on the order of 1 km², and even in reserves on the order of 0.1 km² (Halpern et al., in press; Jennings, 1998). The increase is often seen soon after NTR establishment, within 1-3 years or even less, but greater gains may be achieved by longer periods of protection. Russ & Alcala (1996a) observed a linear increase in the abundance and species richness of large predatory reef fishes in an NTR at Apo Island, Philippines, over a period of 12 years, with abundance after 12 years of protection nearly four times that after 3 years. Pacific Islanders have long been aware of the rapid buildup of biomass in NTRs: harvest tabus were widely used to allow stock buildup in anticipation of communal harvests for special occasions such as village feasts.

Such increases are not universal, however, at least on short time scales. Over 3-year time scales some species of exploited invertebrates failed to recover in NTRs in Palau and the Solomon Islands, probably because of recruitment failure, although other species did recover (Lincoln-Smith et al., 2001; Smith et al., 2001).

4.1.1 Seeding and Spillover

To benefit fisheries any increase in target species biomass that occurs within an NTR must result in the export of individuals of target species from the reserve to the fishing ground. The objectives, design, and function of NTRs depend to a large extent upon the life history stage at which individuals are exported. One possibility is "seeding", in which the NTR exports eggs and/or larvae to enhance recruitment in surrounding areas. The other is "spillover", in which post-recruitment individuals (juveniles and/or adults) move out of the NTR. "Seeding" and "spillover" are sometimes used interchangeably, but the distinction has important implications for MPA design and function.

NTRs are thought to be especially beneficial in seeding because there is often an exponential relationship between size and fecundity, so that the increased size of target species that usually occurs inside NTRs results in a disproportionate increase in reproductive output. Egg production from Nassau grouper per unit area, estimated from size-frequency data, was 6 times higher in an NTR than adjacent fished areas, for example (Sluka et al.; 1997). Thus, the protection of relatively few large spawners within NTRs may help sustain populations as a whole. The benefits may be greater when spawning success is a function of population density (Sánchez Lizaso et al., 2000), for example in fishes that form spawning aggregations or sessile invertebrates such as giant clams, for which NTRs that protect broodstock may be essential to reseeding adjacent areas (e.g., Bell, 1999).
This increased reproductive output will benefit a fishery only if recruitment to the fishery is dependent upon larval supply and larvae from the NTR are transported to and recruit in the fishing grounds. For most fisheries, and certainly in the Pacific Islands, there is little information on either larval limitation or larval distribution patterns, so the extent to which these conditions apply is not known. A few field studies do provide evidence for a seeding benefit from NTRs. Distributions of Queen conch larvae in the Bahamas indicate that the Exuma Cay NTR acts as a larval source for fished areas downstream (Chiappeo & Sullivan Sealy, 2000; Stoner & Ray, 1996). Following creation of the Verata NTR in Fiji the abundance of small individuals of the bivalve A nada r a antiquata increased in both the reserve and fished areas, which is consistent with a seeding effect (Tawake & Aulbersberg, in prep.; Tawake et al., in review).

Spillover of juveniles and adults from NTRs into surrounding areas may be either density-independent or density dependent. Density-independent spillover occurs as individuals regularly move in and out of the reserve in foraging and other daily activities or in periodic movements such as migration to spawning sites. This will generally not benefit fisheries. It essentially extends fishing mortality inside the reserve boundary, making the NTR effectively smaller, since individuals can still be caught even if their home ranges are centered within the reserve (Bohnsack, 2000, Walters, 2000). It reduces the buildup of biomass inside the reserve, and therefore seeding. This depends on the species’ vulnerability to fishing and mobility relative to the size of the reserve (Kramer & Chapman, 1999; Rollley, 1994; Walters, 2000). Unless NTRs are large, density-independent spillover will negate any protective effects for highly mobile species such as coastal pelagics (Bohnsack, 2000). Much smaller NTRs can be effective for site-attached species. This includes large predatory reef fishes and sedentary invertebrates, the species most likely to be overexploited in Pacific Islands coastal fisheries. Small NTRs will not, however, provide effective protection even for normally site-attached species if a high proportion of a population periodically moves outside the reserve and is targeted by fishers (Sladek Nowlis & Roberts, 1999). This is why the importance of including reef fish spawning aggregation sites is increasingly recognized (Chiappeo & Sullivan Sealy, 2000; FSM, 2001; Johannes, 1998b; Sánchez Lisazo et al., 2000; Smith et al., 2001).

In density-dependent spillover individuals move out of the NTR to the fishing ground in response to population increase and resultant competition for resources within the NTR. A dense core population remains inside the NTR that can continue to provide emigrants to fished areas. Density-dependent spillover can enhance fisheries in which there is growth overfishing because emigrants from the NTR enter the fishery at a larger size. Furthermore, benefits from seeding are not negated because a spawning stock of large individuals should remain inside the NTR, assuming that large adults are less likely to emigrate than smaller individuals. Thus, it is density-dependent spillover that has the potential to benefit adjacent fisheries, but it will not occur until after the buildup of biomass within the NTR.

Tagging studies, decreasing gradients in target species abundance moving away from NTRs, and the fact that fishers often redirect effort to reserve boundaries show that spillover from NTRs
occurs (Bohnnsack, 1998; Kramer & Chapman, 1999; Raktin & Kramer, 1996; Roberts & Hawkins, 2000; Sluka et al., 1997), but evidence that it is density-dependent is equivocal (Sánchez Lizaso et al., 2000). Spillover may be minimal highly site-attached fishes (Holland et al., 1993; Tupper & Juanes, 1999), and will obviously not occur in sessile invertebrates such as giant clams and precious corals. Habitat discontinuities such as areas of soft bottom between reefs may act as barriers to spillover of mobile species. The best field evidence for density-dependent spillover is correlation of biomass within and outside the NTR at Apo Island (Russ & Alcala, 1996a). This occurred only in the 9th year of protection and only within 300m of the reserve boundary. Although fishes commonly concentrate effort near NTR boundaries there is little evidence that higher catch rates there compensate for the loss of fishing grounds.

Modelling studies indicate that seeding is more likely to be effective than spillover in enhancing surrounding fisheries, and that the benefits of spillover will occur primarily near reserve boundaries and when fishing mortality outside the reserve is high (Bohnnsack, 2000; DeMartini, 1993; Holland & Brazee, 1996; Man et al., 1995; Polacheck, 1990). The relative benefits of spillover vs. seeding depend, however, upon the spawning stock-biomass relationship, target species mobility, degree and type of overfishing, level of juvenile fishing mortality, and other factors.

4.1.2 Evidence that NTRs enhance fisheries yields

Quantitative evidence for or against a fisheries benefit from NTRs is very limited. Polunin (in press) considers it inconclusive, although a consensus statement recently released by a large group of leading marine scientists says that the weight of the evidence favours a benefit (Consensus, 2001). Increased biomass of large predatory fishes (Carangidae, Lethrinidae, Lutjanidae, Serranidae) outside the Apo and Sumilon Island reserves in the Philippines correlated with increases within the reserves (Alcala, 1988; Russ & Alcala, 1996a, b). Actual catch rates were not measured but interviews with fishers indicated that yields also increased (Russ & Alcala, 1996a). McClanahan & Kaunda-Arara (1996) found that CPUE approximately doubled within three years of closure of 65% of a coral-reef fishing ground in Kenya. Total yield from the fishery decreased by nearly half, however, because fishing effort declined in proportion to the area closed (i.e. by about 65%) as fishers moved to other grounds or occupations, options that are not often available to Pacific Island fishers. In another Kenyan study, Watson et al. (1997) found increased reef fishery yields adjacent to one protected area but not another, in which there was evidence of poaching.

Tawake & Aalbersberg (in prep.) report from Fiji not only that abundances of several invertebrate species increased in harvest areas following the protection of a seagrass area by traditional tabu but that village women reported CPUE increases of as much as 500% for the bivalve Anadara antiquata and increased fishing incomes of 20%. These benefits may not arise solely from the NTR because other measures such as a ban on destructive fishing methods were applied to the fishing grounds.

The positive response of fishing communities provides indirect evidence that NTRs enhance
yields. In many places communities have decided to establish an NTR after hearing positive reports from a neighboring community that has done so (Table 3). It is also common for communities to extend the length of harvest tabus or make the rules governing NTRs more restrictive. At Verata, Fiji, for example, tabus on seagrass and mangrove areas were initially species-specific. The harvest bans for the tabu areas were extended to all species when the communities involved decided that the tabus on harvesting individual species were not effective because fishers were usually non-selective, retaining essentially everything that was caught (Tewaki & Aalbersberg, in prep.)

4.1.3 NTRs vs conventional fisheries management

Models indicate that NTRs can increase production under the right conditions but are unlikely to do a great deal better in optimising fisheries yields than effectively implemented conventional fisheries management, and under some conditions will result in lower yields unless measures are taken to prevent the displacement of effort into the adjacent fishing ground, i.e. unless total effort in the fishery is reduced (e.g., Bohnsack, 2000; Hannesson, 1998; Hastings & Botsford, 1999; Holland and Brazee, 1996; Mace et al., 1995; Sladek Nowlis, 2000; Sladek Nowlis & Roberts, 1997, 1999). Other conditions that favoured NTRs as an alternative to conventional management in the above models include a high level of exploitation prior to NTR establishment, inclusion of a spawning stock biomass - recruitment relationship, low target species mobility, Allee effects (reduced fitness, in this case spawning success, at low density) and the absence of juvenile fishing mortality.

These considerations are beside the point. Effective conventional fisheries management has not been implemented in Pacific Islands coastal fisheries and given the limited capacity of governments and the difficulty of centrally managing highly dispersed, multi-use, multi-gear fisheries almost certainly never will be (Johannes, 19988). The advantage of NTRs is that they are probably easier to implement and enforce than conventional fisheries management. Often established by traditional tabu (see Annex 4), they are easily understood by both traditional leaders and the general community, and therefore more likely to gain community support.

It is often asserted that reserve design is less data-dependent than conventional fisheries management. In fact, optimal reserve design requires information that is every bit as difficult to obtain, and sub-optimal design is not without risk (see section 4.4). Nonetheless, the risk that catastrophic fisheries failure will result from inaccurate or inadequate information is almost certainly much less than in conventional management. Models suggest that MPAs act as insurance against the failure of conventional management, can prevent stock collapse at very high levels of overexploitation, and can stabilise annual catches in fluctuating environments by maintaining a richer age structure (Dahlgren & Sobel, 2000; Hall, 1998; Holland & Brazee, 1996; Lauck et al., 1998; Quinn et al., 1993; Sladek Nowlis & Roberts, 1999). These effects may explain why fisheries in which there is some natural habitat refuge from fishing mortality tend to be more robust (Dugan & Davies, 1993). Even very small NTRs (1% of the fishing ground) can theoretically reduce directional selection for characteristics such as small size and slow growth that may be selected for by fishing (Trexler & Travis, 2000), and a 20% NTR can eliminate it entirely. It is unlikely that this is a significant issue in Pacific Islands coastal
4.2 Conservation MPAs

There is broad scientific consensus that MPAs are valuable tools for nature conservation (Concensus, 2001; NRC, 2001; Roberts & Hawkins, 2000), although quantitative evidence of this is lacking (Palmubli, 2001a; Polunin, in press). The existence of ecological benefits within MPAs appears straightforward: the recovery of heavily exploited populations within NTRs, for example, has conservation value in and of itself, and increases of non-target species have occasionally been observed inside NTRs (e.g., Russ & Alcala, 1989; Tawake et al., in review).

The protection of target stocks within NTRs may also have broader ecological benefits to the extent that the selective removal of certain species alters ecological processes such as trophic cascades or competitive relationships. Sluka et al. (1996), for example, found that the increased abundance of heavily exploited Nassau grouper in an NTR in the Bahamas correlated with reduced abundance of smaller grouper species. In Kenya, a population increase in an urchin released from predation by overexploitation of a triggerfish led to increased reef bioerosion and resultant decreases in topographic complexity, algal cover, and fish diversity relative to an NTR (McClanahan, 1994; McClanahan & Arthur, 2001). Conversely Jennings & Polunin (1997) found that the removal of predatory reef fishes in Fiji had no effect on prey biomass or diversity. The ecological relationships among coastal marine species in the Pacific Islands are far too poorly understood to predict the possible effects of MPAs upon them.

MPAs that reduce or eliminate destructive practices such as blast fishing, destructive trawling, excessive mangrove cutting, or diver damage will clearly benefit habitat quality and thus presumably biodiversity, fisheries, and other values. No-use zones on Red Sea reefs have less coral damage and higher coral recruitment than adjacent reefs subject to intense dive tourism, for example (Epstein et al., 1999). Where damage has already occurred, the time scale for recovery will be longer than for target species because of the longer recovery times for habitat-creating species such as corals and mangroves (Palmubli, 2001a).

MPAs are often established to achieve broader ecosystem benefits outside the MPA boundaries by providing larval sources, protecting vulnerable life history stages or critical areas such as nursery or spawning grounds, or preserving ecosystem functions, for example the sediment trapping function of mangroves. The only direct evidence for such benefits other than for exploited fisheries stocks is the recovery of some sea turtle populations following the protection of nesting sites, but again studies are almost non-existent (Palmubli, 2001a).

4.3 Ancillary benefits of MPAs

Effective MPAs provide benefits not directly related to fisheries or conservation (Agardy, in prep.) Multiple-use MPAs reduce use conflicts. Maintaining relatively undisturbed natural environments has value in education and scientific research. MPAs are often established to enhance tourism. The large predatory fishes that typically build up inside NTRs, for example,
Marine habitats may also be linked by source-sink relationships whereby some areas have net production of larvae while others have net settlement. In marine systems these relationships may be determined largely by location relative to prevailing currents. Complex local hydrodynamics might also determine sources and sinks at fine scales (Stockhausen et al., 2000). Habitat quality may also be a determining factor: habitats presumably favor increased growth and reproduction and are therefore likely to act as larval sources, and low-quality habitats as sinks (Crowder et al., 2000). Increased habitat quality within MPAs could enhance their status as sinks. Conversely, density-dependent processes could reduce it. Increased abundance of piscivorous grants in a Barbados NTR, for example, led to increased predation on new recruits (Tupper & Juanes, 1999).

The effectiveness of MPAs as larval source/sinks also depends upon whether populations are limited by larval supply and recruitment, or by post-settlement, density-dependent processes such predation and competition. Caley et al. (1996) conclude on the basis of demographic models that all open marine populations must be influenced by recruitment to some extent. To what extent, however, remains unknown, as does the degree of density dependence (Sánchez Lizaso et al., 2000).

Larval and recruitment dynamics and population regulation are very poorly known and difficult to study, and will vary widely among species. We are as unlikely to have the information needed to design biologically optimal reserves as we are to have the data needed to design optimal fisheries regulations. Furthermore, socioeconomic factors will be at least as important to the success of MPAs as biological ones. It has therefore been suggested that attempts to optimise MPA design be abandoned, or at least that MPA establishment not be delayed pending further study, and that instead reserves be established more or less opportunistically based on available information wherever possible (Crowder et al., 2000; Johannes, 1998b; Roberts, 2000; Stockhausen et al., 2000). This is probably the only realistic approach in PICs, but it means that an MPA design that works well at one location may not work at all when replicated at another (Stockhausen et al., 2000).

The establishment of MPAs in the absence of detailed scientific information is not without risk. Ineffective MPAs impose the opportunity costs of losing resource use and development opportunities. They are also likely to alienate communities. Even beneficial MPAs involve short term costs from the loss or restriction of use of the area. While optimal MPA design is unrealistic, application of some basic principles is likely to enhance their success.

4.4.2 Size and Location of MPAs

As noted in section 4.1 even very small NTRs allow the recovery of sessile and site-attached species. Considerably larger MPAs are probably needed for biodiversity and fisheries conservation. A somewhat arbitrary figure that 20% of coastal areas should be protected has often been recommended as a target for governments (FSM, 2001; Plan Development Team,
Fisheries models generally suggest that 20-30% of fishing grounds need to be in NTRs to enhance yields and 30-60% for risk reduction, although the figures vary widely up to 80% (NRC, 2001). For habitat and biodiversity conservation studies suggest that a proportion in the range 10-35% is appropriate (NRC, 2001). These proportions may, however, be overestimates because most models look address only fishing mortality and do not look at the benefits of protecting critical areas such as spawning and nursery grounds (NRC, 2001).

In practice, MPA and NTR size in PICs will in most cases be determined by social factors such as the size of a community's CMT area, dependence upon marine resources, and the availability of alternative sources of food and income. Where alternatives exist, communities may wish to make their entire sea area an NTR (Evans, in prep.; King & Fa'asili, 1999a; Johannes, 1998a), but this is probably unlikely in most cases and as noted by King & Fa'asili (1999a) may be unfair if only some members of the community have access to alternatives.

Smaller MPAs are needed where other management measures are in place outside the MPA. Very small reserves may be effective, beyond their biological merits, if they catalyse effective management in the rest of a community's area (see section 4.3). It should also be noted that NTRs are most effective when stocks are severely overexploited, and in the relatively lightly exploited fisheries in many PICs the benefits may be modest or accrue in the long term (Adams, 1998; Jones et al., 2001), so that high expectations for large NTRs may not be met. For these reasons it is probably best that community-based NTRs start small and be coupled with broader management of fished areas.

There has been considerable scientific debate whether it is preferably to have a single large reserve or several small ones. This is probably irrelevant to individual community-based MPAs, since few communities will hold large enough areas to contemplate establishing multiple MPAs. In the broader context we merely note that a single large MPA will provide protection for more mobile species, promote biomass buildup and therefore seeding, and by virtue of a low perimeter-to-edge ratio reduce spillover. Small NTRs will have opposite effects.

4.4.3 Location of MPAs

An important consideration for MPAs is to site them in high-quality habitats. Creating NTRs at larval source sites may divert fishing effort to adjacent larval sources, resulting in decreased rather than increased population growth (Crowder et al., 2000). To the extent that larval sources and sinks are determined by habitat quality, protecting high-quality habitats can reduce this risk. Where communities have local knowledge of important recruitment sites these are good candidates for protection. The same applies to nursery, spawning aggregation, and other critical areas. Similarly, spillover is likely to follow gradients from low- to high-quality habitats, so that fishing in high quality habitat surrounding a low-quality NTR can efficiently extract biomass from the NTR (Kramer & Chapman, 1999).

To enhance the seeding effect it makes sense to place MPAs upstream of suitable larval
settlement sites. Small MPAs are unlikely to be viable in isolation from larval sources, so attempts should also be made to place them downstream of similar habitats, and to prevent their degradation. Coastal communities usually know local circulation patterns well enough to predict likely larval flows, if not larval duration, retention, or limitation. MPAs should also be places to exclude as broad a range of habitats as possible because many marine organisms move between habitats at different life history stages, for example from mangrove and seagrass nursery areas to reefs or from shallow to deep reef areas. Habitat diversity is also a good surrogate for species diversity (Ward et al., 1999).

If it is known whether seeding or spillover is the primary objective the MPA can be designed accordingly. Spillover and the resultant loss of spawning stock can be reduced by placing MPAs in bays to reduce the boundary perimeter or by taking advantage of natural barrier (Sladek Nowlis, 2000). Conversely, spillover may be enhanced by locating MPA boundaries within contiguous habitat (Chiappone & Sullivan Sealy, 2000).

The social dimensions of MPA location are important. MPAs should not be put in places where restriction of use causes undue hardship. Few communities will do this if the community as a whole is affected, but decision-making may not consider all groups in the community. It is also beneficial to place MPAs where the location and geography facilitate community surveillance (Johannes, 1993; Parks et al., in prep); this will also make the MPA more visible. Remote sites are expensive and difficult to patrol (e.g., Patris in prep.)

4.4.4 Need for Networks

There is broad consensus that networks of MPAs covering large geographic areas and including both a representative spectrum of habitats and replicate areas of similar habitats will provide the greatest benefit to both fisheries and conservation (Chiappone & Sullivan Sealy, 2000; Consensus, 2001; Dayton, et al., 2000; Murray et al., 1999; Roberts, 1995, 1997a, 2000; Sladek Nowlis & Roberts, 1997; Palumbi 2001a, b). Networks can act to link larval sources with settlement areas as well as habitats used by organisms at different life history stages. Biodiversity is most likely to be conserved by protecting a variety of habitats. Networks are also a bet-hedging strategy against a high degree of biological uncertainty, natural variability, and the possible collapse of individual MPAs due to management failure or catastrophe.

Individual communities in PICs are unlikely to establish MPA networks, but the experience has been that when one community establishes an NTR or other MPA neighbouring communities tend to follow suit (Table 3), so that networks tend to form organically. This is a significant benefit of a community-based approach based on CMT systems.

4.4.5 Temporary vs. permanent NTRs

The establishment of community-based NTRs in the Pacific has often involved the enactment of tabs, which following traditional practice have usually been initially established for periods of at most 2 years, although the tabu period has often been extended, or an extension is being considered (Table 3, Annex 4). In other cases harvest bans on different species are alternated.
At Otang Java, Solomon Islands, for example, harvest tabus on trochus and bêche-de-mer are enacted in alternating years (Ref).

Temporary closures are a common tool with established value in conventional fisheries management. Like any measure that reduces fishing mortality, temporary harvest bans will benefit overexploited fisheries, especially if the closure is long enough to allow escapement into reproductive size classes.

Permanent NTRs are, however, expected to provide greater benefits than temporary ones (Roberts & Hawkins, 2000). Temporary closures are unlikely to deliver two important benefits of permanent NTRs: the proportionately greater larval production achieved by allowing some individuals to grow to large size, and the recovery of habitat-forming organisms such as corals, mangroves, and seagrass, which typically take longer to recover than fished stocks. Temporary reserves are also unlikely to result in density-dependent spillover, except for species that recruit and grow rapidly. Furthermore, temporary closures will provide temporary benefits: fisheries rapidly return to pre-closure conditions when re-opened (Russ & Alcala, 1996a; Sladek Nowlis, 2000). A detailed study of customary management regimes in Melanesia (MRAG, 1999) concluded that this is the case for traditional tabus.

4.4.6 The need for complementary measures

Connectivity of marine environments means that MPAs will not conserve marine resources and biodiversity in the absence of complementary measures. The designation of an area as an MPA cannot protect it from the effects of pollution or invasive species (Agardy, in prep.; Allison et al., 1998; Simberloff, 2000). Fisheries models invariably indicate that the effectiveness of MPAs in increasing yields and reducing risk is greatly enhanced by if not dependent upon the reduction of fishing mortality in fished areas (NRC, 2001). MPAs will usually be unable to maintain viable populations of most species unless external larval sources and nursery sites are maintained, as well as flows of energy and materials. The need for complementary environmental measures outside MPA boundaries generally increases with decreasing MPA size. MPAs networks and embedding core NTRs within larger multiple-use MPAs, both of which are used at community level in the Pacific, go some way to addressing these issues but are not enough. Broader management structures are also needed, including Integrated Coastal Management to reduce negative impacts of land-based activities and maritime safety to reduce risks of ship groundings and pollution emergencies.

4.4.7 Monitoring and evaluation

Communities constantly monitor both their marine resources and management systems in an informal way. More formal monitoring, however, provides feedback on management success and informs decisions on future action (Salm et al., 2000; Wells and White, 1995).

Simple, inexpensive community monitoring techniques can produce scientifically valid data (King & Lambeth, 2000; Tawake et al., in review), and standard techniques are becoming
available. The Global Coral Reef Monitoring Network, for example, has developed community monitoring techniques for its ReefCheck programme in which a number of Pacific Islanders have been trained. The Australian "Seagrass Watch" programme has developed similar techniques and recently receive funding from the Packard Foundation to extend the programme to the Pacific Islands.

Beyond its value in providing information, community monitoring provides environmental education and stimulates discussion of environmental issues and solutions. It can also be useful in integrating traditional and "scientific" knowledge for management purposes (Kostka, in prep., Parks et al., in prep.) Monitoring and other activities may enhance the success of an MPA in and of themselves by keeping people actively involved and enhancing the sense of ownership (Pollnac, in prep.) As always, it is important that communities control monitoring, for example by choosing which organisms to monitor (Parks & Salafsky, 2001). Furthermore, it should be accepted that the community and not external partners own the data: the community may well be willing to share the data but it must be their choice.

Monitoring to rigorously test hypotheses about MPAs requires highly sophisticated experimental designs, and often require specialist expertise (Jones et al., 2001; Lincoln-Smith, et al., 2001; Palumbi, 2001a). Although scientifically interesting it is questionable whether the benefits of sophisticated monitoring programmes justify their cost in the context of the IWP.

At the management and policy levels, the IUCN has produced general guidelines for evaluating the effectiveness of protected areas (Hockings et al., 2000) that in principle can be applied at levels ranging from specific sites and projects through to regional and global systems of protected areas but have not been tested in the Pacific. The Pacific Islands RoundTable for Nature Conservation has developed a general framework for monitoring implementation of the 1999-2002 Action Strategy for Nature Conservation in the Pacific Island (RoundTable, 1999). On the basis of specific criteria (Box 1) the framework identifies 19 indicators of progress toward achieving specific intended outcomes of the Action Strategy, many of which relate to the number, characteristics, and effectiveness of conservation areas. A database is being developed to track two of the identified indicators, namely the number, type, year established, and size of protected areas based on IUCN categories and the number of community-based conservation areas (Shanefelter, 2001).

5. Inventory of MPA activities in IWP countries

Traditional measures such as tabus and limited access under CMT have existed for thousands of years in the Pacific. The history of "conventional" MPAs is much shorter. The first MPA in the Pacific was established in 1956 for the Ngerukewid Islands (70 islands) in Palau, but real attempts at management extend back only about 2 decades. As in the rest of the world, the initial approach to establishing MPAs in the Pacific was sometimes a "top-down" process where government agencies identified and declared the protected area with little community involvement. There was also often a lack of realistic planning for the development and ongoing operation of protected areas, with the result that a number of MPAs have been nothing more than
"paper parks" with no real existence beyond their inclusion in various reports or proposals. This problem is by so means unique to the Pacific and applies to most regions of the world (Kelleher et al., 1995; McClanahan, b1999).

As is the case for fisheries management, the emphasis for MPAs has shifted from centralised "conventional" management to community-based management. Community-based protected areas are by no means exempt from the "paper park" syndrome. A notable example of this is the Wildlife Management Area (WMA) system in PNG. WMAs are areas that are formally designated, usually at the request of the customary landowners, for the conservation of specified wildlife species (Asigau, 1989). Management rules are established and enforced by landowners through a landowner committee. Unfortunately, most WMAs have essentially ceased to function, largely because the responsible government agency lacks resources to provide communities with the support they need (Huber & Bain, 2000; P. Hunnam, pers. comm.; Jenkins & Kula, 2000). The common characteristics of the three marine WMAs do appear to be working are ongoing support by NGOs and the availability of alternative development opportunities, namely dive tourism (A. Jennings, pers. comm.)

5.1 Site-specific MPA activities

The number of MPA activities in the countries participating in the IWP has grown rapidly in recent years and continues to grow. Annex 4 summarises available information on MPAs in the participating countries. The table is based on information available on the internet (Annex 4) as well as published literature; information sources are documented in the table. Where information about an MPA was unavailable the corresponding cell in the table is left blank. Where all cells for an MPA are blank, the area is listed in a compilation of MPAs (e.g., Bleakley, 1995; RoundTable, 1998) but we could find no other information about it. We suspect that most such cases are "paper parks".

None of the compilations that we examined (Bleakley, 1995; RoundTable, 1998; Whye, 1998) overlap completely and none includes all of the MPAs listed in Annex 4, which inevitably must fail to include some existing MPAs. Failed MPAs are probably under-represented due to reporting bias. Furthermore, successful attempts are most often reported by external partners, particularly conservation organisations, rather than by communities, so that self-sufficient community MPAs without external partners may not be reported. In describing the Makogai marine reserve in Fiji, for example, Adams (1998) notes that it is not listed in recent MPA lists and speculates that this is "perhaps because it is not legislated, or perhaps because it was negotiated and supported by the Fisheries Division rather than the conservation service." Similar cases elsewhere in the Pacific may not be included in Annex 4.

More than 80% of the ca. 130 MPAs listed in Annex 4 are primarily community-based but supported by various external organisations including development and environment organisations, donor agencies, local, national, and international NGOs, and in some cases national government agencies. Of the 14 countries participating in the IWP, only Niue and Nauru have no recorded MPAs, and Marshall Island and Tuvalu have only one. The vast
majority of MPAs in Annex 4 have the primary objective of fisheries management, although
external partner organisations probably have other objectives such as biodiversity conservation.
The few projects involving multiple use MPAs or integrated coasal management approaches are
in the early stages of development or have had implementation problems.

The IUCN categories of MPAs are shown in the "other comments" column where they are
provided by information sources, but we have made no attempt to assign IUCN categories
ourselves. Where different sources listed different IUCN categories for the same MPA we show
the category given by the most recent source.

5.1.1 Country summaries

Cook Islands
Trochos sanctuaries have been established at Aitutaki, Manuae, and Palmerston Is., all involving
individual island councils and varying ancillary management measures. A national park has
been established at Suwarrow Atoll. Six rai‘i (traditional tabu) areas have been declared on
Rarotonga.

Federated States of Micronesia
There are state trochos sanctuaries in Pohnpei, Chuuk, Kosrae and Yap. Pohnpei State has
initiated several marine and mangrove sanctuaries under the Marine Sanctuary and Wildlife
Refuge Act (1998), but none of these are yet being actively managed. Lengger Island marine
reserve (see section 6.3) is currently the only community-based MPA in Pohnpei. There are no
community MPAs in Chuuk, Kosrae or Yap although the national government is keen to foster
NGO development and conservation partnerships since budget cuts have diminished the
government’s capacity for natural resource management and conservation in FSM (FSM, 2001).

Fiji
Blakley (1995) states that conservation efforts in Fiji appear to concentrate on terrestrial areas
and at a national level this is still true. Fiji has no national marine parks although Astrolabe Bay
is worth of consideration (WWF web site). The two officially recognised marine reserves in Fiji
are Makogai Island, under Fisheries (MAFF) jurisdiction, and the first legally recognised
community-based reserve at Ono Island, Kadavu. Waqainabete and Rupeni (2001) list a number
of community-based reserves that are not government regulated, and several proposed MPAs
involving various interest groups including Fiji Fisheries Dept. WWF, USP, local communities
and business concerns.

The Verats Tikina project includes several community-managed and monitored MPAs that
include NTRs established by traditional tabu within larger management areas, and alternative
income generation (AIG) through bioprospecting. It involves partnerships between local
communities, various NGOs and USP and has been used as an example to promote
establishment of similar projects elsewhere in Fiji.

Kiribati
The Kirimati conservation area is listed by Bleakley (1995) as an MPA although data from the UNEP-WCMC database (web site in Annex 3) refers only to supra-tidal components. The North Tarawa conservation area was established by the SPBCP, which terminates in 2001. A draft transition strategy has been prepared (SPBCP, 2000b) but the future of the project has not been determined.

**Marshall Islands**
Jaluit Atoll, the only MPA recorded for the Marshall Islands, is the most recent conservation area established by the SPREP South Pacific Biodiversity Programme.

**Nauru**
No MPAs recorded.

**Nue**
No MPAs recorded. Nevertheless fishing may be regulated by the customary measures of *fono* (a traditional taboo prohibiting entry for fishing or harvest of any resources, living or non-living) or *tapa* (apparently a less restrictive and/or not area-based form of traditional tabu), and these are supported by the Domestic Fishing Act 1995 (Hicks, 1998). The Huvalu Forest Conservation Area, an initiative of the Niue Environment Unit together with local villages, contains certain fishing areas such as Tauta (a sea track and fishing ground) which are *fono*. In these areas the use of fish poisons and spear fishing are *tapa* and use of nets is restricted (Hicks, 1998).

**Palau**
Most MPA initiatives in Palau are State/community projects covered by state legislation and initiated since 1994 (Smith et al., 2001). "All these areas were established due to a local concern over depleted resources or habitat, and over diminishing control" (Smith et al., 2001).

Exceptions are the Ngerukewid Islands and the Ngerumekaol grouper spawning area, which are covered by both national and state legislation. Conservation areas are initially established with customary authority, such as a *bul*, which in most cases is reinforced with state legislation. The different states provide varying degrees of ongoing support for the MPAs (Smith et al., 2001). The future of most of the areas is uncertain past the end of the *bul* and Smith et al., (2001) identify, among other things, the need for management plans and parallel national legislation to support conservation areas.

Koror State has the most active marine conservation programme. Koror State Conservation Officers actively monitor fish and benthic communities around state waters and enforce the conservation areas and fishery reserves (Golbuu, 2000). A local NGO, The Palau Conservation Society, and TNC are actively promoting multiple-use management strategies for the Rock Islands Conservation area, which is one of Palau's premier tourist attractions. The Palau International Coral Reef Centre (PICRC), due to open in 2001, has been established with the mandate to "provide information and assistance to Palau traditional chiefs in their role of managing reefs and implementing traditional management practices."

**Papua New Guinea**
Attempts to establish national marine parks in Papua New Guinea have been unsuccessful with
the Horseshoe reef Marine Park gazetted by the Lands Dept in 1981 but not finally declared under the National Parks Act (1982) due to problems over customary tenure. Nanuk Island Park (East New Britain Province), the only Provincial marine park, has not been a success. A number of international and national NGOs are actively promoting the establishment of MPAs, all of which are community-based WMAs, ICAD projects, or conservation areas.

The wildlife management areas were mostly established in the 1970's and 80's. They have had, at best, limited success due to lack of government support, inadequate community support and education, and an inability to enforce the rules. Few offenders are prosecuted and there is often confusion over the regulations and associated penalties (Jenkins & Kula, 2000).

In contrast, recent efforts are generally characterised by NGO-supported community-based initiatives, many of which are still in their infancy e.g. The Milne Bay ICAD project, renewed efforts in the Maza WMA. Others, such as Kimbe Bay are continuing with ongoing support from local business and donor agencies. The success of these projects is yet to be evaluated and depends largely on the commitment of local communities and their desire and ability to work together as a cohesive unit to conserve their marine resources. Local politics, particularly with regard to customary tenure, unrealistic expectations, cargo cultism, the lure of immediate cash returns for resource exploitation, disputes over the ownership and control of assets belonging to community projects, and lack of ongoing maintenance and support to communities have been identified as negative factors in Melanesia (Schoeffel, 1997; Whyte et al., 1998).

Samosa
Samosa's only national MPA is the Palolo Deep marine reserve. As of May 2001, 62 villages have established fisheries management plans under the Fisheries Division Extension programme, of which 57 have established NTRs (see section 6.2). The Sa'anapu-Satoa CA established by the SPBCP has had limited success but there is support for its continuation (SPBCP, 2000a). IUCN is executing a GEF project to establish large multiple-use MPAs in the Aleipata and Safata districts, the latter of which includes the villages of Sa'anapu and Satoa. The only other recorded project in Samos is the Uafato CA being established by the Uafato Village Council in collaboration with local NGO the O le Siosiomaga Society, DEC, MAFF, Western Samoa visitors Bureau, and SPBCP.

Solomon Islands
There are at least six community-based fisheries reserves in the Solomon Islands (SPREP, 2001). The Amavon Islands community marine CA involves three villages and a variety of agencies and organisations. WWF also has projects at Marovo Lagoon and Simbo Island. There is currently no marine component to the Simbo Island project but the opportunity exists to extend the project into marine areas. The East Rennel World Heritage site is the first such site in the insular Pacific.

Tonga
Six of the 8 listed MPAs in Tonga have been established under the Parks and Reserves Act (1995) and the 1974 Birds and Fish Preservation Amendment, administered by the Ministry of
Lands, Survey and Natural Resources. Tenure in all of these belongs to the state. Current management status of these reserves is unknown but according to the UNEP-WCMC database there is no active management in the Ha'atafu Beach Reserve and, apart from noticeboards proclaiming the rules, this may well reflect the situation in the other state reserves. There appears to have been some local community opposition to establishment of at least some of these areas e.g. the Pangaimotu reef reserve. The only truly community-managed projects in Tonga appear to be the giant clam sanctuaries which were established by the Ministry for Lands, Survey and Natural Resources but are run by local communities.

Tuvalu
Tuvalu has a single MPA at Fatuafu atoll, established under the SPBCP, for which funding terminates in 2001. SPBCP has prepared a draft transition strategy (SPBCP, 2000d) for project continuation.

Vanuatu
With the exception of the President Coolidge and Million Dollar Point Reserve, all of the MPAs in Vanuatu are community-managed areas under customary tenure arrangements, supported in many cases by the Fisheries Department. Some of these appear to be quite successful while others have failed, largely as a result of division within communities and CMT disputes between communities. Detailed accounts are provided by Johannes (1994, 1998a), Naviti & Aston (2000) and Whyte et al. (1998).

5.2 Overarching MPA activities

In addition to the individual more or less site-specific activities listed in Annex 4 there are a number of overarching initiatives at the national and regional levels. These activities seek both to improve the effectiveness of local MPAs, for example through the sharing of information and resources, and to extend the benefits of local MPAs more widely by establishing networks and replicating success to additional sites. Such leveraging of benefits is of course a common goal of many programs and organisations active in the region but several specifically target the development of effective MPAs.

5.2.1 South Pacific Biodiversity Conservation Programme (SPBCP)

The SPBCP has established MPAs or conservation areas with significant marine components in FSM, Kiribati, Marshall Islands, Palau, Samoa, Solomon Islands, and Tuvalu (see Annex 4). Funding for most of these terminates in 2001 and SPBCP have prepared draft transition strategies for the projects beyond the termination of SPBCP funding (SPBCP, a-g). While the ideal goal is that the projects will become self-sufficient, most if not all projects require an additional period of external assistance before they are sustainable.

5.2.2 Pacific Round Table

The Pacific Islands Round Table for Nature Conservation was formed in 1998 in response to a
call by the Sixth South Pacific Conference on Nature Conservation and Protected Areas for more active coordination and collaboration among regional and international agencies active in conservation in the region. The Round Table is a forum in which most of the major regional and international organisations can share "ideas, experience, information, and knowledge on how best to address the main issues of nature conservation facing the region" (Round Table 1999). Major activities of the Round Table to date are to finalise the Action Strategy for Nature Conservation in the Pacific Islands region (Round Table, 1998), initiate a monitoring program to assess implementation of the Action Strategy (Round Table, 1999), initiate the development of an inventory of ongoing and planned conservation activities in the region with an eye to identifying critical gaps, and establish several working groups on specific issues, including sites, threats, national reporting, capacity building, awareness, and education (Round Table, 1999).

5.2.3 MPA Learning Portfolio

With funding from the Packard and MacArthur Foundations, the World Resources Institute (WRI) and Foundations of Success (FOS) are coordinating the development of a "learning portfolio" of community-based locally managed marine areas (LMMA's) in the Asia-Pacific region (Parks & Salafsky, 2001). The "locally managed" designation includes both community-based and co-management. The objective of the learning portfolio is to network LMMA projects in order to share experiences and evaluate the effectiveness of different tools and approaches. The learning portfolio was initiated in August 2000 with a workshop in Fiji involving representatives from 10 Pacific Islands MPA projects and another in the Philippines involving 12 MPA projects in Indonesia, Malaysia, and the Philippines. In October the two groups participated in a workshop at the International Coral Reef Symposium. Some participants met again in June 2001 during the 10th Pacific Science Inter-Congress, which included a symposium on LMMA's sponsored by WRI. The number of projects included in the portfolio has increased from the initial 22 to 37 (Parks, in press). Both WRI and FOS have established worldwide web sites for information exchange and dissemination (Annex 3).

5.2.4 U.S. Coral Reef Task Force and the All-Islands Group

The U.S. Coral Reef Task Force was established by Presidential decree in 1998. It involves 11 US federal agencies and the governors of US states, territories, or commonwealths that have responsibilities for corals reefs. In the Pacific the current activities of the Task Force are limited to American Samoa, Guam, Hawaii, and the Northern Mariana Islands, but activities may be extended to other US-associated Pacific Islands countries (G. Davis, pers. comm.). A goal established by the Task Force is the protection within NTRs of 20% of the coral reef area under U.S. jurisdiction by 2010. At present about 10% of US reefs are in NTRs, but much of this is in 'easy' areas such as remote, uninhabited atolls (Koltes, 2001). The 20% goal has influenced policy in the US-associated countries participating in the IWP. The Part of the Task Force is the US All Islands Coral Reef Initiative Coordinating Committee, which is composed of government representatives from American Samoa, Guam, Hawaii, the Northern Marianas, Puerto Rico, and the U.S. Virgin Islands. The All Islands Committee has had considerable influence in shaping the activities of the Coral Reef Task Force to better reflect
the needs and concerns of small islands.

6. Case Studies

6.1 Safata Bay, Samoa

Three partially overlapping projects on Upolu exemplify features common to community-based MPA initiatives in the Pacific Islands. The first is the Sa'anapu-Satoa Conservation Area (SSCA), in Safata Bay on the south coast. The area was identified by a 1991 scientific survey as a high-priority area for biodiversity conservation containing the best remaining mangrove forest in Samoa (Park et al., 1992). The conservation area is under the customary ownership of two villages, Sa'anapu and Satoa. Both are larger than most Samoan villages, and are divided into coastal and inland settlement units (Thisthlethwaite & Huber, 1995). The biological environment is a mangrove forest, lagoon, and barrier-reef complex that supports subsistence fisheries and an important artisanal fishery for mangrove crabs (Scylla serrata), as well as tourism. The SSCA was established in response to concerns about degradation of habitats, particularly mangroves, from clearing, solid waste dumping, and destructive fishing methods (SPBCP, 2000a).

When the results of the 1991 survey were presented to them, the communities indicated their support for conservation, which they reaffirmed when the Division of Environment and Conservation (DEC) submitted a successful project proposal to the SPBCP in 1994 (SPBCP, 2000a). Project activities focused on raising environmental awareness, controlling environmentally unsound practices, and alternative income generation, initially growing ginger and ecotourism. A complementary ICM project proposed for the area to address broader watershed and development issues (Thisthlethwaite & Huber, 1995) did not eventuate.

SPBCP funding for the SSCA terminates in 2001. The draft transition strategy (SPBCP, 2000a) indicates that although the communities recognize benefits from conservation and strongly support continuation of the project, the SSCA has had serious problems. These are largely due to a lack of community ownership. Community ownership and ongoing management of the SSCA was a primary objective of the project, but it was designed so that DEC initially played the lead role. Over the course of the project SPBCP also developed an important advisory role due to its physical location near the site and limited capacity in DEC. Once the project was established as "belonging" to DEC and SPBCP it proved difficult to transfer ownership and responsibility to the communities. Resulting impediments to the success of SSCA have included unrealistically high initial expectations of project benefits, internal conflicts within communities, a lack of tradition for the two communities to work together, communication problems, conflicts and poorly defined roles of the conservation area coordinating committee (CACC) and village fonos, the lack of capacity in DEC to fulfill its defined role, lack of project continuity due to frequent CASO turnover, and a lack of transparency in financial management. Ginger growing largely ceased. Ecotourism activities declined and those that continued operated as a private rather than community enterprises with resultant social conflicts.

There was some improvement in 1999 when a new CASO re-emphasised the roles of the
communities. A new ecotourism plan was established which among other things took into account the villages' desire to work independently rather than together. Issues such as business management capacity, marketing, some aspects of product quality (e.g. the impact of free-range pigs on the mangroves and their attractiveness to tourists), unrealistically high expectations, and potential community conflict remain unresolved.

The second project is the Fisheries Division's community-based fisheries extension project. Planning and staff training commenced in 1995 and field operations in 1996 (King & Fa'asili, 1999a). The project focused from the beginning on ownership and responsibility for management interventions by individual villages, and recognised the fono as the primary local authority while allowing participation by other sectors of the village.

The extension process begins with an expression of interest from a village (King & Fa'asili, 1999b). Fisheries extension officers then meet with the fono to provide information to allow the village to decide whether or not to participate. If the decision is 'yes' a series of meetings of different village groups is held to discuss fisheries problems and possible solutions. These discussions were structured in the form of a rapid historical appraisal of recent changes in fisheries and the environment and the construction of problem/solution trees. Then an advisory committee with representatives from the different groups is formed. After several meetings the advisory committee and extension officers conduct a "stroll through environmental assessment" to further the discussions and evaluate alternative actions (King & Fa'asili, 1999b). The advisory committee, with the assistance of extension officers, prepares a draft management plan for consideration by the fono. Once approved by the fono the plan takes the form of an agreement between the community and the Fisheries Division that specifies the resource management and conservation undertakings of the community and the support to be provided by the Fisheries Division, primarily technical advice and assistance in environmental management and alternative fisheries development (King & Fa'asili, 1999b). A Fisheries Management Committee (FMC) is formed to implement the plan.

Throughout the process, the extension officers' skills in facilitating (but not leading) community discussions and promoting a sense of community responsibility for management are emphasised at least as much as technical knowledge (King & Fa'asili, 1999b; King & Lambeth, 2000). Technical inputs are focused on assisting communities with evaluating the likelihood of success of alternative actions, avoiding unrealistic expectations, and providing information on request rather than on recommending courses of action (Fa'asili & King, 1997; King & Fa'asili, 1999a, 1999b). The pace of the process is set by the communities.

The extension process commenced in 54 villages in the first sixteen months of operation (Fa'asili & King, 1997), growing to 65 villages after two years (King and Fa'asili, 1999b). Nine of these villages rejected the process, which was discontinued in another four when extension officers felt there was a lack of community commitment. Of the 52 remaining villages, 44 had produced Village Fisheries Management Plans. Adopted measures include enforcement of national laws for minimum size limits or against destructive fishing practices, imposition of more restrictive minimum sizes, further bans on fishing practices, gears or removal of beach sand, removal of
crown-of-thorns starfish (COTS) or rubbish, protection of mangroves, and re-introduction of giant clams. Thus, each of the community fishing areas can be considered to be an MPA under the IUCN definition. Unexpectedly, 81% of villages decided to establish NTRs within the larger managed area (King & Fa'asili, 1999b). These NTRs are very small, the largest being only 0.18 km², but together form a network with the potential to link larval sources with settlement sites and foster recruitment to surrounding areas (King & Fa'asili, 1999a). It took an average of about 3 months for a village to produce an approved management plan.

The programme has continued to grow, with 72 villages participating as of May 2001, of which 65 have completed their management plans and 57 have established NTRs (M. King, pers. comm.). On the basis of such indicators as conducting FMC meetings, community knowledge of the management plan, and enforcement of rules (see King & Lambeth, 2000), 21 villages are doing very well at management (overall score > 85%) and only 4 are doing poorly (< 55%). Rules established in the management plans are internally enforced by the community, but where outside violators are a concern villages have sometimes formalised the rules as village by-laws, which allows them to be enforced upon outsiders through the court system (Fa'asili & Kelokolo, 1999). In some cases, however, the community becomes frustrated with the pace of the courts and takes enforcement into its own hands, creating potential conflicts (Fa'asili & Kelokolo, 1999).

Sa'anapu is participating in the extension programme, but Satoa is not. Initial undertakings by Sa'anapu village include mesh size limits, bans on the use of explosives, bleach, fish poisons in fishing, on smashing coral, and on exporting bêche-de-mer, the removal of COTS and rubbish, and the establishment of a village reserve (NTR) in which giant clams have been stocked (King & Fa'asili, 1999b). Mud-crab farming has recently been initiated, a seen as supportive of the continuation of the SSCA (SPBCP, 2000a). Four other villages in the Safata district have established management plans under the programme (King & Fa'asili, 1999b).

The final project is the Marine Biodiversity Protection and Management Project, a World Bank-implemented GEF project being executed by IUCN. The project aims to establish large multiple-use MPAs in the Safata and Aleipata districts that include core protected areas for coral reefs, mangroves, and seagrass beds. The Safata component involves all 9 villages of the Safata district, including Sa'anapu and Satoa. A social assessment performed at the project inception stage (IUCN, n.d.) recognised that the villages had little tradition of working together, but devised a strategy of working at the district level where there was some history of district-level cooperation, for example for hospitals and secondary schools.

From the design phase the project stressed customary practices and the authority of traditional leaders. It also sought to minimise unrealistic expectations and emphasise links with the existing

But King & Fa'asili (1999a) note that the network as a whole does not fit any of the IUCN protected area categories.
Fisheries Division extension programme (IUCN, n.d.). The project has also cooperated with the SPBCP Sa'anapa-Satoa project and a variety of other organisations. A March 2001 project evaluation (IUCN, 2001) concluded that the project thus far has exemplified best practice both in its collaboration with District Committees and in building partnerships with other projects and agencies.

6.2 Kimbe Bay, Papua New Guinea

Kimbe Bay, lies on the north coast of New Britain, in the Islands region of PNG, harbours coral reefs of exceptional physiographic and biological diversity, as well as mangroves, seagrass beds, and other marine resources (Holthus, 1995). There are concerns, however, about reef damage from the use of explosives and derris root in fishing, declines in the abundance of exploited fishes and invertebrates, and the effects of sediments and other pollution from land-based sources including logged areas, oil palm plantations, and Kimbe town, which is more or less centrally located on the shore of the Bay. The employment opportunities provided by the oil palm and logging industries, and growth of Kimbe town, have brought large numbers of outsiders into the area who often fish on the reefs, to the concern of the customary owners.

During the 1980s these concerns led the owners of Walindi Plantation Resort, a small resort west of Kimbe with an international reputation as a diving destination, to begin discussing environmental issues and the conservation value of Kimbe Bay with communities around Walindi, the West New Britain Provincial Government, and scientists in PNG and Australia. The resort supported some preliminary scientific surveys that confirmed Kimbe Bay’s exceptional biodiversity, and the area began to attract interest from conservation organisations both within PNG and overseas.

In the early 1990s a local NGO, Mahonia na Dari, was formed to promote environmental awareness and action in the communities around Kimbe Bay who are the customary owners of the reef. In partnership with TNC, the European Union, the resort, and others, a small education and research centre was built at Walindi. The centre adopted a strategy that stresses the role of education in promoting environmental awareness and discussion in local communities, and in 1995 developed an ambitious programme of developing curricula and teaching materials for local schools, educational activities for school children at the research centre, and community environmental awareness programmes for people of all ages.

Simultaneously the centre was used to support a series of studies, for example a Rapid Ecological Survey in late 1994 (Holthus, 1995) and an Ecotourism Report in 1996 (Brown & Mayer, n.d.), that substantially improved the knowledge base of the area. Complementary activities including a sustainable forestry (“wokabout sawmill”) project funded by the European Union were also based at Walindi, although not directly tied to Mahonia na Dari’s programme. The resort, as an active member of the PNG Diver’s Association, played a leading role in developing an environmental Code of Practice for the dive tourism industry and installed permanent moorings at regular dive sites to reduce anchor damage. The partnership proposed the creation of a Kimbe Bay Marine Conservation and Management Area (KBMCMA) using a
community-based approach.

In 1996, more than a year after Mahonia na Dari commenced its education and awareness programmes, the local village of Kilu Tamare expressed interest in establishing a management programme for the reefs under their tenure. Mahonia na Dari initiated an "ad hoc, opportunistic consultative process" (Lokani & Seeto, in prep.) to provide the necessary support to the community. The process began with informal discussions with leaders and elders, which led to a series of targeted discussions to help the community identify its chief concerns and alternative solutions, and decide on a course of action (Lokani & Seeto, in prep.) in 1997 the community decided to completely close four inshore reefs to fishing, and to ban the use of derris root and explosives on the 20 other reefs under their customary control. The MPA operated without a formal basis in legislation until 1998, when legislative support was provided under the Fisheries Act, 1998 (Lokani & Seeto, in prep.).

Scientific monitoring of the closed reefs has been inconclusive, at least in part because of the effects of mass coral bleaching and mortality during the 1997-98 El Niño (Jones et al., 2001). The community, however, perceives that the number of fish on the closed reefs has increased and that they are less wary of divers (Lokani & Seeto, in prep.), and even that pelagic fish catches have improved (A. Smith, pers. comm.) Hearing of the positive perceptions of the Kilu Tamare MPA, two other villages invited Mahonia na Dari and TNC to assist them in establishing similar MPAs. Both communities identified destructive fishing methods, declining fisheries resources, and incursions by outsiders into their traditional areas as important concerns (Lokani & Seeto, in prep.) Both villages have decided to follow a similar strategy to that at Kilu Tamare, closing a few inshore reefs to fishing and developing management rules for other parts of their areas. One community, Ruango, has identified four reefs for closure and formed a management committee to develop additional management rules, coordinate the management of the area, and disseminate information about the MPA. Patenga village is in the process of forming a management committee to select the reefs to be closed to fishing and develop other management rules (Lokani & Seeto, in prep.) While biological monitoring at Kilu Tamare has thus far been performed under contract by an Australian university, community-based monitoring programmes are being developed for Ruango and Patenga at the request of the communities, who wish to monitor the closed reefs themselves (Lokani & Seeto, in prep.) Several other villages in the area have also expressed interest in establishing MPAs (A. Smith, pers. comm.) Lokani & Seeto (in prep.) have concluded that there is considerable local interest in establishing community-based MPAs, but that communities need guidance and assistance in order to take action none have as yet taken full management responsibility.

Although the MPA at Kilu Tamare functioned for two years without it, legislation is needed to support the long-term maintenance of local MPAs in Kimbe Bay, to enhance enforcement of community management rules, especially against outsiders, and to support the larger-scale KBMCMA, which is now proposed to encompass the entire bay including some offshore components (Lokani & Seeto, in prep.) The KBMCMA is not envisioned as superseding the MPAs that individual villages have established, but rather to encompass them in a framework that can respond to such broad-scale threats as shipping and land-based activities. A co-management model is envisaged for offshore areas beyond a network of community-based
MPAs based on customary ownership (Lokani & Seeto, in prep.)

All of the reefs that communities have selected for closure are inshore reefs that have relatively low biodiversity for Kimbe Bay (Holthus, 1995), and would not necessarily be the first choice of Mahonia na Dari and TNC for protection (Lokani & Seeto, in prep.) On the other hand, they are among the reefs most threatened by land-based activities, overfishing, and destructive fishing practices. Communities have selected them because declining resources and habitat damage are most apparent there, and because their proximity to the village makes enforcement easier (Lokani & Seeto, in prep.) Thus, while the objectives of the communities and external partners overlap, they may not always be the same.

6.3 Lenger Island Marine Reserve, Pohnpei

As elsewhere in Micronesia, Pohnpei State in the Federated States of Micronesia (FSM) has rich and diverse coastal marine resources upon which its people depend. Despite a long history of traditional resource management, these resources are threatened by coral and sand mining, overfishing and destructive fishing practices, sedimentation and pollution from land-based sources, poorly planned development, and other pressures (CSP, 2000; FSM, 2001; Gawel, 1993). These threats result from population increase, the advent of a cash economy, the privatization of communal land and marine holdings, and the decline of traditional management systems (Kostka, 2001; Raynor & Kostka, unpubl.) National conservation legislation and other government efforts to improve marine resource management have had little effect, because of capacity limitations and a lack of community consultation or ownership (CSP, 2001; Kostka, 2001).

In 1999 the Conservation Society of Pohnpei (CSP), a local NGO, commenced a pilot project to establish a community-based NTR at Lenger Island, which lies adjacent to Kolonia, the capital of Pohnpei. Lenger Island was selected as a pilot site on several criteria (CSP, 2000), including:

- a very small (6 families), cohesive community with traditional leadership and high dependence on the surrounding reefs;
- reef communities which although partly degraded retain a high conservation value;
- proximity to Kolonia, which enhances the value of the project as a demonstration site.

The project began with "community visioning" discussions that ranged beyond resource management considerations to include the community's broader goals and aspirations (e.g., education, lifestyle; Kostka, 2001). When the community decided that it wished to proceed, a

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A recent Draft FSM Environmental Sector Strategy report prepared in conjunction with negotiations for a Compact of Association with the U.S. (FSM, 2001), however, reports that with the assistance of community leaders the Keppara Marine Reserve has now generated widespread community support and conservation benefits including the recovery of a grouper spawning aggregation.
marine survey was conducted that incorporated both the recording of local knowledge and formal scientific surveys in which community members participated. The scientific surveys generally confirmed local knowledge. The community and CSP jointly analysed the information and the community decided to establish an MPA. The MPA, with an area of about 4 km², encompasses all the island's nearshore waters and includes mangrove, seagrass, and coral reef habitats. Waste dumping, fishing with explosives or poison, and anchoring on reefs are prohibited within the MPA. About 40% of the MPA is designated as an NTR. The MPA was established and its boundaries marked in October 2000, and officially opened in March 2001 (M. Kostka, pers. comm.)

It has been decided that enforcement of these rules requires formal legal status. The community and CSP have prepared a bill, to be submitted to the legislature, to include the Lenger Island MPA in the Pohnpei State Marine Sanctuary Act.

CSP has also helped the community develop two sponge farms, which were established in February 2001. While the farms meet the community's desire for a marine-based enterprise and are strongly supported, CSP recognizes that the sponge farm alone will probably be inadequate for the communities' needs and other enterprises such as ecotourism need to be explored.

In 2001 CSP, with funding from the Packer Foundation, commenced projects to adapt the Lenger Island process at three additional sites, each of which presents challenges not encountered at Lenger Island. The biodiversity (and in one case historical significance) of all three sites has been previously identified, and two of the sites incorporate areas that have been legislated as protected areas but have little or no active management by government agencies (CSP, 2000). The establishment of MPAs will be supported by general environmental education and awareness programmes.

CSP has identified the following lessons learned (Kostka, 2001):

- Pohnpei communities place high value on a healthy environment
- communities are willing to accept responsibility for managing their resources, if they have ownership of the management regime and are provided with necessary support
- in Pohnpei, community-based MPAs require formal recognition in legislation
- the provision of alternative income opportunities is necessary for the success of MPAs
- community-based approaches take time
- community-based initiatives can build upon existing information (e.g. previous scientific surveys) and frameworks (e.g. protected areas already recognized in legislation)

To this might be added that local NGOs can be valuable partners to communities and effective agents for change.

7. Synthesis
7.1 Lessons Learned

Consistent messages emerged from our examination of reports and case histories of individual MPA projects in preparing Annex 4. These are much the same as the conclusions of other recent analyses in the Pacific, notably those by Parks & Salaofsky (in prep.) and Parks et al. (in prep.) of projects in southeast Asia and the Pacific, Whyte et al. (1998) of community-based management in Vanuatu, the World Bank (2000) of 31 coastal communities in Fiji, Palau, Samos, Solomon Islands, and Tonga, and MacKay (unpubl.) of fish reserves in the Cook Islands, Fiji, and Samoa. They also concord with lessons learned internationally (e.g., Roberts & Hawkins, 2000; Salm et al., 2000; White et al., 1994). The references provided in the following distillation are purely exemplary; comprehensive reference lists would be very long.

Community-based MPAs appear to work in the Pacific. While the declaration of MPAs by government agencies has generally resulted at best in "paper parks" (Evans, in prep.; Kostka, 2001; Parks et al., in prep.), community-based initiatives have resulted not only in management plans, marked boundaries, enforcement of rules, and other verifiable indicators of success (Johannes, 1998a; King & Pa'asili, 1999b; Parks et al., in prep.) but in community perception of benefit (Table 3) and in at least one case quantitative evidence of fisheries and economic benefit (Tawake & Aalbersberg, in prep.; Tawake et al., in prep.) All observers agree that community control and ownership of the process from the very beginning is critical. Ownership is difficult to transfer from external partners to communities once a project is underway (section 6.1).

But they have not yet been sustained. On this point our perspective is slightly different from those of most other reviews. Past initiatives have often failed because of conflicts within and between communities, unrealistic expectations, lack of support to communities, poorly conceived and executed assistance, and other factors (Whyte et al., 1998). Many lessons have been learned from this, and the need to develop long-term sustainability by building the capacity of communities to manage their resources and of local institutions to support them is widely recognised. The successful projects to date are mostly young, so the long-term sustainability of locally-managed MPAs in the Pacific has yet to be demonstrated.
Start small, scale up. As discussed above, many Pacific MPA initiatives have started out in one or a few villages, with small, temporary reserves, and/or dealing with one or a few issues. This makes it easier to build consensus (Parks et al., in prep.), limits unrealistic expectations, and requires fewer resources from supporting organisations. Where communities have perceived benefits they have made tabus longer, adopted more restrictive rules, and neighbouring communities have also established MPAs. Networks of small community-based MPAs have help stimulate larger multiple-use MPA initiatives, though these are in the early stages of implementation.

MPAs can catalyse broader environmental management. This is addressed in section 4.3 but is important enough to repeat and is confirmed by a recent World Bank (2000) report.

Avoid unrealistic expectations. Unrealistic expectations and enthusiasm, followed by frustration and anger when expectations are not met, are a recurrent problem in the Pacific (Fa'asili & King, 1997; IUCN, n.d.; Whyte et al., 1998).

Alternative seafood and income sources are needed to compensate for the short-term losses of establishing MPAs and relieve pressure on resources (King & Fa'asili, 1999b; MacKay, unpubl.; Parks et al., in prep.) Ecotourism is the most common AIG activity, followed by alternative fisheries development. AIG opportunities provide motivation and reinforcement for conservation activities (SPBCP, 2000c; Whyte et al., 1998), but can also generate unrealistic expectations. Most alternative income generation schemes efforts in the Pacific are not perceived to be successful (World Bank, 2000) or have limited replicability (Aalbersberg et al., 1999). In isolated rural areas the replacement of subsistence fishing with cash income generation activities also has a risk of increasing cash dependence (Parks et al., in prep.)

Communities need external assistance. Sometimes an external stimulus for community discussion is needed, and this does not seem to compromise community ownership so long as the external role is one of facilitation and not coercion or control (King & Lambeth, 2000; Parks et al., in prep.) Once they decide to establish an MPA, communities have the will and initiative to do so but need technical and management guidance to achieve their goals (Johannes, 1998a; King & Fa'asili, 1999b; MRAG, 1999; Parks et al., in prep.; Whyte, 1998, SPBCP, 2000d). Management strategies can be strengthened with formal government support (Johannes, 1998a; King & Fa'asili, 1999b; Whyte et al, 1998). External partners should, however, tailor their approach to the community rather than promoting their own agendas.

Supporting legislation is needed. Communities that have established MPAs usually decide that the MPA needs legal status to strengthen traditional authority, allow enforcement on outsiders, and enhance the sustainability of the MPA (Fa'asili & Kelokolo, 1999; Johannes, 1998a; Kostka, in prep.; Lokani & Seeto, in prep.; MacKay, unpubl.; Whyte et al., 1998). This is a delicate issue, however. Communities may fear that formal declaration of an MPA may create fears of loss of ownership and control. Legal formalisation of CMT and traditional authority may enhance local control but it can also reduce flexibility, slow enforcement, and create conflict (Fa'asili & Kelokolo, 1999; Ruddle, 1998).

Success depends on effective partnerships. Co-management options must be carefully
analysed and transparent. Too many or too few partners, and poorly defined roles, can slow the process (Parks et al, in prep; SPBCP, 2000a). If agencies lack capacity or authority to perform their designated roles communities get frustrated or lose interest, or the lead role may pass by de facto to others not mandated to perform it (Whyte et al., 1998; SPBCP, 2000a). [BOX 2]

**Management structures must be socially appropriate, equitable, and transparent.** Intracommunity co-operation and participation is vital. Management regimes must consider the relative roles, rights, responsibilities, interests and power of community leaders, landowners, leaseholders, gender and age groups (Whyte et al., 1998). Management committees must be representative but not cumbersome (SPBCP, 2000b, f). Perceptions of misuse of project funds or inequitable distribution of costs and benefits lead to disputes and failure.

**Build awareness through education.** Education often provides the impetus for communities to take and sustain action, and gives them tools to do so (MRAG, 1999). Education of school children is particularly effective (King & Fa'asili, 1999b; Kostka, in prep.; Lokani & Seeto, in prep.; Takesy, 2001). Education activities should start at the outset and continue throughout a project (Parks et al., in prep.)

**Community monitoring is a powerful tool.** Simple community monitoring techniques can provide scientifically valid information that is relevant to the community, reinforces social cohesion and a sense of ownership, and provides feedback on progress (Parks & Salafsky, 2001; SPBCP, 2000f; Tawake, et al., in review; Wells and White, 1995) Monitoring is also effective in environmental education and building capacity for environmental management.

7.2 Further conclusions in the context of the IWP

Most but not all IWP countries have ongoing MPA-related initiatives, but the area protected remains small. There are opportunities for the IWP to intervene on several levels, depending upon the country:

- facilitating new community-based MPAs in areas where they are currently lacking;
- assisting the development of projects in the planning or early implementation stages of development, of which there are many;
- developing or providing continuing support for more mature projects that are not yet sustainable, such as the SPBCP conservation areas;
- developing co-managed MPAs in urban areas (see below);
- developing more comprehensive frameworks for existing locally-managed MPAs, for example by encompassing them within a multiple-use MPA or ICM project.

The large majority of locally-managed MPAs in the Pacific are in rural areas. Rural conditions (small population, generally greater social cohesion and more intact traditional authority, often fewer environmental issues) favor the development of community-based MPAs. Urban areas, however, generally have the most degraded coastal environments and tend to have the greatest opportunities both for alternative income generation and for realisation of the recreational, educational, and scientific benefits of MPAs. The IWP may wish to consider an urban MPA project, but this will require a higher level of co-management and admittedly be more complex and risky than rural projects. Pilot projects in secondary
towns (e.g., provincial seat, district centres) rather than national capitals may help reduce this risk, but it may also to reduce available national government support.

Because MPAs are generally not viable in isolation, IWP pilot MPA projects should as much as possible integrate the other IWP focal areas. The sustainable fisheries focal area will usually if not always be directly relevant but waste reduction and freshwater resources (in the context of watershed management), particularly for urban and/or multiple-use/ICM scenarios.

Although the need for alternative fishing and income generation opportunities and the economic sustainability of MPAs is widely recognised, and the private sector has been involved in a number of locally-managed MPAs, discussion of private sector involvement is notably absent from much of the documentation on Pacific Islands MPA activities. The IWP may wish to explore ways to strengthen private sector involvement in MPA partnerships.

Finally, while the 5-year time scale of the IWP is long by the standards of development assistance projects, overwhelming experience in the Pacific is that developing self-sufficient, institutionally sustainable MPAs will take much longer. Project continuity can be enhanced by building upon existing activities and by developing from the outset of project strategies for their continuation beyond the life of the IWP.

8. Expanded Bibliography
[INSERT HERE]
Box 2: Obstacles to inter-agency co-operation include:

- different priorities and sometimes conflicting interests
- project based rather than holistic approach
- prevailing gender based attitudes
- limited will to cooperate
- top down approach to planning
- limited capacity of agency staff to assume additional commitments and individual worker overload inhibiting creative and flexible approaches to emerging issues or the interests of other organisations.

(Whyte et al., 1998)

Box 1. Pacific RoundTable key criteria for monitoring indicators

(RoundTable, 1999).

**Significant** - measures an important change on issues identified in the Action Strategy

**Feasible** - can be measured in a simple, practical way

**Comparable and Consistent** - can be defined in the same way by all

**Sensitive** – reliably reflects any significant changes

**Meaningful** - to users and decision-makers

**Understandable** - easy to understand and report

**Multilevel** - applicable at different scales (e.g. site, national, regional levels) and has the potential to “roll up” or be aggregated from one level to the next. (NOTE: the last criteria was considered highly desirable but not required)
<table>
<thead>
<tr>
<th>Category</th>
<th>Classification and Management Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Strict Nature Reserve/Wilderness Area: managed mainly for science of wilderness protection</td>
</tr>
<tr>
<td>IA</td>
<td>Strict Nature Reserve: managed mainly for science</td>
</tr>
<tr>
<td>Ib</td>
<td>Wilderness Area: managed mainly for wilderness protection</td>
</tr>
<tr>
<td>II</td>
<td>National Park: managed mainly for ecosystem protection and recreation</td>
</tr>
<tr>
<td>III</td>
<td>Natural Monument: managed mainly for conservation of specific natural features</td>
</tr>
<tr>
<td>IV</td>
<td>Habitats/Species Management Area: managed mainly for conservation through management intervention</td>
</tr>
<tr>
<td>V</td>
<td>Protected Landscape/Seascape: managed mainly for landscape/seascape conservation and recreation</td>
</tr>
<tr>
<td>VI</td>
<td>Managed Resource Protected Area: managed mainly for the sustainable use of natural ecosystems</td>
</tr>
<tr>
<td>Dimension</td>
<td>Central Management</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Socioeconomic</td>
<td>low resource dependency for food and income</td>
</tr>
<tr>
<td></td>
<td>diverse and stable alternative income options</td>
</tr>
<tr>
<td>Cultural</td>
<td>no customary tenure</td>
</tr>
<tr>
<td></td>
<td>no traditional management</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Legal</td>
<td>full state ownership of waters and resources</td>
</tr>
<tr>
<td></td>
<td>open, public access</td>
</tr>
<tr>
<td>Institutional</td>
<td>strong human, technical, and financial capacity</td>
</tr>
<tr>
<td></td>
<td>centralized, bureaucratic decision-making structure</td>
</tr>
<tr>
<td></td>
<td>balance preservation and restricted use</td>
</tr>
<tr>
<td></td>
<td>complex, multiple-levels of regulatory control</td>
</tr>
<tr>
<td>Biological</td>
<td>large, complex systems</td>
</tr>
<tr>
<td></td>
<td>not a principal determinant</td>
</tr>
</tbody>
</table>
Table 3. Indicators that communities perceive fisheries benefits from MPAs in Pacific Islands Countries.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Country</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fiji</td>
<td>Tawake et al., in prep.; MacKay,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>unpbl.</td>
</tr>
<tr>
<td></td>
<td>FSM (Pohnpei)</td>
<td>FSM, 2001</td>
</tr>
<tr>
<td></td>
<td>Samoa</td>
<td>MacKay, unpbl.</td>
</tr>
<tr>
<td>More communities establish MPAs</td>
<td>Cook Is.</td>
<td>Evans, in prep.; MacKay, unpbl.</td>
</tr>
<tr>
<td></td>
<td>Fiji</td>
<td>Tawake et al., in prep.; MacKay,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>unpbl.</td>
</tr>
<tr>
<td></td>
<td>Palau</td>
<td>Smith, 2001</td>
</tr>
<tr>
<td></td>
<td>Samoa</td>
<td>King &amp; Fa’a’asili 1999b</td>
</tr>
<tr>
<td></td>
<td>PNG</td>
<td>Lokeni &amp; Seeto, in prep.</td>
</tr>
<tr>
<td></td>
<td>Vanuatu</td>
<td>Johannes, 1998a</td>
</tr>
<tr>
<td>New or more restrictive rules</td>
<td>Fiji</td>
<td>Tawake et al., in prep.</td>
</tr>
<tr>
<td></td>
<td>PNG</td>
<td>Lokeni &amp; Seeto, in prep.</td>
</tr>
<tr>
<td></td>
<td>Samoa</td>
<td>King &amp; Fa’a’asili 1999b</td>
</tr>
<tr>
<td></td>
<td>Vanuatu</td>
<td>Johannes, 1998a; Whyte et al., 1998</td>
</tr>
<tr>
<td>Length of closed period extended</td>
<td>Cook Is.</td>
<td>Evans in prep.</td>
</tr>
<tr>
<td></td>
<td>Vanuatu</td>
<td>Johannes, 1998a; MRA/G, 1999;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noviti &amp; Aston, 2000; Whyte et al.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1998</td>
</tr>
</tbody>
</table>
Figure 1. Spectrum of MPA management models (From Kenchington, 1999).

**LOCAL MANAGEMENT**

**CENTRAL MANAGEMENT**
- Full control by the agency in charge

**CO-MANAGEMENT**
- Shared control by the agency in charge and the community

**COMMUNITY-BASED MANAGEMENT**
- Full control by the community

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**PARTNERSHIP IN THE MANAGEMENT OF A PROTECTED AREA**

- **Activity and decision-making**
  - No interference or contribution from the community stakeholders

- **Participatory processes**
  - Increasing expectations, contributions, commitment and accountability of the community’s stakeholders

- **Negotiation and decision-making**
  - Negotiating (involving in decision-making and developing specific agreements)

- **Sharing authority and responsibility**
  - Sharing authority and responsibility in a formal way (e.g., via seats in a management body)

- **Transferring authority and responsibility**
  - Transferring authority and responsibility

---

No interference or contribution from the agency in charge.


8. Expanded Bibliography


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