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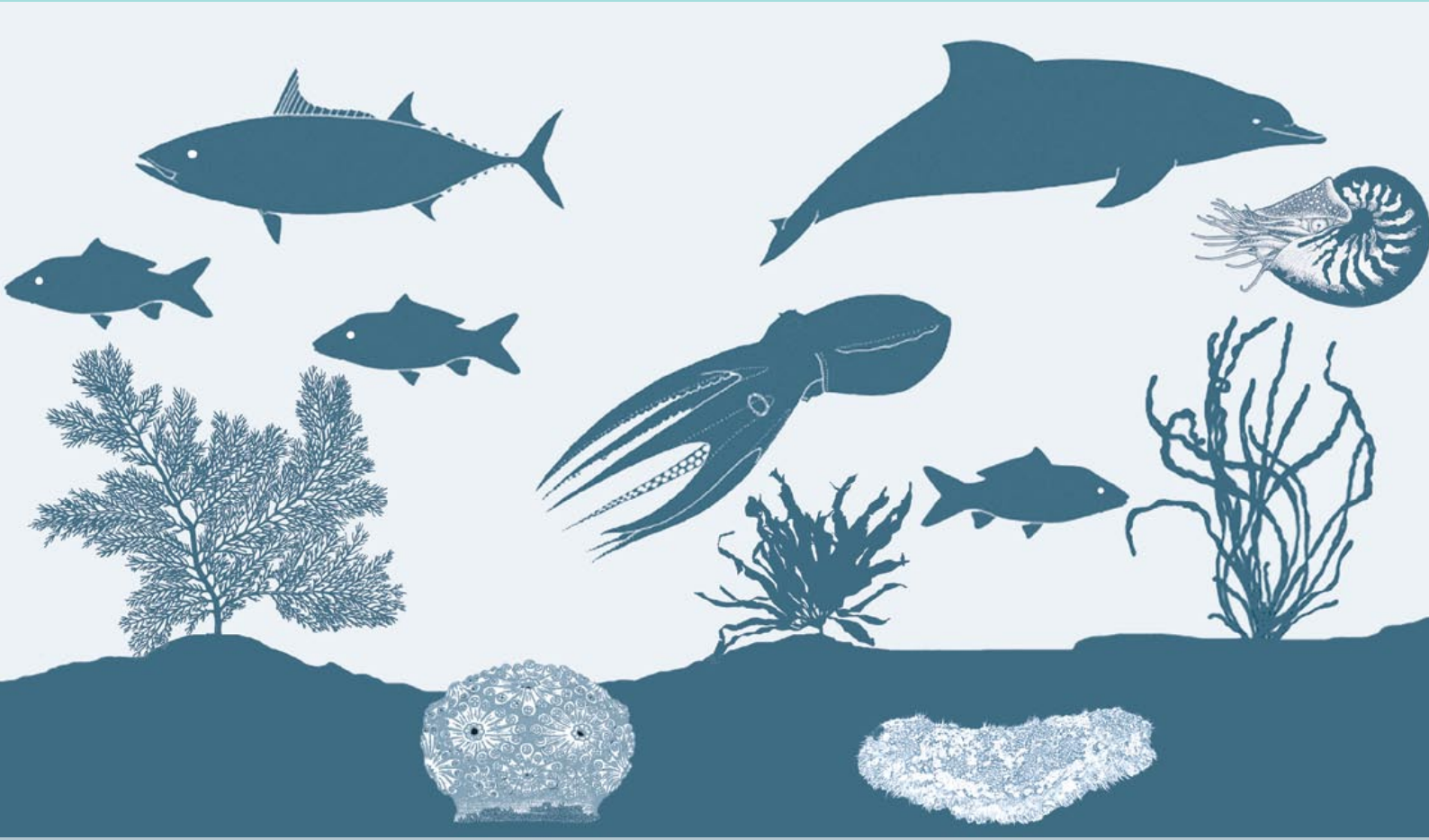
Marine protected areas

Country case studies on policy, governance and institutional issues

Japan – Mauritania – Philippines – Samoa



***Cover illustration*:**
Manuela D'Antoni

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Preparation of this document

The four case studies from Japan, Mauritania,the Philippines and Samoa were prepared as part of a set of 16 studies gathering national experiences from around the world. The studies are intended to ground the FAO Technical Guidelines on Marine Protected Areas (MPAs) and Fisheries[1] in practical experience and to inform the use of MPAs globally.

The planning and development of the case studies were carried out by a team including Dominique Gréboval, Patrick Christie, Antonia Hjort and Jessica Sanders. The case studies were carefully reviewed by Katrina Ole-Moiyoi, Oliver Schultz and Clotilde Bodiguel. Ariane Acqua was instrumental in project operations and the publication of this document. The maps of each country were prepared by Fabio Carocci. Final editing of the case studies was provided by Lynn Ball and Sacha Lomnitz.

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[1] FAO. 2011. *Fisheries management. 4. Marine protected areas and fisheries*. FAO Technical Guidelines for Responsible Fisheries No. 4, Suppl. 4. Rome. 198 pp.

Abstract

This Fisheries and Aquaculture Technical Paper presents case studies of the policy, governance and institutional issues of marine protected areas (MPAs) in Japan, Mauritania, the Philippines and Samoa. It is the second of four in a global series of case studies on MPAs. An initial volume provides an analysis and synthesis of all the studies.

The set of global MPA case studies was designed to close a deficit in information on the governance of MPAs and spatial management tools, within both fisheries management and biodiversity conservation contexts. The studies examine governance opportunities in and constraints on the use of spatial management measures at the national level.

They were also designed to inform implementation of the FAO Technical Guidelines on Marine protected areas (MPAs) and fisheries, which were developed to provide information and guidance on the use of MPAs in the context of fisheries.

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Samoa

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Introduction

Marine protected areas (MPAs) are currently much discussed and often strongly promoted from a biodiversity conservation perspective, particularly in response to international calls to safeguard the marine environment. Many countries have agreed to international targets or goals, such as the Plan of Implementation of the World Summit on Sustainable Development (WSSD-POI), which called on countries to use:

> *… diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods …*
>
> – WSSD-POI, paragraph 32(c)

The Convention on Biological Diversity's (CBD) tenth Conference of the Parties (COP 10) encouraged Parties and other governments to "achieve long-term conservation, management and sustainable use of marine resources and coastal habitats, and to effectively manage marine protected areas…" (Decision X/29, paragraph 15).[1] During the same COP, a CBD decision also recommended that MPAs for conservation and management of biodiversity could, when in accordance with management objectives for protected areas, also be established as fisheries management tools (Decision X/31, paragraph 24).[2]

In fisheries management, spatial management tools, including MPAs, have been used for centuries and do not constitute a new management tool. Protection of specified areas through bans on gears or fishing activities have long been part of the fisheries management toolbox and have been practised by communities employing traditional management arrangements around the world. The FAO Code of Conduct for Responsible Fisheries mentions the use of spatial management measures, for example in Article 6.8, which emphasizes the importance of protection and rehabilitation for all critical habitats, and particularly protection against human impacts such as pollution and degradation. In an effort to promote its goal – sustainable fisheries – the Code addresses protected area measures:

> *States should take appropriate measures to minimize waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and negative impacts on associated or dependent species, in particular endangered species. Where appropriate, such measures may include technical measures related to fish size, mesh size or gear, discards, closed seasons and areas and zones reserved for selected fisheries, particularly artisanal fisheries.*
>
> – Article 7.6.9

A convergence of interests has taken place as fisheries managers emphasize healthy ecosystems, and conservation groups have become increasingly aware of the necessity to include human needs and interests in designing and implementing MPAs. However, despite the long-term, widespread use of spatial management tools in fisheries

[1] COP 10 Decision X/29, Marine and coastal biodiversity.
[2] COP 10 Decision X/31, Protected areas.

management and conservation, there remains significant confusion regarding the establishment of MPAs with varying objectives, as well as the general role of MPAs meeting multiple objectives within fisheries management. Views on how and when to use MPAs and what they can achieve differ significantly among diverse political, social and professional groups, and also among individuals. A shift towards broader ecosystem considerations in fisheries management and the ecosystem approach to fisheries (EAF) has led to the increased use of tools such as MPAs to pursue multiple objectives. However, multiple-objective MPAs have not been as thoroughly studied in recent literature or case studies.

The FAO Fisheries and Aquaculture Department was asked to further explore the role of MPAs in relation to fisheries at the Twenty-sixth Session of the FAO Committee on Fisheries (COFI) in 2005. This request resulted in the FAO Technical Guidelines on Marine protected areas and fisheries, which discuss MPAs in relation to fisheries management and aspire to enhance understanding of how MPAs can contribute to bridging fisheries management and biodiversity conservation objectives within broader management frameworks (i.e. EAF).

Despite the many studies and guides on MPAs, there is a dearth of information and research on MPAs in a fisheries context, and particularly in relation to governance of MPAs for multiple objectives or the involvement of many institutions. MPAs invariably affect fisheries when designated with biodiversity or other primary objectives, and vice versa. Thus, an understanding of governance regimes for spatial management measures and the coherence or confusion within countries are crucial aspects in understanding the use and improving the effectiveness of MPAs.

The set of global MPA governance case studies was designed to address a deficit of information on the governance of MPAs and spatial management tools, within both fisheries management and biodiversity conservation at the national level.

The studies were conducted using a consistent research framework to facilitate their eventual analysis, which is presented as the initial volume of the series.[3] All authors were provided with a background and outline for their case study, including the goals, objectives, working definitions, framework for the study and list of relevant literature.

The goals were to:

- describe the means and outcomes of MPAs for fisheries management planning and implementation in various contexts, in particular emphasizing developing countries;
- identify the ability of MPAs, as implemented, to meet both biodiversity conservation and fisheries management objectives (and others);
- identify key governance opportunities in and constraints on MPA implementation;
- ground the MPA Guidelines in current practice.

To create a common understanding among the authors, a working definition of "governance" was provided:

> *… the concept of governance conceived of as "the formal and informal arrangements, institutions, and mores which determine how resources or an environment are utilized; how problems and opportunities are evaluated and analyzed, what behavior is deemed acceptable or forbidden, and what rules and sanctions are applied to affect the pattern of resource and environmental use.*
>
> – Juda 1999[4]

[3] FAO. 2011. FAO Fisheries and Aquaculture Technical Paper No. 556. Rome.

[4] Juda, L. 1999. Considerations in the development of a functional approach to the governance of large marine ecosystems. *Ocean Development and International Law*, 30: 89–125.

A definition and a characterization of MPAs were developed. The definition was taken from the CBD, and the characterization of MPAs for fisheries was adapted from a 2006 FAO workshop:

> *'Marine and coastal protected area' means any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings.*
>
> – CBD, COP 7, Decision VII/5, paragraph 10, note 1(a)

An MPA used as a fisheries management tool:

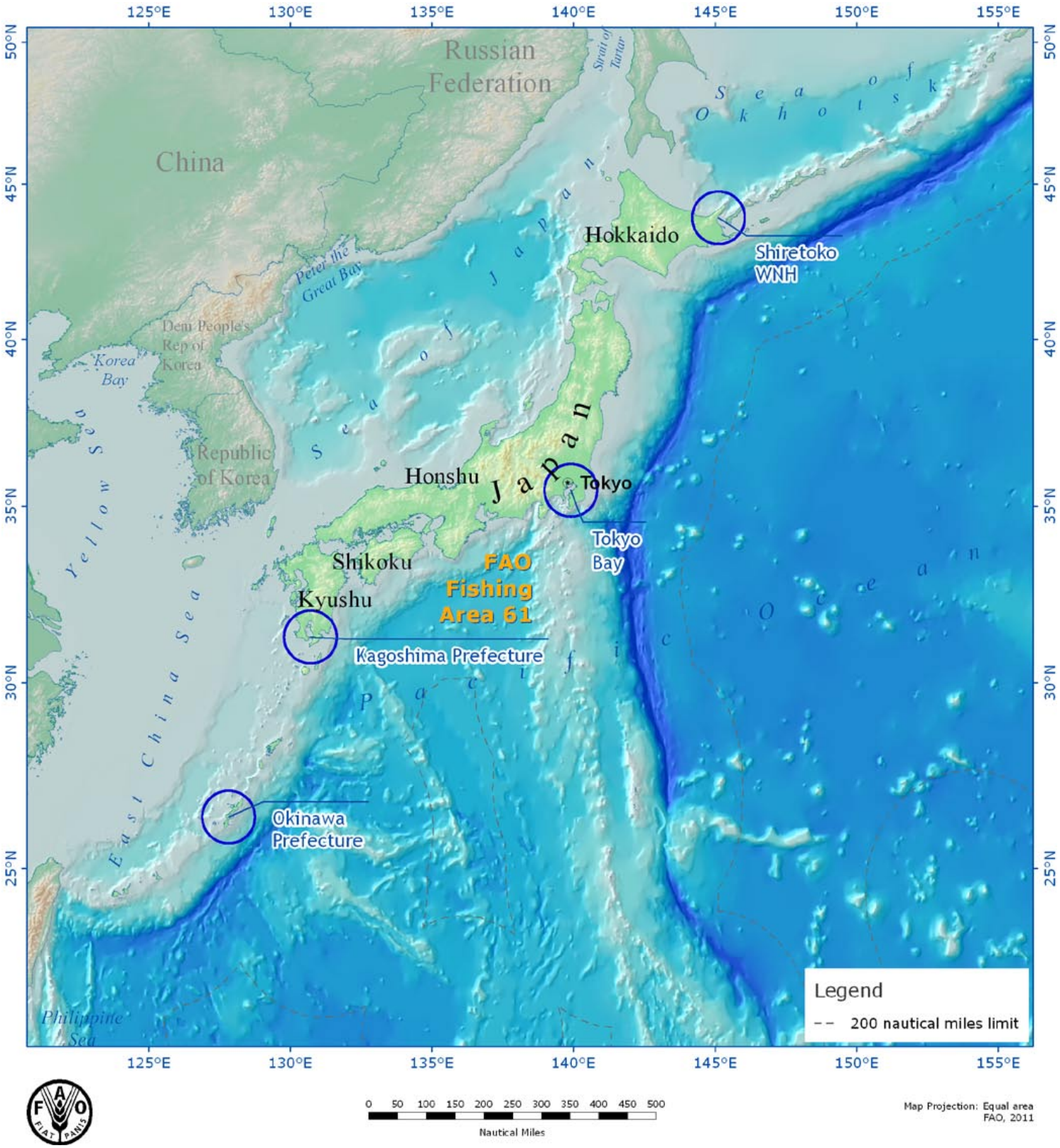
- is intended to contribute to achieving conservation and sustainability objectives of fisheries management, while contributing to biodiversity and habitat conservation (with intended or unintended social and economic consequences);
- is temporally and geographically specified in three dimensions for a portion of the geographic range of the fishery management unit;
- would afford fishery resources a higher degree of protection within the geographic boundaries of the MPA than the resource is afforded elsewhere within the geographic range of the fishery management unit;
- is established through legally binding mechanisms and/or other effective means;
- is usually expected to have resource conservation and sustainability benefits, other ecological benefits, and/or social benefits, beyond the boundaries of the MPA.[5]

In addition to the definition and characterization provided, however, authors were asked to formulate a context-specific definition for MPAs for the country reviewed and to focus on the characterization of an MPA within the country.

This document provides the five case studies; Japan, the Philippines, Samoa and Mauritania. Two additional volumes of case studies will follow. The first volume in the series presents an overall global analysis.

[5] FAO. 2007. *Report and documentation of the Expert Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and Considerations, Rome, 12–14 June 2006*. FAO Fisheries Report No. 825. Rome. 332 pp.

Map 1
Japan and the four cases of autonomous MPAs



Japan

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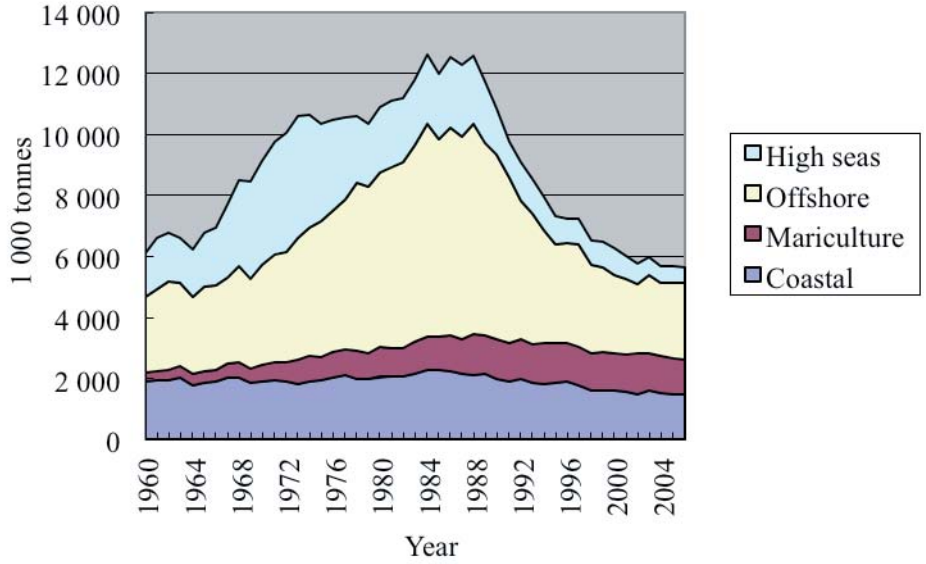
1. INTRODUCTION

Japan has been known as one of the most important fisheries countries in the world in terms of production and consumption. Figures 1 and 2 show tonnage changes in Japanese catch and production value in Japanese yen from 1960 to 2006 (US$1 = 97.6 JPY in February 2009). In the late 1960s and early 1970s, the high sea fisheries constituted the most significant fisheries sector in Japan. However, after establishment of the 200 nautical mile system globally, the importance of this fishery declined drastically. Offshore fisheries peaked from the late 1970s to 1980s. The main catch in that period, in tonnage, was Japanese sardine (*Sardinops melanostictus*). However, owing to natural fluctuation of biomass and overfishing, landings of Japanese sardine declined severely in the late 1980s (Yatsu *et al.*, 2005). The coastal fishery has shown relatively stable landings since the 1960s, with a slight decline in the last 15 years, and it has been the most important sector in terms of production value since the late 1980s. In the 1960s and 1970s, coastal mariculture developed considerably, and now it is the second-largest sector in terms of production value.

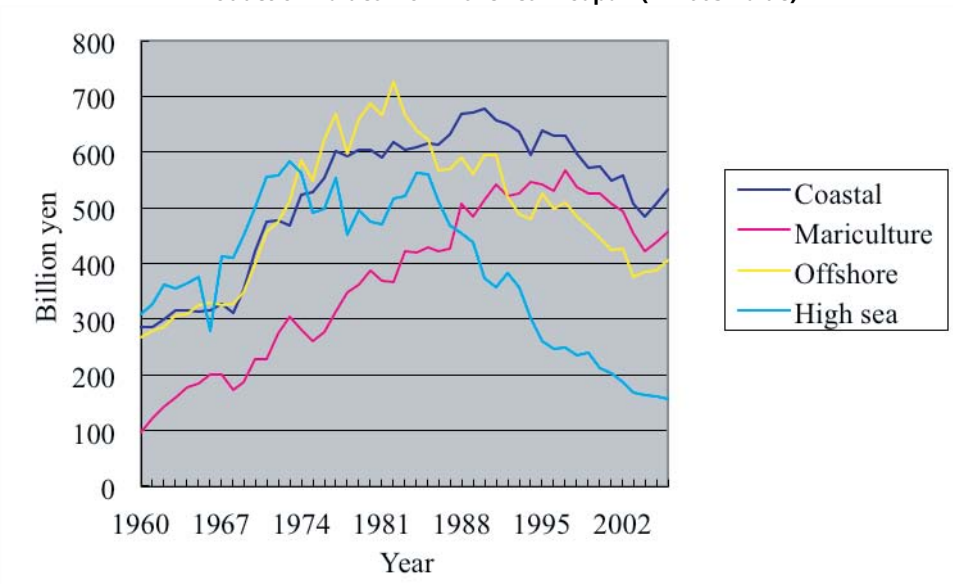
Immediately after the Second World War, the number of fishers in Japan was more than one million. However, as Figure 3 shows, it has continuously declined, and in 2007 total workers in the fishery production sector numbered some 350 000. Moreover, the advancing age of fishers is a serious issue. Figure 4 shows a continuous decline, as

FIGURE 1
Fishery production in Japan



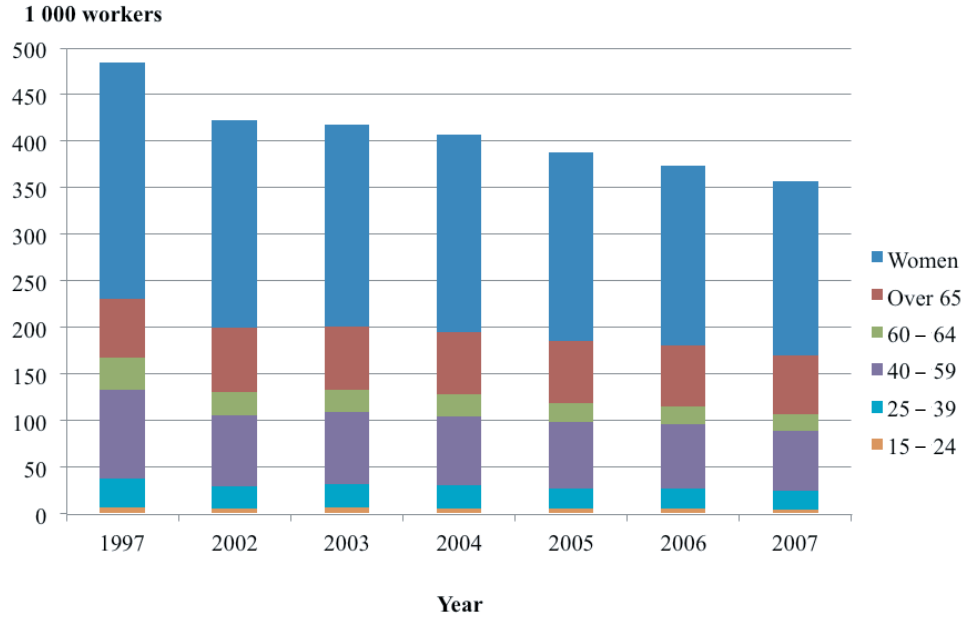
Source: Ministry of Agriculture, Forestry and Fisheries, 1960–2006.

FIGURE 2
Production values from fisheries in Japan (in 2005 value)



Source: Ministry of Agriculture, Forestry and Fisheries, 1960–2006.

FIGURE 3
Number of workers in fishery production sector

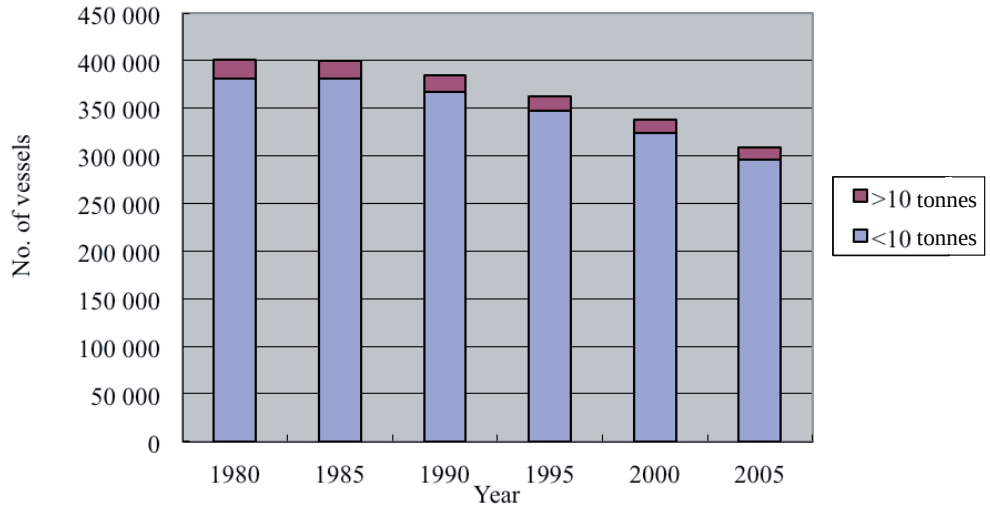


Source: Ministry of Agriculture, Forestry and Fisheries, 1997–2007.

well, in the number of powered fishing vessels in Japan in the last 25 years. It is worth mentioning that more than 95 percent of the powered fishing vessels in Japan are small-scale, coastal vessels (less than ten tonnes).

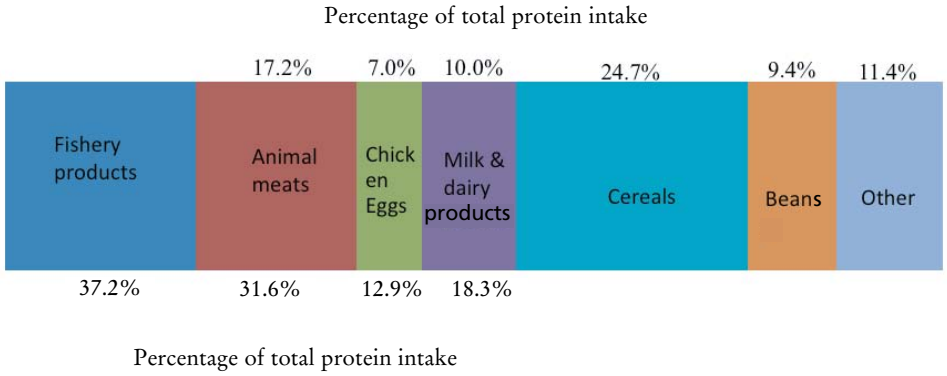
At the end of this section, it is worth mentioning the consumption aspects. Japanese people are fish-eaters. The average Japanese citizen consumes more than 66 kg of fishery products each year. Figure 5 shows the composition of the protein intake for the average Japanese person. Fishery products are the most important source of animal protein, covering 37 percent of total intake. This figure is one of the highest in the world, and indicates the importance of seafood to food security in Japan (Makino and Matsuda, 2011).

FIGURE 4
Number of powered fishing vessels



Source: Fisheries Agency, 1980–2005.

FIGURE 5
Composition of protein intake for the average Japanese person in 2007



2. FISHERIES AND SPATIAL MANAGEMENT

Marine fisheries are classified into three categories in Japan: (i) fishing rights for coastal fisheries, including mariculture; (ii) fishing licences for offshore and high seas fisheries; and (iii) free fisheries (Ruddle, 1987). Although the expiration period is fixed in the Fisheries Law of 1949, fishing rights are regarded as real rights, and the provisions of the territorial rights law are applied *mutatis mutandis*. However, they do not include the right to privatize the sea surface or marine resources into portions. Fishing rights are rather similar to use rights in their attributions, i.e. the right to conduct fishery operations exclusively in specified areas by specified methods. Fishery licences, on the other hand, are not real rights, but, taking the large capital investments of licence holders into account, they are also strongly protected.

The fundamental concept of fisheries management in Japan is "the holistic utilization of the sea surfaces" by resource users themselves, as stated in section 1 of the Fisheries Law of 1949 (as amended) (Makino and Matsuda, 2005). Under this concept, the wide range of fishing operations conducted within an area are to be arranged and coordinated with the overall impact of usage in mind, and not simply from the

TABLE 1
Coordinating organizations in Japan

Level	Organization	Function
National level	Fishery Policy Council	The advisory body to the Government for national-level fishery coordination, design of national fishery policy, etc.
Multijurisdictional level	Wide-area fishery coordinating committees (WFCCs)	Coordination of resource use and management of highly migratory species. Also drafts resource restoration plans.
Prefectural level	Areal fishery coordinating committees (AFCCs)	Mainly composed of democratically elected fishers. Coordination through the AFCCs' fishery ground plans, prefectural fishery coordinating regulations and committee directions.
Local level	Local fisheries cooperative associations (local FCAs)	Composed of local fishers. They establish operational regulations (FCA regulations) that stipulate gear restrictions, seasonal/area closures of fishing grounds, etc.
Specialized purposes	Fishery management organizations (FMOs)	Autonomous bodies of fishers. FMO rules are more detailed and stricter than FCA regulations.

viewpoint of each individual economic unit. In order to achieve this, various levels and scales of coordinating organizations have been created to act as instruments to facilitate holistic fishery coordination as explained in Table 1.

In addition to these formal coordinating structures, autonomous bodies of local fishers known as fishery management organizations (FMOs) have initiated various management measures to maintain and improve their incomes, and to sustain resources. FMOs are often formed by a group of fishers within a fisheries cooperative association (FCA). According to the biological nature of the target species, FMOs are sometimes organized by members from several neighbouring FCAs or even by members of FCAs from several prefectures (FAO, 1993).

Within this framework, the principal decision-makers with regard to management are local fishers. The Fisheries Law provides a framework for fisheries management through a system of fishing rights and licences. In order to achieve holistic utilization of marine areas, these coordinating organizations have been granted wide-ranging authority and power. For example, the AFCCs, which consist mainly of the representatives of local fishers, determine allocation of, and restrict applications for, fishing rights and licences by means of their fishery ground plans and committee directions. A variety of fishing restrictions have been stipulated by prefectural fishery coordinating regulations, FCA regulations and FMO rules. The prefectural regulations broadly stipulate fishing restrictions, and these regulations apply throughout the prefecture. FCA regulations stipulate fishing restrictions in more detail, and these are applicable only locally. In particular, FCA regulations consider the restrictions set out in the prefectural fishery coordinating regulations and make additions to them. Similarly, the FMO rules constitute a further refinement of the FCA regulations. Thus resource conservation is an integral part of resource use by local fishers.

In addition to these fisheries management activities, there are other types of spatial conservation measures implemented by the environmental administration. For example, the national park system, founded in 1970, covers more than 1.7 million hectares (ha) of coastal areas in order to protect outstanding marine scenery. In these areas, artificial constructions or land refills are regulated by the Ministry of the Environment or the governors of prefectures. Also, the take of endangered species such as sea turtles is prohibited in the "special area" of the National Park, and these species are strictly conserved (details are provided in the following section).

3. MPA DESIGN AND MANAGEMENT STATUS

For the moment, there are no agreed national definitions of marine protected areas (MPAs) in Japan. This section tentatively follows that of the Convention on Biological Diversity (CBD): "…any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna, and historical and cultural

features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings" (CBD COP 7 Decision VII/5, note 11). Based on this definition, MPAs in Japan can be divided into two categories.

The first category is legal MPAs, i.e. based on law. There are at least six types of legal MPAs in Japan, as summarized in chronological order in Table 2. The two oldest types of MPAs – i.e. no-bottom-trawling zones and protected waters, based on the Fisheries Law of 1949 and the Fisheries Resource Protection Law of 1951 – are administrated by the Fisheries Agency. Four newer types of MPAs are administered by the Ministry of the Environment. In addition to these six types, there are other marine areas protected by the Ministry of Land, Infrastructure, Transport and Tourism, based on the Ports Law of 1950 or the Coasts Law of 1956.

The second category is autonomous MPAs based on local initiatives, often by local fishers or local non-governmental organizations (NGOs). Usually, autonomous MPAs are established on an issue-specific basis. The autonomous MPAs can then be grouped into two types: (i) fishery-resource-management-oriented MPAs, and (ii) ecosystem-management-oriented MPAs. Typical cases of the former type – such as the snow crab no-take zones (Makino, 2008) or moving MPAs for sand eel (Tomiyama, Komatsu and Makino, 2008) – have already been published in FAO Fisheries Technical Paper 504, *Case studies in fisheries self-governance* (Townsend, Shotton and Uchida, 2008). Thus, this paper we would like to concentrates on the latter type, the more-ecosystem-oriented MPAs.

Historical records of autonomous MPAs for the purpose of ecosystem/biodiversity conservation by local people date back at least some hundreds of years. These activities typically focus on the primary productivity of marine ecosystems, such as seagrass beds, tidal lands or coral reefs. In addition in recent the last decades, prevention measures for rocky shore calcification have been implemented all along the Japanese coast. In many cases, these activities cannot be separated from fisheries management. In other words, they are a part of the responsibilities of local fishers, which come with

TABLE 2
Legal MPAs in Japan

Name of MPA	Legal basis	Objective	Content	Estimated area
No-bottom-trawling zone	Fisheries Law of 1949, Law on the Fisheries Resource Conservation of 1951	Demarcation of marine use between coastal fisheries and offshore bottom-trawlers	Ban on bottom-trawling	About 3 nautical miles from the coastline
Protected waters	Fisheries Resource Protection Law of 1951	Protection of marine resources for spawning, nursery, etc.	Regulation of refill, use of specified gear, catch of specified species, etc.	About 2 950 ha
Special marine area	Nature Conservation Law of 1952	Protection of special natural environment	Regulation of catch of specified species, artificial constructions, digging, refill, etc.	About 128 ha
Marine park	Natural Parks Law of 1957	Protection of outstanding marine scenery	Regulation of catch of specified species, artificial constructions, digging, refill, etc.	About 1.7 million ha
Natural coast conservation area	Special Law on the Seto Inland Sea Environmental Protection of 1973	Preservation of natural status and public use	Regulation of artificial constructions, digging, refill, etc.	91 areas
Special protection area, other area	Wildlife Protection and Appropriate Hunting Law of 2002	Conservation of wild animals	Regulation of catch of specified species, artificial constructions, digging, refill, etc.	About 4 900 ha

Source: Based on information provided by the Ministry of the Environment.

the fisheries rights and licences. In order to grasp the "big picture" of these activities, the Fisheries Agency of Japan conducted a survey of FCAs in 2006. According to the report of the survey, 57.1 percent of FCAs implemented some kinds of spatial conservation measures for seagrass beds, tidal lands or coral reefs (Fisheries Agency, 2007a). Examples of conservation activities are: artificial seeding of seagrasses or extermination of sea urchins for the recovery of seagrass beds; sand refill or cleaning up of drift dusts for tidal lands; extermination of *Acanthaster planci*; or prevention of soil coverage for coral reefs.

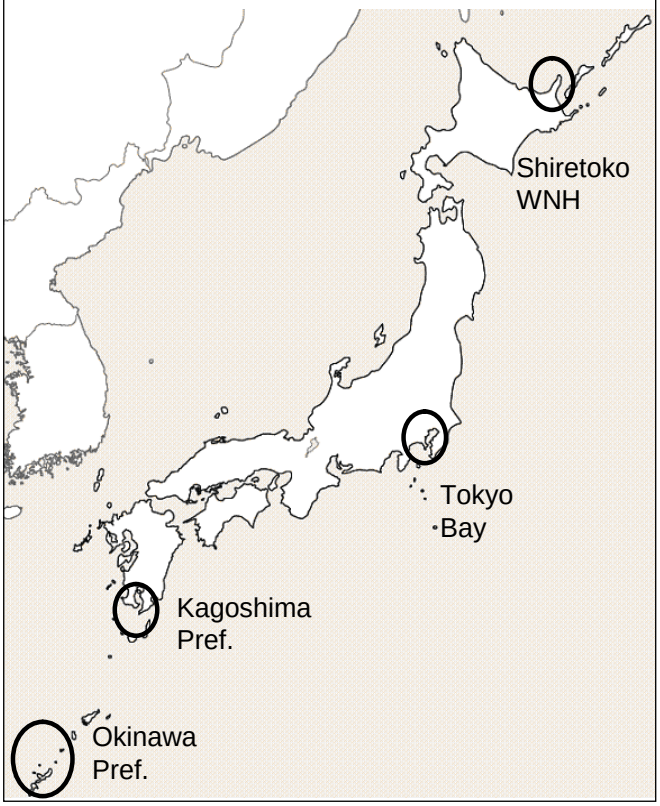
4. MPA GOVERNANCE

The governance of MPAs in Japan is highly dependent on the types explained in the previous section. For legal MPAs, the administrative ministries or local government have broad authority in planning, establishing and implementing MPAs. However, consensus-building with local stakeholders is a prerequisite. For example, there are many fishing communities in the national parks, because local people have conducted fisheries activities along almost the entire Japanese coast since much earlier than the establishment of the national park system in 1970, and their activities are protected by fishing rights/licences. According to the 11th Census of Fisheries conducted in 2003, 44 percent of the fisheries areas are included in national parks. Under such social conditions, consensus-building among local fishers is one of the most important activities when the Government intends to establish a legal MPA.

The autonomous MPAs, on the other hand, are characterized as more site-specific and flexible to local conditions. The following four cases illustrate the diversity of the autonomous MPAs in Japan (Figure 6).

The first case is the Shiretoko World Natural Heritage Site. In this area, various fisheries management measures have been autonomously implemented by local fishers. In particular, seasonal no-take zones for walleye pollock spawning stocks have been implemented by local gillnet fishers since 1995. The no-take zones are re-examined every year on the basis of the previous year's performance and scientific advice from the local research station. These activities are officially incorporated into the marine management plan of the heritage area as a part of the ecosystem-based management measures (Makino, Matsuda and Sakurai, 2009). Thus, the MPAs begin as local initiatives, but are formally recognized under the World Natural Heritage framework of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

FIGURE 6
Autonomous MPAs in Japan: four typical cases



The second case is the MPA for seagrass beds. Beds along Japanese coastal areas have disappeared drastically since the 1970s, especially around urban areas. Tokyo Bay (Figure 6) is the most urbanized area in Japan, and the seagrass recovery activities have been eagerly conducted by wide-ranging participants from NGOs, local FCAs, schools, private companies, local/central government and

local research institutions. This case is famous for its highly bottom-up and voluntary process, initiated by local NGOs in 1981. The areas where seagrasses are seeded are now protected as no-take zones based on the Areal Fishery Coordinating Committees Direction (Table 1), and part of their activities is funded by local and central government. The goal of the activities was decided based on the experiences of the director of the board of a local FCA, i.e. to restore coastal ecosystems to their state of some 50 years ago.

The third case of autonomous MPAs is rehabilitation of the calcified rocky shores in Kagoshima Prefecture. The local FCA, a research station and high school students have jointly planned the extermination of sea urchins and have planted seagrasses at the calcified areas since 2005 (Fisheries Agency, 2007b). This is also a bottom-up process, and the distinguishing feature of this case is its educational purpose. The goal of the activity is to recover seagrasses in the area and to observe the spawning of bigfin reef squid (*Sepioteuthis lessoniana*).

The final example is from Okinawa Prefecture. This prefecture is famous for its tropical marine ecosystems, and many recreational divers visit every year. Based on the consensus among local FCAs, scuba-diving tourism associations and recreational fishing, several areas of coral reef are designated as seasonal sanctuaries (no-take and no-diving) to limit human impact (Kakuma, 2007). The local research station supports the activities with scientific information, technical instruction and monitoring.

These four cases are only some examples of the many autonomous MPAs along the Japanese coast. Based on these experiences, the Fisheries Agency issued several guidelines for autonomous MPA activities undertaken by local initiative (Fisheries Agency, 2007a, 2007b, 2007c). The guidelines teach organization, coordination of stakeholders and the reaching of consensus, as well as providing technical information.

The autonomous MPA is an effective approach for several reasons: (i) local ecological and traditional knowledge, often conserved among local fishers, is effectively used with scientific support from local (prefecture) research stations; and (ii) the decision-making process is basically consensus-building and is very often unanimous, which means that costs of monitoring and enforcement are relatively low, because mutual monitoring by local people/fishers works.

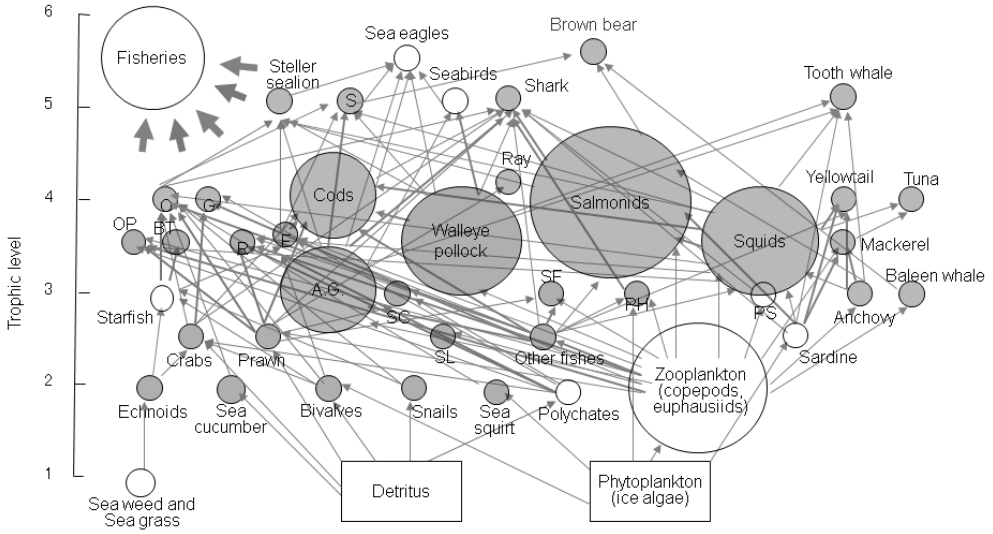
On the other hand, autonomous MPAs are weak in the following points. First, the emphasis on consensus-building can lead to cost-effective implementation, as explained above, but that does not necessarily mean that the MPAs and other management measures implemented in the area are sufficient for the conservation objectives. The consensus-building approach often results in moderate, rather than drastic and sweeping decisions. Thus continuous monitoring and adaptive revision of the management plan based on scientific information is important. Second, precisely because the implementation and enforcement processes are autonomous, there is always the threat of moral hazard among participants, especially when a wide range of sectors or stakeholders with varying interests participate in the process. Potentially, if all the participants were to fall into moral hazard, autonomous MPAs could be worse than top-down or legal MPAs. Thus not only the decision-making and implementation authorities, but also local organizations should achieve accountability for conservation.

5. SOCIO-ECONOMIC AND ECOLOGICAL CONSIDERATIONS AND IMPACTS

Setting objectives for marine ecosystem conservation is a highly social process, as the first principle of the Ecosystem Approach of the CBD points out (www.cbd.int/ecosystem/principles.shtml). Diverse sectors of society view ecosystems in terms of their own economic, cultural and social needs. Local communities and people are important stakeholders and their rights and interests should be recognized. Both cultural and biological diversity are central components of ecosystem conservation.

As mentioned in section 1, the Japanese are fish-eaters, and fishery products are the most important source of animal protein. Closely related to that, a large number

FIGURE 7
Food web of the Shiretoko WNH Site



Note: AG = arabesque greenling; BT = bighand thornyhead; F = flatfishes; G = greenlings; O = octopus; OP = ocean perch; PH = Pacific herring; PS = Pacific saury; R = rockfish; S = seals; SC = saffron cod; SF = sandfish; SL = sand-lance.

Source: Marine Area Working Group of the Shiretoko WNH Scientific Council.

of small-scale fishers have historically operated along the Japanese coast. In particular, the coastal areas near highly productive marine areas have been inhabited by people for dozens of centuries. In such areas, local people have been subsisting on marine ecosystem resources, and human beings have been incorporated as a part of local ecosystems. For example, Figure 7 shows the food web of the coastal marine ecosystem at Shiretoko World Natural Heritage Site. Many components of the web, and most of the keystone species, have been consumed by local people for a very long time. This means that the responsible fisheries sustainably harvesting a wide range of species in the area are very close to the "conservation of ecosystem" structures and functions. In other words, local fisheries are the keystone species of local marine ecosystems (Makino and Matsuda, 2011). This is the reason that Japanese MPA governance processes, especially those of the autonomous MPAs, are closely linked to the local people. This is also the essential difference in the socioecological conditions between fish-eating countries, such as Japan or other Asia-Pacific countries, and countries where the main food source is land-oriented species. Without understanding this important fact, it might be very difficult to have constructive discussions on MPAs in the international arena.

The scientific sector plays an important role in implementing MPAs. In many cases of autonomous MPAs, the place, size and timing of MPA constructions are decided based on biological and technical support from the prefecture research institutions. Monitoring is also an important scientific role. Of course, the local, traditional knowledge accumulated in coastal areas is an important source of ecosystem status recognition, but that kind of information is limited in space, in other words, to that of local fishing grounds. The official monitoring that covers wider areas and larger ecosystems is indispensable for the adaptive improvement of management measures.

The evidence of socio-economic and ecological improvement through the introduction of MPAs should be monitored and estimated based on sound science. For example, the Tokyo Bay seagrass MPAs resulted in the expansion of seagrass-covered areas and the observation of bigfin reef squid spawning for the first time in 30 years. In one of the seasonal sanctuaries in the Okinawa case (about 4 km^2), it was reported that the stock biomass of spangled emperor (*Lethrinus nebulosus*) increased from 15 to

20 tonnes, with decreased estimated fishing mortality and increased annual landing (Okinawa Prefectural Fisheries and Ocean Research Center, 2007). For other examples of successful MPA outcomes in both economic and ecological aspects, see Makino (2008) and Tomiyama, Komatsu and Makino (2008).

6. COORDINATED APPROACHES TO MPAS FOR FISHERIES MANAGEMENT AND CONSERVATION

As explained above, local fishers are among the most important actors in the process of MPA introduction, even when the Government intends to establish legal MPAs. However, other stakeholders also participate in conservation activities, as exemplified by the four autonomous MPA cases in section 4. Actually, the participation of non-fishers in autonomous MPAs initiated by local fishers is not rare in Japan. According to the survey report by the Fisheries Agency (2007a), non-fishers, such as environmental NGOs, local schools, local residents, private companies, etc., participate in more than 25 percent of conservation activities conducted by local FCAs.

Integrated coastal-zone management (ICZM) is a relatively new, but important concept in the marine policy framework of Japan. The Fisheries Research Agency of Japan conducted a social survey of 2 000 Japanese citizens (Fisheries Research Agency, 2009), asking them to identify the one or two most important human activities among various marine uses. The results showed that some 83 percent thought fishery production was the most important; the second was energy generation by tide or wind (54 percent), followed by transport (21 percent) and recreation (8.2 percent). Based on this result, it can be understood that the ideal ICZM approach in Japan is not the exclusion of fisheries activities from some areas, but rather that fisheries activities are part of the core of ICZM. MPAs with close relations to local fishers can be one of the most important tools for achieving ICZM in Japan.

It should be emphasized, however, that ideal fisheries management is not always enough for the conservation of ecosystem structures and functions. For example, autonomous MPAs initiated by local fishers usually expect increases in the landing of valuable species, and they would not pay due attention to species without market value. There exist certain gaps between fisheries management and ecosystem conservation. The nature of the gaps differs case by case and area by area, and identification of those gaps requires the participation of a wide range of stakeholders in ecosystem service use. The identification process is very important, because once the gap has been identified, it could be filled with environmental policy measures. This approach would be cost-effective. For example, in the case of the marine management plan of the Shiretoko World Natural Heritage Site, various environmental policy measures, such as endangered species protection or basic environmental monitoring, were implemented after identification of the gap between local autonomous fisheries management and ecosystem conservation. The total costs of the additional environmental measures were less than 1 percent of the fishery production of the area (Makino, Matsuda and Sakurai, 2009).

In fact, coordinating the various sectors is a difficult task. However, a clue can be found in the words of the leader of an environmental NGO active in the Tokyo Bay seagrass-bed recovery activities. He pointed out that "even with very wide gaps in values or beliefs among participants, I think we can at least share the importance of education for local children … in that sense, we cannot omit the children's experiences in catching and eating seafood in the field. This is very important." (Citizen Group Meeting for the Promotion of Nature Restoration, 2005).

7. FUTURE DIRECTIONS

The objective of ecosystem conservation is a societal choice, and it varies from area to area. The fundamental concept of MPAs in fish-eating countries/areas such as Japan would be local, autonomous MPAs aiming for sustainable food provisioning as one

of the ecosystem services. However, other ecosystem services, such as regulation, cultural and support services, are also important, as pointed out by the United Nation's Millennium Ecosystem Assessment (2005). With recognition of both the effectiveness and shortcomings of autonomous MPAs, environmental policies should supplement the gaps to achieve ecosystem conservation.

One lesson learned from the Japanese cases is that the sharing of authority and responsibility among government and local fishers, NGOs and other stakeholders is important in achieving effective ecosystem conservation, and MPAs are one of the tools for accomplishing that. Moreover, local, traditional and scientific information are important foundations for planning, enforcing, monitoring and adaptively revising MPAs.

Some future tasks for Japanese MPAs would be to: (i) establish the theoretical and empirical foundation for adaptive management, using MPAs as one of the tools for ecosystem conservation; and (ii) identify the differences in design/effect of MPAs in cold water ecosystems, such as Shiretoko, and in tropical water ecosystems such as Okinawa Prefecture.

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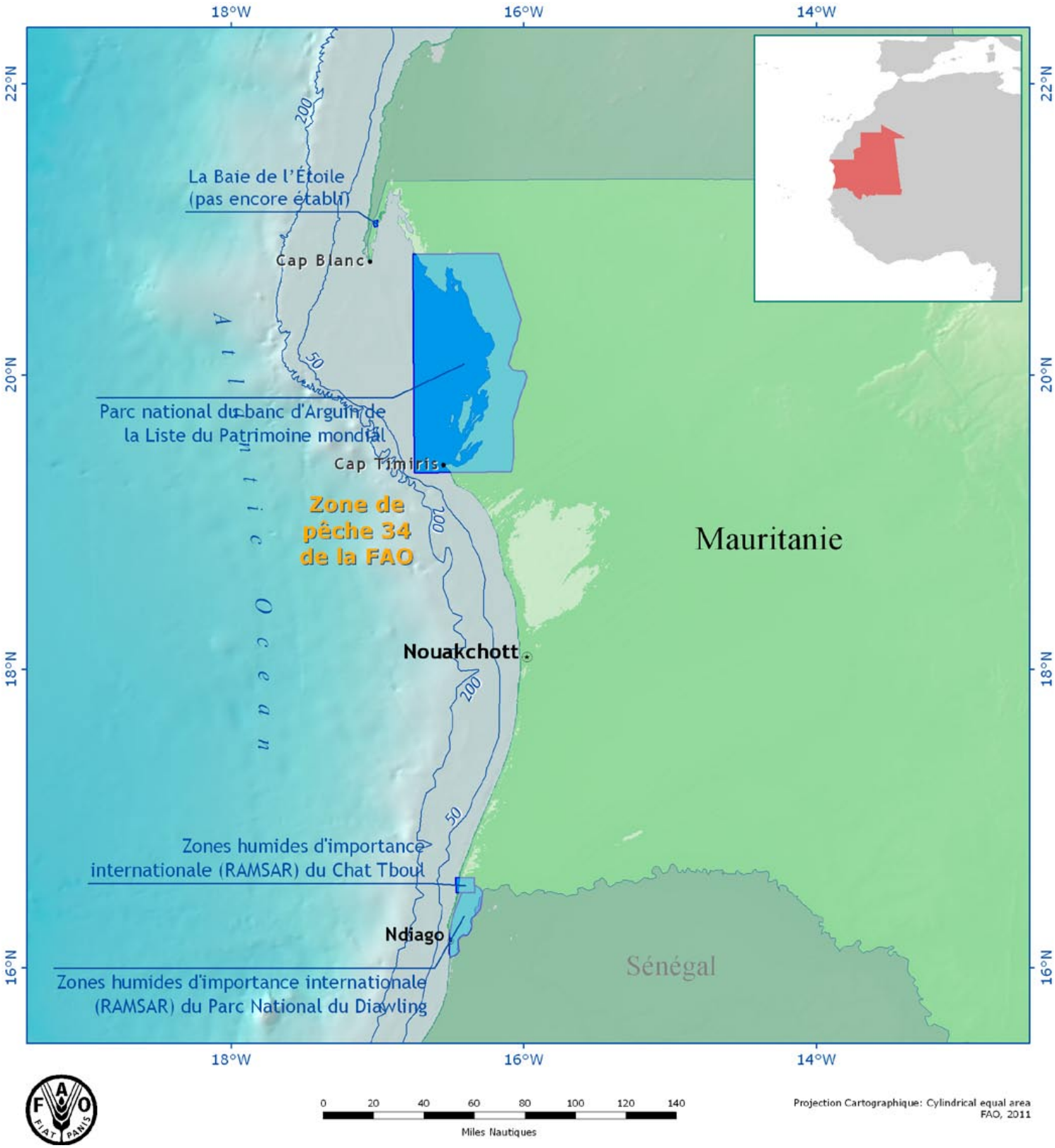
Carte 1
Mauritanie



Mauritanie

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1. INTRODUCTION

La Mauritanie possède la plus grande Aire marine protégée (AMP) de l'Afrique de l'Ouest avec le Parc national du Banc d'Arguin (PNBA) ((cf. carte 1). L'AMP du PNBA, créée il y a une trentaine d'années, s'étire sur près d'un tiers du littoral et englobe des zones maritimes considérables (environ 17 pour cent de la surface du plateau continental ou encore près de 60 pour cent des fonds inférieurs à 20 mètres) considérées parmi les plus poissonneuses au monde. Cette situation exceptionnelle en Afrique de l'Ouest s'explique notamment par l'implication historique d'éminents scientifiques dont Théodore Monod dans la préservation des écosystèmes littoraux du Banc d'Arguin et à la faible vocation maritime et tradition halieutique de la population mauritanienne.

Jusqu'au début des années 90, les capacités de pêche et la pression anthropique sur le littoral mauritanien étaient modérées. Les interactions entre la pêche et la conservation étaient alors faibles, et la cohabitation spatiale entre les deux secteurs ne posait pas de problèmes particuliers. À partir de la deuxième moitié des années 90, la situation a commencé à changer suite à la combinaison de plusieurs facteurs de déstabilisation que l'on peut brièvement résumer comme suit : développement de surcapacités dans la pêche industrielle notamment chalutière en zone côtière ; signaux de plus en plus alarmants sur l'état de la ressource halieutique ; prémices d'un développement incontrôlé de la pêche artisanale ; forte prégnance du marché dans les dynamiques de production et de commercialisation du poisson ; et pressions démographiques et économiques grandissantes sur le littoral mauritanien. Ces évolutions se sont traduites par des changements importants dans les objectifs poursuivis par la politique publique en relation avec la mer et le littoral. L'administration (pourtant très affaiblie suite aux politiques d'ajustement structurel) a dû renforcer son dispositif de gestion des pêches et promouvoir une politique concertée d'aménagement du littoral afin de concilier le développement et la préservation de l'environnement marin.

Parallèlement à cela, les gestionnaires du PNBA ont dû commencer à s'intéresser à la gestion des pêcheries « Imraguen » (la principale activité économique dans le parc), suite à l'émergence de pêcheries de sélaciens orientées vers l'exportation, et à introduire des mécanismes de concertation avec les populations résidentes du parc en conformité avec l'évolution des concepts internationaux en matière de conservation.

Une autre AMP est également mise en œuvre en Mauritanie. Il s'agit du Parc national du Diawling (PND), créé en 1991. Une troisième AMP est aussi en gestation depuis quelques années dans la Baie de l'Étoile dans le cadre du processus d'aménagement du littoral. Mais l'intérêt de l'étude de cas en Mauritanie réside principalement dans le fait qu'une AMP créée à des fins de conservation et aux dimensions considérables est mise en œuvre depuis une trentaine d'années et coexiste au côté d'un secteur pêche qui constitue depuis plus d'une décennie l'un des piliers de l'économie nationale. Or, après plusieurs décennies de cohabitation relativement pacifique, les interactions entre les deux grandes unités de gestion sont de plus en plus fortes et les modes de gestion des pêches mis en place à l'intérieur ou à l'extérieur de l'AMP du PNBA, semblent de moins en moins compatibles avec les exigences de développement durable du pays.

L'analyse de ces mutations en cours, avec en toile de fond les prémices d'une planification côtière unique à l'échelle de la sous-région et l'émergence d'une approche écosystémique pour la gestion des pêches, permet de tirer des enseignements pour appuyer les réflexions sur les AMP en tant qu'instrument de l'aménagement des pêches.

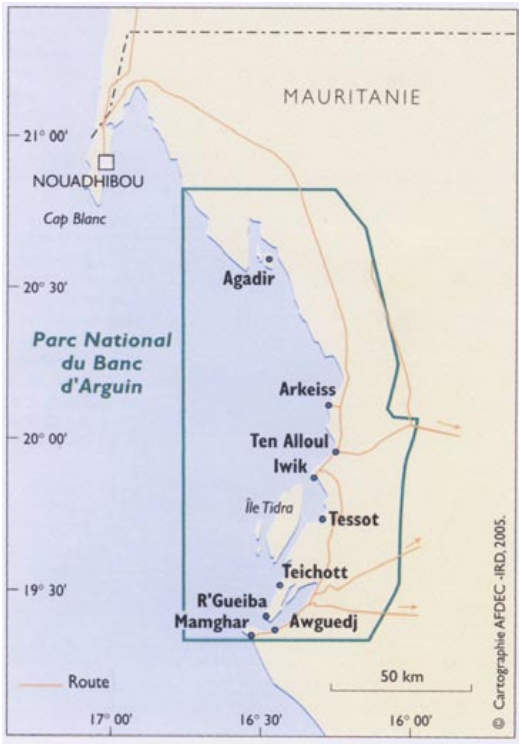
2. AMÉNAGEMENT DES PÊCHES

2.1 Situation actuelle

La zone économique et exclusive (ZEE) de la Mauritanie couvre une superficie d'environ 230 000 km². Les eaux mauritaniennes sont très productives du fait de l'existence d'un large plateau continental et de la conjonction de facteurs océanographiques favorables, avec notamment l'existence d'un upwelling quasi-permanent dans le Golfe d'Arguin (zone située entre le Cap Blanc, à l'extrême nord du pays et le Cap Timiris, à la limite avec le PNBA). Trois grandes catégories de ressources halieutiques peuvent être distinguées : les démersaux (poissons, mollusques, notamment des céphalopodes, et crustacés), les petits pélagiques côtiers (notamment les sardinelles) et les grands pélagiques. À ces trois grandes catégories s'ajoutent d'autres ressources encore non exploitées, notamment les praires présentes en grande quantité dans certaines zones du Golfe d'Arguin (le potentiel de production du stock de *Venus rosalina* serait ainsi de 300 000 tonnes par an). Le potentiel de captures (hors pêcheries émergentes) se situe autour de 1,6 million de tonnes/an, avec une prédominance de petits pélagiques.

À l'exception des stocks de céphalopodes et de crevettes, tous les stocks de poissons démersaux sont des stocks partagés avec le Maroc, le Sénégal et/ou la Gambie. Les stocks de petits pélagiques sont quant à eux partagés entre plusieurs pays de la sous-région. Tous les stocks de démersaux et de petits pélagiques, à de rares exceptions près (comme ceux de la sardinelle ou de l'anchois), sont pleinement exploités à surexploités. Dans l'ensemble, les recommandations scientifiques relatives aux espèces démersales convergent au mieux vers un gel de l'effort, ou la recommandation d'une réduction de celui-ci pour certaines espèces importantes comme le poulpe et les merlus.

CARTE 2
Parc National du Banc d'Arguin



Source: AFDEC-IRD in Weigel *et al.* (2007) Les aires marines protégées d'Afrique de l'Ouest, UPVD/ IRD

On dénombre régulièrement environ 250 navires de pêche industrielle en activité, dont environ 120 nationaux. Il s'agit essentiellement de chalutiers céphalopodiers. La flotte étrangère est en grande partie composée de navires européens opérant dans le cadre de l'accord de pêche de partenariat 2006-2012 avec l'Union européenne (une centaine de navires étaient en activité en 2007). Les captures totales réalisées par les navires de pêche industrielle, nationaux et étrangers, opérant dans la ZEE mauritanienne se situent en moyenne autour de 600 000 tonnes par an, dont près de 90 pour cent de petits pélagiques. En termes économiques, si l'on utilise le chiffre d'affaires à la première vente comme indicateur, la valeur des captures industrielles dans la ZEE mauritanienne peut être estimée à 375 millions d'euros par an en moyenne.

On recense par ailleurs près de 4 000 unités de pêche artisanale et côtière en Mauritanie, dont les captures avoisinent 80 000 tonnes par an. Le développement de la pêche artisanale et côtière est un processus relativement récent par rapport à la situation observée dans les pays voisins. Le segment

de la pêche artisanale mauritanienne repose principalement sur l'exploitation du poulpe et des poissons démersaux. Des artisans pêcheurs sénégalais opèrent par ailleurs dans les eaux mauritaniennes, soit dans le cadre d'un accord de pêche bilatéral, soit dans le cadre de contrats d'affrètement avec des opérateurs mauritaniens, en particulier les usiniers. La composition des captures montre une prédominance des espèces démersales (environ 70 pour cent du total), et la région nord (le Golfe d'Arguin) concentre près des deux tiers des prises de la pêche artisanale.

L'analyse des différents segments de pêche[1] permet de dégager plusieurs caractéristiques importantes à mentionner dans le cadre de la présente étude :

- tous les segments de pêche, industrielle ou artisanale, à l'exception de celui de la pêche aux grands pélagiques, travaillent sur le plateau continental ou ses accores, et sont en interaction sur de nombreuses pêcheries ;
- la pêche industrielle travaille sur des pêcheries plurispécifiques du fait de la sélectivité restreinte de l'engin de pêche principalement utilisé, à savoir le chalut ;
- les taux de prises accessoires pourraient être très importants dans certains segments de pêche (notamment les céphalopodiers et les crevettiers, mais aussi les pélagiques), dont une quantité importante est rejetée en mer ce qui rend l'évaluation des stocks plus complexe ;
- les chalutiers concentrent leur effort de pêche dans la zone nord et plus particulièrement dans un secteur situé au large de Nouadhibou jusqu'à la limite avec le PNBA.

Du point de vue des politiques publiques, la pêche constitue l'un des piliers de l'économie nationale (20-25 pour cent des recettes budgétaires de l'État, 40 pour cent des recettes en devises d'exportation, 6-10 pour cent du PIB en considérant l'ensemble des filières, 30 000 emplois). Les performances financières du secteur sont surtout imputables à l'accord de pêche de partenariat avec l'UE (poids financier de l'ordre de 120 millions d'euros/an en cas de pleine utilisation des possibilités de pêche). Le secteur de la pêche en Mauritanie offre par ailleurs des perspectives considérables en termes de création de richesse et d'emplois, notamment à travers une meilleure localisation des captures de la pêche industrielle et le développement d'industries à terre. Ainsi, les enjeux liés à la pêche, et notamment à la mise en place d'un dispositif de gestion durable des ressources, demeurent considérables.

Les différentes politiques sectorielles qui se sont succédé depuis une quinzaine d'années ont été articulées autour de trois grands axes stratégiques : la gestion durable des ressources (et de l'environnement), la maximisation de la rente halieutique et l'intégration du secteur dans l'économie nationale. La politique sectorielle en vigueur (Stratégie de gestion durable du secteur des pêches et de l'aquaculture, période 2008-2012), s'inscrit dans la continuité, avec peut-être un accent particulier mis sur la modernisation du secteur et le développement des infrastructures de débarquement et de valorisation des captures.

2.2 Cadre et instruments de l'aménagement

Le cadre général en vigueur pour l'aménagement des pêches repose sur la loi n° 2000-025 du 24 janvier 2000 portant Code des Pêches[2] et son décret d'application n° 2002-073. En vertu de la loi, « les ressources halieutiques de la ZEE sont un patrimoine national que l'État a l'obligation de gérer dans l'intérêt de la collectivité nationale ». Le droit de pêche appartient à l'État qui peut en autoriser l'exercice à travers la licence, dont l'octroi par le Ministre chargé des pêches est subordonné au paiement d'un droit d'accès.

[1] Océanic Développement (2007). Étude stratégique sur les pêches de la Banque Mondiale : Les plans d'aménagement des pêcheries.

[2] Le dispositif législatif a été complété par l'Ordonnance 2007-022 du 09 avril 2007 qui a apporté quelques modifications au texte de la loi de 2000 sans vraiment en changer les éléments de fond.

Le décret d'application de la loi précise les principales règles concernant l'accès aux ressources et les mesures techniques de l'aménagement. Il traite aussi des plans d'aménagement par pêcherie et du Conseil consultatif pour l'aménagement et le développement des pêcheries (CCNADP) autour duquel devrait s'organiser la concertation entre les différents intervenants publics et privés sur l'aménagement du secteur.

Le système d'aménagement en vigueur est un système de gestion classique, basé sur la recherche d'un effort de pêche compatible avec les capacités de renouvellement des ressources, stock par stock, en fonction des recommandations de la recherche. Le dernier Groupe de travail quadriennal de l'Institut mauritanien de recherches océanographique et des pêches (IMROP), organisé en décembre 2006, tend toutefois à marquer une certaine rupture dans la démarche scientifique en appelant au développement d'une approche écosystémique qui complète l'approche par stock et vise à combler les lacunes dans la connaissance des écosystèmes marins et du fonctionnement de ces derniers.

Les modes de gestion mis en œuvre sont plutôt de type centralisé, même si, dans la pratique, la profession est fréquemment et étroitement associée aux décisions par l'intermédiaire de la Fédération nationale des pêches (FNP). Le mécanisme du CCNADP est pour sa part encore balbutiant. La cogestion en tant que système de gouvernance - entendue au sens du partage des responsabilités et d'un transfert de certaines compétences de l'administration centrale aux usagers et/ou aux collectivités locales - ne peut en aucun cas être évoquée aujourd'hui en Mauritanie.

Une autre caractéristique du système d'aménagement mauritanien est que celui-ci tend à distinguer plusieurs unités de gestion, dont le critère principal se réfère au segment de pêche (industriel national, industriel étranger, artisanal et côtier). Le Plan d'aménagement et de développement maîtrisé de la pêche artisanale et côtière (PDAPAC), en cours de finalisation, en est une illustration. L'accord de pêche avec l'UE, qui fournit un cadre réglementaire en matière de capacités de pêche (possibilités de pêche exprimées en termes de nombre de navires par catégories de pêche) et de niveau de prélèvement (par ex. quota de capture pour les petits pélagiques) autorisés pour les navires européens, en est une autre.

Toutefois, dans le même temps, en accord avec les orientations politiques qui datent de la fin des années 90 et conformément aux dispositions prévues par les textes en vigueur, la Mauritanie avance dans le processus de réalisation de plans d'aménagement par pêcherie où l'unité de gestion pourrait être le stock[3]. C'est ainsi qu'un Plan d'aménagement du poulpe (la ressource la plus stratégique pour le pays) a été adopté lors d'un Conseil des ministres en avril 2006. Le plan poulpe pourrait aboutir à terme à la mise en place d'un système de gestion basé sur des quotas par segments de pêche, nationaux ou étrangers, voire des quotas individuels transférables (QIT). Un plan crevette est par ailleurs en cours de finalisation.

En ce qui concerne les mesures techniques de l'aménagement, plusieurs types de mesures destinées à minimiser l'impact de la pêche sur les espèces exploitées, ainsi que les interactions entre les différents types de navires, peuvent être distinguées :

- le zonage, qui vise notamment à repousser les navires de pêche industrielle plus au large afin de limiter le chalutage à des zones dont la profondeur est supérieure à 20 mètres afin de préserver les habitats côtiers (zone de forte productivité, de frayères et nourriceries) ;
- les mesures sur les engins de pêche (par ex. l'établissement de maillages minimaux, l'interdiction de certains engins ou de certaines pratiques de pêche) ;

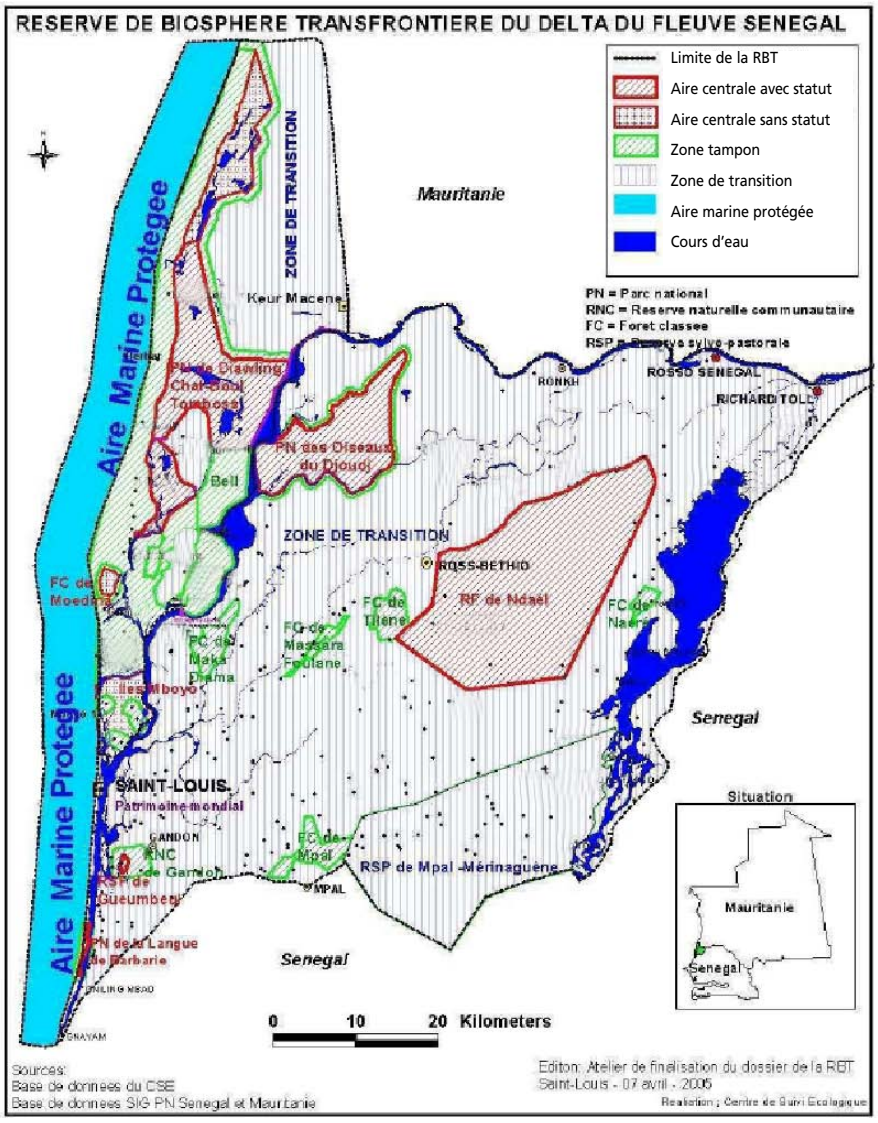
[3] Conformément à l'article 9 du Code des pêches, le terme « pêcherie » désigne un ou plusieurs stocks d'espèces biologiques et les opérations menées sur ces stocks qui, sur la base de leurs caractéristiques géographiques, scientifiques, techniques, économiques, sociales et/ou récréatives, peuvent être considérés comme constituant une unité à des fins de conservation et d'aménagement.

- les tailles minimales (ou le poids minimal) des espèces, pour tenir compte de la taille à la première maturité des espèces ;
- le pourcentage autorisé d'espèces accessoires ;
- le repos biologique (2 mois) applicable à tous les types de bateaux ciblant les ressources démersales, même si cette mesure constitue avant tout une mesure phare de la gestion des pêcheries ciblant le poulpe afin d'appliquer le principe de précaution ;
- les fermetures spatio-temporelles pendant des périodes données, lorsque des concentrations exceptionnelles de juvéniles sont relevées (cette mesure a été appliquée pour le poulpe jusqu'en 2004 au nord du Cap Timiris).

IMAGE 1
Lanche dans le Parc National du Banc d'Arguin

Source: C. Breuil, octobre 2008.

CARTE 3
Parc National du Diawling et Réserve de Chott Boull



Source: Rapport d'évaluation du projet d'appui à la gestion durable du littoral, AFD 2008.

En plus de ces mesures techniques relatives à la pêche, on doit aussi évoquer les mesures visant la préservation des habitats sensibles. C'est ainsi que la mise en place d'une AMP fait partie des mesures de gestion et de conservation des ressources et de la biodiversité marines évoquées par la législation des pêches. Le réseau d'AMP en Mauritanie se compose principalement de deux parcs naturels : le PNBA et sa réserve satellite du Cap Blanc d'une part, le Parc national du Diawling (PND), avec la réserve du Chott Boul, d'autre part. Dans le PNBA, la pratique de la pêche est soumise à une réglementation spécifique. En particulier, les seules embarcations de pêche autorisées sont les lanches à voile, dont le nombre total est limité à 110. Ainsi, en excluant la pêche artisanale motorisée et en limitant le nombre de lanches, l'administration promeut dans cette AMP un système de gestion basé sur un contrôle des capacités de pêche et de l'accès aux ressources.

Dans l'ensemble, les mesures techniques de l'aménagement en Mauritanie sont relativement bien appliquées, notamment grâce à l'efficacité du dispositif de surveillance des pêches. Les capacités de la Délégation à la surveillance des pêches et au contrôle en mer (DSPCM) ont en effet été nettement renforcées depuis une dizaine d'années, à la faveur notamment d'une forte volonté politique d'aménagement des ressources et de l'apport de nouvelles technologies, dont le système de surveillance des navires par satellite (SSN) rendu obligatoire depuis 2005. Le processus de consolidation du dispositif de surveillance côtière se poursuit quant à lui, avec l'acquisition récente de stations radars à Ndiago, Tiwilit et Nouakchott.

2.3 Description des régimes d'accès

Les règles qui régissent l'accès aux pêcheries sont précisées dans le décret d'application de la loi portant Code des pêches, et complétées par les dispositions des circulaires n° 26/MPEM du 29 juin 2006 et n° 38/MPEM du 31 juillet 2006 déterminant les conditions financières d'accès des navires à la pêche dans la ZEE mauritanienne.

Il existe trois types de licences de pêche, avec les catégories et zones de pêche qui leur correspondent:

- Type I : licence de pêche artisanale, avec 3 catégories : a) pêche de céphalopodes, b) pêche de crustacés, c) pêche de poissons.
- Type II : licence de pêche côtière, avec 4 catégories : a) pêche de céphalopodes, b) pêche de crustacés, c) pêche de poissons démersaux, d) petits poissons pélagiques.
- Type III : licence de pêche industrielle, avec 10 catégories : a) petits pélagiques, b) thon, c) céphalopodes, d) crevettes côtières (langostinos), e) crevettes profondes (gambas), f) merlu, g) poissons démersaux autres que merlu et engin autre que chalut, h) poissons démersaux au chalut, i) langouste rose, et j) crabe profond.

À l'heure actuelle, seul le système prévu pour les licences de type III (pêche industrielle) est appliqué. Il faut cependant souligner que la pêcherie crevettière est gérée dans la pratique sur la base d'une seule licence « crustacé » qui réunit les licences de type d) et e) en une seule catégorie. En revanche, la réglementation pour les licences de type I et II, qui concernent la pêche artisanale et côtière, n'est pas appliquée et un seul type d'autorisation de pêche est délivré sous la dénomination de « droit territorial », dont le montant est par ailleurs dérisoire.

Les deux nouvelles circulaires de 2006 ont introduit des modifications importantes dans le régime d'accès des navires étrangers, en clarifiant les différents types de régime et en précisant leur tarification réglementaire. Par ailleurs, le décret n° 2006-019 du 9 mars 2006 relatif aux modalités pratiques de répartition du montant du droit d'accès à la pêche de fond et d'un droit territorial pour la pêche artisanale a fixé une nouvelle fiscalité, basée à la fois sur le navire (droit d'entrée) et la production (droit de sortie). Cette nouvelle fiscalité sur les produits destinés à l'exportation peut être théoriquement considérée comme un instrument de régulation de l'effort de pêche. Mais cette mesure est récente et ne peut pas encore faire l'objet d'une évaluation.

Malgré l'existence d'un système de licences, de plans d'aménagement et de régimes différenciés d'accès aux navires étrangers, ainsi que de l'accord de pêche avec l'UE, c'est le régime du libre accès qui domine encore en Mauritanie. Certaines pêcheries emblématiques pour la Mauritanie comme celle qui cible le poulpe font toutefois l'objet d'une plus grande attention (avec par ex. le gel officiel de l'effort de pêche céphalopodier national depuis 1997 ou la diminution théorique des possibilités de pêche céphalopodière dans le nouvel accord de pêche avec l'UE). Mais les constats alarmants et récurrents dressés par la recherche concernant la situation de la plupart des stocks, notamment au sujet des stocks démersaux liés aux zones côtières, tendent à confirmer les insuffisances du dispositif actuel en matière de régulation de l'accès aux ressources.

Dans le même temps, on assiste à une stagnation, voire à une régression des capacités de la pêche industrielle nationale si l'on considère la vétusté des outils de production. Cette situation contraste avec l'augmentation continue des capacités de la pêche artisanale, dans un contexte où l'administration ne semble toujours pas en mesure de contrôler le parc des embarcations et de réguler leur accès aux ressources[4].

2.4 Description des réglementations de la pêche relatives aux mesures de gestion spatiale

L'expérience ayant montré que les possibilités de fermetures spatio-temporelles offertes par la réglementation sur les pêches sont très peu utilisées par l'administration, la seule mesure de gestion spatiale adoptée en Mauritanie se limite, en plus des AMP, au zonage.

Le zonage, différent selon le type ou la catégorie de licence, vise trois objectifs : prévenir la dégradation des habitats sensibles (fonds inférieurs à 20 mètres) par le chalutage ; réduire les interactions et diminuer en conséquence les conflits entre la pêche artisanale et la pêche industrielle ; et soutenir le développement de la pêche artisanale, considérée plus sélective et mieux intégrée dans l'économie nationale, en lui réservant une zone à son seul profit. La gravité des sanctions encourues en cas d'infraction sur le zonage atteste de l'intérêt accordé par l'administration à cette mesure (il s'agit d'une faute grave avec des amendes pouvant aller jusqu'à environ 300 000 euros).

Depuis fin 2007, la Mauritanie a entrepris de réviser le zonage afin de prendre en compte les évolutions du contexte politique et technique relatif à la pêche (plans d'aménagement par pêcherie pour le poulpe et la crevette, développement accru de la pêche artisanale, utilisation du système de SSN[5], nouvelles exigences en matière de sécurité en mer, émergence de nouvelles pêcheries comme les praires dont l'exploitation pourrait reposer sur des mesures de gestion spatiale) ainsi que les nouvelles dynamiques d'occupation et de préservation de l'espace littoral. Une étude spécifique est en cours de réalisation[6].

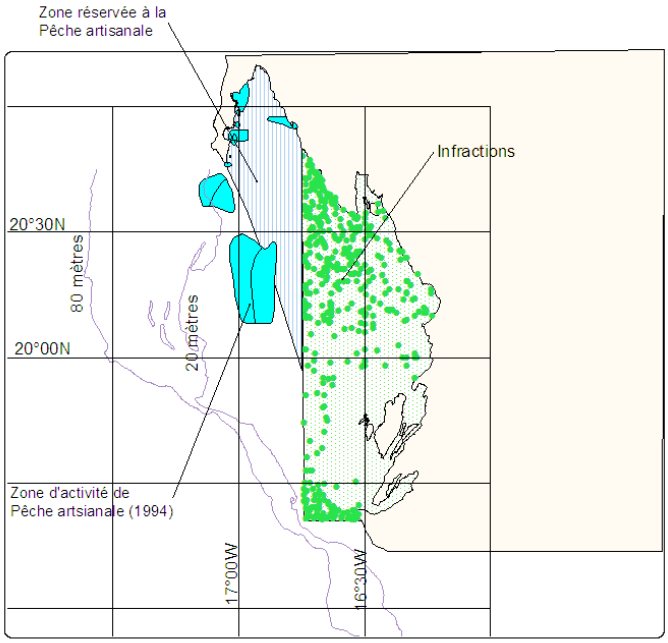
Les premières investigations conduites dans le cadre de cette révision ont montré que les conflits de zonage les plus fréquents se réfèrent à la délimitation sud du PNBA (absence d'une zone tampon), à la nécessité de repousser les bateaux pélagiques encore plus au large ainsi qu'aux interactions fréquentes entre les engins de pêche

[4] Par exemple, dans le cadre de l'opération d'immatriculation conduite entre 2006 et 2007, près de 4 000 embarcations ont été recensées et un nombre significatif d'entre elles ne répondait pas aux critères d'éligibilité. La quasi-totalité de ces embarcations semble pourtant avoir été régularisée, notamment sous l'influence de différents groupes de pression.

[5] Depuis l'introduction du SSN en 2005, les infractions de la pêche industrielle concernant le zonage ont considérablement diminué. Pour certaines catégories de pêche comme les petits pélagiques, cela s'est traduit par d'importantes pertes économiques. Cela pourrait du reste expliquer en partie la nette diminution du nombre de licences libres pour la pêche des petits pélagiques (environ 60 licences en 2003 contre 20 à 30 licences en 2007).

[6] Cheikh Inejih (Réseau développement durable et écosystèmes marins), Coordinateur de l'étude relative à l'Audit du zonage de la pêche en Mauritanie, 2008.

CARTE 4
Infractions commises par la pêche artisanale dans le PNBA



Source: C. O. Inejih *et al.* Rapport d'audit sur le zonage – Version provisoire, 2008.

passifs et traînants ou entre la pêche et la navigation maritime dans la partie nord du Golfe d'Arguin. Pour ce qui est de la problématique spécifique au PNBA, on peut remarquer que la localisation des infractions commises par la pêche artisanale dans le PNBA concerne pratiquement toutes les zones accessibles du parc, alors dans le cas de pêche industrielle les infractions sont concentrées à la limite des délimitations du PNBA (cf. carte 4). Enfin, l'étude confirme le caractère complexe du zonage actuel, ce qui constitue une contrainte aussi bien pour la profession que pour la surveillance.

L'étude sur le zonage aborde également la question des pêcheries émergentes, avec notamment les pêcheries de praires dont les gisements sont localisés dans une zone de pêche importante, mais aussi dans une zone de grand trafic maritime. L'exploitation éventuelle des praires devra par conséquent tenir compte de cette contrainte spatiale, en plus des contraintes d'ordre écosystémique (par ex. la possible interaction poulpe/praire) et d'ordre environnemental liées aux modes d'exploitation (par ex. l'utilisation de la drague). Au sujet de ce dernier impact potentiel, les tensions sont vives entre d'une part le secteur de la pêche, qui voit dans cette ressource une manière de favoriser

CARTE 5
Perspectives en matière de pêches expérimentales

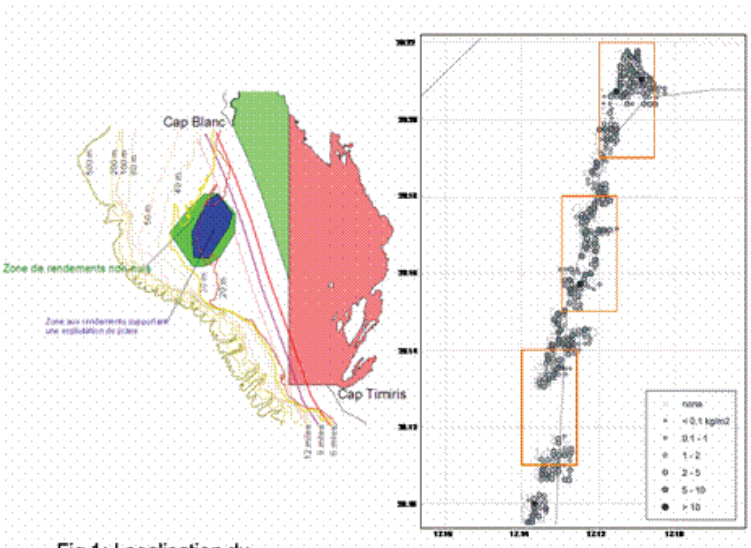


Fig 1: Localisation du gisement des Praires Source: Audit du zonage (2008)

Figure 2: Aires proposées pour la pêche expérimentale, superposées sur les résultats de la campagne de 2008.

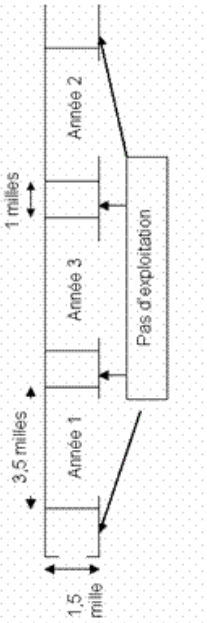


Fig 3: Plan expérimental proposé pour l'exploitation

Source: MPEM, 2008.

la croissance du secteur, et d'autre part le secteur de l'environnement qui redoute des effets irréversibles sur les écosystèmes côtiers et notamment sur l'intégrité du PNBA (le stock de *Venus rosalina* est situé environ 30 km à l'ouest des limites du parc). Afin de promouvoir une démarche responsable, les autorités mauritaniennes encouragent depuis fin 2006 la mise en œuvre d'un certain nombre de principes avec la création d'un comité scientifique sur les praires au sein de l'IMROP, la conduite de pêches expérimentales[7], la réalisation d'une étude environnementale stratégique et la concertation via la création d'un comité interministériel de suivi sur les praires.

2.5 Description des institutions

Les principales institutions, publiques ou privées, concernées par l'aménagement des pêches sont le ministère des Pêches et de l'économie maritime (MPEM), l'IMROP, la DSPCM et la Fédération nationale des pêches (FNP). Pour ce qui est des institutions concernées directement ou indirectement par les questions environnementales et/ou en relation avec les AMP, on peut distinguer le ministère en charge de l'environnement et les autres ministères techniques.

Le ministère délégué auprès du Premier Ministre chargé de l'Environnement et du développement durable est un département récent créé en 2005. Les structures suivantes lui sont aujourd'hui rattachées :

- La DAPL (Direction des aires protégées et du littoral). Il s'agit d'une direction centrale dont la mission est notamment de « concevoir la politique nationale en matière d'aires protégées et de conservation », de « développer le réseau des aires protégées de Mauritanie dans une optique de développement durable » et de « favoriser la gestion intégrée et harmonieuse du littoral ».
- Le PNBA (Parc national du Banc d'Arguin). Il s'agit d'un établissement public à caractère administratif ayant un objet scientifique et culturel, doté d'une grande autonomie financière. Il n'est rattaché que depuis 2006 au ministère en charge de l'environnement (son ancrage institutionnel précédent se faisait directement au niveau du Secrétariat général du gouvernement). Le PNBA comprend un Conseil d'administration, assisté dans sa mission par un conseil scientifique (le CSBA)[8], et un organe exécutif, représenté exclusivement par son directeur. La mission du PNBA est de gérer et de protéger le Parc national du Banc d'Arguin.
- Le PND (Parc national du Diawling). Il s'agit également d'un établissement public à caractère administratif, chargé de la gestion et de la protection du Parc du Diawling.

Les autres ministères techniques concernés directement ou indirectement par les questions environnementales sont :

- Le MPEM, qui est doté de compétences en matière d'aménagement du littoral, de mise en place d'un dispositif de prévention et de lutte contre les pollutions marines, et de suivi de la qualité des eaux.
- Le ministère de l'Équipement et des transports, qui est doté de compétences en matière d'aménagement du littoral et de suivi des questions liées à la sécurité ainsi qu'à l'environnement en zone portuaire.
- Le Commissariat à la promotion des investissements privés, qui a récemment développé une initiative de planification côtière dans la baie de Nouadhibou.
- La Marine nationale, qui est chargée de la gestion de la réserve du Chott Boul.

Les principales ONG impliquées dans l'aménagement des pêches et la conservation sont :

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[7] Le protocole de pêche expérimentale, en cours de préparation au niveau du ministère en charge des pêches, prévoit de définir trois zones de pêche (3,5 x 1,5 miles), séparées par une zone tampon, qui seraient exploitées en alternance (système de jachère) – cf. carte 5.

[8] La loi n° 2000-024 relative au PNBA précise que son conseil scientifique est une autorité consultative, composée de personnalités compétentes, sans distinction de nationalité.

- La FIBA (Fondation internationale du Banc d'Arguin), principalement impliquée dans la gestion du PNBA, et dans une moindre mesure dans l'aménagement du littoral.
- L'UICN (Union mondiale pour la conservation de la nature), fortement impliquée dans le processus d'aménagement du littoral mauritanien, dans la gestion du PND et, dans une moindre mesure, dans l'aménagement des pêches à travers le projet « mulet ».
- Le PRCM (Programme régional de conservation de la zone côtière et marine en Afrique de l'Ouest) - une initiative conjointe du WWF, de la FIBA, de l'UICN et de Wetlands International – qui soutient différentes initiatives en Mauritanie en relation avec la gestion des AMP et la protection du littoral, et soutient le développement d'un réseau régional des AMP en Afrique de l'Ouest à travers l'institution RAMPAO.

Par ailleurs, on peut noter l'implication croissante de la CSRP (Commission sous-régionale des pêches) sur les questions ayant trait à la gestion des pêcheries d'intérêt commun concernant la Mauritanie et la préservation de l'environnement marin à l'échelle de la sous-région. En particulier, la CSRP est en train de développer une stratégie régionale pour les AMP en Afrique de l'Ouest.

3. ÉTAT DES LIEUX CONCERNANT LA CRÉATION ET LA GESTION DES AMP (PÊCHE ET CONSERVATION)

3.1 Terminologie, principaux objectifs et description générale des AMP

En se basant sur la classification de l'UICN, les AMP prises en considération dans le cadre de la présente étude appartiennent à la catégorie 6 des « aires protégées gérées principalement à des fins d'utilisation durable des écosystèmes naturels ». Ce sont des zones majoritairement marines où des mesures particulières de gestion sont mises en œuvre dans un objectif de maintien à long terme de la biodiversité. Il s'agit, pour ce qui est des AMP existantes, du Parc national du Banc d'Arguin, avec sa réserve satellite du Cap Blanc qui est un sanctuaire pour les phoques moines, du Parc national du Diawling et de la Réserve naturelle du Chott Boul. Pour ce qui est des AMP en gestation, il s'agit seulement de la Baie de l'Étoile.

L'analyse de la genèse du PNBA tend à montrer que l'objectif principal assigné à cette AMP était, au moment de sa création en 1976, de préserver la biodiversité des écosystèmes côtiers afin de servir de zone refuge pour les oiseaux à l'intérieur de l'AMP. Il s'agit donc d'une AMP de type conservatoire, même si, avec le temps, le PNBA s'est vu attribuer – sans que cela n'ait été encore clairement démontré d'un point de vue scientifique - un rôle de soutien au secteur de la pêche en contribuant au maintien de la biomasse exploitable dans la ZEE mauritanienne en servant de réserve pour les ressources halieutiques. Les délimitations orthogonales du parc illustrent du reste assez bien la faible prise en compte des facteurs océanographiques et des considérations halieutiques au moment de sa création. Le PNBA a été classé site Ramsar en 1982, site du patrimoine mondial par l'UNESCO en 1989 puis offert symboliquement par le gouvernement mauritanien comme don à la Terre en 2001. La réserve satellite du Cap Blanc, rattachée au PNBA, a été créée en 1986, elle figure également sur la liste des sites du patrimoine mondial. La principale institution ayant soutenu la création et le développement du PNBA est la FIBA.

Le PNBA couvre une superficie de près de 12 000 km², répartis de manière plus ou moins égale entre les milieux terrestres et les milieux aquatiques. La richesse du Banc d'Arguin du point de vue halieutique et de la biodiversité marine tient à des conditions environnementales exceptionnelles dues notamment de l'imbrication de différents habitats (zones de hauts fonds, bancs de sables, vasières, herbiers, zones rocheuses). Le PNBA recense une population d'environ 1 500 personnes, communément appelée « population Imraguen » ou « population résidente du parc ». La revendication

d'une forte identité Imraguen dans le parc (malgré l'emploi d'une main d'œuvre non originaire de la zone, voire étrangère) est souvent mise en avant par les gestionnaires du PNBA pour marquer le particularisme des dynamiques de pêche dans celui-ci et servir les besoins de la communication pour les gestionnaires du parc. De récents travaux de recherche sur l'histoire du peuplement du PNBA tendent toutefois à remettre en question la réalité de cette autochtonie promue par les tenants d'une approche centrée sur la conservation[9].

La création du PND en 1991 trouve son origine dans la volonté du pays de restaurer les conditions de fonctionnement de l'écosystème du bas delta du Sénégal, fortement dégradé suite à la construction du barrage de Diama et de la digue de la rive droite du fleuve Sénégal. Le PND a par conséquent été principalement conçu dans un objectif de restauration des zones humides, même si des actions génératrices de revenu ont été encouragées dès sa création. Le PND est constitué de plaines d'inondation, de marais et de dunes. La pression démographique y est très faible, ce qui en fait un site de grand intérêt pour l'avifaune. La partie maritime du parc est très étroite et ne présente pas un grand intérêt halieutique compte tenu de la nature de la côte et des conditions de navigation qui y sont difficiles. Le PND a été classé site Ramsar en 1994. Il fait partie depuis 2005 de la Réserve de biosphère transfrontière (RBT) du bas delta du fleuve Sénégal. La mise en œuvre du PND a bénéficié depuis le début de l'appui de l'UICN et de divers financements, notamment des Pays-Bas et de la France (Fond français pour l'environnement mondial – FFEM – et Agence française de développement).

La création de la Réserve naturelle du Chott Boul, un estuaire fossile du fleuve Sénégal, s'est inscrite dans le cadre d'un objectif de conservation d'un échantillon d'écosystèmes naturels du littoral sud mauritanien et de protection du site et de ses environs. La réserve a été classée site Ramsar en 2000. À terme, la réserve de Chott Boul pourrait être classée, par rattachement au PND, en tant que zone humide du périmètre de la RBT du bas delta du fleuve Sénégal en raison de sa richesse en biodiversité. Là aussi, les activités anthropiques sont particulièrement faibles.

La Baie de l'Étoile pourrait être amenée à devenir à terme une AMP. Il s'agit d'une zone peu étendue, proche de Nouadhibou- D'un intérêt écologique primordial, notamment pour la pêche, elle est soumise à une forte pression foncière. La création de cette éventuelle future AMP repose en grande partie sur la dynamique scientifique impulsée par l'IMROP dès 2004, avec l'appui du Muséum de Paris, qui est en partie soutenue financièrement par la FIBA. Cette dynamique scientifique a également bénéficié du soutien du processus national d'aménagement du littoral, relancé en 2005 avec l'appui de la coopération française et de l'UICN. Une étude d'aménagement de la Baie de l'Étoile est depuis lors en cours, qui pourrait bénéficier prochainement de l'appui de l'AFD.

3.2 Processus de prise de décision

Le PNBA était à l'origine un parc principalement dédié à la protection et la conservation de l'avifaune. Ce n'est qu'à partir du milieu des années 90, suite à l'émergence de pêcheries Imraguen de sélaciens dans le parc et aux interactions de plus en plus fréquentes avec les pêcheries périphériques au PNBA, que s'est affirmée la nécessité de suivre les activités halieutiques dans celui-ci. La mise en place dès 1998 d'un dispositif de surveillance visant à empêcher les incursions de la pêche industrielle dans le parc, avec l'installation des premières stations radars côtiers dans celui-ci, a marqué un véritable tournant dans l'histoire du PNBA. Certains acteurs n'hésitent pas à dire à cet égard que le PNBA n'est

[9] « Les enjeux des aires marines et côtières protégées ouest-africaines » (J.-Y. Weigel, J. Worms, A. W. O. Cheikh, R. Fall, et A. S. Da Silva) *in J.-Y. Weigel, F. Féral* et *B. Cazalet (2007) Les aires marines protégées d'Afrique de l'Ouest. Gouvernance et politiques publiques* (Presses Universitaires de Perpignan).

CARTE 6
Plan Directeur d'Aménagement du littoral Mauritanien

Zonage schématique du littoral et localization des DAL prioritaires

Zonage schématique
- protéction renforcée
- bai sensible
- littoral péri-urbain
- aire protégée
- autres unités
- système d'unités à considérer
- Directives d'Aménagement Littoral

43 0 43 86 130
Kilomètres

Échelle: 1:2 000 000

Source: MPEM, 2008.

réellement devenu une AMP qu'à partir de ce moment-là. Il faut toutefois préciser que les faibles profondeurs moyennes dans le PNBA, exception faite dans la zone nord où se trouve une fosse, constituaient déjà une contrainte naturelle à la pratique du chalutage dans une grande partie du parc.

C'est aussi à partir de 1995 que se succèdent une série de projets « pêche », dotés d'experts présents de façon permanente qui jouent un rôle clé dans la définition, la mise en œuvre et le suivi des activités du PNBA en matière de promotion d'une pêche traditionnelle et durable ne contrariant pas l'objectif premier du parc en matière de conservation[10]. La multiplicité de ces projets, dotés d'experts permanents, associée au fait que des conseillers techniques se succèdent depuis de nombreuses années pour soutenir le travail du directeur du PNBA (financement FIBA, coopération française et/ou coopération allemande), attestent 'une influence certaine des partenaires extérieurs sur le processus de gestion du PNBA.

Les autres éléments importants du processus de prise de décision dans l'AMP sont, d'une part, les mécanismes de concertation avec les populations résidentes du parc introduits en 1998 (afin de mieux prendre en compte leurs aspirations et de les impliquer davantage dans la gestion de l'AMP), et, d'autre part, l'adoption en 2005 d'un Plan quinquennal d'aménagement et de gestion (PAG) fixant les priorités et le cadre de programmation du PNBA. Une réorganisation du PNBA a par ailleurs été mise en œuvre en 2007 suite à un audit réglementaire et institutionnel du PNBA. Cela a notamment donné lieu à la création d'un Observatoire du PNBA, qui devrait à terme constituer un instrument utile à la prise de décision. Le constat actuel est que le PNBA a mis en place un certain nombre d'instruments destinés à améliorer la qualité

[10] Projet ACGEBA (Appui à la conservation, la gestion et la valorisation de l'écosystème du Banc d'Arguin), financé par la coopération française, entre 1995 et 2001, projet « mulet », financé par l'UICN depuis 1998, auxquels s'ajoutent une série de projets financés par la FIBA depuis 1998 : projet « Raies-requins », projet ARPI (Appui à la reconversion de la pêche Imraguen), projet VPDI (Vers une pêche durable Imraguen) et projet RARES (Régulation de l'accès aux ressources naturelles et surveillance).

du processus de prise de décision. Mais dans la pratique, en raison du caractère encore récent de ces instruments et de la persistance de certaines pratiques, l'approche projet tend à dominer la programmation des activités du parc et le poids du directeur dans le processus décisionnel demeure important malgré les mécanismes de concertation mis en place avec les populations résidentes.

Dans le cas du PND, on a vu précédemment que l'établissement de l'AMP répondait avant tout à un besoin de protéger et de suivre l'évolution de milieux en cours de restauration (faune et qualité de l'eau) et de formuler des recommandations pour une meilleure gestion de l'eau. Le suivi de la pêche, à l'intérieur ou dans la partie maritime du parc, n'a en outre jamais constitué un enjeu particulier. De fait, les seules études en relation avec le secteur des pêches dans le PND ont été conduites dans le cadre du projet « mulet », avec l'appui de l'UICN. En ce sens, il paraît peu pertinent d'aller plus loin dans l'analyse du processus décisionnel au sein de cette AMP, principalement tournée vers la protection des milieux terrestres.

3.3 Perception des AMP

La perception des AMP en Mauritanie, et singulièrement celle du PNBA, est très différente selon les groupes d'acteurs considérés. Pour les gestionnaires de la pêche, le PNBA est perçu en général comme un instrument de gestion potentiellement intéressant pour la mise en place d'une gestion des pêches basée sur une meilleure prise en compte des dynamiques des écosystèmes côtiers et plus respectueuse de la préservation de l'environnement. La manière dont cette AMP est mise en œuvre soulève en revanche de nombreuses questions : faiblesse des mécanismes de concertation entre le PNBA et les autres administrations de l'État, persistance de conflits en matière de compétence institutionnelle en raison des incohérences du cadre juridique régissant la gestion du domaine maritime, prégnance de partenaires extérieurs dans la gouvernance du PNBA, prise en compte insuffisante des populations dans le processus de mise en œuvre de l'AMP, etc. Le PNBA est davantage perçu comme un instrument de conservation que de promotion d'une approche écosystémique pour la gestion des pêches. Son espace est assimilé à un espace de gestion individualisé et insuffisamment interconnecté au dispositif national de l'aménagement des pêches.

Pour la profession, la perception du PNBA n'est pas que le reflet des revendications exprimées à chaque fois que l'occasion se présente (par ex. lors du séminaire national sur l'aménagement des pêches artisanales en octobre 2005) d'un droit d'accès pour la pêche artisanale. La profession a en effet démontré à plusieurs reprises, par le passé, son intérêt à collaborer avec l'administration des pêches pour définir et appuyer la mise en œuvre de politiques ou de mesures techniques en matière d'aménagement (avec par ex. la formulation du plan d'aménagement du poulpe ou le respect du repos biologique de deux mois de la part des pêcheries démersales) dès lors que les enjeux sont clairement présentés et discutés. Or, dans le cas du PNBA, la perception est mitigée : la profession reconnaît la pertinence qu'il y a à protéger intégralement certains habitats sensibles, mais elle s'interroge en revanche sur le bien-fondé de protéger l'intégralité de l'AMP en l'absence d'argumentation scientifique. La profession regrette aussi le caractère arbitraire des règles régissant l'accès aux ressources dans le parc car les ressources halieutiques sont un patrimoine national et pourraient aussi servir la cause du développement et de la lutte contre la pauvreté[11]. La question de la pertinence des délimitations du PNBA est par ailleurs souvent évoquée.

[11] Les questions que se posent la profession sont notamment les suivantes : Pourquoi limiter l'accès aux seules populations résidentes (dont le statut de résident se rattache en fait principalement à la nature de la propriété de la lanche) ? Pourquoi interdire la pêche artisanale motorisée à l'échelle de l'ensemble de l'AMP alors que certaines pratiques de pêche sélective pourraient être autorisées dans certaines zones et à certaines périodes de l'année (pêche à la courbine notamment) ? Pourquoi ne pas autoriser l'accès aux ressources crevettières situées dans la fosse à certaines périodes de l'année ?

La profession déplore par ailleurs le fait de ne pas être représentée au sein du conseil d'administration du PNBA. Cela permettrait de dégeler les relations et de contribuer à une meilleure compréhension mutuelle des enjeux et des intérêts de chacun à collaborer. Ce mécanisme de concertation entre la profession et l'administration des pêches, qui consiste à avoir un ou deux représentants de la FNP dans les conseils d'administration d'établissements publics (par ex. IMROP, Port de pêche artisanale de Nouadhibou - EPBR, Port de pêche industrielle de Nouadhibou - PAN, etc.), a en effet contribué depuis plusieurs années à l'établissement de bonnes relations de partenariats entre la profession et l'administration des pêches.

Pour les acteurs et partenaires du PNBA, l'idée qui domine, et qui du reste figure explicitement dans le PAG 2005-2009, est que l'AMP joue un rôle déterminant dans la préservation des ressources halieutiques, à l'échelle nationale voire sous-régionale. Dans ce contexte, outre sa mission de conservation des écosystèmes du Banc d'Arguin et de gestion des pêcheries Imraguen, le PNBA remplit aussi une mission nationale de soutien au secteur des pêches. Une autre idée-force est que la pêche artisanale exercée à la périphérie du parc est perçue comme une grave menace pour le PNBA dans le cadre de la réalisation de sa mission de conservation, au même titre que la mise en place du nouvel axe routier Nouakchott-Nouadhibou ou que l'émergence du secteur de l'exploitation pétrolière (off-shore ou à terre). Ces différentes perceptions peuvent expliquer en partie les réticences du PNBA (ou de ses partenaires) à instaurer un dialogue avec les gestionnaires de la pêche, en dehors des services de la surveillance des pêches, et a fortiori avec la profession.

Pour les populations résidentes du parc, la perception de l'AMP semble également mitigée. Même si celui-ci permet dans une certaine mesure de protéger les intérêts des pêcheurs résidents en leur assurant l'exclusivité du droit d'accès à une zone de pêche particulièrement riche, la gouvernance du parc leur pose un certain nombre de problèmes : dénaturation des systèmes traditionnels de gestion[12] ; incompréhension de certaines règles souvent impulsées par les gestionnaires du parc lors des ateliers de concertation ; sentiment d'exclusion lié à la faiblesse du pouvoir d'achat à mettre en relation avec le coût élevé des services sociaux (par ex. l'obligation de scolarisation des enfants à Nouadhibou ou l' absence de centres de santé dans le parc) ; précarité de leur devenir compte tenu du vieillissement du parc de lanches et de leur incapacité financière à envisager leur renouvellement.

Un tournant dans l'histoire des relations entre les populations résidentes et les gestionnaires du parc peut toutefois être souligné avec l'introduction, à partir de 1998, de mécanismes de concertation. Ces mécanismes ont mis du temps à susciter l'intérêt des populations à cause d'un manque de sensibilisation et de compréhension des enjeux liés à la cogestion. Ils contribuent aujourd'hui à une meilleure perception de l'AMP et de ses modalités de gestion de la part des populations résidentes, même si des problèmes demeurent quant à la question de la représentativité des populations réellement autochtones au sein des ateliers de concertation. Les ateliers demeurent par ailleurs un lieu privilégié pour la défense des intérêts de certains groupes de pression influents (mareyeurs, propriétaires de lanches non résidents, chefs de village).

4. GOUVERNANCE DANS LES AMP (PÊCHE ET CONSERVATION)

4.1 Bases légales concernant l'établissement des AMP et instruments internationaux relatifs aux AMP

Les deux parcs nationaux ont été créés par décret, le PNBA par un décret de 1976 et le PND par un décret de 1991. Les activités dans le PNBA sont régies par la loi 2000/24 du 19 janvier 2000 relative au Parc national du banc d'Arguin et son décret

[12] Les règles de gestion reposaient en grande partie sur des savoirs traditionnels et sur des mécanismes d'ententes inter-villages notamment pour le respect de la mise en défens de certaines vasières.

d'application 2006-068 du 3 juillet 2006. L'analyse du cadre juridique du PNBA a permis de définir l'AMP comme « un dispositif de police administrative spéciale » dans les limites administratives de l'AMP et de considérer l'AMP comme « un montage juridico-institutionnel » autour d'un établissement public - le PNBA - aux importantes compétences territoriales (Féral et Cazalet, 2007[13]).

Pour l'AMP en gestation que constitue la Baie de l'Étoile, le montage juridique est différent et, en ce sens, il ne semble pas d'actualité, du moins dans l'immédiat, de classer cette zone en parc naturel. En outre, la promotion de cette AMP est inscrite dans le processus d'aménagement du littoral (PDALM – cf. section 6.1.). À cet effet, l'ordonnance n° 2007-037 relative au littoral (c'est-à-dire la loi littorale) a été promulguée en avril 2007. Sa vocation est d'offrir un cadre juridique au processus d'aménagement du littoral. La loi littorale reconnaît aussi la possibilité d'élaborer des Directives d'aménagement du littoral (DAL) dans certaines zones sensibles comme la Baie de l'Étoile. Le concept de DAL s'apparente toutefois d'avantage à un régime de gestion territoriale spécifique dans lequel les activités de développement seront censées être mieux encadrées que dans d'autres parties du littoral, qu'à un régime de gestion de parc ou de réserve.

En ce qui concerne les engagements internationaux, la Mauritanie est signataire de la plupart des conventions internationales relatives à la gestion des zones côtières, en particulier des Accords multilatéraux sur l'environnement (AME) relatifs à la zone côtière et des textes de l'OMI en relation avec la lutte contre les pollutions (conventions MARPOL). En revanche, le Sommet de Johannesburg de 2002 et le Congrès mondial de Durban sur les parcs (2003) ne se sont pas traduits par des engagements supplémentaires du pays concernant le développement de nouvelles AMP. Le cas de la Mauritanie est toutefois atypique compte tenu de l'existence dans ce pays de la plus grande AMP de l'Afrique de l'Ouest, en l'occurrence le PNBA.

Les récents développements internationaux ont en revanche donné une nouvelle impulsion au processus national d'aménagement du littoral, avec notamment l'organisation de « Journées de découverte du littoral » en décembre 2004, la relance du processus de renforcement du dispositif de prévention et de lutte contre les pollutions marines depuis 2005 et la finalisation du Plan directeur d'aménagement du littoral mauritanien (PDALM) fin 2005. Ce dernier a notamment confirmé le rôle important que les AMP doivent jouer dans la préservation des écosystèmes côtiers. Il a aussi caractérisé certaines zones qui représentent un intérêt particulier du point de vue environnemental (par ex. la Baie de l'Étoile).

Dans le prolongement de ce qui précède, il n'y a pas de points de référence internationaux ou nationaux en relation avec les AMP en Mauritanie.

4.2 Description des institutions et mesures incitatives à la mise en œuvre des AMP

Les principales institutions concernées par le processus des AMP ont été décrites dans la section 2.5. La présente section apporte quant à elle des éléments d'analyse complémentaires sur les questions de gouvernance dans l'AMP du PNBA.

Sur le plan de l'ancrage institutionnel, le PNBA bénéficie toujours de passerelles avec le plus haut niveau de l'État même s'il est rattaché depuis 2006 au ministère en charge de l'environnement. La présidence du conseil d'administration du PNBA est en effet assurée par un représentant du Secrétariat général du gouvernement (qui serait aussi membre du conseil d'administration de la FIBA).

Le budget consolidé du PNBA (dotation de l'État + contribution des partenaires, notamment de la FIBA) est important : il était de l'ordre de 1,8 million d'euros en 2007.

[13] « Le cadre juridique de la gouvernance : un système de droit syncrétique » (F. Féral et B. Cazalet) *in J.-Y. Weigel, F.Féral et B.Cazalet (2007)* in *Les aires marines protégées d'Afrique de l'Ouest. Gouvernance et politiques publiques.* (Presses Universitaires de Perpignan).

À titre de comparaison, le budget de la DAPL, dont le positionnement institutionnel se situe au même niveau hiérarchique que les parcs nationaux au sein du ministère en charge de l'environnement, et dont la mission consiste notamment à concevoir la politique nationale en matière d'aires protégées et de conservation, dispose d'un budget annuel d'environ 30 000 euros par an.

Conformément à son Plan d'aménagement et de gestion 2005-2009, le PNBA est par ailleurs en train de renforcer son dispositif interne de gestion pour une meilleure gouvernance de l'AMP grâce aux actions suivantes :

- Création d'un Observatoire du PNBA en 2007. Dans le cadre de sa mission de veille environnementale et de mise à disposition de l'information scientifique relative au PNBA, l'Observatoire pourrait devenir un instrument utile pour améliorer la concertation entre le parc et les autres administrations directement ou indirectement concernées par la gestion de l'AMP.
- Perspective de création d'un Fonds fiduciaire. La première étude de faisabilité remonte à 2002. Le principe est de créer un fonds dont les intérêts serviront à dégager des ressources financières pérennes pour soutenir la mise en œuvre d'activités dans le PNBA. Ce mécanisme pourrait permettre d'assurer la pérennisation des projets et ainsi contribuer à l'autonomie financière de l'institution que représente le PNBA. L'objectif à terme est de pouvoir capitaliser 15 millions d'euros afin de dégager en moyenne 750 000 euros/an (5 pour cent d'intérêts).

On peut mentionner une autre innovation majeure dans le fonctionnement de l'institution du PNBA. Il s'agit de la dotation d'une enveloppe destinée à celui-ci dans le cadre du nouvel accord de pêche de partenariat avec l'UE[14]. Une partie de la dotation annuelle sert à alimenter le budget du PNBA, en plus de la dotation budgétaire de l'État L'autre partie contribue au fonds fiduciaire afin de susciter d'autres contributions par effet de levier. Cette aide partenariale a pour objet d'améliorer la gouvernance dans le PNBA, grâce notamment au renforcement de l'autonomie financière de l'institution. De fait, entre 2005 et 2007, le budget consolidé du PNBA a été renforcé et le ratio entre la dotation de l'État (y compris accord de pêche) et le budget consolidé est passé d'environ 30 à 40 pour cent.

Il est intéressant de constater que l'accord de pêche en vigueur établit un lien direct entre l'aménagement des pêches et la conservation. De manière plus globale, on peut souligner que l'accord mauritanien constitue une nouveauté dans la mesure où c'est la première fois qu'un accord de pêche reconnaît les AMP en tant qu'instruments de l'aménagement des pêches au titre du volet partenarial (anciennement « actions ciblées »)[15]. On peut toutefois regretter que la dotation budgétaire ne fasse référence à aucun cadre de planification des dépenses relatives au PNBA (malgré l'existence d'un PAG), et que le principe d'allouer un montant au PNBA n'ait pas été libellé sous la forme d'un « appui aux AMP » afin d'en faire aussi bénéficier le PND et éventuellement le processus d'aménagement de la Baie de l'Étoile (au travers de la DAPL).

[14] La Communauté européenne et la Mauritanie ont signé en juillet 2006 un Accord de partenariat dans le secteur de la pêche pour une durée de 6 ans. Le premier protocole 2006-2008 prévoyait une contrepartie financière de 86 millions d'euros par an, dont 75 millions correspondant à la contrepartie commerciale et 11 millions alloués au partenariat répartis comme suit : 10 millions d'euros pour l'appui à la politique sectorielle des pêches et 1 million d'euros pour le PNBA. Le protocole 2008-2012 a revu à la baisse les possibilités de pêche et a diminué la contrepartie commerciale (compensée néanmoins par une augmentation des fonds FED). Ce nouveau protocole a en outre reconduit le montant et les modalités de mise en œuvre du volet partenarial.

[15] Une précision doit cependant être apportée en ce qui concerne la nature du volet partenarial relatif au PNBA. En effet, le montant alloué au PNBA ne semble pas devoir être pris en compte dans le calcul de la contrepartie, contrairement au montant alloué au secteur pêche. Autrement dit, un arrêt de la dotation annuelle au PNBA ne remettrait aucunement en cause l'accord de pêche. Du reste, la question de l'utilisation des fonds destinés au PNBA n'est pas inscrite à l'ordre du jour des réunions de la commission mixte.

4.3 Modes de gestion

Depuis 1998, les gestionnaires du PNBA ont lancé la mise en place de mécanismes de concertation avec les populations résidentes pour définir des règles de gestion dans l'AMP. Ces mécanismes reposent sur l'organisation d'ateliers de concertation annuels qui réunissent différentes parties prenantes dans la gestion de l'AMP. En théorie, ces mécanismes visent à favoriser les discussions entre les populations résidentes du parc, les collectivités locales (communes) et les gestionnaires de celui-ci sur tous les sujets ayant trait au développement économique et humain des populations. Ces ateliers entendent aussi soutenir le processus de programmation annuelle des activités du PNBA (en appui à la mise en œuvre du PAG).

Toutefois, dans la pratique, la question de la pêche domine les débats, notamment en matière de définition des règles de gestion (par ex. au sujet du calendrier de pêche selon l'espèce cible, du zonage, de la réglementation sur les engins, etc.). Les engagements mutuels pris par les différentes parties sont ensuite formalisés sous forme de notes de service signées par le directeur du PNBA. Les ateliers de concertation offrent aussi l'occasion de discuter et de régler les différends pouvant opposer différentes catégories d'acteurs au sein des populations résidentes du parc, ce qui semble être très apprécié de l'avis des communautés. Ces mécanismes ont par ailleurs été renforcés récemment avec la mise en place de Comités de pêche permettant de suivre la mise en œuvre des engagements et de régler les litiges au cas par cas.

Ces mécanismes de concertation constituent une amélioration indéniable dans la gouvernance du PNBA. Selon de nombreux observateurs, ils pourraient cependant être plus pertinents et plus efficaces si les aspects suivants étaient pris en considération :

- Les mesures discutées lors des ateliers de concertation sont le plus souvent introduites en réponse à des problèmes particuliers liés aux dysfonctionnements et aux faiblesses du système actuel de gestion dans l'AMP. Les questions de prospective visent à promouvoir des modes de gestion des pêches dans le PNBA qui soient compatibles avec les objectifs de conservation et d'amélioration des conditions de vie des communautés de pêcheurs pourraient être également abordées.
- Le MPEM est faiblement associé aux mécanismes de concertation. Seul un représentant du MPEM ayant rang de chef de service (le chef d'antenne de la zone Nord) est présent lors des ateliers de concertation. Le MPEM n'est par conséquent pas considéré comme un acteur à part entière de la cogestion, ce qui peut paraître surprenant d'un point de vue non seulement institutionnel, mais aussi technique si l'on considère les interactions entre les écosystèmes côtiers du Golfe d'Arguin et la nécessité d'aborder la gestion de ces systèmes dans leur ensemble.
- Les décisions formulées dans le parc (dans les domaines de la pêche, du social, du tourisme, etc.) sont adoptées sous la forme de notes de service du directeur du PNBA. Cela peut sembler logique compte tenu du mandat du parc. Mais cela ne va pas sans poser des problèmes de gouvernance dans la mesure où ces notes de services ne peuvent pas servir de support juridique pour entraîner l'action des autres administrations. Cela complique l'insertion des populations dans les politiques publiques de développement et de lutte contre la pauvreté.

4.4 Principaux enjeux liés à la mise en œuvre effective des AMP

Les principaux enjeux liés à la mise en œuvre du PNBA qui font l'unanimité, sont que l'AMP puisse effectivement garantir un maintien de la biodiversité marine, qu'elle puisse augmenter l'abondance des ressources halieutiques dans l'AMP et à l'extérieur de celle-ci pour soutenir l'activité pêche en général, et enfin qu'elle puisse soutenir le développement économique et humain des populations résidentes du parc.

Une fois énoncés ces principaux enjeux, d'autres questions plus catégorielles et liées à la mise en œuvre de l'AMP semblent se dégager. Pour les gestionnaires du PNBA, il

s'agit de parvenir à terme à une traduction directe des règles de gestion élaborées dans le cadre des mécanismes de concertation en véritables réglementations, de manière à bénéficier de l'appui de la DSPCM pour les faire appliquer. À l'heure actuelle, les ententes ne sont en effet reconnues que par les agents des parcs.

Pour les gestionnaires de la pêche, il s'agit de participer de manière effective à l'élaboration des règles régissant la pêche dans le parc en apportant une expertise pêche ainsi qu'une vision plus globale de la gestion dans un contexte d'ouverture croissante et d'intensification des échanges marchands, entre l'intérieur et l'extérieur du parc, et de promotion d'une approche écosystémique.

5. IMPACTS ET PROBLÉMATIQUES D'ORDRE ÉCOLOGIQUE ET SOCIO-ÉCONOMIQUE

5.1 Impacts des AMP sur l'aménagement des pêches

En théorie, les AMP sont des mesures de gestion spatiale pouvant contribuer à limiter la surexploitation de recrutement (lorsque l'AMP accueille des zones de frayère) et améliorer le rendement de certains stocks dans les zones adjacentes tout en contribuant à la préservation de l'intégrité d'une partie des écosystèmes côtiers. Selon une étude récente conduite par l'IMROP[16], l'importance dans le PNBA de la fraction de juvéniles dans la zone côtière confirme l'hypothèse que cette zone est effectivement une zone de nurseries et de nourriceries pour plusieurs dizaines d'espèces. Cette fonction de nourricerie constitue l'une des contributions essentielles du parc à l'enrichissement biologique de la zone adjacente. Cette étude confirme aussi la richesse spécifique globale du Banc d'Arguin et l'efficacité des écosystèmes en termes de production benthique, qui s'expliqueraient par la diversité des habitats (vasières, chenaux, herbiers, hauts fonds), leur intégrité en raison du caractère protégé du site, et de la qualité de l'eau.

De l'avis de nombreux acteurs, le parc a aussi permis de freiner le processus de dégradation des écosystèmes côtiers et des ressources halieutiques dans le Golfe d'Arguin, en offrant notamment des zones refuges pour certaines espèces stratégiques comme le mulet, une espèce migratrice fourrage pour de nombreuses espèces de niveau trophique supérieur et à forte valeur marchande. L'application du principe du non-prélèvement d'autres espèces dont une partie du cycle biologique s'effectue dans le parc, comme les crevettes côtières, peut également être considérée comme une source d'impact positif pour le secteur des pêches (le chiffre d'affaires à la production des crustacés est de l'ordre de 20 millions d'euros par an). En outre, l'étendue de la zone protégée (un tiers du littoral) constitue un garant de l'impact présumé positif de l'AMP en tant qu'instrument indirect et important de l'aménagement des pêches, même si les deux espèces phares du secteur des pêches en Mauritanie (le poulpe et la sardinelle) sont absentes du parc.

Toutefois, l'un des problèmes majeurs associés à l'analyse de l'AMP du PNBA (la seule AMP effective en Mauritanie) en tant qu'instrument de politique publique pour la durabilité des écosystèmes marins et côtiers est que, trente années après la création du parc, on ne dispose finalement que de peu de données scientifiques sur son fonctionnement et son impact sur les pêcheries mauritaniennes. Ce manque de connaissances scientifiques tend à brouiller le discours politique et à alimenter les controverses entre les différents protagonistes. Le PAG 2005-2009 du PNBA reconnaît ce problème et en fait l'une de ses priorités. Des projets de recherche ont par ailleurs été lancés récemment.

Pour ce qui est de l'analyse de l'impact de l'AMP à l'intérieur du parc, un premier constat est que les modes de gestion mis en place ne semblent pas avoir endigué le

[16] Mahfoudh Ould Taleb Ould Sidi (2007) *Synthèse préliminaire des travaux scientifiques menés par l'IMROP dans le PNBA : période 1997-2006*. IMROP/RARES.

IMAGE 2
Séchage de mulet dans le Parc National du Banc d'Arguin

Source: C. Breuil, octobre 2008.

processus d'accélération de la mortalité par pêche observé depuis le début des années 90. L'effort de pêche est ainsi passé de moins de 50 sorties par lanche en 1997 à 130 sorties par lanche en 2007, suite notamment à l'arrivée d'une main d'œuvre étrangère au parc. Dans le même temps, l'éventail des captures s'est élargi, avec l'émergence depuis quelques années d'une production importante de mâchoirons et de tilapias destinés aux marchés de Nouakchott. Mais une question domine les débats, à savoir la persistance de débarquements importants de sélaciens, groupe d'espèces protégées, malgré les efforts d'aménagement consentis dans le cadre des concertations.

Un autre impact de l'AMP du PNBA sur l'aménagement des pêches peut être mentionné au sujet de la concentration des opérations de pêche (artisanales et industrielles) à la périphérie du parc, notamment dans les parties nord et sud. Ce problème est d'autant plus aigu qu'il n'existe pas de zone tampon, notamment dans la partie sud.

L'analyse des impacts socio-économiques du PNBA peut être abordée à travers l'analyse de l'évolution des pêcheries Imraguen, les seules pêches autorisées par le Code des pêches et la loi relative au PNBA. La pêche Imraguen était à l'origine une pêche de subsistance centrée principalement sur le mulet. Elle s'est par la suite globalement intensifiée et diversifiée sous l'effet de la mondialisation. Même si elles sont encore qualifiées de traditionnelles dans divers supports de communication, les pêcheries Imraguen sont en fait pleinement intégrées aujourd'hui dans l'économie de marché et sont orientées vers l'exportation de produits transformés (mulet et sélaciens) ou de produits frais (courbine, tilapia, mâchoiron). D'après certaines estimations, le chiffre d'affaire produit par les lanches s'élève à environ 800 000 euros par an (M. O. Taleb, *Op. cit.*).

Les relations entre pêcheurs, mareyeurs, grossistes et détaillants sont devenues de plus en plus complexes, et la dépendance financière des communautés de pêcheurs à

l'égard des mareyeurs n'a cessé de s'accroître malgré des initiatives visant à renforcer leur organisation à travers la mise en place de coopératives. La pêche Imraguen a fait par ailleurs de plus en plus appel à de la main d'œuvre étrangère. Les changements survenus dans les modes de production et de valorisation ont également eu un impact sur la marginalisation des femmes qui, auparavant, étaient fortement impliquées dans la transformation des produits de la pêche. Ces dernières sont aujourd'hui confrontées à des difficultés d'accès à la matière première, qui est captée par d'autres circuits de distribution plus rémunérateurs pour les mareyeurs.

Le bilan de l'impact socio-économique de l'AMP du PNBA sur l'émancipation des populations locales peut apparaître par conséquent assez mitigé. Un autre indicateur qui saute aux yeux du visiteur est de constater le niveau apparent de pauvreté des communautés de pêcheurs et la faiblesse ou l'absence des infrastructures sociales de base relatives à l'éducation et la santé.

5.2 Problématiques majeures d'ordre socio-économique et/ou écologique

L'analyse de l'impact socio-économique de l'AMP du PNBA ne doit toutefois pas se contenter de dresser des constats simplistes et critiques à l'encontre des gestionnaires du parc. La complexité et le manque d'équité qui caractérisent en général les relations entre les pêcheurs et les mareyeurs en Mauritanie existent malheureusement aussi à l'extérieur des limites du parc. En revanche, si l'on considère que les conditions de gestion dans le parc sont relativement faciles à appréhender (une centaine de lanches au total, dont 70 en activité, un droit d'accès exclusif à des zones de pêche particulièrement riches, des points de débarquements suivis et contrôlés, un millier de personnes résidant dans le parc, des pêcheries rentables au regard notamment de la courbine et pleinement insérées dans les systèmes d'économie marchande, etc.), une question récurrente peut être posée : À qui profite la rente halieutique alors que l'on constate le dénuement presque complet dans lequel vivent les populations effectivement résidentes et qui, en outre, dessert l'image de marque du parc, même si des facteurs d'ordre sociologique peuvent expliquer en partie cette situation (par ex. la place des Imraguen dans l'organisation tribale et hiérarchique de la société maure, les comportements d'épargne et d'investissement dans des secteurs autres que la pêche, etc.) ?

Du point de vue écologique, la principale problématique concerne le besoin d'une meilleure compréhension du fonctionnement des écosystèmes et des interactions entre les différentes pêcheries du Golfe d'Arguin, qui englobent l'AMP du PNBA et qui concentrent la majeure partie des enjeux liés à la pêche en Mauritanie. Par ailleurs, les problématiques liées à l'AMP du PNBA dans le contexte de l'aménagement des pêches renvoient à la question de l'accès aux ressources dans le parc. Car si le principe de placer de vastes zones recensant des habitats sensibles sous un régime de protection fait l'objet d'un consensus général, de nombreuses voix plaident en faveur d'un accès limité, dans l'espace et dans le temps, de la pêche artisanale à certaines zones situées dans les limites ou à l'intérieur du parc (par ex. les fosses) et ne présentant pas d'intérêt écologique avéré. Une révision du zonage paraît également souhaitable. Mais les conditions d'un dialogue constructif entre la pêche et l'environnement ne semblent pas encore réunies, en raison du manque de connaissances scientifiques et aussi de la faiblesse actuelle du système de contrôle et de régulation de la pêche artisanale à l'extérieur du parc.

5.3 Rôle des sciences naturelles et des sciences sociales

Les programmes de recherche halieutique dans l'AMP du PNBA ont été conçus jusqu'à présent afin de répondre à des problèmes de gestion (c'est le cas par ex. du programme sélacien pour diminuer les prises de raies et requins ou du programme de suivi des débarquements), et non pour aborder des thèmes plus généraux en relation avec le rôle du parc en tant qu'instrument de l'aménagement. Cela peut être dû au fait que le maître d'ouvrage de la recherche dans les limites géographiques du parc est le PNBA si l'on se

réfère aux textes relatifs au parc. Cela peut aussi être imputable à la faiblesse des coûts d'opportunité pour l'IMROP pour mettre en œuvre des programmes de recherche dans le PNBA. La recherche halieutique en Mauritanie a en effet été jusqu'à présent surtout mobilisée sur des programmes de suivi et d'évaluation des stocks pour appuyer la gestion des pêcheries hors AMP.

Les premiers travaux de recherche sur la pêche conduits par l'IMROP dans le PNBA remontent à 1997, dans le cadre de la mise en place d'un système de suivi des pêches avec l'appui du projet ACGEBA, c'est-à-dire près de 20 ans après la création du parc. La pêche s'est en fait invitée dans les débats scientifiques et les discussions relatives à la gestion du PNBA à partir de la deuxième moitié des années 90, avec le développement des pêcheries de sélaciens. Les données fournies par le système de suivi sur la pêche ont été progressivement complétées par des campagnes de chalutage, des données de sennes de plage et des enquêtes socio-économiques, ce qui permet de disposer aujourd'hui de connaissances appréciables sur le système pêche et d'alimenter le processus de cogestion des pêches dans le parc. Mais force est de constater que les travaux de recherche concernant le rôle présumé du parc dans la productivité et la durabilité des ressources halieutiques dans la ZEE mauritanienne, voire à l'échelle de la sous-région, sont restés marginaux. Du reste, il n'existe encore aujourd'hui que très peu de publications scientifiques sur le fonctionnement des écosystèmes du PNBA et les interactions entre ces derniers et les pêcheries du Golfe d'Arguin.

Mais cette vision cloisonnée et opportuniste de la recherche dans l'AMP du PNBA est en train de changer à la faveur de deux nouveaux projets de recherche : le projet PACOBA et le projet Amphore.

- Projet PACOBA (Approfondissement des connaissances scientifiques des écosystèmes du Banc d'Arguin), financé par la coopération française. À partir du postulat que la gestion du Golfe d'Arguin devient de plus en plus difficile en raison du manque d'informations océanographiques, biologiques, écologiques et socio-économiques, l'objectif de ce projet est d'améliorer les connaissances scientifiques sur cet espace en renforçant les capacités de l'IMROP en matière de recherche sur les écosystèmes et l'écologie halieutique, ainsi que celles du PNBA dans le domaine de l'organisation de l'information et de la mise à disposition de cette dernière au service de la prise de décision pour la gestion des activités environnementales et des pêches. L'un des principaux enjeux du projet sera d'évaluer le rôle joué par les écosystèmes du Golfe d'Arguin sur la productivité du système pêche aux niveaux local et sous-régional.
- Projet AMPHORE (AMP et gestion Halieutique par optimisation des ressources et des écosystèmes), financé par l'Institut français de la biodiversité. Ce projet de recherche pluridisciplinaire porte sur le rôle de plusieurs AMP en France et en Afrique de l'Ouest, dont le PNBA, dans le cadre de la conservation de la biodiversité et de la gestion des pêches. Les deux premières composantes se rapportent à la définition d'indicateurs biologiques, écologiques, économiques et sociaux à des fins de gestion écosystémique des pêches, et sur l'évaluation de l'efficacité réelle des AMP sur les systèmes pêche et des bénéfices induits par les AMP. La troisième composante aborde plus particulièrement les problèmes de gouvernance grâce à l'analyse des mécanismes décisionnels qui conditionnent la mise en place des AMP et des politiques régionales basées sur la notion de réseau d'AMP.

Par ailleurs, la création en 2007 de l'Observatoire du PNBA suscite beaucoup d'espoirs pour les tenants d'une amélioration des connaissances concernant les dynamiques océanographiques, écologiques et socio-économiques du parc. Son développement repose notamment sur l'instauration de partenariats scientifiques et techniques avec différentes institutions nationales et étrangères. L'observatoire a pour ambition de rendre accessibles à terme un ensemble de données élaborées via Internet

pour différents utilisateurs (par ex. des cartes, des bases de données, des publications, etc.).

6. APPROCHES CONCERTÉES APPLIQUÉES AUX AMP POUR L'AMÉNAGEMENT ET LA CONSERVATION

6.1 Intégration des AMP dans les politiques plus globales d'aménagement de l'espace maritime

En réponse à une nouvelle et relativement forte dynamique de pression sur l'arc littoral du pays suite à la conjonction de différents éléments (concentration des populations, urbanisation et industrialisation croissantes, développement du trafic portuaire, développement de la pêche, occupation anarchique de l'espace littoral proche de Nouakchott et de Nouadhibou, occupation de l'espace à des fins de protection, etc.), la Mauritanie s'est lancée dès la fin des années 90 dans une démarche d'aménagement du littoral. L'objectif principal de la démarche était de préparer un plan directeur, en veillant à intégrer les préoccupations de l'ensemble des acteurs concernés par le développement du littoral et à proposer plusieurs scénarios envisageables pour la zone côtière en prenant en compte la vocation des différentes zones.

Après plusieurs années de balbutiements, résultant en grande partie de conflits de compétence institutionnelle, la démarche a été redynamisée fin 2004 pour aboutir en 2005 à la formulation d'un Plan directeur d'aménagement du littoral mauritanien (PDALM). Le document relatif au PDALM se présente sous la forme d'un cadre concerté pour l'aménagement et le développement du littoral, en proposant notamment une qualification du littoral (ou zonage d'orientation de l'espace) en fonction des vocations de l'espace considéré auxquels sont des prescriptions d'aménagement fournies (cf. carte 6). Le document du PDALM a été adopté en 2005 par un comité interministériel chargé de l'aménagement du littoral, présidé à l'époque par le ministère en charge des pêches.

Depuis, le processus peine à avancer, de nouveau pour des raisons de conflits de compétences entre les différents ministères concernés par l'aménagement du littoral : Pêche, Environnement (DAPL) et Transports. Une ordonnance portant sur le littoral (loi littorale) a été adoptée début 2007. Celle-ci fournit un cadre légal au PDALM et créée plusieurs institutions pour soutenir la mise en œuvre du processus d'aménagement du littoral, notamment un Conseil consultatif du littoral, chargé de donner un avis sur toutes les questions relatives à la gestion, au développement et à la protection des ressources du littoral et plus généralement sur toutes les questions concernant le littoral, ainsi qu'un Observatoire du littoral géré par la DAPL. Mais les décrets d'application n'ont toujours pas été publiés, notamment celui devant fixer les règles d'organisation et de fonctionnement du Conseil consultatif du littoral qui concernera aussi les AMP[17].

Ainsi, en théorie, la Mauritanie prend en compte les AMP dans la politique d'aménagement du littoral, ainsi que la question de l'articulation de celles-ci avec d'autres politiques sectorielles dont la pêche. Mais dans la pratique, le processus n'est pas encore achevé et force est de constater que les politiques sectorielles de développement priment encore sur les politiques concertées de gestion intégrée des zones côtières. Le dernier exemple en date remonte au début de l'année 2008 avec le lancement des premières études en vue de la préparation d'un Schéma de développement stratégique de la baie de Nouadhibou, sous l'impulsion du Commissariat à la promotion des investissements

[17] La loi littorale prévoit que le Conseil consultatif du littoral sera présidé par le ministre chargé de l'aménagement du littoral (dans un contexte où plusieurs ministères se disputent la compétence de ce domaine). Ce conseil comprendra des représentants des administrations centrales, des collectivités locales concernées, des parcs et réserves naturelles, des organisations de la société civile, des organismes de recherches ainsi que des personnalités qualifiées sur le plan scientifique.

privés[18]. La faiblesse du dispositif institutionnel relatif au PDALM tient également à l'absence d'un chef de file pouvant animer et coordonner le processus.

6.2 Concertation ou conflits d'ordre institutionnel

Concertation

Dans le cas de l'AMP du PNBA, des mécanismes intéressants de concertation ont été mis en place entre l'IMROP et le PNBA pour le suivi des pêches dans le parc et l'analyse des données dans le cadre d'un Groupe de travail scientifique. Ces mécanismes de concertation ont été initiés en 2001, avec l'appui financier des projets pêche du PNBA (ACGEBA, ARPI, VPDI, RARES) pour la prise en charge des enquêteurs en particulier. Depuis la refonte du système de suivi statistique de la pêche artisanale de l'IMROP réalisée en 2006 (système SSPAC), les enquêteurs sont intégralement pris en charge par l'IMROP. Il faut par ailleurs remarquer qu'au niveau des 9 sites de suivi statistique, chaque enquêteur est aidé par un suppléant local (généralement un pêcheur), ce qui aurait permis d'améliorer significativement la qualité des données collectées.

Ces mécanismes de concertation permettent à chacun des partenaires de remplir ses missions, à savoir, pour l'IMROP, une mission de suivi, de veille et d'évaluation régulière des pêches dans le PNBA, et, pour les projets, une mission de promotion de la cogestion dans le parc dans la mesure où les résultats des Groupes de travail contribuent à enrichir les discussions lors des ateliers annuels de concertation. Ces mécanismes ne sont toutefois pas pérennes au sens où ils ne reposent sur aucun protocole de coopération formalisé entre les deux institutions.

Un autre mécanisme de concertation dans l'AMP du PNBA peut être souligné dans le domaine de la surveillance des pêches. Il implique la DSPCM (personnel assermenté) et le PNBA (moyens navigants, équipements et frais de fonctionnement) au niveau de trois stations de surveillance dotées de radars (Mamghar, Iwick et Agadir). À chaque sortie (aléatoire ou non), la mission de surveillance comprend un agent de la DSPCM, un agent du PNBA et un représentant des populations Imraguen qui sert en même temps de guide. Le dispositif concerté de surveillance produit des résultats indéniables en ce qui concerne le respect de l'application des dispositions prévues par le Code de la pêche, malgré les difficultés de maintenance des stations radars (celle de Mamghar est par exemple hors d'usage depuis 2002) et le budget limité accordé au financement des sorties de surveillance. Les succès de la surveillance dans le parc sont également imputables, en ce qui concerne la lutte contre la pêche industrielle illicite, au système SSN mis en place de manière effective depuis 2005.

Dans le cas du Parc national du Diawling, la concertation entre la pêche et l'environnement est réduite au minimum, probablement en raison de la faiblesse des enjeux en matière de pêche pour chacun des partenaires. L'IMROP serait pourtant demandeur de concertations car le PND joue a priori un rôle important dans la bio-écologie de certaines espèces d'intérêt comme le mulet ou la crevette, et devrait être pris en compte pour une approche systémique de la gestion des pêches. Mais hormis la réalisation d'études conduites en relation avec des projets (par ex. le projet « mulet » soutenu par l'UICN ou le projet FFEM en 2003), il n'y a pas d'activités régulières de recherche. Pour ce qui est de la surveillance, aucune disposition particulière n'a été prise en termes de concertation entre la DSPCM et le PND. Les agents du parc veillent au respect de la réglementation dans la partie terrestre du parc et la DSPCM remplit sa mission de surveillance en s'appuyant sur son dispositif national.

[18] Dans le cadre de la préparation du Schéma de développement stratégique de la baie de Nouadhibou, un comité interministériel *ad hoc* a été constitué. Or, la DAPL n'a intégré le comité interministériel qu'en cours d'étude. Par ailleurs, on peut noter que l'étude ne fait référence au PDALM que dans le cadre de l'analyse du cadre de protection de l'environnement, ce qui est assez restrictif. L'étude évoque plusieurs scenarios de qualification de la Baie de l'Étoile, qui est une AMP en gestation (réserve, écotourisme, aquaculture, etc.).

Dans le cas de la Baie de l'Étoile (une AMP en gestation), des mécanismes de concertation tendent à émerger au cas par cas lors de réunions ou d'ateliers de travail entre l'IMROP et la DAPL organisés dans le cadre de l'étude sur l'aménagement de la zone en relation avec le PDALM.

Les mécanismes de concertation entre la pêche et l'environnement trouvent souvent leur origine dans les mécanismes internes de gestion des projets. Cette concertation a été circonscrite jusqu'à présent à l'échelle des AMP. Deux projets qui tendent à montrer que le champ de la concertation peut parfois être élargi à l'échelle plus large des écosystèmes méritent d'être mentionnés à ce sujet. Il s'agit, d'une part, du projet PACOBA qui au travers d'une de ses composantes vise à renforcer les mécanismes de concertation entre le PNBA et l'IMROP et à faire correspondre au mieux les travaux de recherche avec les besoins en matière de gouvernance des pêches à l'échelle de l'écosystème du Golfe d'Arguin. D'autre part, on peut mentionner le projet « mulet », qui inscrit les mécanismes de concertation à l'échelle de l'aire de répartition de cette ressource fortement migratrice. Ainsi, les mécanismes de concertation mis en place dans le cadre du projet « mulet » (commissions techniques et commission consultative), tant au niveau national en associant la pêche (MPEM, IMROP, DSPCM) et l'environnement (PNBA, PND), qu'au niveau bilatéral avec le Sénégal, reflètent bien cette volonté de promouvoir une approche écosystémique pour la gestion de cette ressource.

Conflits

Parmi les freins au développement de la concertation, on peut mentionner le climat de méfiance qui caractérise encore parfois les relations entre les gestionnaires de la pêche et certains partenaires du parc : méfiance par rapport à l'IMROP considéré comme un instrument de développement des pêches[19], méfiance par rapport au MPEM considéré comme le porte-parole des intérêts de la profession, ou encore méfiance par rapport à la surveillance qui se cantonne à veiller au respect de la réglementation de la pêche. En ce qui concerne ce dernier point, il est reproché à la DSPCM de ne pas s'impliquer dans le contrôle de l'application des règles adoptées lors des ateliers de concertation. Mais ces règles ne sont pas traduites en actes réglementaires car elles ne sont pas reconnues par l'administration des pêches. De ce fait, la surveillance ne se réfère qu'à ce que prescrit la loi portant code des pêches et ses textes d'application en relation avec le PNBA (zone interdite à la pêche industrielle et à la pêche artisanale motorisée, utilisation interdite de filets en monofilament). Certains expliquent aussi le manque de zèle de la DSPCM en raison des faibles coûts d'opportunité que représente la surveillance de la pêche artisanale (coûts élevés de surveillance, fortes pressions sociales lors de la procédure de traitement des infractions, amendes dérisoires).

Un autre conflit d'ordre institutionnel est à mettre en relation avec le rôle mineur joué par les collectivités locales dans le processus de développement des populations résidentes dans le parc. Ces dernières, malgré leur mandat, n'ont pas en effet une grande compétence dans des domaines clés comme les programmes d'éducation et de santé, dans la mesure où le directeur du PNBA dispose de pouvoirs élargis dans sa « circonscription administrative », pouvoirs qui dépassent le cadre de la protection des espaces naturels.

6.3 Enjeux et opportunités

Les principaux enjeux associés à la question des liens entre AMP et aménagement des pêches en Mauritanie peuvent être résumés comme suit (certains de ces enjeux sont davantage développés dans la partie qui suit) :

[19] Les crispations entre l'IMROP et le PNBA tiennent aussi à l'interprétation abusive des textes, par ailleurs pas toujours cohérents, de la part de certains partenaires du PNBA. Ainsi, selon les textes du PNBA, l'IMROP est normalement soumise à autorisation préalable du directeur du PNBA pour effectuer des travaux de recherche dans le parc.

- Mettre en place des modes de gestion plus vertueux de la pêche artisanale dans la ZEE mauritanienne en général (maîtrise des capacités, régulation de l'accès), de manière à répondre aux besoins de base en matière d'aménagement et incidemment pour créer un climat de confiance nécessaire à l'établissement de relations de partenariat entre l'administration des pêches et les gestionnaires des AMP de type « conservation ».
- Améliorer les connaissances scientifiques pour éclairer les débats concernant le fonctionnement et le rôle des AMP dans l'aménagement des pêches et lutter contre les approches partisanes (dans un sens ou dans un autre) qui nuisent à la concertation entre la pêche et l'environnement.
- Instaurer un dialogue serein et constructif, reposant encore une fois sur de vraies bases scientifiques, entre les différents acteurs concernés directement ou indirectement par les AMP.
- Diminuer les capacités d'influence de certains partenaires extérieurs – parmi lesquels certains semblent privilégier la substitution à l'accompagnement des institutions – et promouvoir des mécanismes de gouvernance des AMP impliquant en premier lieu les administrations de la pêche et de l'environnement.
- Clarifier le cadre institutionnel et juridique relatif à la gouvernance du littoral, en veillant à promouvoir le principe de la recherche de l'intérêt général avant la satisfaction des intérêts particuliers.

Des opportunités existent incontestablement en Mauritanie pour relever ces enjeux et certaines actions sont déjà mises en place aujourd'hui. Il s'agit notamment :

- du renforcement en cours des capacités de l'institution PNA (observatoire, autonomie financière, mode de programmation) ;
- du renforcement en cours du dispositif de l'aménagement des pêches et notamment de la révision du zonage, de la mise en œuvre des plans d'aménagement par pêcherie, de la consolidation du dispositif de surveillance et des initiatives en matière d'immatriculation de la pêche artisanale ;
- de la mise en œuvre de programmes de recherche scientifique encourageant une approche écosystémique appliquée à la gestion des pêches ;
- de la mise en place des instruments de soutien à la mise en œuvre de la démarche d'aménagement du littoral (Observatoire du littoral, Conseil consultatif du littoral, développement de DAL)

7. ENSEIGNEMENTS ET PERSPECTIVES

7.1 Contribution des mesures de gestion spatiale, y compris les AMP, à l'aménagement des pêches

L'expérience mauritanienne apporte beaucoup d'enseignements en ce qui concerne cette problématique car elle permet de mesurer l'impact de deux mesures de gestion spatiale, assez uniques dans la sous-région de par leur ampleur : le zonage dont l'effectivité de la mesure est indiscutable, notamment depuis la mise en œuvre du système VMS en 2005, et la mise en œuvre d'une AMP aux dimensions considérables depuis une trentaine d'années (le PNBA).

Si l'on prend en considération les paramètres biologiques de l'aménagement, on constate une dégradation continue de la biomasse et un niveau de surexploitation croissant de la plupart des espèces démersales ainsi que, depuis peu, des espèces pélagiques. Ce premier constat peut interpeller quant à la pertinence réelle des mesures de gestion spatiale sur la durabilité des ressources. Cela peut s'expliquer par le fait que les ressources font partie d'un continuum et que le fait qu'elles soient capturées par la pêche artisanale au lieu de la pêche industrielle, en référence au zonage, ou qu'elles ne soient capturées que dans certaines zones en référence aux AMP, n'a finalement pas d'impact significatif sur la mortalité par pêche qui demeure le facteur prépondérant de la gestion des ressources. Sans compter que les données statistiques les plus récentes attestent d'une augmentation continue de l'effort de pêche également dans le parc.

D'autre part, il convient de reconnaître que les mesures de gestion spatiale permettent d'apporter des éléments de réponse concernant d'autres aspects de l'aménagement. En premier lieu, il s'agit des questions environnementales, avec notamment la préservation des capacités biotiques des habitats sensibles. La pertinence de l'interdiction du chalutage sur les fonds de moins de 20 mètres, en référence au zonage, est à cet égard indéniable. Pour ce qui est de l'AMP, le manque de données scientifiques empêche malheureusement de confirmer l'hypothèse du rôle important joué par les écosystèmes du PNBA dans le soutien à la productivité des pêcheries plurispécifiques du Golfe d'Arguin. Plusieurs indices, ainsi que l'application d'une approche de précaution, conformément au CCPPR, peuvent toutefois plaider en faveur de la promotion de cet instrument de l'aménagement des pêches.

En deuxième lieu, il s'agit des aspects socio-économiques. Pour ce qui est du zonage, l'autre moteur essentiel de la mesure est en effet de limiter les conflits entre plusieurs métiers ainsi que les accidents en mer, et de soutenir le développement de la pêche artisanale dans une optique de meilleure intégration du secteur des pêches dans l'économie nationale. À cet égard, l'impact du zonage est également indéniable si l'on considère la croissance considérable du parc piroguier opérant en Mauritanie et de sa production depuis une dizaine d'années. Pour ce qui est des aspects socio-économiques dans le parc, il semble difficile de dresser un constat objectif dans la mesure où le mode de gouvernance dans le parc semble avoir beaucoup influé sur les changements survenus dans les systèmes de pêche traditionnels et sur la stagnation apparente des conditions financières et de vie des communautés de pêcheurs. L'exemple du PNBA ne permet pas en tout cas de répondre à la question de savoir si une AMP permet de mieux appréhender la dimension socio-économique de la gestion des pêches.

Sur la base de ce qui précède, on voit bien que les mesures de gestion spatiale, y compris les AMP, ne permettent d'aborder que certains aspects de l'aménagement des pêches. En ce sens, les AMP conçues et gérées indépendamment des autres composantes du dispositif de l'aménagement ne sauraient relever seules le défi d'une pêche responsable.

7.2 Clarification des objectifs assignés aux AMP et promotion d'une approche écosystémique : un préalable à la concertation ?

L'un des préalables à la concertation dans les AMP semble être la clarification des fonctions que l'on attribue à celles-ci, et, sur cette base, l'adoption d'une vision commune concernant sa mise en œuvre. Deux grandes fonctions sont généralement mises en avant : instrument de conservation stricto sensu - ce qui serait conforme à la mission d'un parc naturel - ou instrument de développement durable du pays et d'aménagement des pêches dans le respect de la protection de certains habitats sensibles. Or, dans le cas du PNBA, les connaissances scientifiques destinées à caractériser le rôle de l'AMP dans l'aménagement des pêches sont encore insuffisantes et le projet « politique » rattaché à sa mise en œuvre manque encore de clarté.

Des programmes de recherche visant à mieux caractériser la fonction écologique de l'AMP du PNBA dans le Golfe d'Arguin – qui concernent les pêcheries les plus stratégiques en Mauritanie – sont néanmoins en cours. Ces programmes devraient également apporter des éléments de réponse concernant la cohérence des unités de gestion des pêches en vigueur dans un contexte où il peut paraître surprenant d'un point de vue écosystémique de distinguer deux sous-unités de gestion: le Parc et le reste du Golfe d'Aguin, notamment pour la gestion de ressources migratrices telles que la courbine, le mulet, voire la crevette côtière. Ces programmes de recherche devraient en outre permettre de développer des méthodologies utiles au niveau de la sous-région ainsi que des capacités au niveau de l'IMROP en matière de recherche écosystémique en appui à la gestion des pêches. Enfin, il est possible que ces programmes permettent de déboucher sur la formalisation de protocoles de coopération entre l'IMROP et

le PNBA, afin de pérenniser des programmes de recherche concertés et visant une meilleure articulation entre les objectifs de conservation et de gestion durable des ressources halieutiques.

7.3 Promotion d'un cadre de médiation et de concertation pour la gestion intégrée des espaces littoraux

Le littoral mauritanien est en pleine mutation, avec une concurrence accrue pour l'accès aux ressources littorales entre différents usagers. Dans le même temps, les aspirations de la société mauritanienne, y compris dans les AMP, sont en train de changer, notamment à la suite des expériences récentes en matière de démocratie (avec par ex. la revendication de plus en plus affirmée de droits à l'éducation, à la santé, au bien-être économique, à une meilleure gouvernance, etc.). C'est dans ce contexte, et aussi afin de promouvoir un développement harmonieux et respectueux de l'environnement marin, que la Mauritanie s'est engagée depuis plusieurs années dans un processus de planification côtière. Ce processus rencontre aujourd'hui des difficultés à aboutir, notamment en raison de conflits de compétence institutionnelle entre plusieurs ministères sur les questions d'aménagement du littoral. Afin de soutenir le processus, plusieurs propositions en complément des initiatives en cours, comme la création d'un observatoire du littoral et la mise en activité du Conseil consultatif du littoral, peuvent être avancées :

- Mettre en place un cadre de concertation et de médiation au plus haut niveau, dont le but serait de promouvoir un dialogue constructif entre la pêche et l'environnement, et de rechercher des voies et des moyens de concilier les objectifs de conservation assignés aux AMP et les objectifs de développement durable de la pêche. Ce cadre de concertation pourrait par exemple prendre la forme d'un Comité interministériel sur les AMP, présidé par une instance de niveau supra-ministériel. Ces initiatives pourraient être appuyées en parallèle par la promotion de projets structurants et fédérateurs comme la réalisation d'une étude environnementale stratégique relative à une redéfinition du zonage du PNBA.
- Promouvoir des programmes de sensibilisation et de renforcement des capacités au plus haut niveau de la décision en matière d'analyse des enjeux liés à la gestion intégrée des espaces côtiers et littoraux. De tels programmes pourraient aussi aborder les enjeux de l'approche écosystémique. L'objet de ces programmes serait de faire évoluer les perceptions et les mentalités au plus haut niveau de l'État, dans un contexte où beaucoup de décisions se prennent encore sans mettre en œuvre des mécanismes de concertation interministériels.

7.4 Amélioration de la gouvernance dans les AMP

Les modes de gouvernance dans l'AMP du PNBA ont connu de nettes améliorations au cours des dix dernières années, avec notamment le développement des ateliers de concertation qui sont une première étape vers la co-décision avec les populations résidentes du parc. Il est en effet admis que l'une des clés de la réussite des AMP reposera sur la compréhension mutuelle des enjeux et des objectifs liés aux AMP de la part de tous les acteurs ainsi que sur la pertinence et la faisabilité des mesures de gestion (légitimité, acceptabilité et applicabilité).

D'autres mesures visant à améliorer la gouvernance dans les AMP et à favoriser une meilleure articulation avec le dispositif d'aménagement des pêches peuvent être énumérées comme suit :

- Renforcer les capacités des administrations de la pêche en matière d'environnement et celles de l'environnement en matière d'aménagement des pêches car, en dépit de spécialisations très marquées, chacune des administrations est amenée à prendre des initiatives dans l'un ou l'autre des deux domaines dans le cadre de la réalisation de son mandat. Or, faute de compétences suffisantes, cela peut se

traduire par certaines approximations (par ex. l'impact mitigé des mesures de gestion des pêches dans le PNBA sur la conservation des sélaciens). De plus, le fait de promouvoir une mise à niveau mutuelle de chacune des institutions aurait pour effet de faciliter le dialogue.

- Associer de manière très étroite les populations dans la construction des mesures de gestion, de manière à prendre en considération les savoirs traditionnels et les connaissances pratiques des pêcheurs, et à susciter leur adhésion. La mesure doit en effet être comprise et partagée par les professionnels pour être efficace et applicable à moindre coût. Le cas de la mesure du repos biologique sur les pêcheries démersales, très bien comprise et respectée dans l'ensemble, illustre bien ce propos.
- Mettre en place des mécanismes formalisés de collaboration entre les différentes administrations concernées directement ou indirectement par la mise en œuvre des AMP (par ex. le protocole pour la recherche, protocole pour la surveillance, la participation de l'administration des pêches aux ateliers de concertation, etc.)
- Poursuivre le processus de renforcement des capacités des administrations et veiller à inscrire les projets et les partenariats divers dans des logiques d'accompagnement des institutions (et non de substitution).

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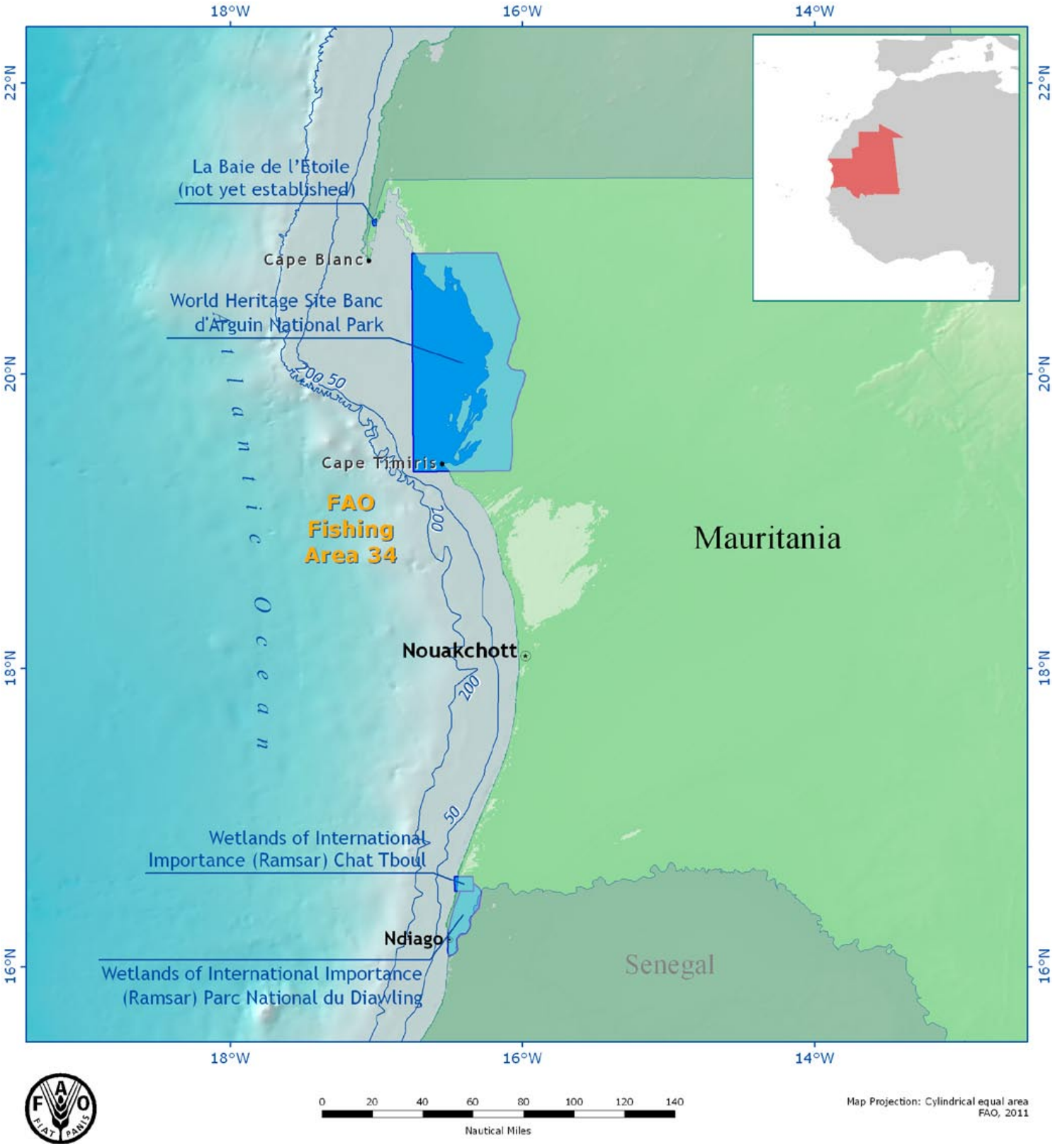
Map 1
Mauritania



Mauritania

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1. INTRODUCTION

The Islamic Republic of Mauritania's Banc d'Arguin National Park (PNBA) is the largest marine protected area (MPA) in West Africa (Map 1). Created some 30 years ago, it spreads over one- third of the coast, encompasses extensive maritime zones (some 17 percent of the continental shelf area and about 60 percent of the seabed less than 20 metres deep) and contains some of the richest fish resources in the world. This unique protected area may be explained particularly by the historical involvement of eminent scientists, such as Théodore Monod, in the conservation of the Banc d'Arguin coastal ecosystems and by the limited maritime vocation and fisheries tradition among Mauritanian populations.

Until the beginning of the 1990s, fishing capacity and human pressure were moderate along the Mauritanian coast. Interactions between fishing and conservation were limited and the fact that the two sectors shared the space did not cause particular problems. From the second half of the 1990s, the situation began to change. The combination of several destabilizing factors can be briefly summarized as follows: development of overcapacity in the industrial fishery, especially of trawlers in the coastal zone; increasingly alarming indicators of the state of the resource; beginning of the uncontrolled development of artisanal fishing; a strong market influence on the dynamics of fish production and trade; and growing demographic and economic pressure on the Mauritanian coastline. These developments led to important changes in the objectives sought in public policies on the sea and the coast. The administration (although weakened by structural adjustment policies) had to strengthen its fisheries management system and promote a concerted coastal management policy in order to reconcile development with conservation of the marine environment.

At the same time, PNBA managers had to consider the management of fisheries undertaken by Imraguen people in the park (the main economic activity), following the emergence of export-oriented shark and ray fisheries. They had to introduce mechanisms for dialogue with the park's resident population in accordance with the evolution of international concepts of conservation.

A second MPA, Diawling National Park (PND), was created in 1991. A third has been in development in the Baie de l'Étoile in recent years, within the framework of coastal management. However, the most interesting feature of the Mauritanian case study is that a very large MPA, created for conservation reasons, has existed for some 30 years and has coexisted for more than a decade with a fisheries sector that has become one of the pillars of the national economy. Yet, after several decades of relatively peaceful coexistence, friction is increasing between the two large management units. Fisheries management systems established inside and outside the PNBA MPA appear to be increasingly incompatible with the country's sustainable development requirements.

Against the backdrop of a budding coastal planning process unique in the subregion and the emergence of an ecosystem approach to fisheries management, an analysis of these ongoing changes facilitates conclusions that contribute to the debate on MPAs as a fisheries management tool.

2. FISHERIES AND SPATIAL MANAGEMENT

2.1 Current situation

Mauritania's exclusive economic zone (EEZ) covers an area of some 230 000 km^2 (see Map 1). The wide continental shelf, favourable oceanographic factors and a quasi-permanent upwelling in the Golfe d'Arguin (an area situated between Cap Blanc, the northern boundary of the country, and Cap Timiris, on the border of PNBA) make Mauritanian waters very productive. Three large categories of fish resources can be distinguished: demersals (fish and molluscs, in particular cephalopods and crustaceans), small coastal pelagics (in particular sardinellas) and large pelagics. Other unexploited resources can be added to these categories, clams in particular, which can be found in large volumes in some areas of the Golfe d'Arguin (the production potential of *Venus rosalina* appears to be some 300 000 tonnes per annum). The catch potential (excluding emergent fisheries) is about 1.6 million tonnes per annum, with small pelagics representing the greatest share.

Except for cephalopod and shrimp, demersal fish stocks are shared with the Gambia, Morocco or Senegal, while small pelagic stocks are shared among several countries of the subregion. All demersal and small pelagic stocks, with few exceptions (such as sardinella or anchovy), are fully exploited or overexploited. On the whole, scientific recommendations relating to demersal species converge towards either freezing fishing effort (at best) or else reducing it for some important species such as octopus and hake.

About 250 industrial fishing vessels are regularly active, some 120 of which are national. They are predominantly cephalopod trawlers. The foreign fleet mostly consists of European vessels operating within the framework of the 2006–2012 Fisheries Partnership Agreement with the European Union (Memeber Organization) (some 100 vessels were active in 2007). The total catch from national and foreign industrial fishing vessels operating in the Mauritanian EEZ averages about 600 000 tonnes per annum, 90 percent of which consists of small pelagics. In economic terms, using "turnover at first sale" as an indicator, the value of industrial catch in the Mauritanian EEZ can be estimated at EUR375 million euros per annum on average.

There are also some 4 000 artisanal and coastal fishing units in Mauritania, catching about 80 000 tonnes per annum. The development of artisanal and coastal fleet segments is a relatively recent process compared with the situation observed in neighbouring countries. The Mauritanian artisanal segment relies mainly on exploitation of octopus and demersal fish. In addition, Senegalese artisanal fishers operate in Mauritanian waters, through either a bilateral fishing agreement or charter contracts with Mauritanian operators (in particular those who are also processors). The catch composition shows a predominance of demersal species (some 70 percent in all), with about two-thirds of the artisanal fish catch coming from the northern region (Golfe d'Arguin).

Analysis of the different fleet segments[1] reveals several characteristics significant for this study (Oceanic Développement 2007):

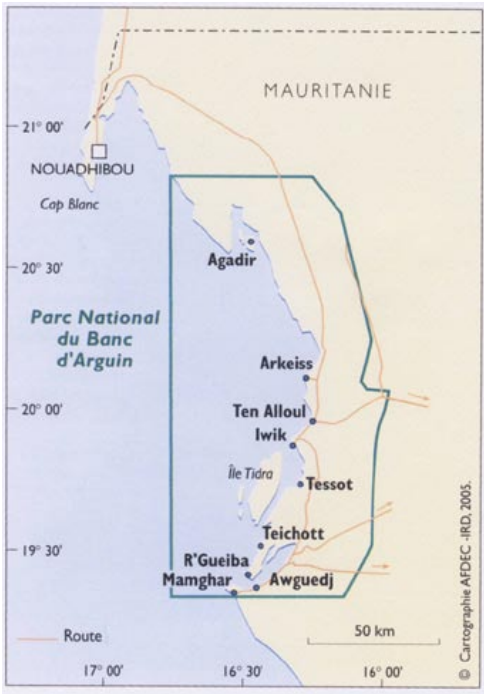
- All fleet segments, whether industrial or artisanal, with the exception of large pelagics, work on the continental shelf or the shelf break and interact with numerous fisheries.
- The industrial segment operates in multispecies fisheries, given the limited selectivity of the main fishing tool used, i.e. the trawl.
- Bycatch may be significant in some segments (in particular cephalopod and shrimp vessels, but also pelagics) and a large part is discarded at sea, which complicates stock assessment.
- Trawlers focus their fishing effort in the northern area, especially in a sector off Nouadhibou on the boundary of the PNBA (Map 2).

[1] Océanic Développement (2007). Strategic Study on Fisheries of the World Bank : Fisheries management plans.

From a public policy viewpoint, fishing is one of the pillars of the national economy (20–25 percent of the state budget; 40 percent of export income in hard currency; 6–10 percent of GDP if the complete value chain is taken into account; and 30 000 jobs). The sector's financial performance is essentially due to the fishing agreement with the European Union (Member Organization) (which is worth some EUR120 million per annum if the fishing possibilities are exploited completely). Moreover, the fisheries sector in Mauritania has considerable prospects in terms of wealth and job creation, especially through increased in-country landings from industrial fishing and the development of onshore industries. Thus the stakes concerning fishing are high, especially implementation of a system for the sustainable management of resources.

In the last 15 years, the various successive sectoral policies have been based on three main strategic themes: sustainable management of resources (and of the environment), maximization of fisheries rent, and integration of the sector into the national economy. The current sectoral policy (Development Strategy of Sustainability for the Fisheries and Aquaculture Sector 2008–2012) follows the same line, with perhaps a special emphasis on modernization of the sector and the development of infrastructure for the landing of catches and value addition.

MAP 2
National Park of the Banc d'Arguin



Source: AFDEC-IRD in Weigel, Féral and Cazalet, 2007.

2.2 Management framework and tools

The current general framework for fisheries management is based on Law No. 2000-025 of 24 January 2000 pertaining to the Fisheries Code[2] and its Implementation Decree No. 2002-073. In accordance with the law, "the fish resources of the EEZ constitute a national heritage that the State has the duty to manage in the collective national interest". The right to fish belongs to the State, which may authorize fishing through licences that are issued by the ministry in charge of fisheries, subject to the payment of an access right.

The decree implementing the law specifies the main regulations governing access and the technical management measures. It also covers fisheries management plans and the Advisory Council for Fisheries Management and Development (CCNADP: Conseil consultatif pour l'aménagement et le développement des pêcheries), around which a dialogue should develop on management of the sector among the various public and private stakeholders.

The current system is a classic management system based on the search for a fishing effort consistent with resource renewal capacities, stock by stock, in accordance with research recommendations. The most-recent quadrennial working group of the Mauritanian Institute for Oceanographic Research and Fisheries (IMROP), organized in December 2006, signals a certain change in the scientific approach, because it calls for an ecosystem approach that complements the stock-based approach and aims to fill the gaps in knowledge of marine ecosystems and their functioning.

Current management methods tend to be centralized, even though, in practice, the profession is often and closely associated with decisions through the National Federation of Fishers (FNP: Fédération Nationale des Pêcheurs). For its part, the

[2] The legal arrangements were completed by Ordinance 2007-022 of 9 April 2007. However, although these made some amendments to the text of the law of 2000, they left its substance essentially unchanged.

CCNADP mechanism remains in its infancy. Co-management as a governance system – understood as sharing responsibilities and transferring some competencies from the central administration to users and/or to local authorities – is not currently relevant to Mauritania.

Another characteristic of the Mauritanian management system is that it tends to distinguish several management units based on the fishery segment (national industrial, foreign industrial, artisanal and coastal). An example is the plan for the management and controlled development of artisanal and coastal fisheries (PADPAC), which is in the process of being finalized. Another example is the fishing agreement with the European Union (Member Organisation), which provides a regulatory framework for fishing capacity (fishing possibilities expressed in terms of the number of vessels by fishing category) and harvesting levels (e.g. catch quotas for small pelagics) authorized for European vessels.

However, at the same time, in line with political guidance dating back to the end of the 1990s and in accordance with the current legal framework, Mauritania is developing fisheries management plans in which the stock may be the management unit.[3] Hence, a management plan for octopus (the most strategic fisheries resource for the country) was adopted by the Council of Ministers in April 2006. This plan may ultimately lead to implementation of a management system based on quotas by fishery segment, national or foreign, and perhaps even on individual transferable quotas (ITQs). A shrimp plan is also being finalized.

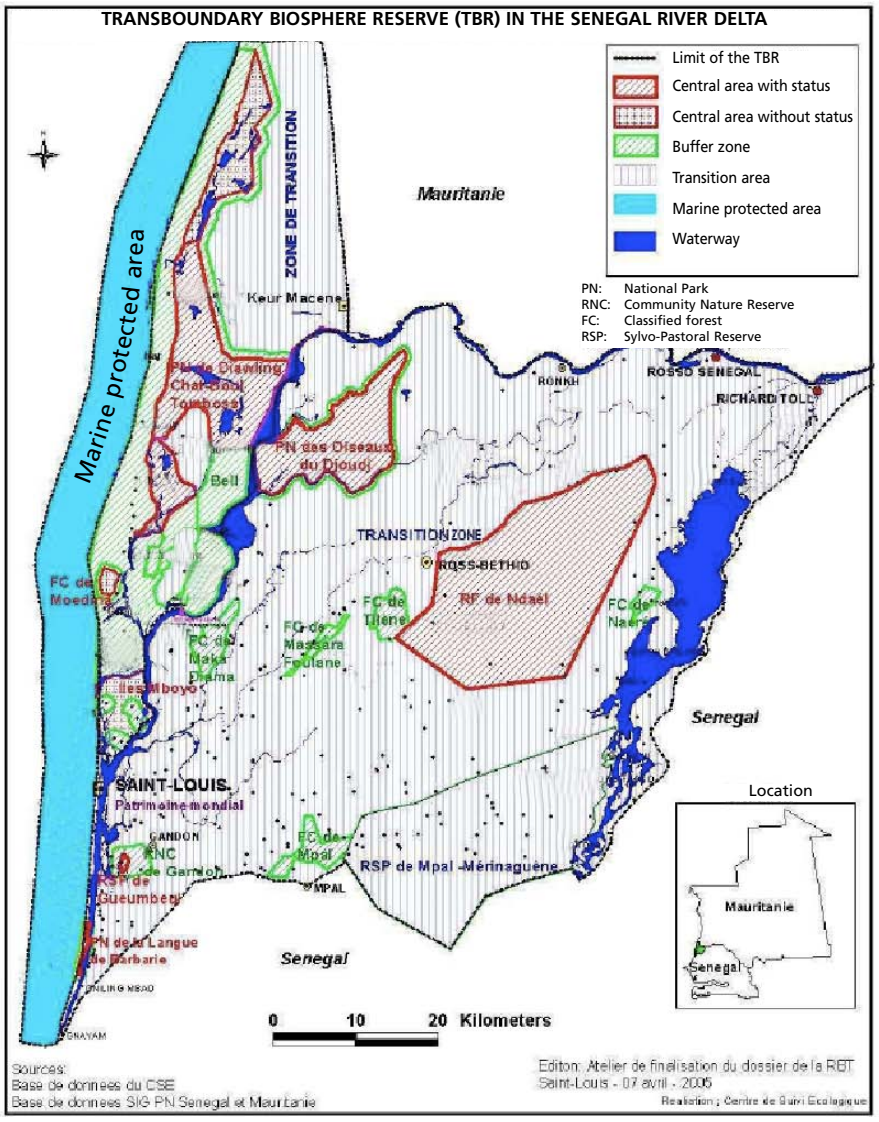
Several types of technical management measures seek to minimize the impact of fishing on the exploited species and regulate interactions between different types of vessels:

- zoning, which aims to move industrial fishing vessels further offshore to restrict trawling to areas more than 20 metres deep in order to preserve coastal habitats (zones of high productivity, spawning grounds and nurseries);
- measures relating to fishing gear (e.g. establishment of minimum mesh sizes, banning of some gears or some fishing practices);
- minimum sizes (or minimum weights) of species, in order to take into account the size of species at first maturity;
- authorized percentages of bycatch species;
- biological rest period (two months) applicable to all types of vessels targeting demersal resources, even though this measure is primarily a key measure in the management of the octopus fishery, in application of the precautionary principle;
- spatio-temporal closures during certain periods, when exceptional juvenile concentrations are found (this measure was applied for octopus until 2004 to the north of Cap Timiris).

In addition to these technical measures related to fishing, there are also measures for the conservation of sensitive habitats. It is in this sense that implementation of an MPA may be considered one of the measures for the management and conservation of marine resources and biodiversity mentioned in fisheries legislation. The MPA network in Mauritania consists mainly of two natural parks: the PNBA and its satellite reserve of Cap Blanc, and the PND with the reserve of Chott Boul (Map 3). In the PNBA, fishing is subject to a specific set of regulations. In particular, the only authorized fishing vessels are lanches (traditional wooden vessels with triangular sails) (Plate 1), and their total number is limited to 110. Hence, in this MPA, by excluding motorized artisanal fishing and by limiting the number of *lanches*, the administration promotes

[3] In accordance with Article 9 of the Fisheries Code, the term "fishery" designates one or several stocks of biological species and the operations carried out on these stocks, which can be considered units for conservation and management purposes on the basis of their geographical, scientific, technical, economic, social and/or recreational characteristics.

MAP 3
Diawling and Chott Boul Reserve National Parks



Source: AFD, 2008.

a management system based on the control of fishing capacity and resource access.

On the whole, technical management measures are relatively well implemented in Mauritania, due particularly to the effective fisheries surveillance system. The capacities of the Delegation for Fisheries Surveillance and At-Sea Control (DSPCM) have been noticeably strengthened over the last ten years, due to strong political will to manage the resources and the use of new technologies – for example, the satellite-based vessel monitoring system (VMS) that became compulsory in 2005. The process of strengthening the coastal surveillance system has continued, with the recent purchase of radar stations in Ndiago, Tiwilit and Nouakchott.

PLATE 1
Lanche in Banc d'Arguin National Park

Source: C. Breuil, October 2008.

2.3 Access systems

Rules that control fisheries access are specified in Decree No. 2002-073 and complemented by the provisions of Circulars No. 26/MPEM of 29 June 2006 and No. 38/MPEM of 31 July 2006, which establish the financial conditions for vessels to obtain access to fishing in the Mauritanian EEZ.

There are three types of fishing licence with specified categories and zones:

- Type I: artisanal fishing licence with three fisheries categories: (i) cephalopods, (ii) crustaceans and (iii) fish;
- Type II: coastal fishing licence with four fisheries categories: (i) cephalopods, (ii) crustaceans, (iii) demersal fish and (iv) small pelagic fish;
- Type III: industrial fishing licence with ten categories: (i) small pelagics, (ii) tuna, (iii) cephalopods, (iv) coastal shrimp (langostinos), (v) deep shrimp (gambas), (vi) hake, (vii) demersal fish other than hake and fishing gear other than trawler, (viii) demersal fish with trawler, (ix) pink crayfish and (x) deep-water crab.

Only the Type III system (industrial fisheries licence) is currently operational. However, it must be noted that, in practice, the shrimp fishery is managed on the basis of a single "crustacean" licence that encompasses in one category the licence subtypes (iv) and (v). But the regulations for Type I and II licences concerning artisanal and coastal fisheries have not been applied, and a single type of fishing authorization is called a "territorial right" in return for a nominal payment.

Two circulars issued in 2006 introduced significant changes in the access system for foreign vessels by clarifying the different types of systems and specifying their statutory payment schedules. Moreover, Decree No. 2006-019 of 9 March 2006, concerning practical modalities for calculating the price of access rights to bottom fishing and of territorial rights to artisanal fishing, established a new fiscal system based on both the vessel (entry right) and the catch (extraction right). This new fiscal system concerning exports can in theory be considered a tool in the regulation of fishing effort. However, because the measure is recent, it cannot yet be evaluated.

Despite the existence of a licensing system, management plans, different access arrangements for foreign vessels and the fishing agreement with the European Union (Member Organization), the system remains predominantly open access. However, greater attention is paid to those fisheries that are emblematic for Mauritania, such as the octopus fishery (for example, the official freeze on the national cephalopod fishing effort since 1997 or the theoretical reduction in cephalopod fishing possibilities in the new fishing agreement European Union (Member Organization). However, alarming and recurrent evaluations of the state of most stocks, in particular demersal stocks in coastal zones, tend to confirm the deficiencies of the current system in regulating resource access.

At the same time, there is stagnation, and perhaps even regression, in national industrial fishing capacity, given the age of the production tools. This situation contrasts with the ongoing increase in artisanal fishing capacity, in a context where the administration does not always appear able to control the number of vessels or to regulate their access to resources.[4]

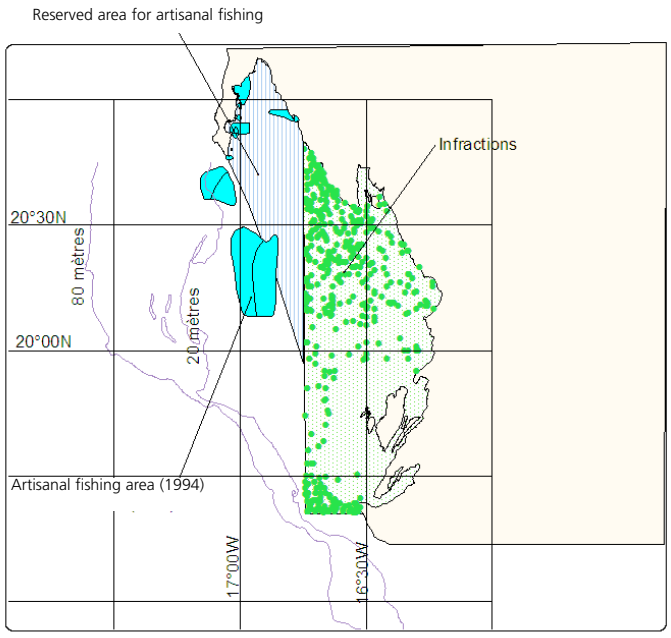
2.4 Fishing regulations related to spatial management measures

Experience shows that the spatio-temporal closure possibilities offered by fisheries legislation have been little used by the administration, and the only spatial management measure adopted in Mauritania, other than MPAs, is zoning.

[4] For example, during the registration operation carried out from 2006 to 2007, almost 4 000 boats were counted and a significant number did not meet eligibility criteria. However, almost all these boats now seem to have been brought into line with legal requirements, in particular under the influence of various pressure groups.

Differing according to the type or category of licence, zoning has three objectives: prevent the degradation by trawling of sensitive habitats (depths of less than 20 metres); reduce interactions and thus conflicts between artisanal and industrial fishing; and support the development of artisanal fisheries, considered to be more selective and better integrated into the national economy, by setting aside a zone for their sole use. The seriousness of the penalties incurred for infractions of zoning confirms the importance of this measure to the administration (with fines that can reach some EUR300 000).

MAP 4
Infractions committed by artisanal fisheries in PNBA



Source: Inejih, C., *et al.* Rapport d'audit sur le zonage (Audit report on zoning). (draft).

Since the end of 2007, Mauritania has undertaken a revision of zoning to take into account new dynamics in the occupation and conservation of the coastal space, as well as evolution in the policy and technical contexts of fishing: fisheries management plans for octopus and shrimp, increased development of artisanal fishing, use of the VMS,[5] new requirements concerning safety at sea and the emergence of new fisheries, such as the clam fishery, which could be exploited on the basis of spatial management measures. A specific study is under way.[6]

Initial investigations of this revision have shown that zoning conflicts most frequently concern the southern boundary of the PNBA (no buffer zone), pelagic vessels need to be pushed even further offshore, and interactions between active and passive fishing gear or between fishing and maritime navigation in the northern part of the Golfe d'Arguin are frequent. In the PNBA itself, infractions by artisanal fishers occur in almost all accessible zones of the park, whereas infractions by industrial fishers are concentrated along PNBA boundaries (Map 4). Finally, studies confirm the complex nature of current zoning, which constrains both the profession and surveillance.

The study also addresses the issue of emerging fisheries and, in particular, clam fisheries, whose beds can be found in an important fishing zone, but which is also an area of busy maritime traffic. As a result, any exploitation of clams will have to take into account this spatial constraint, in addition to constraints of an ecosystem nature (e.g. possible octopus/clam interaction) and of an environmental nature related to the method of exploitation (e.g. use of dredges). This latter potential impact has greatly strained relations between the fisheries sector, which sees this resource as a way to encourage growth of the sector, and the environment sector, which fears irreversible effects on coastal ecosystems and in particular on the integrity of the PNBA (the stock of *Venus rosalina* is located about 30 km west of the park's boundaries). In order to promote a responsible approach, since the end of 2006, the Mauritanian authorities have encouraged the development of a certain number of principles – with the creation of a

[5] Since introduction of the VMS in 2005, zoning infractions by industrial fisheries have dropped significantly. In some fishing categories, such as small pelagics, it has meant considerable economic loss. This may partly explain the marked decrease in the number of licences libres (licences outside of fishing some 60 licences in 2003 compared with 20–30 in 2007).

[6] Inejih, C. Sustainable development and marine ecosystems network. Inejih is the coordinator of the study, based on the audit of fisheries zoning in Mauritania (Labrosse *et al.* 2010).

MAP 5
Perspectives on experimental fishing

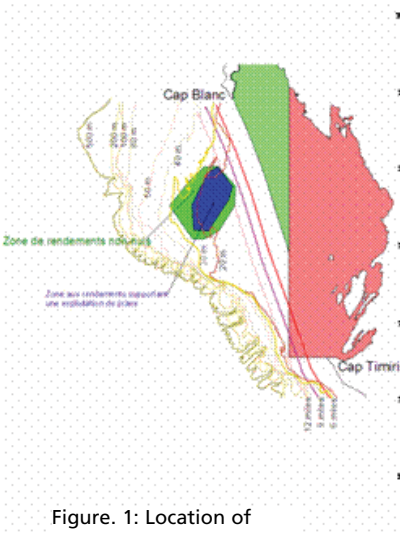


Figure. 1: Location of clam placement
Source: Audit du zonage (2008)

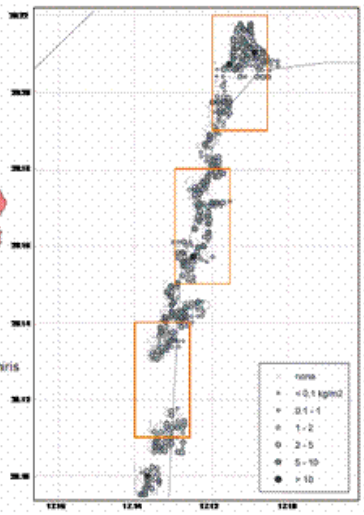


Figure 2: Proposed areas for experimental fisheries, superimposed on the results of the 2008 campaign

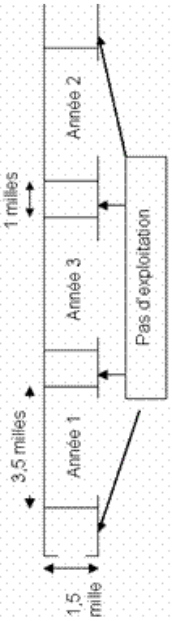


Figure 3: Experimental scheme for exploitation

Source: MPEM, 2008.

scientific committee on clams within IMROP, some experimental fishing,[7] undertaking of a strategic environmental study, and dialogue.

2.5 Institutions

The main public or private institutions concerned with fisheries management are the Ministry of Fisheries and Maritime Economy (MPEM), IMROP, DSPCM and the National Federation of Fishers (FNP). Institutions concerned directly or indirectly with environmental issues and/or related to MPAs are the Ministry of the Environment and other technical ministries.

The Ministry of the Environment was created in 2005 under the authority of the prime minister. It comprises the following structures:

- Directorate for Protected Areas and the Coast (DAPL), which is a central directorate whose mission is to "develop the national policy concerning protected areas and conservation", to "develop the protected area network in Mauritania in the context of sustainable development" and to "promote the integrated and harmonious management of the coast";
- Banc d'Arguin National Park (PNBA), which is a public administrative structure with a scientific and cultural purpose and significant financial autonomy. It has only been part of the ministry since 2006 (previously it came under the General Secretariat of the Government). The PNBA is comprised of a board of directors, assisted in its mission by the Scientific Council of Banc d'Arguin (CSBA),[8] and an executive body, represented exclusively by its director. The mission of the PNBA structure is to manage and protect the Banc d'Arguin National Park;

[7] The experimental fishing protocol, which is currently being developed by the Ministry of Fisheries and Maritime Economy, foresees the definition of three fishing zones (3.5 x 1.5 miles) separated by a buffer zone, which would be exploited in rotation (fallow system – Map 5).

[8] Law No. 2000-024 related to the PNBA specifies that its scientific council is a consultative authority, consisting of competent persons, irrespective of nationality.

- Diawling National Park (PND), which is also a public administrative structure, is responsible for the management and protection of Diawling Park.

Other technical ministries directly or indirectly concerned with environmental issues are:

- MPEM, which has responsibilities in coastal management, in implementing a system to prevent and combat marine pollution and in water-quality monitoring;
- Ministry of Equipment and Transport, which has responsibilities in coastal management and in monitoring issues relating to port safety and the environment;
- Commission of Investment Promotion, which recently developed an initiative for coastal planning in Nouadhibou Bay;
- the national navy, which is responsible for managing the Chott Boul reserve.

The main NGOs involved in fisheries management and conservation are:

- International Foundation for the Banc d'Arguin (FIBA), which is mainly involved in managing the PNBA and to a lesser extent in coastal management;
- International Union for the Conservation of Nature (IUCN), which is heavily involved in the management process for the Mauritanian coast, in managing the PND, and to a lesser extent, in fisheries management through a project on mullet conservation and sustainable use in Mauritania and neighbouring countries (the "mullet project");
- Regional Programme for the Conservation of the Coastal and Marine Zone in West Africa (PRCM) – a joint initiative of the WWF, FIBA, IUCN and Wetlands International – which supports various initiatives in Mauritania relating to MPA management and coastal protection, as well as the development of the Regional Network of MPAs in West Africa (RAMPAO).

Moreover, the Subregional Fisheries Commission (SRFC) is increasingly involved in issues concerning the management of common-interest fisheries in Mauritania and conservation of the marine environment at the subregional level. In particular, it is developing a regional strategy for MPAs in West Africa.

3. MPA DESIGN AND MANAGEMENT STATUS

3.1 Terminology, main objectives and general description of MPAs

On the basis of the IUCN classification, MPAs covered by this study belong to category VI: "protected areas managed mainly for the sustainable use of natural ecosystems". These are predominantly marine zones in which special management measures are implemented with the objective of long-term maintenance of biodiversity. They include: Banc d'Arguin National Park, with its satellite reserve of Cap Blanc, which is a sanctuary for monk seals; and Diawling National Park with the natural reserve of Chott Boul. Another MPA, Baie de l'Étoile, is under development.

Analysis of the development of the PNBA tends to show that, at the time of its creation in 1976, the main objective of this MPA was to preserve the biodiversity of coastal ecosystems so they could serve as bird sanctuaries within the MPA. Hence, it is a conservation MPA, even if, over time, the PNBA has been given a role in support of the fisheries sector – despite the lack of any clear scientific evidence. This has come about through its contribution, as a reserve for fish resources, to the maintenance of exploitable biomass in the Mauritanian EEZ. Moreover, the orthogonal boundaries of the park show that little attention was given to oceanographic factors and fisheries considerations at the time of its creation. The PNBA was listed as a Ramsar site[9] in 1982, a UNESCO heritage site in 1989, and then offered symbolically by the Mauritanian Government as a gift to the earth in 2001. The satellite reserve of Cap Blanc, which is linked to the PNBA and was created in 1986, is also listed as a World Heritage site. The main institution supporting the creation and development of the PNBA was FIBA.

[9] Convention on Wetlands of International Importance, called the Ramsar Convention.

The PNBA covers an area of nearly 12 000 km^2, divided more or less equally between terrestrial and aquatic environments. The wealth of the Banc d'Arguin in fish and marine biodiversity is due to exceptional environmental conditions, and in particular to the overlapping of diverse habitats (areas of great depth, sandbanks, mudflats, seagrass meadows, rocky areas). The PNBA has a population of some 1 500 people, commonly called the "Imraguen population" or the park's "resident population". The claim for a strong Imraguen identity in the park (despite the fact that the workforce in the park comes from outside the zone and is even foreign) is often put forward by PNBA managers to stress the distinctive dynamics of the fisheries in the park and to serve their communication needs. Recent research into the history of the PNBA population tends to cast doubt on the reality of this native origin – promoted by supporters of a conservation-centred approach (Weigel *et al.* 2007).

The creation of the PND in 1991 derived from the country's will to restore the ecosystem of the lower Senegal River delta, which was seriously degraded by the construction of the Diama dam and the dyke on the right bank of the Senegal River. As a result, the PND was mainly conceived with the objective of wetland restoration, even though income-generating activities were encouraged from the time of its creation. PND consists of floodplains, marshes and dunes. The demographic pressure is very low, so it is a site of great interest to avian fauna. The maritime part of the park is very narrow and is of little interest from a fisheries viewpoint, given the nature of the coast and the difficult navigational conditions. The PND was listed as a Ramsar site in 1994, and since 2005 has been part of the Trans-Border Biosphere Reserve (RBT) in the lower delta of the river. From the beginning, implementation of the PND has benefited from the support of the IUCN and various donors, in particular the Netherlands and France (the French Fund for World Environment [FFEM] and Agence Française de Développement [AFD]).

The creation of the natural reserve of Chott Boul, a fossil estuary of the Senegal River, was part of the framework for the conservation of a sample of natural ecosystems on the south Mauritanian coast and for the protection of the site and its neighbouring areas. The reserve was listed as a Ramsar site in 2000. Ultimately, the reserve of Chott Boul, given its rich biodiversity, could be listed, as part of the PND, as a wetland on the perimeter of the RBT in the lower delta of the river.

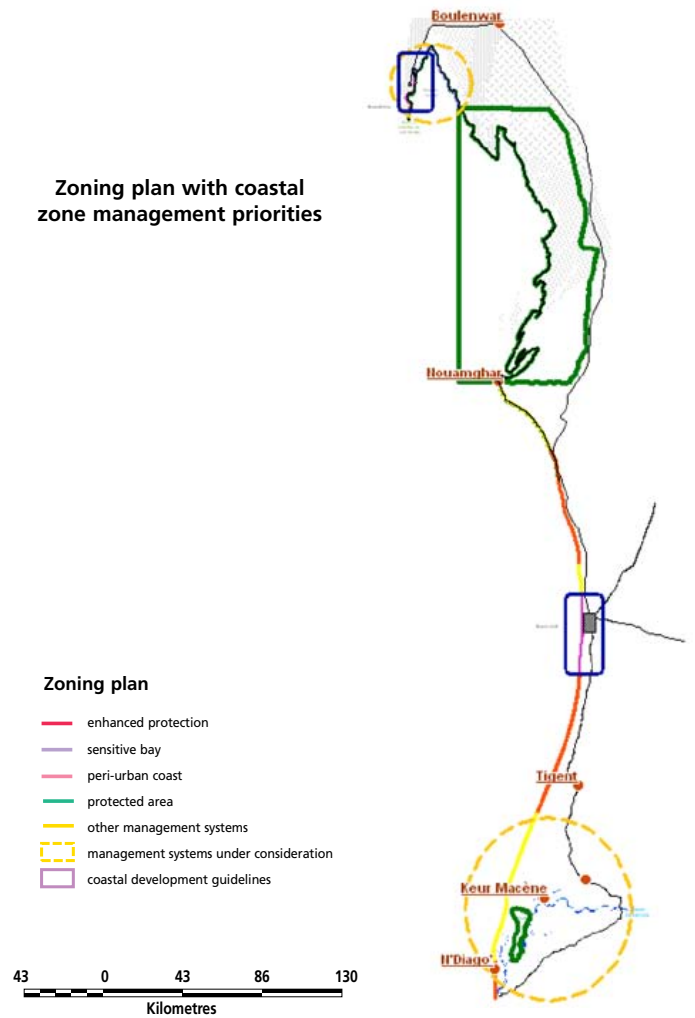
The Baie de l'Étoile could eventually become an MPA. A small area, close to Nouadhibou, it has primary ecological importance, especially for fisheries, but suffers from strong demand for land. The creation of this possible future MPA depends mainly on the scientific dynamic initiated by IMROP in 2004 (with the help of the Museum de Paris), which is partially financially supported by FIBA. This scientific dynamic has also benefited from the support of the national coastal management process, relaunched in 2005 with assistance from French cooperation and the IUCN (Map 6). A management study of the Baie de l'Étoile is ongoing, which may soon benefit from the support of AFD.

3.2 Decision-making process

The PNBA's original main objective was the protection and conservation of avian fauna. The need to monitor fisheries activities inside the park only arose in the mid-1990s with the emergence of the park's Imraguen shark and ray fisheries and the increasing number of interactions with fisheries peripheral to the PNBA. The implementation in 1998 of a monitoring system to prevent industrial fishery incursions inside the park, with the installation of the first coastal radar stations, was a veritable turning point in the history of the PNBA. Some actors even state that the PNBA only genuinely became an MPA from that time. However, it must be noted that the low average depth of the PNBA, except for the trench in the northern area, was already a natural constraint on trawling in most of the park.

From 1995, a succession of "fisheries" projects with resident experts played a key role in the definition, implementation and monitoring of PNBA activities to promote traditional and sustainable fishing without undermining the park's primary conservation goal.[10] The number of such projects with permanent experts, and the fact that there has been a succession of technical advisors over numerous years to support the work of the PNBA director (FIBA and the French and/or German cooperation), testify to the influence of external partners on the PNBA management process.

MAP 6
Mauritanian Coastal Zone Management Plan



Source: RCT, 2005.

Other important elements in the MPA decision-making process are, first, mechanisms for dialogue with the park's resident population (introduced in 1998 to recognize their aspirations and increase their involvement in management of the MPA), and, second, a five-year development and management plan (PAG) establishing the PNBA priorities and its programming framework. Moreover, a reorganization was implemented in 2007 following a statutory and institutional audit. This resulted, in particular, in the creation of the PNBA Observatory, which should ultimately become a useful tool in decision-making. Hence, it appears that the PNBA has developed a number of tools to improve the quality of the decision-making process. However, in practice, given the recent nature of these tools and the persistence of certain practices, the project approach still tends to dominate when programming the park's activities. In addition, the weight of the director in the decision-making process remains significant, despite mechanisms for dialogue with the resident population.

In the case of the PND, as mentioned above, the MPA was primarily established to protect and monitor the environments that were being restored (fauna and water

[10] These include: Support for the Conservation, Management and Value Enhancement of the Banc d'Arguin Ecosystem (the ACGEBA project), funded by French cooperation between 1995 and 2001; the mullet project funded by the IUCN since 1998; and a series of projects funded by FIBA, also since 1998: the "ray-shark project", Support to the Conversion of Imraguen Fishing (the ARPI project), Towards Sustainable Imraguen Fishery (the VPDI project) and Regulation of Natural Resource Access and Surveillance (the RARES project).

quality) and to formulate recommendations to improve water management. The monitoring of fishing, inside the park or in its maritime part, was never a particular issue. In fact, the only studies relating to the fisheries sector in the PND were carried out within the framework of the mullet project with the support of the IUCN. Thus it does not seem very relevant to go further in analysing the decision-making process within this MPA, which is mainly focused on protecting terrestrial environments.

3.3 MPA perception

The perception of MPAs in Mauritania, and particularly of the PNBA, differs greatly according to the group of actors being considered. Fisheries managers generally perceive the PNBA as a potentially interesting tool for fisheries management that takes greater account of coastal ecosystem dynamics and pays more respect to environmental conservation. However, the way this MPA is implemented raises a number of issues: weak mechanisms for dialogue between the PNBA and other state administrations, persistent conflicts over institutional competency due to inconsistencies in the legal framework governing maritime management, the role of external partners in PNBA governance, insufficient involvement of the resident population in the MPA implementation process, etc. the PNBA is perceived mainly as a conservation tool, rather than as a tool to promote an ecosystem approach to fisheries management. It is perceived as a space with individualistic management that is insufficiently connected to the national fisheries management system.

The industry's perception of the PNBA does not simply reflect their claim to an access right for artisanal fisheries, a claim that is expressed at every possible occasion (e.g. during the national seminar on the management of artisanal fisheries in October 2005). Indeed, on many occasions in the past, the industry has shown its interest in collaborating with the fisheries administration to define and support the implementation of policies or technical measures concerning management (for example, with the formulation of an octopus management plan or compliance with the two-month biological rest period for demersal fisheries) – as long as the issues were clearly presented and discussed. Yet, in the case of the PNBA, the perception is ambivalent: the industry acknowledges that some sensitive habitats must be fully protected, but it questions the legitimacy of protecting the whole MPA in the absence of scientific evidence. The industry also has misgivings about the arbitrary nature of the rules governing resource access in the park, because fish resources are part of the national heritage and could also serve the cause of development and poverty reduction.[11] Moreover, the issue of PNBA boundaries is often raised.

The industry also bemoans its lack of representation on the PNBA board of directors. This would thaw relations and contribute to better mutual understanding of the issues at stake and common interest in collaboration. For example, the dialogue mechanism between the industry and the fisheries administration, which consists of having one or two FNP representatives on the boards of public institutions (e.g. IMROP, Nouadhibou Artisanal Fisheries Port [EPBR], Nouadhibou Industrial Fisheries Port [PAN]), has helped establish good partnership relations over several years between the industry and the administration.

For PNBA actors and partners, the dominant idea, clearly stated in the 2005–2009 PAG, is that the MPA play a determinant role in the conservation of fish resources at the national and even subregional level. In such a context, in addition to its role in the conservation of the Banc d'Arguin ecosystems and in the management of Imraguen

[11] The questions asked by the industry are the following: Why restrict access only to the resident population (the resident status being, in fact, mainly related to the nature of lanche ownership)? Why ban motorized artisanal fishing in the whole of the MPA when some selective fishing practices could be authorized in certain zones and during certain times of the year (meagre fishing in particular)? Why can access to shrimp resources in the trench not be authorized at certain times of the year?

fisheries, the PNBA also fulfils a national role of supporting the fisheries sector. Another key element is that artisanal fishing at the periphery of the park is perceived as a serious threat to achieving the PNBA conservation mission, as are the new Nouakchott-Nouadhibou road link and the emergence of oil exploitation (offshore or onshore). These different perceptions may partly explain the reluctance of the PNBA (or of its partners) to establish a dialogue with fisheries managers, except for the fisheries surveillance department, and, *a fortiori*, with the industry.

The resident population's perceptions of the MPA are also ambivalent. Even though the park protects the interests of resident fishers to a certain extent – because it ensures their exclusive access rights to a particularly rich fishing zone – the governance of the park raises a number of issues: undermining of traditional management systems;[12] failure to understand some of the rules (an observation often made by park managers during dialogue workshops); feelings of exclusion related to low purchasing power and the high cost of social services (e.g. compulsory schooling for children in Nouadhibou or the absence of health centres in the park); a precarious future, given the age of the lanche fleet and the inability to fund its renewal.

However, a turning point in the relationship between the resident population and park managers took place with the introduction, in 1998, of mechanisms for dialogue. Such mechanisms took time to generate interest within the population, given a lack of awareness and understanding of the issues at stake in co-management. Now, however, they contribute to an improved perception by the resident population of the MPA and its management modalities, even though there remain unresolved issues concerning representation of the truly native population within dialogue workshops. Moreover, workshops remain a privileged setting for defending the interests of certain influential pressure groups (traders, non-resident lanche owners, village chiefs).

4. MPA GOVERNANCE

4.1 Legal bases for the establishment of MPAs and international MPA instruments

The existing national parks were created by decree – the PNBA in 1976 and the PND in 1991. Activities in the PNBA are governed by Law No. 2000-024 of 19 January 2000 and its Implementation Decree No. 2006-068 of 3 July 2006. Analysis of the PNBA legal framework leads to definition of the MPA as "a special administrative policing mechanism" within the administrative boundaries of the MPA, and considers the MPA as "a juridical-institutional montage" around a public institution – the PNBA – with significant territorial competency (Féral and Cazalet, 2007).

The legal framework is different in the case of the emerging Baie de l'Étoile MPA; thus, classifying this zone as a natural park does not seem appropriate for the time being. Moreover, the promotion of this MPA is part of the coastal management process.[13] To that effect, Ordinance No. 2007-037 relating to the coast (the Coastal Law) was enacted in April 2007. Its purpose is to provide a legal framework for that process. This law allows for development of coastal management guidelines (directives d'aménagement du littoral [DAL]) in certain sensitive areas such as the Baie de l'Étoile. However, the DAL concept is more closely related to a specific territorial management system – where development activities are supposed to be better supervised – than to a park or reserve management system.

As regards international commitments, Mauritania has signed most international conventions relating to coastal zones, in particular the multilateral environmental

[12] For the most part, those management rules relied on traditional know-how and on inter-village agreements, especially concerning compliance with the closure of some mudflats.

[13] Master Plan for the Management of the Mauritanian Coast (Plan directeur d'aménagement du littoral mauritanien [PDALM]), section 6.1.

agreements (MEAs) on the coastal zone and International Maritime Organization laws relating to the battle against marine pollution (MARPOL 73/78[14]). However, the 2002 Johannesburg Summit and the Durban World Parks Congress (2003) did not result in further national commitments concerning the development of new MPAs. Nevertheless, the case of Mauritania is atypical because it hosts the largest West African MPA – the PNBA.

Recent international developments have spurred the national coastal management process, for example, the organization of Coastal Open Days in December 2004, the relaunching in 2005 of the process to strengthen arrangements to prevent and combat marine pollution, and completion of the Master Plan for the Management of the Mauritanian Coast (PDALM) at the end of 2005. The latter has notably confirmed the significant role MPAs must play in the conservation of coastal ecosystems. It has also highlighted certain zones of particular interest from an environmental viewpoint (e.g. the Baie de l'Étoile).

As mentioned above, Mauritania has not subscribed to international benchmarks for MPAs.

4.2 Institutions and incentives for MPA implementation

The main institutions involved in the MPA process were described in section 2.5. This section presents some complementary analysis of governance issues in the PNBA MPA.

For its institutional underpinning, the PNBA benefits from links with the highest level of the State, even though it has been part of the Ministry of the Environment since 2006. The presidency of the PNBA board of directors is held by a representative of the General Secretariat of the Government (who is also a member of the FIBA board).

The consolidated budget of the PNBA (state funding plus partners' contributions, especially FIBA) is significant: it was of the order of EUR1.8 million in 2007. In comparison, the budget of the DAPL, which institutionally is at the same hierarchical level as national parks within the Ministry of the Environment and whose mission is to develop the national policy concerning protected areas and conservation, has an annual budget in the region of EUR30 000.

In accordance with the 2005–09 PAG, the PNBA is also strengthening its internal management system to improve governance of the MPA though the following actions:

- Creation of the PNBA Observatory in 2007. Within the framework of its mission as an environmental watchdog and a provider of scientific information relating to PNBA, the observatory could become a useful tool in improving dialogue between the park and other administrations that are directly or indirectly involved in its management.
- Possible creation of a trust fund. The first feasibility study dates back to 2002. The principle would be a fund generating interest that would provide recurrent financial resources to support the implementation of PNBA activities. This system could ensure the long-term future of projects and thus contribute to the financial autonomy of the PNBA as an institution. Ultimately, the objective is to capitalize EUR15 million in order to generate, on average, EUR750 000 per annum (at a 5 percent interest rate).

Another major innovation in the functioning of the PNBA is the provision of a PNBA budget within the framework of the new fishing agreement with the European

[14] MARPOL 73/78 is the International Convention for the Prevention of Pollution From Ships, 1973, as modified by the Protocol of 1978.

Union (Member Organization).[15] Part of the annual payment will be added to the PNBA budget along with the state funding. The remainder would contribute to the trust fund to generate other contributions through financial leverage. The purpose of this partnership support is to improve governance in the PNBA, in particular by strengthening the institution's financial autonomy. In fact, from 2005 to 2007, the consolidated budget of the PNBA was strengthened and the ratio between state funding (including the European Union [Member Organization] fishing agreement) and the consolidated budget rose from about 30 to 40 percent.

The current fishing agreement establishes a direct link between fisheries management and conservation. More generally, it should be stressed that the Mauritanian agreement is a novelty, insofar as it is the first time a fishing agreement acknowledges MPAs as fisheries management tools within the partnership section (formerly "targeted actions").[16] It is regrettable that the budget allocation makes no reference to an expenditure planning framework for PNBA (despite the existence of a PAG), and also that the principle of granting an allocation to the PNBA was not labelled as "support to MPAs", because then PND could also have benefited from it and possibly the management process in the Baie de l'Étoile (through the DAPL).

4.3 Management methods

Since 1998, PNBA managers have been implementing mechanisms for dialogue with the resident population to define management rules in the MPA. These mechanisms rely on the organization of annual dialogue workshops that bring together various stakeholders in MPA management. In theory, the mechanisms aim to promote discussions between the resident population, local authorities (communes) and park managers on all topics concerning the economic and human development of this population. The workshops also aim to assist in the annual programming process of PNBA activities (in support of implementation of the PAG).

In practice, however, the issue of fishing dominates discussions, in particular the definition of management rules (e.g. the fishing calendar by target species, zoning, and fishing gear regulation). Mutual commitments made by the diverse parties are then formalized in the form of memos signed by the PNBA director. Dialogue workshops also provide an opportunity to discuss and resolve disagreements that can divide categories of actors within the park's resident population, and this is highly valued according to the communities. These mechanisms have been strengthened recently by the establishment of fisheries committees, which monitor the implementation of commitments and resolve conflicts on a case-by-case basis.

The dialogue mechanisms are an undeniable improvement in PNBA governance. According to numerous observers, they could be more pertinent and effective if the following aspects were taken into consideration:

- Most of the time, measures discussed during dialogue workshops are introduced in response to particular problems related to dysfunctions and weaknesses in the current MPA management system. A more proactive approach could be

[15] The European Community and Mauritania signed a six-year Fisheries Partnership Agreement in July 2006. The initial 2006–08 protocol included a financial compensation of EUR86 million annually, of which EUR75 million was commercial compensation and EUR11 million was allocated to the partnership as follows: EUR10 million to fisheries sectoral policy and EUR1 million to PNBA. The 2008–-2012 protocol decreased the fishing possibilities and reduced the commercial compensation (although this was compensated by an increase in European Development Fund [EDF] funds). Moreover, this new protocol carried forward the amount and implementation modalities of the partnership section.

[16] However, some clarification is necessary concerning the nature of the partnership section relating to the PNBA. It would appear that the sum allocated to the PNBA should not be taken into account when calculating the compensation, unlike the sum allocated to the fisheries sector. In other words, stopping the annual funding to the PNBA would in no way call into question the fisheries agreement. Moreover, the issue of the use of the funds intended for the PNBA is not included in the agenda of meetings of the joint commission.

adopted that seeks to promote fisheries management in PNBA compatible with the objectives both of conservation and of improving the livelihoods of fishing communities.

- The MPEM has little involvement in the dialogue mechanisms. Only one representative of the ministry – at the departmental director level (the station chief for the northern zone) – is present during dialogue workshops. As a result, the MPEM is not felt to be a full actor in co-management not only from an institutional viewpoint, but also from a technical one, given the interactions between the coastal ecosystems of the Golfe d'Arguin and the need to address management of these systems as a whole.
- The decisions formulated in the park (in the fisheries, social, tourism and other areas) are adopted in the form of memos from the PNBA director. This may seem logical given the park's mandate. However, it is not without posing governance problems insofar as the memos cannot be used as legal support to encourage actions by other administrations. This complicates integration of the resident population into public policies for development and poverty reduction.

4.4 Main issues at stake in the effective implementation of MPAs

The main issues of PNBA implementation on which there is unanimous agreement relate to the MPA's role in maintaining marine biodiversity, increasing the abundance of fish resources inside and outside the MPA in support of fishing activity in general, and supporting the economic and human development of the park's resident population.

Apart from these main issues, others of a more categorical nature may be identified. PNBA managers ultimately seek to translate management rules developed within the framework of dialogue mechanisms into genuine regulations in order to benefit from enforcement by the DSPCM. Currently, the agreements are recognized only by park officials.

Fisheries managers seek to promote an ecosystem approach and to participate effectively in the development of rules governing fishing in the park through their expert fisheries knowledge – and their more-global vision of management in a context of increasing openness and intensifying trade exchanges between the interior and exterior of the park.

5. SOCIO-ECONOMIC AND ECOLOGICAL CONSIDERATIONS AND IMPACTS

5.1 MPA impacts on fisheries management

In theory, MPAs are spatial management measures that can help limit overfishing of recruits[17] and improve the yield of some stocks in adjacent zones, while contributing to preserving the integrity of part of the coastal ecosystem. According to a recent study carried out by IMROP, the PNBA's important share in the fraction of juveniles found in the coastal zone confirms the hypothesis that this zone is effectively a zone of nurseries and of spawning grounds for several dozen species (Ould Taleb Ould Sidi 2007). This nursery function is one of the main contributions of the park to the biological enrichment of adjacent zones. The study also confirms the global species wealth of the Banc d'Arguin and the efficiency of ecosystems in terms of benthic production, which can be explained by habitat diversity (mudflats, water channels, seagrass meadows, great depths), integrity (resulting from the protected nature of the site) and water quality.

According to numerous actors, the park has also slowed degradation of coastal ecosystems and fish resources in the Golfe d'Arguin, in particular by offering refuge

[17] "Recruits" are fish added to the exploitable stock in the fishing area each year through reproduction and growth of young fish to an exploitable size or through migration (i.e. the fish move into the fishing area).

zones to some strategic species such as mullet, a migratory forage species for many higher-trophic-level species of great commercial value (Plate 2). Enforcing the principle of not harvesting other species when part of their biological cycle takes place inside the park, as for coastal shrimp, is another source of positive impact for the fisheries sector (the first-hand value of crustaceans is about EUR20 million annually). Moreover, the extent of the protected zone (one-third of the coast) guarantees the expected positive impact of the MPA as an indirect and significant tool in fisheries management, even though the two flagship species of the fisheries sector in Mauritania (octopus and sardinella) are not found in the park.

PLATE 2
Drying of mullet in Banc d'Arguin National Park

Source: C. Breuil, October 2008.

However, one of the major problems associated with analysis of the PNBA MPA (the only effective one in Mauritania) as a public policy tool in the sustainability of marine and coastal ecosystems is that, 30 years after the creation of the park, there is little scientific evidence on how it functions and the impact it has on Mauritanian fisheries. This lack of scientific knowledge tends to confuse political debate and fuel controversy among the various protagonists. The 2005–09 PAG recognizes the problem and treats it as a priority. Research projects have recently been launched.

Initial findings of analysis of MPA impact inside the park show that the management methods implemented do not seem to have stopped the accelerating fish mortality observed since the early 1990s. Fishing effort rose from 50 trips per lanche in 1997 to 130 in 2007 – as a result of a newly arrived workforce foreign to the park. At the same time, the range of fish caught has widened, with the emergence of a significant production of catfish and tilapia intended for the Nouakchott market. However, one issue dominates the debate: the persistence of significant landings of sharks and rays, a group of protected species, despite the management efforts agreed within the dialogue framework.

Another impact of the PNBA MPA on fisheries management may be mentioned. It concerns the concentration of fishing operations (artisanal and industrial) at the park's periphery, above all in the north and south. This problem is all the more acute in that there are no buffer zones, particularly in the south.

Analysis of the PNBA socio-economic impacts can be addressed through examination of the evolution of Imraguen fisheries, the only fishing authorized by the Fisheries Code and Law 2000-024 relating to PNBA. Imraguen fishing was originally subsistence fishing, mainly centred on mullet. It then intensified and diversified as a result of globalization. Even though Imraguen fisheries are still described as traditional in various communication media, they are today fully integrated into the market economy and directed towards the export of processed products (mullet, shark and ray) or of fresh products (meagre, tilapia and catfish). According to some estimates, the turnover of the lanches reaches some EUR800 000 annually (Ould Taleb Ould Sidi, 2007).

Relationships among fishers, traders, wholesalers and retailers have become increasingly complex, and the financial dependence of fisher communities on traders has continued to grow, despite initiatives to strengthen their organization through cooperatives. Moreover, Imraguen fishing increasingly calls upon a foreign workforce. Changes in production and value enhancement methods have also had an impact on the marginalization of women, who previously were heavily involved in the processing of fishing products. Now, they have difficulty obtaining raw material, which is intercepted by other distribution circuits that are more lucrative for the traders.

Assessment of the socio-economic impact of the PNBA MPA on emancipation of the local population is thus relatively mixed. Another indicator, which is immediately obvious to the visitor, is the noticeable poverty of fisher communities and the weakness or absence of basic social infrastructure relating to education and health.

5.2 Major socio-economic or ecological issues

In analysing the socio-economic impact of the PNBA MPA, however, it is not sufficient to produce simplistic and critical evaluations of the park's managers. The complexity and lack of equity that generally characterize relationships between fishers and traders in Mauritania also exist, outside the park. However, if one considers that management conditions in the park are relatively easy to address,[18] a recurrent question can be raised: who benefits from the resource rent, given the almost total destitution of the resident population? This also works against the image of the park, even if sociological factors can partly explain the situation (e.g. the place of the Imraguen in the tribal and hierarchical organization of Moorish society, and the saving and investment behaviour in sectors other than fishing).

From an ecological viewpoint, the main issue is the need to improve understanding of the way the ecosystems function and the different fisheries interact in the Golfe d'Arguin, which includes the PNBA MPA and raises most of issues related to fishing in Mauritania. Moreover, the fisheries management issues of the PNBA MPA concern access to the park's resources. Although the principle of putting vast zones of sensitive habitats under a protection system is generally agreed on, many speak in favour of some form of spatially and temporally limited access for artisanal fishing to some areas at the edge of or inside the park (e.g. the trenches) that do not present a proven ecological interest. A reappraisal of zoning would also seem desirable. However, given the lack of scientific knowledge and the current weakness of the control and regulation system for artisanal fishing outside the park, the conditions for constructive dialogue between fishing and environmental interests do not seem to exist.

5.3 The role of natural and social sciences

Until now, fisheries research programmes in the PNBA MPA were designed to address fisheries management issues (for example, the shark and ray programme, which aims to reduce catch, or the programme to monitor landings) and not to deal with more general themes related to the role of the park as a management tool. This may be due to the fact that the PNBA is the research contracting authority within the geographical limits of the park, according to Law 2000-024. However, it may also be owing to the low opportunity costs encountered by IMROP in implementing research programmes in the PNBA. In Mauritania, fisheries research has so far focused on stock monitoring and assessment programmes to support fisheries management outside MPAs.

The first fisheries research studies carried out by IMROP in the PNBA date back to 1997, some 20 years after the park's creation. They examined the implementation

[18] Some 100 lanches in all, 70 of which are active; an exclusive right of access to particularly rich fishing zones; monitored and controlled landing points; about 1 000 people living in the park; profitable fisheries, especially as regards meagre, that are fully integrated into the market economy, etc.

of a fisheries monitoring system supported by the ACGEBA project. Fishing invited itself to the scientific debate and to discussions on PNBA management from the second half of the 1990s with the development of shark and ray fisheries. Data provided by the fishing monitoring system were progressively complemented by trawl surveys, beach seine data and socio-economic surveys, which led to the current substantial level of knowledge on the fishing system and fuelled the fisheries co-management process in the park. However, research studies concerning the presumed role of the park in the productivity and sustainability of fish resources in the Mauritanian EEZ, and even at the subregional scale, have remained marginal. Moreover, even today, there are very few scientific publications on how PNBA ecosystems function and on their interactions with the Golfe d'Arguin fisheries.

However, this compartmentalized and opportunistic vision of research into the PNBA MPA is beginning to change with two new research projects: the PACOBA and Amphore projects:

- Project to Improve Scientific Knowledge of the Banc d'Arguin Ecosystems (PACOBA: Projet de approfondissement des connaissances scientifiques des écosystèmes du Banc d'Arguin) funded by French cooperation. Starting from a hypothesis that the Golfe d'Arguin is becoming increasingly difficult to manage because of the lack of oceanographic, biological, ecological and socio-economic information, the objective of the project is to improve scientific knowledge of this area by strengthening IMROP's capacities for research on ecosystems and fisheries ecology, as well as those of the PNBA for organizing information and making it available as an aid to decision-making in the management of fishing and environmental activities. One of the main challenges facing the project is to evaluate the role played by the Golfe d'Arguin ecosystems in fishing system productivity at local and subregional levels.
- Marine Conservation Areas and Fisheries Management through Optimization of Resources and Ecosystems (Amphore: AMP et gestion halieutique par optimisation des ressources et des écosystèmes) funded by the French Institute for Biodiversity (Institut français de la biodiversité). This multidisciplinary research project concerns the role of several MPAs in France and West Africa – including the PNBA – in biodiversity conservation and fisheries management. The first two components concern the definition of biological, economic and social indicators for fisheries ecosystem-based management and evaluation of the real effectiveness of MPAs in fisheries systems and the benefits they generate. The third component deals more particularly with governance issues through an analysis of the decision-making mechanisms that condition the implementation of MPAs and of regional policies based on the notion of an MPA network.

Moreover, the creation in 2007 of the PNBA Observatory has generated much hope for improved knowledge of the oceanographic, ecological and socio-economic dynamics of the park. Its development depends mainly on the creation of scientific and technical partnerships with various national and foreign institutions. Ultimately, the observatory's mission is to provide a set of processed data for various users via the Internet (e.g. maps, databases and publications).

6. COORDINATED APPROACHES TO MPAS FOR FISHERIES MANAGEMENT AND CONSERVATION

6.1 Integration of MPAs into more-global maritime space management policies

A new and relatively strong pressure on the country's coastline developed, due to a conjunction of various elements (population concentration, increasing urbanization and industrialization, increasing port traffic, fishing development, anarchic occupation of the coast near Nouakchott and Nouadhibou, occupation of space for conservation

purposes, etc.). In response, at the end of the 1990s Mauritania began a coastal zone management process. The main objective was to prepare a master plan, ensuring that the concerns of all actors affected by coastal development were included and suggesting several possible scenarios for the coastal zone, taking into account the purpose of the various areas.

After several years of trial and error, due for the most part to competency conflicts between institutions, the process was relaunched at the end of 2004 and led, in 2005, to formulation of the PDALM document. The PDALM presents a concerted framework for management and development, suggesting, in particular, that the coast be designated according to the purpose of the relevant area (spatial zoning guidance) in accordance with management recommendations (see Map 6). The document was adopted in 2005 by an interministerial committee responsible for coastal management, presided at the time by the minister in charge of fisheries.

Since then, the process has struggled to advance, again because of conflicts over competency between the ministries involved in coastal management: Fisheries, Environment (the DAPL) and Transport. Ordinance 2007-037 (the Coastal Law) was adopted in 2007. It provides the PDALM with a legal framework and creates several institutions to support implementation of the coastal development process, in particular: a Coastal Consultative Council responsible for issuing an opinion on all issues concerning the management, development and protection of coastal resources and more generally on coastal issues; and a coastal observatory managed by the DAPL. However, the implementing decrees have not yet been published, in particular the one intended to establish rules for the Coastal Consultative Council, which will also deal with MPAs.[19]

Hence, in theory, Mauritanian coastal management policy takes into account MPAs and the way they interact with other sectoral policies, including fisheries. In practice, the process is not yet complete, and it is clear that sectoral policies for development prevail over concerted policies for integrated coastal zone management. The latest example dates back to the beginning of 2008 with the launch of the first studies for preparation of a Plan for the Strategic Development of Nouadhibou Bay, spurred by the Commission for the Promotion of Private Investment.[20] The weakness of the institutional arrangements related to the PDALM is also due to the absence of a leading figure able to facilitate and coordinate the process.

6.2 Institutional dialogue or conflicts

Dialogue

In the case of the PNBA MPA, interesting dialogue mechanisms were established between IMROP and the PNBA in order to monitor fishing in the park and analyse data within the framework of a scientific working group. These dialogue mechanisms were initiated in 2001 with financial support to PNBA's fisheries projects (ACGEBA, ARPI, VPDI, RARES), in particular to fund enumerators. Since the restructuring of IMROP's statistical monitoring system for artisanal fisheries in 2006 (SSPAC system), these enumerators have been funded in full by IMROP. Moreover, at the nine statistical monitoring sites, each enumerator is helped by a local assistant (usually a fisher), which significantly improves the quality of data collected.

These dialogue mechanisms enable each partner to fulfil its mission: for IMROP,

[19] The Coastal Law states that the Coastal Consultative Council will be presided over by the minister in charge of coastal management (in a context in which several ministries claim competency over this area). This council will consist of representatives of central administrations, relevant local authorities, parks and natural reserves, civil society organizations, research bodies and persons qualified scientifically.

[20] Within the framework of preparing the plan, an ad hoc interministerial committee was formed. Yet the DAPL only joined the committee after the study was ongoing. Moreover, the study only refers to the PDALM in the case of the framework for the protection of the environment, which is quite restrictive. It discusses several scenarios for classification of the Baie de l'Étoile, an MPA in preparation (reserve, ecotourism, aquaculture, etc.).

the monitoring, observation and regular evaluation of fishing in the PNBA, and for the projects, the promotion of co-management in the park, insofar as the results of the working groups contribute to discussions during the annual dialogue workshops. However, the long-term future of these mechanisms is unclear, because they are not based on any formal cooperation protocol between the two institutions.

Another dialogue mechanism in the PNBA MPA is found in the area of fisheries surveillance. This involves the DSPCM (personnel under oath) and PNBA (seagoing resources, equipment and operating costs) in three surveillance stations equipped with radar (Mamghar, Iwick and Agadir). During each trip (random or not), the surveillance mission consists of a DSPCM official, a PNBA official and a representative of the Imraguen population, who also works as a guide. This concerted surveillance mechanism produces undeniable results in compliance with the provisions of the Fisheries Code, despite difficulties in maintaining the radar stations (for example, the Mamghar station has been out of order since 2002) and the limited budget allocated to funding surveillance trips. The success of park surveillance in the battle against illegal industrial fishing can be attributed to the VMS system, which has been effective since 2005.

In the case of Diawling National Park, dialogue between the fishing and environment sectors is reduced to a minimum, probably because there is little at stake for either partner in terms of fishing. Yet IMROP is eager for dialogue, as the PND, a priori, plays an important role in the bioecology of certain species of interest, such as mullet or shrimp, and should be taken into account in a systemic approach to fisheries management. However, apart from project-related studies (e.g. the mullet project supported by the IUCN or the FFEM project in 2003), there are no regular research activities. As regards surveillance, no special provision has been made for dialogue between the DSPCM and PND. Park officials ensure compliance with regulations in the terrestrial part of the park and the DSPCM fulfils its surveillance mission through its national system.

In the case of the Baie de l'Étoile, dialogue mechanisms are emerging on a case-by-case basis during meetings or workshops between IMROP and the DAPL – organized within the framework of the study on the management of the zone in relation to the PDALM.

Dialogue mechanisms between the fishing and environment sectors often find their origin in the internal management arrangements of projects. Until now, this dialogue has been limited in the case of MPAs. Two projects showing that the field of dialogue can sometimes be extended to the wider scale of ecosystems deserve to be mentioned. First, there is the PACOBA project, which aims to strengthen dialogue mechanisms between PNBA and IMROP through one of its components, and to match research studies with fisheries governance needs at the scale of the Golfe d'Arguin ecosystem. Second, there is the mullet project, whose dialogue mechanisms are at the scale of the distribution area of this highly migratory species. Mechanisms set up within the framework of the project (technical and consultative commissions), both at the national level – associating fishing (MPEM, IMROP, DSPCM) and environment (PNBA, PND) – and at a bilateral level with Senegal, reflect this willingness to promote an ecosystem-based approach to management of this resource.

Conflicts

Among the constraints on development of dialogue is the climate of mistrust that sometimes still characterizes relations between fisheries managers and some of the park's partners: mistrust towards IMROP (considered a tool of fisheries development[21]), mistrust towards the MPEM (considered an industry spokesperson), and even mistrust towards surveillance, which focuses only on compliance with fishing regulations. As

[21] The tension between IMROP and the PNBA also arises from the improper interpretation by certain PNBA partners of the legal texts, which are, however, not always coherent. Thus, according to PNBA laws, IMROP should normally obtain prior authorization from the PNBA director before undertaking research studies in the park.

regards the latter point, a reproach made to the DSPCM is that it is not involved in ensuring that the rules adopted during dialogue workshops are applied. However, these rules are not translated into statutory instruments because they are not recognized by the fisheries administration. As a result, surveillance only refers to what is prescribed by the law relating to the Fisheries Code and the law and implementing decree relating to the PNBA (zone closed to industrial and motorized artisanal fishing, ban on the use of monofilament nets). The DSPCM's lack of enthusiasm may also be explained by the low opportunity costs of artisanal fishing surveillance (high surveillance costs, strong social pressure when dealing with infractions, trivial fines).

Another conflict of an institutional nature relates to the minor role played by local authorities in the development process for the park's resident population. These authorities, despite their mandate, have no significant competency in key areas such as education and health programmes: the director of the PNBA has broad powers in his/her 'administrative circumscription' that go well beyond the issue of natural area protection.

6.3 Issues and opportunities

The main issues associated with the links between MPA and fisheries management in Mauritania can be summarized as follows (some of these issues will be developed further):

- implement more-virtuous management systems for artisanal fisheries in the Mauritanian EEZ in general (capacity control, access regulation) in order to meet basic management needs and create the climate of trust necessary to establish partnership between the fisheries administration and the managers of "conservation" MPAs;
- improve scientific knowledge to clarify discussions on the functioning and role of MPAs in fisheries management and to combat partisan approaches (in all senses), which are detrimental to dialogue between the fishing and environment sectors;
- establish a dispassionate and meaningful dialogue with a genuine scientific basis among the diverse actors involved directly or indirectly in MPAs;
- reduce the influence of certain external partners – some of whom seem to prefer to substitute for, rather than to accompany, institutions – and promote governance mechanisms in MPAs involving first and foremost the fisheries and environment administrations;
- clarify the institutional and legal frameworks relating to coastal governance, taking care to promote the principle of dominance of the public interest over any special interests.

There are undeniable opportunities in Mauritania to address these issues and some actions have already been implemented:

- ongoing strengthening of the capacities of the PNBA institution (observatory, financial autonomy, programming systems);
- ongoing strengthening of the fisheries management system and, in particular, zoning reappraisal, implementation of fisheries management plans, consolidation of the surveillance system and initiatives for registration in artisanal fisheries;
- implementation of scientific research programmes promoting an ecosystem-based approach to fisheries management;
- setting up tools to support implementation of the coastal management approach (coastal observatory, Coastal Consultative Council, development of the DAL).

7. LESSONS LEARNED AND FUTURE DIRECTIONS

7.1 Contribution of spatial management measures, including MPAs, to fisheries management

The Mauritanian experience is very valuable in this field, because it enables evaluation of the impact of two spatial management measures that are quite unique in the subregion in terms of their extent: zoning, whose effectiveness is indisputable, in

particular since implementation of the VMS system in 2005, and implementation of an MPA of considerable size over a period of some 30 years (the PNBA).

The biological parameters of interest to management show a continuous decline in biomass and increasing overexploitation of most demersal species and, more recently, of pelagic species. This first conclusion may call into question the genuine relevance of spatial management measures to resource sustainability. This issue of relevance may be explained by the fact that the resources are part of a continuum, and whether they are harvested by artisanal rather than industrial fishing, in the case of zoning, or harvested only in some areas, in the case of MPAs, in the end has no significant impact on fish mortality. It is this that remains the dominant factor in resource management, not to mention that the most recent statistical data show a continuous increase in fishing effort in the park.

On the other hand, spatial management measures provide some answers to other aspects of management. First, these concern environmental issues, in particular the preservation of the biotic capacity of sensitive habitats. In this respect, the appropriateness of the ban on trawling in areas less than 20 metres deep is undeniable. However, the lack of scientific data concerning the MPA means that the hypothesis about the significant role played by PNBA ecosystems in support of multispecific fisheries productivity in the Golfe d'Arguin cannot be confirmed. However, several indicators, together with the application of a precautionary approach in accordance with the Code of Conduct for Responsible Fisheries, plead in favour of the promotion of this fisheries management tool.

Second, there are the socio-economic aspects. The other main driving force behind zoning is to reduce conflicts between several métiers, as well as accidents at sea, and to support artisanal fisheries development with a view to improving integration of the fisheries sector into the national economy. In this respect, the impact of zoning is also undeniable given the considerable growth of the canoe fleet operating in Mauritania and its production over the last ten years. It is difficult to draw an objective conclusion about the socio-economic aspects of the park, because its governance system seems to have greatly influenced the changes that have occurred in traditional fishing systems and the apparent stagnation in the financial conditions and livelihoods of fisher communities. The question of whether an MPA helps address the socio-economic dimension of fisheries management cannot be answered with the example of the PNBA.

On the basis of the above, it is clear that spatial management measures, including MPAs, cannot deal with certain aspects of fisheries management. In this sense, MPAs developed and managed independently of other components of the management system cannot, alone, address the challenge of responsible fisheries.

7.2 Clarification of the objectives of MPAs and promotion of an ecosystem-based approach: a prerequisite for dialogue?

One of the prerequisites for dialogue in MPAs is to clarify the functions they are given, and on this basis, allow adoption of a common vision for implementation. Two main functions are usually put forward: a conservation tool in the strict sense – in keeping with the mission of a natural park – or a tool for sustainable development of the country and to protect certain sensitive habitats. However, in the case of PNBA, the scientific knowledge used to characterize the role of the MPA in fisheries management is still insufficient and the "policy" project related to its implementation remains unclear.

Nevertheless, some research programmes seeking to improve characterization of the ecological function of the PNBA MPA – which concerns the most strategic fisheries in Mauritania – are ongoing. These programmes should provide some answers on the coherence of the current fisheries management units in a context in which two management subunits can be distinguished from an ecosystemic viewpoint: the park and the remainder of the Golfe d'Arguin, in particular as regards the management

of migratory resources such as meagre, mullet and even coastal shrimp. Moreover, such research programmes should make it possible to develop useful methodologies at the subregional level, as well as IMROP's capacities in ecosystem-based research to underpin fisheries management. Finally, these programmes might lead to the formalization of cooperation protocols between IMROP and PNBA, with a view to ensuring the long-term future of concerted research programmes with better linkages between the objectives of conservation and sustainable management of fish resources.

7.3 Promotion of a mediation and dialogue framework for the integrated management of coastal areas

The Mauritanian coastline is in full mutation, with significant competition between different users for access to coastal resources. At the same time, the aspirations of Mauritanian society, including those in the MPAs, are changing, in particular given recent experiences in democracy (for example, growing claims to rights to education, health care, economic well-being, and better governance). It is in this context, and also in order to promote the harmonious and respectful development of the marine environment, that Mauritania has, for several years, been involved in a process of coastal planning. The finalization of this process is currently meeting with some difficulties, particularly because of conflicts between several ministries relating to institutional competency on issues of coastal management. In addition to ongoing initiatives such as the creation of a coastal observatory and the launch of the Coastal Consultative Council, several proposals have been made in support of the process:

- Establish a dialogue and mediation framework, at the highest level, to promote constructive dialogue between the fisheries and environment sectors and to seek reconciliation between the conservation objectives of MPAs and the sustainable development objectives of fisheries. This dialogue framework could, for example, take the form of an interministerial committee on MPAs, presided over by a supraministerial authority. In parallel, these initiatives could be underpinned by the promotion of structuring and unifying projects, such as a strategic environmental study related to the redefinition of PNBA zoning.
- Promote awareness-raising and capacity-building programmes at the highest level of decision-making for analysis of the issues related to integrated management of the coast and shoreline. Such programmes could also deal with issues of the ecosystem-based approach. The objective of these programmes would be to help improve perceptions and mentalities at the highest state level, in a context in which many decisions are still made without the use of mechanisms for interministerial dialogue.

7.4 Improving governance in MPAs

Governance systems in the PNBA MPA have been greatly improved in the last ten years, in particular the development of dialogue workshops, which are a first step towards co-decision-making with the resident population of the park. It is widely agreed that one of the keys to MPA success is mutual understanding of the issues and objectives by all actors and of the relevance and feasibility of management measures (legitimacy, acceptability and applicability).

The following measures also aim to improve governance in MPAs and their linkages with the fisheries management system:

- Strengthen the environmental capacities of fisheries administrations and the fisheries management capacities of environmental administrations. Despite very distinct specializations, each administration may have to take an initiative, at one time or another, in one or the other of these two areas as part of its mandate. However, in the absence of sufficient skills, the results can be rather haphazard (for example, the ambivalent impact of fisheries management measures in the

PNBA on shark and ray conservation). Moreover, the promotion of a mutual upgrade of each institution might facilitate dialogue.

- Closely involve the resident population in the development of management measures, taking into account the traditional know-how and practical knowledge of fishers, in order to secure their support. The measure must be understood and shared by professionals in order to be effective and applicable at the lowest cost. A good example is the biological rest period for demersal fisheries, which is very well understood and on the whole complied with.
- Set up formalized collaboration mechanisms between the diverse administrations involved directly or indirectly in MPA implementation (e.g. the research protocol, surveillance protocol, and the fisheries administration's participation in dialogue workshops).
- Pursue the process of strengthening the capacity of administrations and ensure that the various projects and partnerships support (rather than substitute for) institutions.

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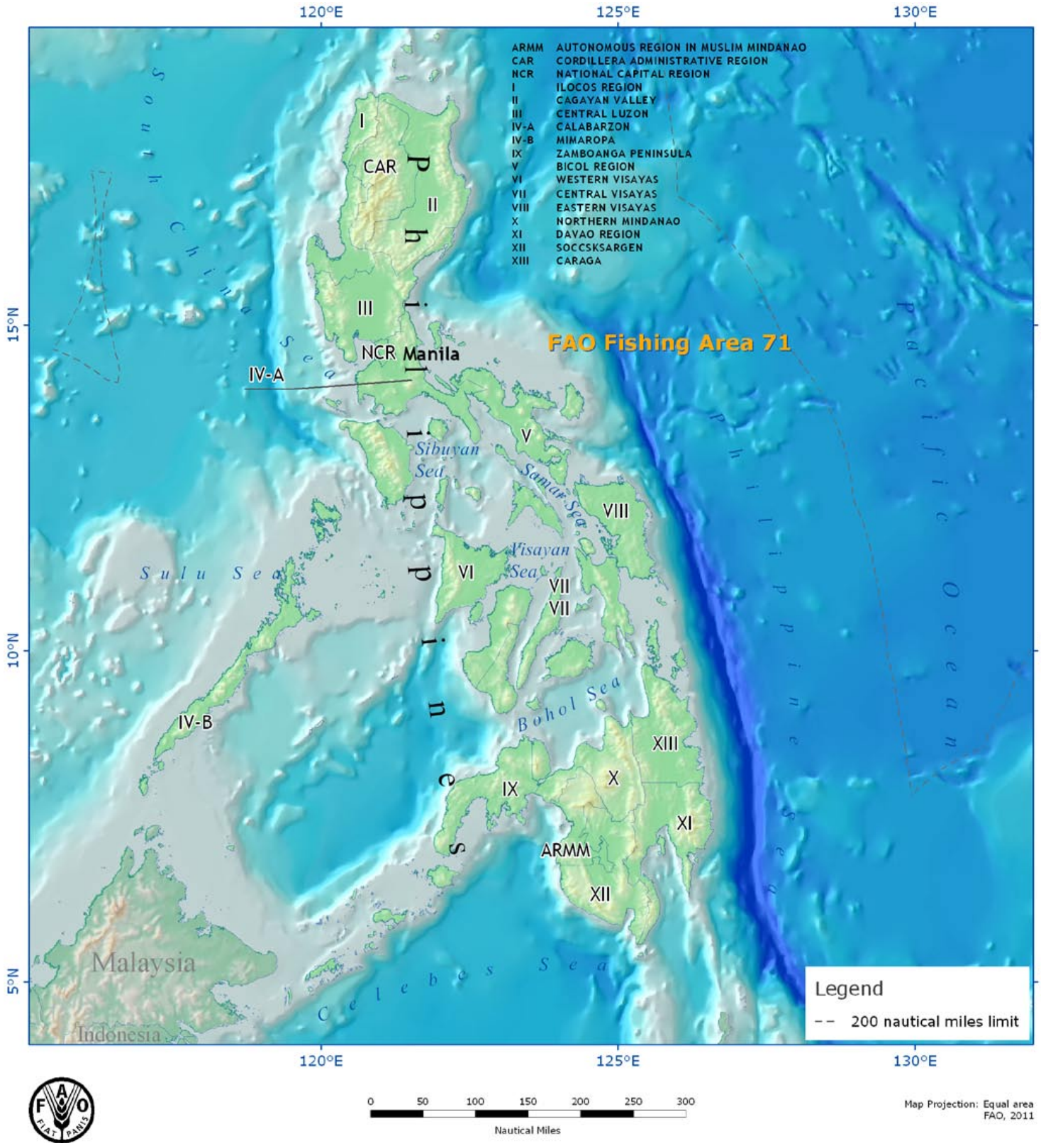
Map 1
Map of the Philippines



The Philippines

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1. INTRODUCTION

The Philippines represents the best and worst case scenarios for ocean resource management. The country originally had abundant marine fishery resources, which have been poorly managed in most locations. It is at the epicentre of a marine biodiversity that is increasingly at risk from various pressures. The adoption of marine protected areas (MPAs) has been widespread in the country, while basic fisheries management techniques, especially fishing effort control and restriction of fishers' movements, have been largely ignored by policy-makers. Some Philippine MPAs are the best documented in the world, and successful MPAs have had a widespread impact within and beyond national boundaries. Initial success with integrated MPAs and fisheries management suggest that these models, with consistent and considerable effort, can be spread to other locations in the country.

2. FISHERIES AND SPATIAL MANAGEMENT

2.1 Condition

The Philippines has 7 100 islands and a coastline of 36 289 kilometres (km). Coastal resources are an important component of the country's society and economy. The *Philippine Environment Monitor 2005* (World Bank, 2005) reports that coastal ecosystems generate approximately US$3.5 billion in annual economic benefits, with coral reefs generating approximately US$1.4 billion or 1.4 percent of gross domestic product (GDP).

Critical marine habitats have been severely damaged, especially in the past few decades. Coral reefs, the most biodiverse and productive marine ecosystems, are heavily degraded in most locations. Nationwide surveys based on more than 700 transects sampled in 14 provinces from the 1970s to the 1990s observed that 4–5 percent of the reefs were in excellent condition (75–100 percent living coral cover), 25–27 percent were good (50–75 percent cover), 39–42 percent fair (25–50 percent cover), and 27–31 percent poor (0–25 percent cover) (Gomez and Alcala, 1979; Licuanan and Gomez, 2000). A recent summary of coral reef conditions in Southeast Asia suggests that Philippine reef condition may be stabilizing, but it is unclear if this is a real improvement or a matter of sampling design (Tun *et al.*, 2008). It is also likely that some areas of the Philippines may be recovering, such as the Central Visayas, where reef conservation efforts are more intensive. While difficult to estimate without baseline information, the incidence of destructive methods such as blast and cyanide fishing has declined

dramatically in areas with coral reef management programmes. Approximately half the seagrass areas have been lost or severely degraded as a result of eutrophication, development, aquaculture and destructive fishing methods (Fortes, 1995; Tun *et al.*, 2008). Approximately 70 percent of mangrove areas – important areas for juvenile fish – have been degraded by wood harvesting, conversion to aquaculture areas or reclamation (White and De Leon, 2004), but reforestation efforts and protection may be increasing the overall mangrove area (World Bank, 2005).

Coastal communities are relatively poor, partly due to declining coastal resources. Average coastal household incomes are generally below national averages – as low as US$470 annually – while the national average is US$2 820.

The marine fisheries sector is important. The Philippines is one of the world's leading fish producers, with production coming from commercial (36 percent), municipal (30 percent) and aquaculture (24 percent) subsectors (World Bank, 2005). From 1995–2003, the contribution of fish aquaculture to total fish production rose from 13 to 18 percent (unpublished data). Municipal fishing operations use boats smaller than 3 gross tonnes, and by law retain exclusive rights to the fishing areas from shore to 15 km offshore. Commercial fishing operations use larger boats and are required to remain beyond 15 km (or may enter from 15 to 10.1 km offshore if granted municipal government approval), but frequently encroach on nearshore areas. They complain that the 15 km line was set arbitrarily by the Local Government Code of 1991 (see subsection 2.2). Enforcement of this line is often lax.

The fisheries sector employs more than 1 million Filipinos, or more than 5 percent of the workforce (Barut, Santos and Garces, 2004). Of those employed in fisheries, approximately 28 percent are involved in commercial fishing and aquaculture operations, while approximately 68 percent are municipal fishers (ADB, 2003). The municipal fisheries subsector provides employment and food to rural people, while commercial fisheries frequently supply major urban centres directly with relatively cheap protein and have strong ties to the national agency responsible for fisheries management. Commercial fishing tonnage increased from 150 260 tonnes in 1988 to 270 281 tonnes in 2000, a trend with implications for municipal fishers and nearshore MPA management (World Bank, 2005). Aquaculture production, especially of milkfish (*Chanos chanos*) and seaweed, has grown rapidly in the last decade at approximately 8.4 percent annually. About 60 percent of aquaculture production is seaweed for industrial purposes (World Bank, 2006).

Marine fishery resources are in a state of decline in most locations, while fishing effort is increasing (Green *et al.*, 2003). Maximum sustainable yields of marine small pelagic and demersal fisheries were exceeded in the late 1970s (Silvestre and Pauly, 1989; Pauly, 2000). The biomass of fish stocks in several important fishery bays in the Philippines is less than 10 percent of what it was in 1950 (Pauly, 2000). The World Bank (2005) reports densities as high as 70 fishers per kilometre of coastline in important bay areas. The fisheries sector's contribution to the economy has declined, from 5 percent of GDP to less than 3 percent since 1997 (Barut, Santos and Garces, 2004; World Bank, 2005). Rent dissipation[1] from overfishing is approximately US$130 million for demersal (bottom-associated) fisheries and US$290 million for small pelagic (offshore) fisheries (World Bank, 2006). As population continues to grow rapidly, these problems are likely to become more apparent. The current population is estimated at 96 061 680 (CIA, 2009), with a 1.99 percent growth rate. Fish scarcity will not be felt uniformly, and considering the status of the environment and productivity, it will not be addressed

[1] Rent, in fisheries, is generally thought of as the difference between total revenues obtained from the fishery and the total costs (estimated at opportunity cost) of employing the various factors of production that together make up the enterprises participating in the fishery. Total costs include charges for replacement of assets. The rent is often considered as a "surplus" profit over and above that considered normal (FAO, 2001).

by either increasing fishing effort or substitution of aquaculture for capture fisheries. The competition for marine resources is intensifying. Municipal fishers compete with commercial fishers for the same fish. As a result of overfishing, habitat degradation, and competition for fish, municipal fisher catch has declined by approximately 30 percent since 1991 (World Bank, 2005).

2.2 Spatial management in fisheries

The key spatial attributes of fisheries management in the Philippines are: delineation of municipal waters, fisheries project boundaries and MPA boundaries. Any traditional management practices or customary marine tenure regimes that may have been in place – and they probably were present, considering practices in Palau and elsewhere in the region – were severely undermined by colonialism and contemporary fisheries management regimes, which ignored traditional management and encouraged resource exploitation (Christie and White, 1997).

Within the commercial and municipal fishing sectors, fishing grounds are generally open access, and fisher movement is not highly restricted. Commercial fishing vessels must be registered and licensed, but limits on catch amounts are not defined. Municipal fishing boats must be registered with the municipal government, but licensing and limits on fish landings are not defined. While commercial fishing vessels are required by law to fish outside municipal waters (15 km offshore), they regularly ignore this regulation and are rarely punished. Although the 1998 Fisheries Code has provisions limiting access by municipal fishers to waters outside their home municipality, rarely are these provisions enacted. In short, the Philippine sea space is generally open access beyond the boundaries of MPAs. Weak national fisheries management policies and ineffectual enforcement through much of the twentieth century resulted in severe overfishing in most areas of the Philippines.

The delineation of municipal fishing areas is an important, spatially explicit management policy intended to reduce competition and conflict between sectors. While the policy has been weakly enforced, this is beginning to change in some locations, as outlined below. Municipal governments are banding together to share enforcement resources to exclude commercial fishing operations (Armada, White and Christie, 2009; Eisma-Osorio *et al.*, 2009).

Since about the 1980s, considerable effort has been made to improve fishery management, with particular emphasis on coastal and fisheries management project areas. These areas range in size from single municipalities, which may have less than 30 km of coastline, to multisite project areas covering thousands of kilometres of coastline (e.g. the Fisheries Improved for Sustainable Harvest [FISH] Project, described at www.oneocean.org; Armada, White and Christie, 2009). After decades of investment by multilateral and foundation donors, spatial management has been initiated mainly using the framework of integrated coastal management (ICM), with no-take MPAs as the favoured management tool (White, Eisma-Osorio and Green, 2005).

Decentralized governance (as encoded in the 1991 Philippine Local Government Code) is a central strategy for marine and fisheries management, with co-management being the most commonly used approach (Christie and White, 1997). Since 1986, the Philippine non-governmental organization (NGO) sector has been a major engine of development and environmental management, and has inspired local government units (LGUs) to change fisheries management practices. Recently, ecosystem-based fisheries management has emerged as the next logical framework for the evolution of practice (Christie *et al.*, 2007; Armada, White and Christie, 2009; Eisma-Osorio *et al.*, 2009). The FISH Project and the Southeast Cebu project of the Coastal Conservation and Education Foundation (www.coast.ph; Eisma-Osorio *et al.*, 2009) are the first explicit examples of ecosystem-based management (EBM) in the Philippines and one of the first within the tropics. Most practitioners appropriately sense that the integrated

approaches used in ICM efforts are very closely related to EBM, although they express concern that the terminology is confusing: it is unclear how EBM is specifically distinct from ICM (Christie *et al.*, 2007). For EBM to become effective and widespread, it will probably need to undergo the lengthy internalization process that has taken place with ICM over the last three decades.

Philippine MPAs are designed and implemented with multiple objectives in mind (White, Salamanca and Courtney, 2002; World Bank, 2006). As outlined below, there is a confused nomenclature for MPAs, with no single definition accepted within the country. In practice, all Philippine MPAs contain some portion of no-take area, and, in some cases, this no-take area is surrounded by other zones of management (White, Salamanca and Courtney, 2002). Almost all MPAs are in coral reef and seagrass areas, which are areas of high biodiversity, high fishing productivity and effort, and with high potential for tourism development.

The tendency to highlight the importance of one objective over another is closely linked to the social position of an individual or the institutional mandate of an institution. Fishers, the national Bureau of Fisheries and Aquatic Resources, and the 1998 Fisheries Code highlight the importance of fisheries outcomes from MPAs. The consistent perspective of fishers on MPAs has been identified in empirical interview research in many sites (Pollnac, Crawford and Gorospe, 2001; Christie *et al.*, 2003a; Oracion, Miller and Christie, 2005; Christie *et al.*, 2009). The majority of those interviewed believe that successfully implemented MPAs either stabilize or increase fisheries yields (Pollnac, Crawford and Gorospe, 2001; Christie *et al.*, 2009). International and national conservation practitioners and NGOs may emphasize the biodiversity conservation aspects of MPAs. However, they realize, in general, that the goals of any community-based MPA must resonate with local constituencies if rule compliance is to be expected (Christie *et al.*, 2003a). Protection of biodiversity *per se* does not generally resonate with local fishers. Indirect benefits from biodiversity conservation, such as increased ecotourism, may benefit some social groups within a community, but usurpation of MPA management by dive tourism ventures creates conflict between local fishers and tourism operators (Christie, White and Deguit, 2002; Oracion, Miller and Christie, 2005).

The declaration of no-take MPAs frequently has associated, positive resource management impacts that go beyond explicit and legal MPA rules. Generally, the use of highly destructive methods such as blast and cyanide fishing decreases dramatically in areas adjacent to no-take areas (Christie *et al.*, 2003b). Community enforcement groups, deputized by local authorities, commonly enforce MPA and fisheries laws simultaneously. The immediate cessation of blast fishing, which commonly targets schooling pelagic species such as fusiliers (Caesonidae), may result in relatively quick and dramatic increases in fisheries yields from certain families of fish (Christie and White, 1994). Awareness-raising on coral reef function and the dramatic improvements in reef conditions within no-take areas may result in the diffusion of such information beyond a community and may raise expectations for improved ocean resource management outside no-take areas. For example, spear-fishing on compressed air results in overfishing (and diving accidents). Large beach seines with fine mesh damage seagrass areas, are quite efficient at capturing juvenile fish and have been banned in areas near no-take areas (Christie and White, 1994). Closed seasons for some fish species such as rabbitfish (Siganidae), which have a clear lunar-cycle-defined spawning period, have been declared in some areas of Bohol under the FISH Project (Armada, White and Christie, 2009).

Some well-managed MPAs, such as those of Apo and San Salvador Islands, have been enclosed within the National Integrated Protected Area System (NIPAS – the law is described below). As such, these areas become part of a larger protected seascape in which zonation may be considered. While such NIPAS declarations have the potential

to strengthen management by providing national government support for local entities, the field outcomes have been mixed. Local governance systems, which support the MPA through a co-management process between communities and municipal governments, can be undermined by the imposition of national agency interests. The NIPAS Protected Area Management Board (PAMB), a multi-institutional governance institution, was weak in the case of the San Salvador Island MPA.

3. MPAS FOR FISHERIES AND CONSERVATION: DESIGN AND MANAGEMENT STATUS

3.1 MPA terminology

A wide range of terms is used for MPAs in the Philippines. Moreover, Philippine terminology is not in agreement with terms used in other countries (however, there are no international standards outside the terminology of the International Union for Conservation of Nature). The term used to refer to an MPA varies depending on the legislation, designating authority, type and quality of the resources and the intent. Inconsistent terminology is apparent when comparing the various laws providing the legal basis for MPA establishment and implementation. For example, NIPAS – Republic Act No. 7586 – contains various definitions for protected area, national park, resource reserve, wildlife sanctuary and buffer zones. Under NIPAS, the Wildlife Act provides for the establishment of "critical habitat" outside protected areas. The Fishery Code of 1998 allows the declaration of fishery refuges, sanctuaries and reserves (White, Aliño and Meneses, 2006). Municipal governments, in consultation with local communities, declare marine sanctuaries and traditional fishing reserves through municipal ordinances – a responsibility allowed under the 1991 Local Government Code, which decentralized ocean governance in municipal waters out to 15 km offshore. It is not clear whether the NGO or environmentalist communities in the Philippines are advocating any one set of MPA terms or types. A "sanctuary" is off limits, while 'reserve' refers to traditional fishing areas adjacent to the sanctuary. These terms are inverted in the United States context, where fishing is allowed in national marine sanctuaries, but not in marine reserves.

This inconsistency of definitions and terminologies is further subject to future interpretation by the courts. In practice, however, a standardization terminology is emerging among policy-makers. The term commonly used in practice is now "marine protected area", which is defined as "any specific marine area which has been reserved by law or other effective means and is governed by specific rules or guidelines to manage activities and protect part of the entire enclosed coastal and marine environment" (White, Aliño and Meneses, 2006). Thus, as in most MPA management practices, there is an evolution of practice over time to address key concerns and challenges.

The MPA Database, hosted by the Coastal Conservation and Education Foundation (www.coast.ph), is the most comprehensive collection of basic MPA information in the Philippines. Philippine MPAs are numerous and vary in size. Most are small in comparison with other contexts. Of the 852 MPAs with known area, 35 percent are less than 10 hectares (ha) in size and 48 percent are within 11 to 100 ha. There are now about 1 169 existing and 164 proposed MPAs in the Philippines, over 100 percent more than the 1997 estimates (Arceo, Aliño and Gonzales, 2008). Although difficult to estimate precisely, the majority of Philippine MPAs protect coral reef and seagrass areas. While mangroves are part of some MPAs, there are currently no offshore MPAs.

The decision-making process leading to declaration and implementation of an MPA depends largely on context, legal framework for declaration, and the institutions involved. To generalize, most community-based MPAs are declared through a co-management process involving: (i) an NGO or project acting as a catalyst; (ii) a municipal government providing legal and enforcement support (often through a local voluntary citizens enforcement group); and (iii) a "people's organization", which

solicits input from nearby coastal community members. The standard MPA programme follows these stages, which are generally cyclic and iterative: (i) problem identification, (ii) information-gathering, (iii) awareness-raising, (iv) community group formation, (v) action, and (vi) evaluation (White, Aliño and Meneses, 2006). Some programmes develop alternative livelihood schemes to offset the loss of fishing grounds enclosed in MPA boundaries. The NGO or project usually employs a community organizer or social worker, who focuses effort on leadership development, environmental education and solidarity-building within the above process at community/municipal levels. Commonly, the organizer lives within the community, although this is not always necessary (Pollnac, Crawford and Gorospe, 2001). The NGO or a local academic institution may provide baseline biophysical assessments and ongoing monitoring information to shape MPA design and inform the community and local policy-makers. Most commonly, underwater assessments consisting of standard benthic and fish diversity/density methods are used (White, Aliño and Meneses, 2006). Rarely are social data collected. Conflicts or controversies associated with trade-offs are commonly addressed at the community or municipal level, but formal conflict resolution is uncommon. Increasingly, individual MPAs are being networked by linking municipalities through collaborative multi-institutional arrangements (Armada, White and Christie, 2009; Eisma-Osorio *et al.*, 2009; Lowry, White and Christie, 2009).

MPA declaration under national agencies and NIPAS is distinct. Communities and municipal governments are consulted, rather than engaged fully under co-management arrangements. National agencies lead the process. Biological assessments are necessary to justify NIPAS declaration. A technical management plan is drafted by the national Department of Natural Resources and Environment (DENR). The PAMB is led by a local DENR representative.

Survey research involving thousands of informants – conducted by Pollnac, Crawford and Gorospe (2001) in 45 MPA sites and Christie *et al.* (2009) in 36 sites – demonstrates that local resource users and elected officials are commonly in favour of MPAs, which they perceive as stabilizing resource conditions and improving fisheries production. As highlighted above, each MPA constituency has distinct goals and objectives for any MPA. As such, each social group tends to perceive an MPA's value and success differently. Failure rates for MPAs are high, with the reasons for failure varying widely and commonly related to conflicts between social groups with distinct interests. Some MPAs are declared by local- or national-level government agencies with weak implementation. These "paper parks" invariably fail. Many other MPAs become embroiled in controversy or conflict that is poorly managed (Christie, 2004). While social tension is a predictable part of any regime change, unmanaged conflict is a strong contributor to MPA failure (Christie *et al.*, 2005; Oracion, Miller and Christie, 2005).

While MPA implementation is challenging and potentially controversial, MPAs remain the preferred marine fisheries and biodiversity management tool. This popularity may be due to the impact of well-known success stories and the perception that policy options are narrow. Globally recognized examples such as the Apo Island MPA have inspired considerable faith and investment in MPAs. Given the lack of political will for fishing effort control, MPAs may be perceived as a management tool that meets multiple objectives – protecting some habitat, stabilizing fisheries yields (albeit at a low level) and providing alternative tourism livelihoods.

Comparative field research (Pollnac, Crawford and Gorospe, 2001; Christie, White and Deguit, 2002; Christie, 2004; Oracion, Miller and Christie, 2005; Christie *et al.*, 2009) and field experience (White, Salamanca and Courtney, 2002; Eisma-Osorio *et al.*, 2009) demonstrate that transparent and participatory decision-making, generation and equitable distribution of benefits, and ongoing institutional and financial support are critical variables determining MPA success.

4. MPA FOR FISHERIES AND CONSERVATION: GOVERNANCE

The main legal regime governing MPA establishment is found in the Philippine Fisheries Code and the NIPAS Act. In the Philippines, MPAs can be established either through a national decree or through local (municipality or city) ordinance. NIPAS allows areas to be established as MPAs by a national law, decree, proclamation or order. The Philippine Fisheries Code allows MPA declaration through a local government/community co-management process.

NIPAS was instituted through Republic Act No. 7586 in 1992. It applies only to those areas or islands established by a presidential proclamation, followed by an appropriate enabling law enacted in Congress. The NIPAS Act applies to practically all types of specially designated areas that require conservation or protection, whether they are simple parks for the recreational use of Filipino citizens or natural habitats of all manner of flora and fauna.

The Fisheries Code was established through Republic Act No. 8550 in 1998. It provides that, where applicable,[2] at least 15 percent of the total municipal waters in each municipality or city shall be identified, based on the best available scientific data, and designated as fish sanctuaries. Pursuant to the thrust of the 1991 Local Government Code mandating local autonomy, LGUs (municipalities/cities) can establish fishery refuges and sanctuaries by ordinance after appropriate consultation.

The spatial extent of the LGU municipal waters is defined as follows:

> *Municipal waters include not only streams, lakes, inland bodies of water and tidal waters within the municipality which are not included within the protected areas as defined under Republic Act No. 7586 (The NIPAS Law), public forest, timber lands, forest reserves or fishery reserves, but also marine waters included between two (2) lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third line parallel with the general coastline including offshore islands and fifteen (15) kilometres from such coastline. Where two (2) municipalities are so situated on opposite shores that there is less than thirty (30) kilometres of marine waters between them, the third line shall be equally distant from opposite shore of the respective municipalities.*
>
> – Section 4 (58), RA 8550

The municipal/city government shall have jurisdiction over municipal waters as defined above. In consultation with municipal/city Fisheries and Aquatic Resource Management Councils (FARMCs), each municipal or city government shall be responsible for the management, conservation, development, protection, utilization and disposition of all fish and fishery/aquatic resources within the 15 km municipal waters. The municipal/city FARMC is an advisory body composed of representatives of the government, fisher organizations and NGOs. It provides advice to the local legislative body on fishery matters, recommends enactment of fisheries ordinances, and assists in the preparation of a fisheries development plan.

A more-recent legislative enactment – the Wildlife Resources Conservation and Protection Act – provides another mode for establishing MPAs. The Wildlife Act of 2001, or Republic Act No. 9147, provides for management of critical habitats outside protected areas under NIPAS where threatened species are found. The management of such designated critical habitats is now the responsibility of various agencies: the DENR for terrestrial plant and animal species, including but not limited to crocodiles, amphibians and dugong (*Dugong dugong*); and the Bureau of Fisheries and Aquatic Resources for all declared aquatic critical habitats and all aquatic resources, including but not limited to all fishes, aquatic plants, invertebrates and all marine mammals

[2] The term "where applicable" is not defined in the Fisheries Code nor clarified in case law.

(except dugong). The Wildlife Act is a fairly new and untested law; thus its effect on previous laws and MPA declaration is unclear.

For the present categories of MPAs in the Philippines, policy-making is primarily lodged either with the LGUs (municipalities/cities) for locally designated fishery reserves and sanctuaries or with national agencies such as the DENR for NIPAS-designated protected areas. The Fisheries Code mandates LGUs as the leading institutions for management and protection of coastal and marine resources within their territories. As such, they can enact ordinances, impose appropriate penalties, approve resolutions, appropriate funds and enforce fisheries laws and regulations for the general welfare of the municipality/city and its inhabitants, including the establishment and maintenance of MPAs.

The administration of NIPAS is basically under the DENR. A multisectoral PAMB, led by the DENR, manages each NIPAS area. The PAMB membership, which consists of representatives of the LGUs within the protected area, decides by majority rule on: (i) budget allocations; (ii) proposals for funding; and (iii) planning, peripheral protection and general administration of the protected area.

The Philippines is a signatory to several key international agreements: the Convention on Biological Diversity (Nairobi, 1972), Convention on International Trade in Endangered Species of Wild Flora and Fauna (Washington, DC, 1973), and Convention Concerning the Protection of the World Cultural and Natural Heritage of the World Heritage Convention (Paris, 1972), among others.

The Convention on Biological Diversity (CBD) aims to conserve biodiversity, promote the sustainable use of its components and encourage equitable sharing in the benefits arising from the use of genetic resources. This convention imposes clear obligations on state parties, for instance with regard to *in situ* conservation of biological resources. Under Article 8, "Each contracting party shall, as far as possible and as appropriate: (a) establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity …" As a party to the CBD, which it ratified in 1993, the Philippines prepared its National Biodiversity Strategy and Action Plan in 1997 to take stock of its biodiversity resources, identify threats, and formulate strategies and an action plan for their conservation, sustainable use and benefit-sharing mechanisms. Under the CBD *in situ* conservation framework, the Philippines now has more than 101 protected areas under NIPAS, with a total area of approximately 3.2 million ha (marine 1.6 million ha and terrestrial 1.6 million ha) (DENR, 2005). There are some 429 LGU-declared MPAs,[3] 28 NIPAS-declared MPAs and slightly more than 1 000 MPAs in total in the Philippines (Arceo, Aliño and Gonzales, 2008).

Aside from the CBD, another international convention of particular significance to one of the largest and most important MPAs in the Philippines – the Tubbataha Reef National Marine Park – is the Convention Concerning the Protection of the World Cultural and Natural Heritage of the World Heritage Convention. Article 2 of the Convention defines "natural heritage" as "… natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view; geological and physiographical formations …". The inclusion of Tubbataha within the World Heritage system brings prestigious global recognition to this MPA. Fishing is banned within the entire 96 000 ha of the park.

Presently, there are national benchmarks driving the implementation of MPAs in the country. As mentioned above, the Fisheries Code requires that at least 15 percent of the total coastal area in each municipality shall be designated as fish sanctuaries by LGUs in consultation with FARMCs (section 81, RA 8550). For nationally proclaimed protected areas, the Medium-Term Philippine Development Plan set time-bound

[3] According to the MPA Database of the Coastal Conservation Education Foundation, www.coast.ph

targets for the period 2004–10, in particular, to delineate 6.34 million ha nationwide for protection. In addition, various key stakeholders in the country participated in formulating the Philippine Marine Sanctuary Strategy to improve the effective, sustained implementation of marine reserves. The strategy aims to target full protection of at least 10 percent of the coral reef areas by 2020 within an ICM framework (Arceo, Aliño and Gonzales, 2008).

A host of challenges limit effective MPA implementation. These include: degraded habitats (World Bank, 2005); limited capacity and resources to undertake law enforcement and ineffective sanctions for MPA violations (Eisma, Christie and Hershman, 2005); lack of public awareness and participation in resource management (White, Aliño and Meneses, 2006); and political and vested interests, as well as weak coordination, among the many agencies tasked to enforce the laws (Lowry, White and Courtney, 2005).

A critical factor limiting MPA management effectiveness is the overlap between LGU territorial jurisdiction over municipal waters and NIPAS-declared protected areas. Ambiguous concepts and principles underlie this jurisdictional problem. Based on the definition cited of municipal waters, confusion arises from the interpretation of LGU authority over municipal waters in the event that any portion is declared an NIPAS "marine protected area". This holds true in the light of the current meaning of local autonomy for local government under the present Constitution and Local Government Code, as well as the protected area management provisions of the NIPAS Act.

The issue of PAMB jurisdiction for protected areas within municipal waters has long been strongly opposed by LGUs, which insist on the genuine and meaningful autonomy espoused in the Philippine Constitution. LGUs argue that full PAMB authority over NIPAS sites in municipal waters would contravene the spirit of local autonomy and the provisions on substantial alteration of boundaries under the Constitution. LGUs further assert that the Fisheries Code is clear that municipalities/cities have primary jurisdiction over municipal waters. On the other hand, the DENR relies strongly on an interpretation of the definition of municipal waters cited earlier and emphasizes the phrase, "Municipal waters include not only streams, lakes, inland bodies of water and tidal waters within the municipality which are not included within the protected areas as defined under Republic Act No. 7586 (The NIPAS Law)." As a result, the conflicting positions have adversely affected the active support and participation of LGUs in the management of some NIPAS-declared MPAs.

Despite the relatively strong regulatory framework for MPAs in the Philippines, there is a lack of coherence in policy implementation and performance. There are enduring problems with monitoring and enforcement, and with harnessing a sustainable financing mechanism. Enforcement of MPAs remains weak due to limited local resources, capacity, distribution of benefits, and awareness among key stakeholders. Finally, sustainable financing is still a challenge, especially to cash-strapped local governments and resource-dependent coastal communities.

Policy challenges are being addressed, in some cases, through innovative arrangements between local governments and local PAMBs. Apo Island is a good example of how the DENR, the LGU and a local academic institution (Silliman University) overcame initial challenges as the MPA evolved from a community-based MPA to an NIPAS site.

The challenge of sustainable financing for MPAs is ongoing. Bilateral and foundation financial support has been considerable and probably amounts to tens of millions of dollars per year (Olsen and Christie, 2000). However, some United States-based foundations have withdrawn from the Philippines. While some donors have invested considerable sums over time, the sustainability of their investment impact is fragile, especially as pressures mount and economic downturn draws away resources from this topic to what are perceived as more fundamental needs (Christie *et al.*, 2005). On a positive note, some LGUs and communities have demonstrated

long-term commitments to marine resource management. While the list of challenges is considerable, the capacity for innovation of Filipino institutions and individuals involved in MPA implementation is equally impressive. Within three decades, a globally recognized system of MPAs has been declared. The management lessons and social and ecological impacts have been documented and widely disseminated through formal and informal means.

In the design and implementation of MPAs, cooperative efforts are similarly often motivated by access to donor funding and stimulated by shared knowledge from past experiences in MPA management. While incentives and disincentives vary by site (and are poorly documented), the multi-institutional collaborations necessary for effective MPA implement, if properly implemented, have the potential to reduce costs and improve the effectiveness of any institution (Eisma-Osorio *et al.*, 2009). If poorly implemented – with unclear goals, imbalances in contribution and cost-sharing, and ill-defined rules of collaboration – then institutional collaboration will result in high costs and little benefit (Lowry, White and Courtney, 2005). Marine resource management, while increasingly mainstream, is still of lower priority than education, basic services and health care for LGUs in the Philippines. As such, MPAs must result in a clear benefit in the form of tangible economic benefits for citizens or reduced cost for government (Christie *et al.*, 2009).

5. SOCIO-ECONOMIC AND ECOLOGICAL CONSIDERATIONS AND IMPACTS

5.1 Impacts of MPAs on fisheries

Consensus has not been reached on the impacts of MPAs on fisheries. However, ongoing research over nearly two decades in two important Philippine sites, the Apo and Sumilon Islands, demonstrates that MPAs have at least a stabilizing effect on reef conditions and fisheries – a significant outcome in a context of declining fisheries yields and marine habitats. Two critical reviews – Maypa *et al.* (2002) and Russ *et al.* (2004) – conclude the following:

> *The utility of no-take marine reserves as fisheries-management tools is controversial. It is hypothesized that marine reserves will help to sustain fisheries external to them by becoming net exporters of adults (the 'spillover effect') and net exporters of propagules (the 'recruitment effect'). Local fishery benefits from spillover will likely generate support from fishing communities for marine reserves. We used underwater visual census to show that biomass of Acanthuridae (surgeonfish) and Carangidae (jacks), two families of reef fish that account for 40–75 percent of the fishery yield from Apo Island, Philippines, tripled in a well-protected no-take reserve over 18 years (1983–2001). Biomass of these families did not change significantly over the same period at a site open to fishing.*
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> *The reserve protected 10 percent of the total reef fishing area at the island. Outside the reserve, biomass of these families increased significantly closer to (200–250 m), than farther away from (250–500 m), the reserve boundary over time. We used published estimates of fishery catch and effort, and fisher interviews (creel surveys) to show that the total catch of Carangidae and Acanthuridae combined at Apo Island was significantly higher after (1985–2001) than before (1981) reserve establishment. Hook-and-line catch per unit effort (CPUE) at the island was 50 percent higher during 1998–2001 (reserve protected 16–19 years) than during 1981–1986 (pre-reserve and early phases of reserve protection). Total hook-and-line effort declined by 46 percent between 1986 and 1998–2001. Hook-and-line CPUE of Acanthuridae was significantly higher close to (within 200 m) than far from the reserve. CPUE of Carangidae was significantly higher away from the reserve, possibly reflecting a local oceanographic effect. The benefits of the reserve to local fisheries at the island were higher catch, increased catch rate, and a reduction in fishing effort. The fishery and tourism benefits generated by the reserve have enhanced the living standard of the fishing community.*

– Russ *et al.*, 2004, 597

Fish yields and catch rates recorded in the 1980s were compared with daily roving creel surveys carried out in 1997/98, 2000 and 2001 at Apo Island. Total annual fish yields were measured six times over the period 1980–2001. Total fish yield was 19–25 t km^{-2} year^{-1}, with reef and reef-associated fish accounting for 15–20 t km^{-2} year^{-1}, for five measurements. A sixth measurement, made in 1986, estimated 36.7 t km–2 year^{-1}. Annual yield remained stable over the study period. Carangidae and Acanthuridae accounted for 26–47 percent and 16–27 percent of the catch, respectively. Non-reef catches declined over time, from 6.21 t year–1 in 1980/81 to 1–2 t year–1 in 2000 and 2001. Estimates of annual hook and line catch per unit effort (CPUE) increased from 0.13–0.17 kg man^{-1} h^{-1} in 1980/81, to 1–2 kg man–1 h^{-1} in 1997–2001. For target families, hook and line CPUE was consistently higher in 1997–2001 than in 1980–1986. However, hook and line CPUE for Carangidae and Acanthuridae declined significantly between 1997 and 2001…. Differences in methods used in estimates, and changes in gears and fishing effort over the years, make comparisons difficult.

– Maypa *et al.*, 2002, 207

These findings suggest that MPAs, alone, will not meet all fisheries management goals. The preponderance of evidence suggests that they improve the sustainability of nearshore, coral reef fisheries, especially those that are overfished – as is the case in the Philippines. While the impact of relatively small no-take areas is still under review, the declaration of a no-take area by local communities certainly reduces illegal and destructive fishing, once common throughout the Philippines (Christie and White, 1994; Christie, White and Deguit, 2002; White, Aliño and Meneses, 2006). As municipal governments collaborate to implement coastal management initiatives that include MPAs, they are also less likely to allow illegal commercial fishing, which has resulted in considerable overfishing in the Philippines (Pauly, 2000; Eisma-Osorio *et al.*, 2009).

Impact on pelagic and offshore fisheries is poorly understood, and no such MPAs exist in the Philippines other than Tubbataha Reef National Marine Park. The impact of "no-fishing" in that large an MPA in the open seas is unknown.

MPAs are more effective when embedded within larger management regimes – such as ICM, EBM or the ecosystem approach to fisheries (EAF) – in contributing to sustainable fisheries outcomes (World Bank, 2006; Christie *et al.*, 2007). Basic fisheries management techniques such as fishing effort control, seasonal closures and gear restrictions are critical to maintaining fisheries. As highlighted above, these techniques have been infrequently applied in the Philippine context.

The impact of MPAs on fisher behaviour, most importantly spatial distribution of fishing effort, has not been studied in the Philippine context. Anecdotal evidence suggests that, in a context of overall resource decline and open access outside no-take areas, fishers are attracted to fish at the boundaries of successful MPAs (Christie, White and Deguit, 2002). This is particularly problematic for community-based MPAs – such "free-ridership" may undermine local community commitment to MPAs and the willingness to sacrifice short-term interests for long-term gains. If costs (for enforcement, loss of fishing grounds) are incurred locally, while benefits are shared beyond community boundaries, incentives to protect any local MPA are reduced. The wide distribution of MPAs throughout the country may tend to reduce this problem.

The tendency to use MPAs as the preferred management tool in the Philippines may preclude consideration of other less popular, but important, fisheries management options. Closing open-access regimes will be difficult. Management techniques such as the reduction of fishing effort and control of fisher access to neighbouring waters were notably unpopular among fishers in 36 communities surveyed in 2007 (unpublished data). One project funded by the United States Agency for International Development

is beginning to engage in MPA and fisheries management (through effort control and seasonal closures) as part of an ecosystem-based fisheries management effort (Armada, White and Christie, 2009).

MPAs also have complex impacts on socio-economic and governance processes. At the most abstract level, MPAs in the Philippines might be considered the means by which communities are reasserting their tenure rights over nearshore areas that had been lost during colonialism and centralized governance. Alternatively, MPAs may be thought of as externally driven management interventions promulgated mainly by NGOs or donor projects for interests external to coastal community needs. Both interpretations may be accurate to some degree in any one site. At the site level, the way MPA benefits, if any, are distributed has enormous impact on community receptivity and support (Christie, 2004; Oracion, Miller and Christie, 2005). Rent-capturing by powerful elites, most notably tourism interests, has created conflict around certain MPAs (Christie, White and Deguit, 2002; Oracion, Miller and Christie, 2005). Tourism presence in an MPA area can increase MPA success as measured by social and biophysical goals, but active involvement of tourism brokers in MPA policy-making and enforcement can have negative impacts on rule compliance by local fishers, who feel that such MPAs are controlled by and benefiting local tourism elites (Oracion, Miller and Christie, 2005; Thiele, Pollnac and Christie, 2005). If participatory and equitable planning processes are established, the likelihood of long-term success and interest in MPAs increases. As a means of protecting coastal ecosystem productivity, MPAs have the potential to contribute to sustainable coastal economies. In conclusion, while general principles of successful MPA governance have been identified (White, Aliño and Meneses, 2006; Christie and White, 2007), MPA policy-makers will need to tailor their strategies to local contexts and realities.

In view of these considerations, tremendous opportunity exists for research by natural and social scientists that is mandate responsive (improving the design and effectiveness of MPAs) or mandate independent (questioning the validity and assumptions of MPAs) (Christie *et al.*, 2003c). The demand for MPAs, as well as the controversies surrounding them, will probably increase in coming years. Researchers have an opportunity to provide relevant information describing the trade-offs associated with MPAs and other management tools. The adoption of such information within an adaptive management framework has been lacking in the Philippines and represents an important challenge. However, various tools exist to help guide the collection of relevant information (Pomeroy *et al.*, 2005). MPA data repositories, such as the MPA Database (www.coast.ph), are also in place to track progress.

6. COORDINATED APPROACHES TO MPAS FOR FISHERIES MANAGEMENT AND CONSERVATION

6.1 MPAs embedded within other larger spatial management regimes

Philippine MPAs are most commonly embedded within other coastal management and fisheries management processes. In fact, MPAs have arguably become one of the dominant management tools, while other options have been overlooked. Fisheries management has generally focused on enforcement of laws against dramatically destructive fishing gear (such as blast, cyanide or *muro-ami* fishing [using weighted scare lines to herd reef fish into nets]), while critical issues related to access and effort have been overlooked.

Successful management initiatives have relied on engaging multiple institutions, including people's organizations, NGOs, LGUs, national agencies and international donors. Within particular project areas, dramatic improvements have been made in coastal and fisheries management (Christie *et al.*, 2007; Armada, White and Christie, 2009; Eisma-Osorio *et al.*, 2009). These initiatives tend to be unstable, however, given the lack of sustained finance and continued institutional commitment (Christie *et al.*, 2005).

Institutional overlap and conflict take place, as noted above with regard to the Fisheries Code or NIPAS designation of MPAs. Rules of support and accountability among institutions and levels of governance – critical to nested institutional regimes (Lowry, White and Courtney, 2005) – are workable, but they require intensive, long-term commitment. When commitment exists among institutions for complementary policy-making, MPAs are generally successful and generate multiple benefits. MPAs fail when institutional competition or conflict is common (Lowry, White and Courtney, 2005; Christie *et al.*, 2009). Under the framework of EBM or EAF, management programmes will need to consider ecological boundaries. In the decentralized context of the Philippines, this translates into multi-LGU cooperation (Armada, White and Christie, 2009; Eisma-Osorio *et al.*, 2009). Realizing EBM in an incremental and bottom-up fashion is probably the most feasible approach to this scaling-up undertaking (Christie *et al.*, 2009).

MPAs are currently supporting sustainable nearshore fisheries. They do not appear to have a negative impact on fisheries management, at least partly because almost no other fisheries management exists. The interfacing of MPA and basic fisheries management systems represents the next critical step in Philippine ocean resource management. Without increased control of fishing effort and fisher movement, existing MPAs will eventually fail. The generally small MPAs will not be able to maintain fish stocks, even if they are well protected. Free-ridership on successful MPAs, as highlighted above, will undermine local co-management arrangements.

7. FUTURE DIRECTIONS

As stated initially, the Philippines represents the best and worst of ocean resource management. The stakes are high locally, considering the size of the fisheries sector, the country's reliance on marine-based protein sources, and the need for ocean-based economic development. The marine ecosystems of the Philippines, at the epicentre of marine biodiversity, are of global significance. Considering progress made in the last three decades towards coastal management and MPA implementation, the improvement of nearshore fisheries management would seem attainable within the next ten years. Integrated programmes, using an EBM framework to implement MPA networks with fisheries management (Armada, White and Christie, 2009; Eisma-Osorio, 2009), are challenging but feasible. There is no reason to believe that systems including fishing effort control, closing of open-access regimes, and MPA networks could not be expanded. Empirical research (Pollnac, Crawford and Gorospe, 2001; Christie *et al.*, 2009) suggests that, as with MPA implementation, the elements of institutional commitment, leadership, ongoing and effective technical support, equitable benefit-sharing and conflict resolution are necessary for progress. Practical field experiences validate these research findings and provide guidance on how to realize these processes effectively (White, Salamanca and Courtney, 2002; World Bank, 2005, 2006). In the context of intense poverty and weak economics, it is almost certain that the Philippines will require ongoing external financial support. The judicious use of expatriate technical assistance is also necessary, despite impressive indigenous technical skills and experience.

The knowledge base for effective MPA implementation is impressive. There is much less understanding of – and leadership commitment to – the implementation of basic fisheries management. The integration of MPA and fisheries management systems is increasingly common and is creating productive results.

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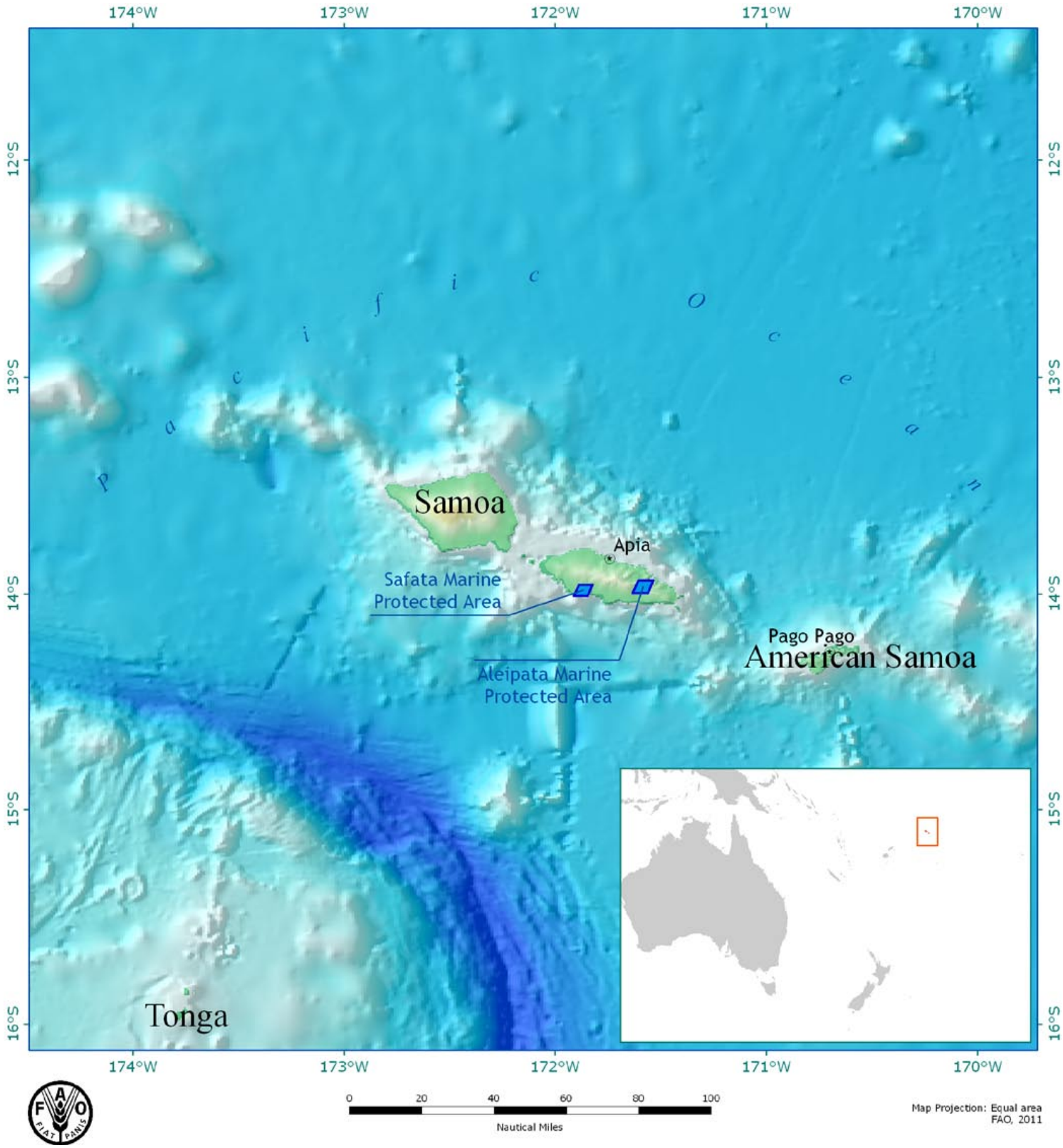
Map 1
Map of Samoa



Samoa

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1. INTRODUCTION

Samoa comprises a small group of islands in the South Pacific with a limited area of coastal reef (Map 1). Despite this, more than 80 percent of the population lives a subsistence lifestyle with fishing considered critically important to both food security and the integrity of Samoan culture.

Samoa remains one of the five least-developed countries in Oceania (United Nations designation), with a society organized around a complex web of family, kinship and village expectations and obligations (Severance *et al.*, 1998). The impacts of fishing have been felt for many decades, with studies in the early 1990s concluding that Samoa's reefs and lagoons were among the most degraded in the Pacific (Zann, 1991, 1992). Zann attributed this to: (i) overfishing due to increasing demand; (ii) use of effective and modern, but non-selective fishing techniques; (iii) use of destructive techniques such as poisons and dynamite; and (iv) loss of fishing habitat through reclamation, coral sand mining and drainage (Tuaopepe, 2005).

The growing concern for addressing and resolving these problems has resulted in various conservation initiatives. Of particular significance is the action taken by a number of villages to set up fish reserves within their traditional fishing grounds. Local community action is arguably the single most important factor driving the conservation movement in Samoa, and this initiative to protect coastal resources is critically important for future generations.

2. FISHERIES AND SPATIAL MANAGEMENT

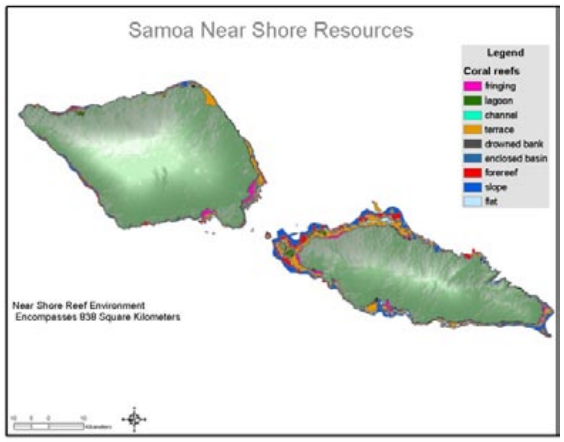
2.1 General condition of marine fisheries

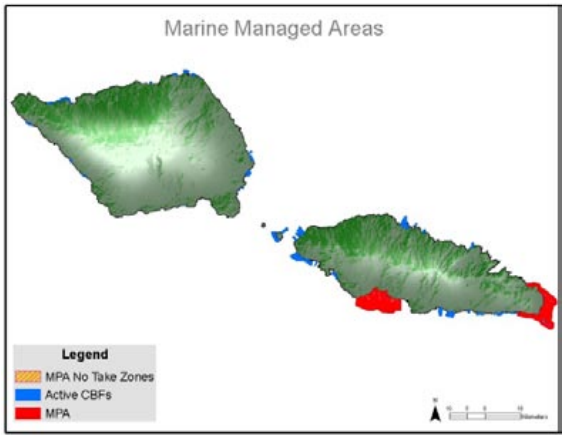
Samoa (previously known as Western Samoa) consists of two large islands, Upolu and Savaii, with eight smaller ones (for a total land area of 2 935 km^2, see Figures 1a and 1b). Samoa became independent in 1962. The population of 180 741 (2006 census) is predominantly settled on the main island of Upolu (in 2008, 76 percent of total residents – Samoa Bureau of Statistics) and has an average density of 61 people per km^2, although higher population densities are found near the coast (up to 420 people per km^2 in some areas). Despite high outmigration to Australia, New Zealand and the United States of America, the population of Samoa is still growing (+0.5 percent per annum).

The Samoan archipelago (Map 1) has volcanic origins and a coastline of 590 km (Paul Anderson, personal communication, 2009). There is a limited amount of shallow water reef, mostly comprised of fringing reef enclosing narrow and shallow lagoons (Skelton *et al.*, 2000). According to calculations based on Landsat imagery,[1] the total

[1] The Landsat Program is a series of Earth-observing satellite missions jointly managed by the National Aeronautics and Space Administration (NASA) and the U.S. Geological Survey.

FIGURES 1A AND 1B
Samoa's nearshore habitats and marine managed areas





Note: CBFs are community-based fisheries management systems, MPAs are larger area controls centred on the Safata and Aleipata communities.

Source: Secretariat of the Pacific Regional Environment Programme (SPREP).

area of shallow reef (less than 30 m deep) is 466 km^2, although a lesser figure of 231 km^2 is generally reported (Johannes, 1982). Due to the proximity of neighbouring countries, the exclusive economic zone (EEZ) of Samoa is also relatively limited and does not extend 200 nautical miles offshore in any direction (Figure 1).

Bell and Mulipola (1995) documented the status of important fishery resources (e.g. finfish, crustaceans, molluscs, lobster, sea cucumbers, sea urchins, Palolo worms [*Eunice viridis*], jellyfish and seaweeds). Many of these plants and animals are endemic to Samoa (Table 1), and reviews of biodiversity values in 226 South Pacific islands in the early 1980s note the relatively high importance of this archipelago (Dahl, 1986; Mittermeier *et al.*, 2004; Conservation International, MNRE and SPREP, 2010).

The limited scale of the resource base in Samoa is reflected in the fact that commercial fishing constitutes only ~5 percent of total employment (with the biggest contributions coming from agriculture and forestry). Possibly because of this limited scale, coastal marine habitats have been heavily affected by natural and human influences for many decades (Green, 1996). Natural disturbances include repeated crown-of-thorns starfish (*Acanthaster planci)* infestations, cyclone damage and coral bleaching events. Samoa's position near the southern edge of the intertropical convergence zone exposes it to regular cyclonic activity, and the country has experienced 16 cyclones in the past 25 years, with major cyclones in the early 1990s and in 2004.

Artisanal and small-scale commercial fishing are carried out both inside and outside the lagoons. Offshore fishers initially used aluminium catamarans to target high-value, deep-water snappers along the southern shelf area. This resource soon became heavily exploited, however, and fishers responded by using fish aggregation devices to target tuna (Itano, 1996a, 1996b). Most community fishing occurs in shallow lagoons, using either hand-gleaning techniques (Eriksson, 2006; Eriksson *et al.*, 2007) or fishing from small vessels. A 2003 creel survey covering 112 villages on Upolu and Savaii showed that hand spears were the main fishing tool (32 percent of total) (FAO, 2006). The survey also found that more-destructive fishing methods, such as dynamiting, poisoning and breaking of coral, have been a concern in the past (Fa'asili and Taua, 2001; Tuaopepe, 2005).

Exploitation of shallow lagoons was traditionally a subsistence activity. Fish landings indicate that resources in such areas have declined with the rise in commercial sales (with marked decreases since 1986) (Samoilys and Carlos, 1991; Horsman and Mulipola, 1995; Green, 1996; Zeller *et al.*, 2006). Skelton *et al.*, (2000) specifically noted declines in landings of grey mullet (*Mugil cephalus*) and milkfish (*Chanos chanos*), giant triton (*Charonia tritonis*) and the mangrove crab (*Scylla serrata*).

TABLE 1
Samoa's biological significance

Samoa is geologically young, with limited number of marine coastal environments (habitats).
Isolation of archipelago contributes generally to high species endemism.
Reef fish diversity is limited to 113 families and 991 species (NOAA, 1984 – listing also covers American Samoa).
About 40 fishes are endemic to Samoa, most of which are not described (Skelton *et al.,* 2000).
Samoa has only 50 species of hard coral diversity (Kramer, 1995; Gosliner, Behrens and Williams, 1996). Neighbouring Fiji has 163.
Three species of native giant clam have been identified (of which two are functionally extinct), and 11 species of commercial sea cucumber (Friedman *et al.,* 2006).
Samoa and American Samoa have 287+ taxa of algae (Skelton and South, 1999; Skelton *et al.,* 2000).
Two species of seagrass have been noted. Seagrass beds are of limited scale.
Mangroves are uncommon, but Vaiusu Mangal is considered largest in East Polynesia (Skelton *et al.,* 2000; Suluvale, no date).
Four turtle species have been recorded in local waters (green [*Chelonia mydas*], hawksbill [*Eretmochelys imbricata*], olive Ridley [*Lepidochelys olivacea*] and a few specimens of leatherback [*Dermochelys coriacea*]). Locally only hawksbill nests, although green and hawksbill turtles nest on neighbouring Rose atoll (part of American Samoa).
Cetacean diversity in Samoa is poorly described, but genetic isolation in three dolphin species is suggested (Walsh and Paton, 2003).
Samoa has at least 20 resident seabird species. Twenty percent rate of endemism in bird species of Samoa (Taule'alo, 1993; Craig, 2002).

Despite these noted declines, total fishery production from subsistence and small-scale commercial fisheries is still substantial (Passfield, Mulipola and King, 2001). Total fish exports (oceanic and coastal) were about 4 500 tonnes in 2000, equivalent to 60 percent and 70 percent, respectively, of the total value of all exports for that year (Watt and Moala, 2001). Assessments made in the late 1990s (Gillett and Lightfoot, 2002) estimated that all subsistence fishing activities produced about 4 293 tonnes, with coastal commercial fishing bringing in an additional 3 086 tonnes (Gillett, 2009). A more recent assessment (Valencia *et al.,* 2007) calculated the local consumption of finfish alone at 10 508 tonnes per year (7 900 tonnes in Upolu and 2 608 tonnes in Savaii). Finfish from the reef and the lagoon (predominantly surgeonfish and parrotfish) contribute greatly to the domestic market. Surgeonfish accounted for 20–40 percent of all inshore fish landings passing through the Apia market (Dalzell and Burgess, 1995; see also Skelton *et al.,* 2000). In 2008, surgeonfish (*Acanthurus lineatus, Ctenochaetus striatus* and *Naso* spp.) again topped the list, constituting 22 percent of the total weight of fisheries products sold (MAF, 2008). Invertebrate resources are typically for subsistence use, and those that are sold commercially are recognized as being under high fishing pressure (e.g. lobster, crab and raw sea cucumber [predominantly *Stichopus monotuberculatus*; Eriksson, 2006]). Jellyfish is also a popular food (Passfield *et al.,* 2000; Tuaopepe, 2005).

In Samoa there is also concern over the decline in marine vertebrates, such as turtles (Witzell and Banner, 1980). Although once abundant (Williams, 1837), turtle numbers have declined, largely due to human exploitation of nesting females and the harvesting of eggs (Travis, 1980; Zann, 1991; Bell *et al.,* 2006; Ward and Asotasi, 2008). In the early 1970s, the Fisheries Division initiated a conservation programme that did not attempt to reserve nesting habitat, but instead involved transferring eggs to a secure hatchery facility in an effort to increase turtle stocks (Witzell, 1974; Philipp, 1978).

2.2 Spatial management in fisheries and conservation – and institutional framework

Before the establishment of a centralized government, the ownership of marine areas and their associated resources was traditionally vested in the matais of each village (titled chiefs and family leaders), and the council of village chiefs (fono a alii ma faipule – hereafter fono), who used their authority to regulate the exploitation of marine resources (Von Bulow, 1902; MacKay, 2001). Regulation techniques included

various ranges of complex taboos or "sa", which restricted certain fishing grounds for ceremonial purposes – establishing temporal or spatial closed areas for certain fish and invertebrate species – or restricted effort or capturing methods to certain seasons and locations.

Since the mid-1980s, some community groups have attempted to ban the use of chemicals, dynamite and plant-derived poisons (ava niukini), and many villages have banned certain traditional fishing methods considered to be destructive, such as the breaking of coral to catch sheltering fish (fa'amo'a and tuiga). Some communities have also limited overly efficient methods of fishing, such as the use of nets and underwater torches for spear-fishing at night. Other community conservation measures have included collecting crown-of-thorns starfish, banning sand removal from beaches, and prohibiting the dumping of rubbish in lagoon waters.

Non-governmental organizations (NGOs) such as the O le Siosiomaga Society advocate for the protection of the marine environment in Samoa (Table 2). Other marine conservation NGOs, such as Faasao Savaii (which has a predominantly terrestrial focus) and Matua-le-o'o Environment Trust Incorporated (METI) are active under the coordinating body for NGOs in Samoa (Samoa Umbrella for Non-Governmental Organisations – SUNGO).

Since 1995, area conservation programmes have typically taken one of two forms. The first involves establishment of village fishery reserves with the support of the Samoan Fisheries Division, while the second involves a more extended marine protected area (MPA) approach (e.g. in the Aleipata and Safata Districts), supported by the Samoan Ministry of Natural Resources & Environment (MNRE). Both approaches involve the establishment of village management plans and community fisheries rules, and in some cases, alternative livelihood projects to offset the opportunity costs of establishing fishery reserves.

The Fisheries Division, within the Ministry of Agriculture and Fisheries (MAF), is the government agency responsible for fishery resources in Samoa (Table 2). Through fisheries legislation (Table 4), the division has sought to conserve fishery resources, manage exploitation, increase fish production, generate employment and improve nutrition (Mulipola, Ropeti and Iosefa, 1995). Most Fisheries Division controls (e.g.

TABLE 2
Institutions responsible for coastal environment and fishery resource management in Samoa

Agency	Planning/ management	Research	Monitoring	Education/ outreach	Training	Surveillance/ enforcement
Community groups and councils	X		Various projects	X		X
NGO: O le Siosiomaga Society (1990–)		X	Land, lagoons and offshore	X	X	
NGO: Faasao Savaii (more-terrestrial focus)	X			X		
Matua-le-o'o Environment Trust Incorporated (METI)	X		Four coral-growing trials	X		
Police Department						X (limited)
Fisheries Division (1970–)	X		Various projects			X
Fisheries Extension Programme (1995–)	X		Advice to communities	X	X	X
Division of Environment and Conservation, Ministry of Natural Resources & Environment (1990–)	X	X	MPAs, including Safata	X	Through exchange visits	X

regulations on what can be fished and at what sizes) have not been wholly effective, as population pressures have increased, coupled with a recognized lack of human and financial resources for surveillance and enforcement. Thus in the early 1990s, the Fisheries Division switched focus and, through its Fisheries Extension Programme (established in 1995 with Government of Australia assistance), began to give greater support to community conservation initiatives, working closely with villages to encourage responsible management and exploitation of inshore resources.

In some cases, these efforts were implemented in conjunction with the MNRE. The Division of Environment and Conservation (DEC), within the MNRE, has a Marine Conservation Section that supports community conservation work to empower larger-scale area governance in the Aleipata and Safata Districts. The Fisheries Extension Programme currently supports development of management frameworks for community-managed fishery reserves in about 117 villages of Samoa. The DEC uses a similar community-based approach to establish (and then verify) the concept of community-based MPA management in these districts (Government of Samoa, 2003).

Spatial controls are being developed further offshore as well. In 2002, the Cabinet approved the designation of the entire EEZ as a national marine sanctuary for sharks, dolphins, turtles and whales (Government of Samoa, 2003). However, no formal legislation or gazettal exists to date. These efforts followed a government initiative to prevent vessels greater than 50 feet in length from fishing within 50 nautical miles of the islands (Chapman, 1998). The partitioning of different-sized vessels or gear types into appropriate areas (i.e. the area closures now under consideration) is consistent with Articles 6.18 and 7.6.5 of the FAO Code of Conduct for Responsible Fisheries.

3. MPAS FOR FISHERIES AND CONSERVATION: DESIGN AND MANAGEMENT STATUS

3.1 MPA terminology, design objectives, descriptions and Institutions

The Fisheries Extension Programme helped communities develop recognized village fisheries management plans (VFMPs). The plans cover various types of marine areas, which are locally managed through a variety of tools and regulations and which may include one or several no-take zones. About 80 percent of the participating communities opted to establish no-take village fishery reserves as part of their VFMP (Vunisea, 2002). During 1996–97, 22 such village fishery reserves were established (Reti, no date), and during 2006–07, the number of locally enforced reserves was estimated to range from 25 to 69, depending on the definition of "reserve" used (MAF, 2007). The latest figures suggest that of the 43 village fisheries management reserves on the main island of Upolu, 26 are active. On the neighbouring large island of Savaii, 25 of the original 36 reserves are active (Govan *et al.,* 2009).

King and Fa'asili (1999) note that small, community-owned, village fishery reserves in Samoa are not easy to classify under existing International Union for Conservation of Nature (IUCN) MPA categories (IUCN, 1994). Category IV (habitat/species management area) appears to provide the best fit, although the category guidelines refer to national rather than community ownership. Category VI (multiple-use MPAs) could also apply. Given the increasing trend towards community-based management, the popularity of reserves as a fisheries conservation tool and the small size of some village reserves, a new IUCN category for "networks of small, highly protected, community-owned MPAs" may be needed. Owing to the community-based management structure of many of the reserves in Samoa, these areas are also not easy to classify using World Commission on Protected Areas (WCPA) classes (Table 3) (UNEP-WCMC, 2008).

In Samoa, reserves are defined as marine parks or reserves. 'Marine parks' are characterized as public lands of 600 hectares (ha) or more – or islands – to which the public is guaranteed access, subject to any controls necessary for the preservation of the park's features. "Reserves" (which may be nature, recreational or historic reserves – or

TABLE 3
Examples of MPAs – with related institution, designation and description

Name	Control agency	Designation	Comments
O Le Pupu-pu'e	MNRE	National park, IUCN II	First and only national park (created in 1978). Predominantly terrestrial coverage, but includes rugged lava coast in south. Total area 4 228 ha.
Palolo Deep	Jack To'omalatai (local landowner), DEC and MNRE	National marine reserve, IUCN IV	Protection of marine habitat diversity and related resource species for public and tourism purposes. A submerged coastal reef, "Deep" is a hole about 200 m in diameter, 10 m deep within a fold in fringing reef. Beach extends onto reef flat, which is dotted with small basalt rocks. On seaward side of Deep is a talus slope of sand and coral debris. Fore-reef slope and extensive submarine terraces have rich coral cover. Marine area 22.3 ha.
Aleipata (including Nu'utele Islands)	Aleipata District Committee, MNRE	Conservation area, IUCN VI	Protection of fish populations, turtles, birds and marine habitats. Multiple no-take zones. Ecotourism objective. Habitat from high-water mark to about 0.8 km seaward of reef drop-off, including four islands. Marine area 4 842 ha.
Safata (including Fusi-Tafitaola Reef, Aau Gasese submerged reef and Sa'anapu-Sataoa)	Community, MNRE	Conservation area, IUCN	Protection of marine habitat diversity and related resource species of subsistence and/or commercial value. Ten no-take zones in MPA designated according to results of scientific survey and local knowledge. Ecotourism objective. Among Samoa's best remaining examples of coral reef, mangrove and lagoon environments. High-water mark to 1.6 km seaward of reef drop-off. Marine area 5 870 ha.
Community fish reserves (with recognized VFMPs and supporting by-laws)	Community, MAF, MNRE	Reserve	Various
Other community fish reserves (not nationally legislated)	Community, MAF, MNRE	Reserve	Various

"other") may include areas of the territorial seas, although customary fishing rights are guaranteed. Access to and activities within reserves may be restricted. Reserves can be nationally or community managed (Table 3).

3.2 Decision-making processes

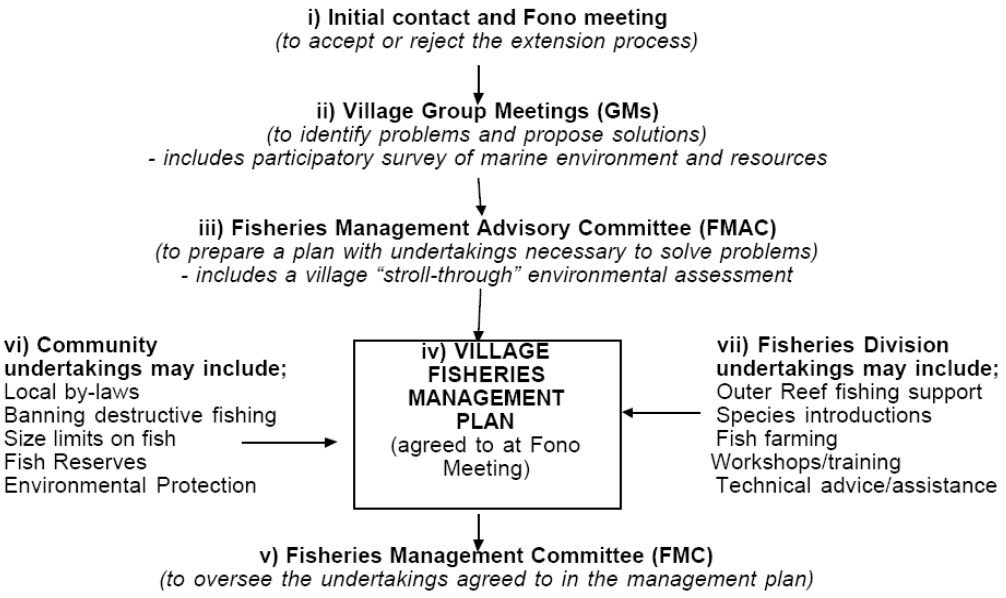
The decision processes for forming community-based reserves in Samoa follow a pathway developed by the Fisheries Extension Programme (Figure 2).

The Fisheries Extension Programme helps villagers develop VFMPs that define a process for better management and conservation of marine resources and habitats. Initially, a demonstration management plan for an imaginary village, "Fiaola", is considered with the community – in order to facilitate the VFMP process. Each participating village then forms a local Fisheries Management Committee (FMC), and a plan is formulated in the Samoan language. In general, the consultations emulate customary procedures: they begin by involving the fono, followed by planning groups in intermediary stages, and finally, a fono meeting notifies the larger community that the VFMP has been accepted.

At all stages of the process, participating communities are encouraged to analyse their fishing problems and develop their own solutions. The overall approach is based on four principles (King and Fa'asili, 1998a, 1998b):

- maximum participation to involve all groups in the community;
- motivation, rather than education, as all village communities already know the importance of responsible exploitation of their fishery resources;
- demand-based extension system using a "bottom-up" approach;
- development of alternative sources of seafood to prevent heavy exploitation of lagoons and nearshore reefs.

FIGURE 2
Diagram of fisheries extension process in Samoan villages



Source: Fa'asili and Taua, 2001.

The Fisheries Extension Programme bases support staff at both Upulo and Savaii to facilitate the process of assisting communities. Assistance consists primarily of technical advice on care of the marine environment and support for moving the management process forward. Secondarily, alternatives can be offered to the present heavy exploitation of lagoons and damaged nearshore reefs through development of ecotourism and/or mariculture activities.

Management plans for both individual villages and larger areas (e.g. the Safata and Aleipata MPAs) are comprehensive in nature. In addition to noting basic conservation controls, they include instructions on educational and awareness-generating activities and suggested goals in the development of alternative income-generating activities. As an example, Table 4 presents the vision statement and guiding principles of the Aleipata MPA.

MPA plans are also very prescriptive in describing permitted fisheries activities and penalties. In the 30+-page Aleipata management plan for 2008–2010 – in addition to outlining rules for no-take areas – no fewer than ten fishing methods are banned (dynamite, ava niukini and related fish poisons, chlorox and related bleaches, cyanide, gramoxone, Barrintonia seed, coral pounding, fish traps, fishing nets and commercial scuba fishing). These controls or area exclusions are accompanied by prescribed penalty rates should violations be detected.

3.3 Perception of MPAs

The Fisheries Division has taken a comprehensive approach to public awareness campaigns, stressing the importance of conservation measures for the limited natural resources of Samoa (Government of Samoa, 2003). In a survey by Bell *et al.* (2006), which assessed community awareness of turtle conservation, the vast majority of villagers surveyed on both Savaii and Upolu were aware of relevant national legislation and control measures. This is not always the case for less iconic species, however, and lack of awareness of management regulations is still an area highlighted as a major barrier to conservation (along with issues of governance) (Momoemausu, Gie and Tuaopepe, 2008).

TABLE 4
Vision and principles of the Aleipata MPA (2008–2010 version)

VISION

Our marine environment is a gift from God to the people of Aleipata. We declare our commitment to working together to conserve our marine resources so that they may be used wisely and can provide new opportunities to sustain the way of life of Aleipata's people now and for future generations.

GUIDING PRINCIPLES

- We believe that Christianity and the fa'a samoa – our way of life and culture – underpin the success of our Aleipata MPA.
- We take responsibility for making all decisions for our Aleipata MPA.
- We commit to maintaining the life-support systems of our marine environment and to conserve and wisely use the resources they contain.
- We will focus on raising awareness and the education of our people, particularly our children, to support our Aleipata MPA.
- We will find opportunities to develop businesses that are sustainable, compatible and profitable for our people and our Aleipata MPA.
- We commit to operating our Aleipata MPA in a transparent and accountable manner.
- We commit to operating our Aleipata MPA in a just manner, and to fair and equitable cost- and benefit-sharing.
- We will build partnerships within and outside Samoa to assist the implementation of our Aleipata MPA management plan.
- We commit Aleipata's offshore islands (Nuulua, Nuutele) and their wealth of biodiversity as a critical part of our Aleipata MPA.
- We believe our Aleipata MPA management plan is a work in progress that, like the MPA, will never end. We will agree to changes over time to best achieve our vision for Aleipata's MPA.
- We commit to sharing the experience of the Aleipata MPA for the betterment of Samoa and its people.

Community-based fisheries conservation measures (such as institution of village fish reserves, prevention of destructive fishing methods and imposition of fish size limits) have fuelled perceptions of short-term decreases in catches. This is especially true for reserves, as they reduce the already limited area available for fishing. Despite the small sizes of these reserves, it is doubtful that community-based fisheries management would continue, as it is invariably dependent on some form of ongoing support and incentives – delivered by the community extension programmes of MAF and the MNRE. In some cases, failure to deliver promised incentives has hindered the development of community management programmes, or caused ill feeling among villagers (e.g. caused by a shortage of giant clam seed from the government hatchery, or the unavailability of funding to purchase boats to encourage fishing in deeper waters).

As communities manage fishery reserves, there is an expectation that local people will have a direct interest in their continuation and success. This makes the prospect of continued compliance more promising than when coastal resource protection relies solely on centralized government controls. However, as resource recovery is likely to be slow, there is always a danger that communities will lose enthusiasm for following their VFMPs, particularly when small groups within communities do not agree or do not voluntarily comply with VFMPs (Lambeth, 1998). Indeed, there is evidence of such failures. According to an interim Fisheries Division report, of the 71 villages developing VFMPs, four withdrew due to village disputes, while the rest continued to operate with "various degrees of success".

Recent surveys by the Pacific Regional Oceanic and Coastal Fisheries (PROCFish) project, within the Secretariat of the Pacific Community (SPC), assessed 17 countries across the Pacific, and collected information from four sites in Samoa (SPC, 2008;

Vunisea *et al.*, 2008). According to the findings, the community management framework is perceived to bring about various levels of spatial protection, ranging from well-protected reserves over productive fisheries grounds to situations with marginal compliance and undefined conservation success (M. Kronen, personal communication, 2008). Other studies highlighted that, in some cases, fishery reserves were placed over areas of low fisheries importance (Fisk, 2003b).

Within the SPC (2008) study, the site of Vaisala stood out. There was long-term involvement in the community-based programme, and the reserve was well respected by fishers, who had a positive perception of its effects. In addition, monitoring by both the community and the Fisheries Division was ongoing. However, the reserve area was relatively small, and the ban on fishing activities was lifted on occasion. Reportedly high catches from within the reserve were one of the reasons for the positive perception of recovery. Moreover, as a result of this management regime, some villagers from Vaisala began fishing in neighbouring fishing grounds, calling the long-term success of this reserve into question.

Salelavalu, the second SPC study site on Savaii, had no fishery reserve. At Manono-Uta (a site west of Upolu), community-based management regimes suffered from non-compliance, but although implementation of most of the management regime was not effective, a very small restoration area for giant clams was still present, and some of the original clams placed there were still alive.

Vailoa, the last of the four sites (east of Upolu), operates as part of the Aleipata MPA. In this case, although there was some indication that reserves were respected, all the clams that the Fisheries Division stocked in the site were lost through village disputes (this was one of 12 initial clam distribution sites in Samoa). Even with community management programmes being applied across sites, PROCFish showed fishing pressure on fish biomass at Samoan sites to be among the highest of all sites sampled across the Pacific (M. Kronen, personal communication, 2008).

4. MPAS FOR FISHERIES AND CONSERVATION: GOVERNANCE

4.1 Legal basis for MPA establishment

The development of legislation for the management and conservation of marine resources in Samoa is spread over a range of legal codes, under the responsibility of a number of government agencies (Tables 4 and 2, respectively). Although more than 80 percent of Samoa's land is under customary ownership, all land below the low-water mark was re-designated under national legislation (Lands, Surveys and Environment Act, 1989), giving the right to all people to navigate over the foreshore and fish within the limits of territorial waters (Bell and Mulipola, 1995). Under this code, entry into established reserves of a neighbouring community is allowed for fishing and/or gleaning purposes (Fa'asili, 1997; Fa'asili and Kelekolio, 1999). To overcome this problem, the Fisheries Division worked to ensure that rules set by village councils in VFMPs were given wider legal recognition. To this end, the Fisheries Act provides that village rules be nationally recognized through the use of "by-laws" (Table 4). From 1997 to 2000, 21 such by-laws were enacted from rules within VFMPs, each one relating to a separate village. By early 2008, 76 by-laws had been legislated.

Although the main advantage of village by-laws is the ability to ban outsiders from fishing in a particular village's reserve, there is a second benefit – the creation of such laws frequently makes a village more active in the process of management, and more committed to enforcement. As the rules "belong" to villagers (i.e. they are not set by remote government agencies with limited resources and personnel for enforcement), village communities with a real interest in conservation have the power to act locally.

TABLE 4
Important legislation for fisheries management and conservation in Samoa

Acts and bills	Objective	Date and comments
Constitution of Independent State of Western Samoa	Article 104 of Constitution provides that all land lying below line of watermark in territorial waters is vested in state	1960
Agriculture, Forests and Fisheries Ordinance	Gives department responsibility for protection of marine environment	1959 – section 4(b) provides a principal function of department: "to promote, in association with Department of Natural Resources and Environment, conservation, production and development of natural resources of Samoa"
Land Ordinance	Coastal aquaculture activities	1959
Fisheries Protection Act	Controls fishing by foreign fishing vessels	1972 – repealed and placed in 1998 Fisheries Act
Fisheries Dynamiting Act	Bans use of dynamite or other explosives for fishing	1972 – repealed and placed in 1998 Fisheries Act
National Parks and Reserves Act	Provides for establishment, preservation and administration of national parks and reserves on public land	1974 – never amended. National parks shall be preserved in perpetuity. Nature, recreation and historic reserves are listed
Fisheries Act	Conservation, protection, management and development of fisheries and licensing. Review includes preservation of marine environment, marine scientific research and exploration. Section 3(4) prescribes requirements for village-based by-laws	1988, amended 1999 and 2002 – currently being repealed and replaced, but has flexibility to allow formulation of by-laws to incorporate local village marine resource and conservation undertakings. Latter part outlined above has resulted in formulation of Fisheries Regulation 1996 and various village by-laws
Lands, Surveys and Environment Act	Establishes Division of Environment and Conservation (DEC). Protection of natural resources and environment	1989
Village *Fono* Act	Legalizes right of villagers to exercise authority in a number of areas, including management of marine resources. Section 6 gives authority to impose punishments	1990 – Village by-laws further promote village ownership and management in accordance with Samoan custom and tradition of adjacent lagoon and reef fishery resources
Watershed Protection and Management Regulations	Establishes National Watershed Management Committee and coordinates management planning	1992
Protection and Conservation of Wild Animals Regulation	Protects birds	1993
Fisheries Regulations	Fishing practices are regulated and fisheries are closed for specified periods of time. Provides system of regulations to conserve, manage and develop fisheries, including corals	1995
Village by-laws	Protection, conservation, management and development of fishery waters and marine environment of individual villages	1998–2008 – as of 2008 more than 76 fisheries by-laws have been gazetted
Fisheries Bill		In process – to replace Fisheries Act of 1988

4.2 International MPA-related instruments

Samoa is a member of SPC, the South Pacific Forum Fisheries Agency (FFA) and SPREP. The Global Coral Reef Monitoring Network (GCRMN), which monitors habitat condition and periodic coral bleaching events in Samoa, is coordinated by the Fisheries Division. Samoa also participates in the Pacific Biodiversity Information Forum, which was convened in 2003 under the auspices of the Pacific Science Association. This forum aims to establish a regional, electronically accessible knowledge base.

In previous times, Samoa and American Samoa were considered "one place, one culture". There is still a close bilateral cooperation between them on conservation and development. American Samoa is currently implementing a community-based management initiative similar to that in Samoa, and both countries have agreed to

participate in the Two Samoas Initiative (TSI) establishing a broad mechanism for collaboration and the sharing of resources.

NGOs and governments have successfully collaborated with large international agencies on conservation initiatives. Conservation International (CI) and Coral Reef Initiatives for the Pacific (CRISP, a French initiative) both offer financial support to MPA development and research in Samoa.

Finally, Samoa is (or has been) a party to a number of regional and international treaties and agreements that obligate the signatory country to proactively comply in the management of coastal and marine areas, including:

- Convention on the Conservation of Nature in the South Pacific (Apia Convention) of 1976 (suspended, not active);
- Protocol for the Prevention of Pollution in the South Pacific by Dumping of 1986;
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (SPREP/Noumea Convention) of 1986;
- Memorandum of Understanding (MoU) for the Convention of Management of Marine Mammals and their Habitats in the Pacific Region of 2005;
- United Nations Convention on Biological Diversity (CBD) of 1992, including the Biosafety Protocol;
- UNFSA – the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (United Nations Fish Stocks Agreement);
- United Nations Framework Convention on Climate Change (UNFCCC) of 1992;
- Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention [WHC], est. 1972) (Samoa ratified 2001);
- International Convention for the Prevention of Marine Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) (Samoa acceded in 2002);
- Convention on Wetlands – formerly entitled the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention, est. 1971) (CITES) (Samoa ratified 2005);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (Samoa acceded 2004, entered 2005);
- Convention on the Conservation of Migratory Species of Wild Animals (CMS) of 1973 (Samoa ratified 2004 and in 2006 also signed the MoU for the Convention of Management of Marine Mammals and their Habitats in the Pacific Region of 2005).

4.3 International or national benchmarks

Spatial controls are proving to be one of the most important and successful tactics for reducing global biodiversity loss. International governmental commitments to site conservation include Samoa's Biodiversity Strategy and Action Plan (SBSAP) – which commits Samoa to "enhance the management of existing protected areas and establish new ones to increase coverage to 15 percent and achieve a full representation of Samoa's ecosystems" (Government of Samoa, 2001) – and the United Nations Convention on Biological Diversity (CBD) – which enjoins parties to establish "a system of protected areas or areas where special measures need to be taken to conserve biological diversity".

4.4 Management processes

The top-down approach of using national policies based on external technologies was replaced in the 1990s by bottom-up or grass-roots approaches. This switch empowered rural populations, allowing them to participate more actively in determining their

own development. The Fisheries Division's community-based Fisheries Extension Programme has assisted approximately 30 percent of Samoa's coastal villages in developing fisheries management plans, including the establishment of many fishery reserves. Extension officers also help communities prepare cases against violators of VFMP rules, especially when the rules are legislated as by-laws (Fa'asili and Taua, 2001). In a particular case at Safata, fines were imposed on a guest of the village (and his host), who used a prohibited chemical when shrimp fishing. To date, there have been numerous cases of enforcement and prosecution against violators of local community reserves and fishing rules. These cases are often facilitated by village councils through national courts. In the last four years, some ten national cases have been prepared or taken to court.

National initiatives bring together participants from various FMCs to assist with management processes. Workshops on village management of fisheries and the marine environment – of which two were held in December 2008 – allow committees from various villages to exchange information and assist each other. Prizes are given (based on monitoring of management outcomes), and the village reserve with the best conditions receives first prize. These workshops provide a forum to share best practices with international visitors. In 2008 village leaders from Wallis and Futuna Islands visited Upolu on a fact-finding mission to learn about the reserves and the community management system. Another example is the Two Samoas Initiative with American Samoa.

Monitoring of some harvested species and coral habitat occurs through annual surveys of inshore fish, invertebrate resources and habitat. In addition to surveys conducted by government agencies and local communities, regional organizations such as the SPC also collaborate with the Fisheries Division to help assess the status of resources (Vunisea *et al.,* 2008). The SPREP, in collaboration with CI, MNRE and MAF's Fisheries Division, has mapped many of the MPAs and fish reserves using satellite imagery, and has conducted an analysis of key biodiversity areas. In association with the Scientific Research Organisation of Samoa, the SPREP also recently conducted a 12-month marine environment monitoring programme in Fagaloa Bay, in the northwest of Upolu (Vieux and Kinch, 2010). The links between marine conservation and land usage are not ignored, and previous projects run by the Forestry Division (now within the MNRE) – through the UNDP-GEF International Waters Programme[2] – attempt to improve the management of catchment areas.

Although most reserves in Samoa are primarily community and government endeavours, Aleipata and Safata have been effectively managed through trust accounts. The trust fund for these MPAs was established in 2003, using US$8 600 generated from tourist access fees. Both MPAs are controlled by villages and have had or currently rely on partnership agreements with international agencies providing operational assistance (the GEF, IUCN, CI and CRISP). This assistance includes a donation of US$104 000 from the CI and CRISP in March 2008. The arrangement is expected to contribute about 30 percent of the annual funds required to maintain and manage the MPAs. However, this is not the case for most community reserves, which have very limited access to financial assistance.

The fact that most significant areas of natural habitat are communally owned proves both a challenge and an opportunity for reserve maintenance. It has been found that VFMP potential to overcome the weaknesses identified with national controls varies from village to village, depending on the governance and regulatory authority of the structures present. The community system is not a panacea – in some villages, internal differences among chiefs have disrupted the village fono. When this happens,

[2] The United Nations Development Programme (UNDP) was designated by the Global Environment Facility (GEF) in 1991 as one of its three implementing agencies.

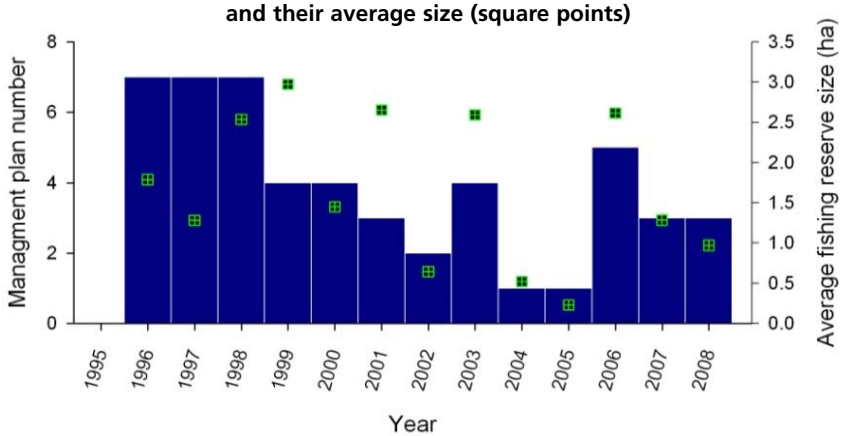
enforcement through the use of by-laws can become ineffective. A six-month review of community management in December 2000 (Fa'asili and Taua, 2001) showed that 42 percent of village communities that had developed VFMPs were doing "very well", 53 percent were "doing well, but needed encouragement", and 5 percent were "not performing to expectation". In addition, although surveys suggest that catches from areas beyond the reefs would support the purchase of boats at a subsidized rate, fishing pressure on inshore areas remains high.

4.5 Key challenges to effective implementation

More research is needed on the marine biodiversity of Samoa, as very little is known (Skelton *et al.,* 2000). There is a lack of standardization and replication over time of research and monitoring activities, which are also hindered by a paucity of historical quantitative data (i.e. baselines) and an uncoordinated approach to research and monitoring across diverse agencies. This lack of focus in activities and delivery of results hinders long-term change in the perceptions of villagers, as communities are not able to develop a sophisticated awareness of the workings of conservation policies. In order to advise communities on MPA issues, government agencies need the capacity to undertake wide-scale, regular monitoring surveys. Mulipola, Ropeti and Iosefa (1995) highlighted the shortage of funding for qualified personnel in marine-related positions in the Fisheries Division and suggested that scholarships could play a key role in addressing this need.

Two factors directly related to fishery reserves have the potential to negatively affect conservation and fisheries outcomes. The first is the allowance of periodic access to reserves by fishers, as outlined in some village VFMPs (Skelton *et al.,* 2000). Such access allows fishery reserves to be targeted on "special occasions" to provide food, for example at an important village council meeting or church activity, or during the spawning season of the Palolo worm. The second factor is the small size of village reserves (Figure 3), which King and Fa'asili (1999) quote as ranging from 0.5–17.5 ha. The average size of 51 village fishing reserves created from 1996 to 2008 was 1.93 ha ± 0.32. This is in contrast to the Aleipata and Safata MPAs, which are multiple-use, include no-take zones and are approximately 5 035 and 6 371 ha, respectively. Alhough many of the community-owned reserves are small, owing to social and geographical necessity, such small reserves are unlikely to be very effective in terms of improving fishery production (see debate about the value of "single large or several small" [SLOSS] reserves as a means of conservation [Diamond, 1975; Simberloff and Abele, 1976]). Fisk (2003a, 2003b) recognizes this dilemma, noting that some Samoan reserve areas are constrained by both size and position, seriously compromising their

FIGURE 3
Number of VFMPs with fishery reserves adopted by year (bars) and their average size (square points)



ability to increase significantly the numbers of sedentary species (including corals) and some fish stocks.

As a developing country, Samoa is constrained when funding environmental management initiatives, both locally and in meeting global obligations. Obtaining the resources to continue village fisheries extension projects and assist new local initiatives is a key challenge. Govan *et al.* (2009) calculated that the cost incurred by the Fisheries Division in assisting community fishery reserves was US$67 220 per year nationally, of which 80 percent (US$53 630) goes towards staff salaries, 5 percent towards field support, 4 percent on awareness-building activities, 3 percent on internal capacity-building, 3–4 percent on boundary mapping and other miscellaneous activities, and 4 percent on transport (note that this figure does not include maintenance and capital costs, and was formulated in 2008).

The estimated cost of maintaining a fishery reserve in Samoa is US$1 345 per site per year. When represented by area, the cost was calculated at US$5 795 per km^2 per year (Govan *et al.,* 2009). Expenditure has also been calculated for the maintenance of larger-scale district initiatives, such as the one at Aleipata. This was estimated at US$179–360 per km^2 per year for the whole MPA area, although the figure rises markedly to US$2 340–4 470 per km^2 if the focus is applied strictly to the maintenance of no-take zones.

4.6 Key incentives and disincentives for implementation and collaboration

As most subsistence fishers require seafood for their families on a daily basis (more than 40 percent of households fish in Samoa), and up to 22 percent of households receive income from fishing (Valencia *et al.,* 2007), it is unreasonable to expect fishing communities to adopt conservation measures that will initially reduce catches without offering alternatives and incentives. Accordingly, the Fisheries Extension Programme promotes development of sources of seafood that are alternatives to those causing the present heavy and destructive exploitation of nearshore reefs and lagoons. These alternatives include promotion of village-level aquaculture, restocking of depleted species of molluscs in village areas, and new types of fish and shellfish options (through tilapia farming and the growing of hatchery-reared giant clams). These initiatives, along with assistance in purchasing small and medium fishing boats, divert fishing pressures from nearshore areas (65 percent of the cost of boat purchase is refunded under a programme of the European Union [Member Organization]) and have helped communities enter extension programmes. Surveys suggest that catches from areas immediately beyond the reefs would support the purchase of such boats by village fishers (Matthew, 1997).

5. SOCIO-ECONOMIC AND ECOLOGICAL CONSIDERATIONS AND IMPACTS

5.1 Impacts of MPAs on fisheries

Olofa Tuaopepe, Principal Fisheries Officer, Fisheries Division, described the general halting of destructive fishing practices in recent times, but added that efforts by the division to stop the selling of undersized fish were limited, as enforcement was restricted to main market outlets (Tuaopepe, 2005). There is no doubt, however, that awareness is now more widespread within communities of the potential for recovery of fishery resources following the advent of a "resting period". In fact, the anecdotally reported recoveries are so great in some cases, that there is danger of creating the perception that instituting a single small reserve is a sufficient conservation measure, when this is not the case.

Quantitative evidence of the impacts of reserves is less easy to find. In Palolo Deep, Samoa's only national marine reserve (22.3 ha), the high level of enforcement has ensured a considerable increase in biomass and diversity (also due in part to natural

recovery processes, following severe cyclones in the 1990s and coral bleaching). Recently, Ward *et al.* (2007) stated that the area was in "good" condition, with targeted fish species in abundance and a high level of live coral cover (up to 44 percent). It is not known what effect, if any, this localized protection has had on the surrounding reef and fisheries, as time series information is not available.

Baseline studies conducted at Aleipata and Safata (Andrews and Holthus, 1989; Fisk, 2003a,b) set out both permanent monitoring sites and qualitative monitoring protocols for community members. Parameters surveyed in this study included: coral cover and a coral damage index; fish density and biomass for 18 families; densities of eight indicator macro invertebrates (including giant clams) and disturbance indicators (coral predators: crown-of-thorns starfish and gastropod *Drupella* spp.). Fisk reports a healthy condition of corals at Aleipata (29.9–65.1 percent cover), but an impacted status of some stocks (e.g. near-extirpation of the giant clam). In the case of giant clams, Fisk (2003b) suggested that it could take decades for stocks to recover, owing to the insufficient abundance of parental stock. Also of concern were the very high numbers of sea urchins, which were thought to be at levels that may negatively affect the recovery and long-term viability of the site (Fisk, 2003a, 2003b). On the other hand, although fish densities were low at Safata (from 6 to 394 individuals per hectare), they were higher at Aleipata (from 17 000 to 110 000 individuals per ha), suggesting that fish recovery would be faster due to the presence of a larger amount of broodstock (Fisk, 2003a, 2003b).

Of 55 coastal villages surveyed in 2000 (Passfield *et al.*, 2000), 17 had VFMPs. Socio-economic data showed that villagers at these sites reported a catch rate 55 percent higher than villagers at sites without management plans. This anecdotal result suggests that the management plans have had a positive impact on fisheries in these villages, though it may be that these villages already had more abundant marine resources before the establishment of reserves. Tiitii, Trevor and Kallie (no date) ran a similar study in four villages with no-take reserves that had been in place for a mean of 39 months (range from 25 to 50 months). According to surveys of villagers, respondents believed that their reserves helped increase the abundance of butterfly fish, parrotfish and goatfish (surgeon and emperor fish abundance were reportedly not changed). Perceptions of changes in shellfish species abundance were relatively less striking, although most villagers agreed that their initiatives to protect part of the fishing areas from fishing are a good management practice. However, on a cautionary note, Tiitii, Trevor and Kallie (no date) point out that while communities appeared to recognize and acknowledge that fish reserves increase fish abundance, some still appear to put FMCs under pressure to "open" fish reserves periodically to fishing – indicating that the long-term objective of protecting these areas for ongoing production of larvae (for settlement in adjacent areas) is not fully appreciated or accepted (Tuaopepe, 2005).

Although quantitative reports of recoveries are difficult to find (Reti and Sullivan, 2004), anecdotal reports continue to suggest recovery. The Safata MPA has reserves that have been protected from fishing for almost ten years, and people claim fish are coming back (as it takes them less time to catch fish) (P. Ifopo, personal communication, 2008). Community members assist in monitoring recovery at Safata, and the updated 2008–2010 Safata management plan recognizes this improvement.

5.2 Socio-economic impacts of MPAs and critical socio-economic/ecological considerations

The development of VFMPs and no-take reserves represents a revival and reinforcement of traditional practices of management, reaffirming fa'a samoa (the Samoan way). Consultations to develop VFMPs allow all members of the community to express their opinions and ideas; matais, the aumaga (village organization of untitled young men) and the komiti a tina (women's committee) are usually central to the FMC. This

participatory approach is well aligned with the principles of Agenda 21 and the Rio Declaration on Environment and Development.[3] In particular, Principle 10 outlines the importance of participation of all concerned citizens in addressing environmental issues, and Principles 20, 21 and 22 stress the vital role of women, youth and indigenous peoples in environmental management and the importance of this role to the achievement of sustainable development.

Threats to village-based conservation areas come from pressures for economic activity, including land reclamation, sand mining and gravel extraction. Such issues are currently under consideration at Aleipata, where unapproved development is currently under review. In the case of the Safata District, the community successfully halted the destruction of mangroves that were previously used for fuelwood or damaged by free-roaming pigs. In addition to managing no-take reserves, communities adopt complementary conservation activities to protect resources and habitat (e.g. the pigs were fenced out of mangrove areas at Safata). According to Saifaleupolu (1996), there is still a need for increased community awareness of the intimate relationship between the biophysical environment and socio-economic development. The great use of chemicals and other destructive gardening methods in highly vulnerable sites is indicative of the issues requiring awareness-building to ensure that communities are able to make informed choices to balance the need for economic development with maintenance of the marine environment.

One initiative responding to the need for education and awareness-raising in support of state and community MPA systems was the creation of the Environment Resource Education Guide in 1999. In 2005, the guide was upgraded in schools (years 7 to 10), with a more holistic approach to environment education. The revised guide (MESC, 2008) incorporates six themes: marine ecosystems, biodiversity, water resources, waste management, climate change and mangroves.

5.3 The role of natural and social science

The Government of Samoa sees its role as a facilitator of village initiatives, rather than as an educator – an important principle when establishing working relationships and trying to empower communities (King and Fa'asili, 1998a, 1998b). Communities are thus empowered, as they receive full credit for their traditional knowledge, and external actors do not impose information and direction. In most cases, the social imperative of empowering communities is perceived as more important than optimizing the position or size of spatial management areas or dictating the nature of controls. Indeed, there is long-standing recognition that conservation measures need to come from the community if they are to be respected and enforced.

Community-based management must involve an adaptive, "learning by doing" cycle. This adaptive management process allows ongoing development of options, while ensuring that community members see themselves as aligned with and integral to management success. Natural and social science research is required in order to test continually the various management strategies on the ground and make pragmatic improvements based on fishers' ideas (Johannes, 1998). Even though the community-based model is under constant revision through adaptive management, there are still difficulties. Taule'alo (2000) argues, "It is extremely difficult to reconcile the public interest against family interest … the co-existence of both modern and traditional authorities is rather complex and not readily conducive to the application of conventional planning methods and concepts." Moreover, there is strong respect for authority in Samoa, often leading to less-democratic practices that tend to exclude low-ranked individuals from consultation and decision-making processes (Taule'alo,

[3] Agenda 21 and the Rio Declaration were adopted at the 1992 United Nations Conference on Environment and Development (UNCED).

2000). Such issues require the ongoing input of social scientists to identify and assist communities and government in overcoming stumbling blocks that could hinder progress towards conservation objectives.

6. COORDINATED APPROACHES TO MPAS FOR FISHERIES MANAGEMENT AND CONSERVATION

6.1 MPAs embedded within other larger spatial management regimes

In terms of total fishery production, the small reserves implemented in Samoa are unlikely to be as effective as the larger ones, because large reserves are more likely to provide suitable breeding areas for small inshore pelagic fish (such as mullets and scads). However, a counter argument exists (Buxton, 1996), which suggests that many small reserves are just as effective – and can even be greater producers of larvae for non-migratory species. Although most reserves in Samoa are primarily single units linked to a village, there are often many small reserves in relatively close proximity. Moreover, the multiple-use MPAs of Aleipata and Safata are examples of villages banding together and agreeing on controls through shared partnership agreements (11 villages for Aleipata and 9 for Safata).

The 'bottom-up' approach of working with communities to define reserves has meant that the Fisheries Extension Programme could not strategically place reserves where it believed downstream settlement was most likely to have positive outcomes, or to comprehensively target environments holistically. Despite these drawbacks, the multitude of small reserves under various types of closure arrangements offers a potential for good fishery and conservation outcomes. This is especially true given the wide-ranging and wide-scale adoption of such reserves by communities. Partnership agreements among neighbouring villages for larger-scale MPA areas offer a multiplier effect for environmental outcomes. Owing to scale, such partnerships are also more likely to gain recognition from international institutions, which might assist with work programmes and contribute to their costs.

6.2 Examples of MPAs linked to fisheries management

The most common VFMP components relating to national fisheries management (those related to spatial management are in italics) include goals to:

- *establish fish reserves;*
- *protect mangroves;*
- *develop and enforce village rules and integrate them into fisheries by-laws;*
- restrict the number and length of fish fences (traps);
- ban the use of underwater torches;
- prevent the catching of small fish;
- ban rubbish dumping on the shoreline;
- introduce new types of seafood into village fishing areas;
- reduce the number of crown-of-thorns starfish;
- *encourage fishing outside the lagoon in offshore habitats.*

6.3 Institutional cooperation, challenges and opportunities

Despite the fact that national fisheries legislation and community management share the goal of actively seeking resource conservation in Samoa, there are still constraints owing to a lack of: an integrated management approach (inter- and intra-departmental); cooperation by resource owners and users; clarity over traditional ownership; and funding for extension advisory services in promoting fisheries management strategies.

The partial overlap of responsibility between the MAF (Fisheries Division) and the MNRE (DEC) is a stumbling block. Section 4 of the Agriculture, Forests and Fisheries Ordinance of 1959 calls on both departments to work together to promote the "… conservation, production and development of natural resources of Western

Samoa …", as the duties of both departments overlap, creating a potential for conflict. In recognition of funding shortfalls and to avoid such conflict, the departments need to clarify their respective duties and continue to work closely together where possible.

Coordinated input by government agencies is also needed in supporting community groups. This includes providing timely information, assisting with upgrades of VFMPs and providing ongoing general support for village management frameworks. Village communities that create their own VFMPs are more likely to respect, abide by and enforce village rules. By-laws, promulgated by village communities themselves, offer a great potential to solve problems stemming from the insufficient capacity of central government agencies for surveillance and prosecution.

However, fisheries legislation issues continue to hinder spatial management, as by-laws and management plans in general still need professional review. Errors – some of which are traceable to confusion when translating VFMPs from Samoan into English (Fa'asili and Taua, 2001) – can undermine management gains, particularly when prosecutions against recognized transgressions fail because of these misunderstandings. Changes that address such concerns include subtle amendments to the wording of by-laws. For example, by-laws should clearly state: "No person shall undertake or attempt to undertake fishing of any nature in the fish reserve," rather than the current phrasing of "Fishing of any nature in the fish reserve is prohibited." Wording should also be amended to make it a violation to assist in the committing of any offence under the by-laws, thus making secondary parties liable for prosecution. Lastly, Fa'asili and Taua (2001) suggest that penalties should be reviewed periodically to reflect the cost of prosecution and the degree of importance placed on fishery reserves.

A review of Samoa's environmental laws by Powell (2004) revealed that, in some cases, the legislative codes did not necessarily correspond to the country's capacity to implement responsible management of the environment. Powell subsequently suggested a review of Samoa's environmental laws and amendment of the administrative responsibility for national parks and reserves. In addition, some important aspects of environmental management – such as a need to conduct environmental impact assessments (EIAs) prior to implementing certain activities – are not stipulated in Samoa's laws (although draft EIA regulations exist). Until such revisions are made, the government will be required to resolve issues through other avenues when dealing with impacts of development activities on neighbouring coastal and marine environments (Reti, no date).

7. FUTURE DIRECTIONS

7.1 Institutional collaboration for better design, implementation and stakeholder participation

The success of protected areas and community fisheries management in Samoa is related to active support by both government and communities of village-based management plans (Lambeth, 1998). However, overfishing – a key cause of the malaise – remains a problem. Increases in Samoa's population, the number of fishers, the efficiency of fishing gear and demand for food pose a serious risk to extirpation and critical depletion of some species. Conservation efforts must be prioritized if the process of conservation and rebuilding of already depleted stocks is to succeed.

The National Capacity Self Assessment (NCSA) project identified several priorities in the area of "mainstreaming biodiversity" that were to be addressed in the period 2005–2010. The actions included an assessment of Samoa's participation in international and regional efforts to protect migratory species, including a small number of wading birds (particularly the Pacific golden plover), as well as green and hawksbill turtles. The conservation of key nesting areas for turtles is included in the MPA project in the Aleipata District, and monitoring of turtles, along with related checks on corals and reef fishes, is ongoing (Bell *et al.,* 2006).

Samoa's national biodiversity strategy and action plan, the National Environment Management Strategies, and the Fisheries Division and MNRE corporate plans continue to offer an excellent framework for the development of a longer-term vision for protecting the marine habitat and resources. Ongoing government support of programmes such as the village-based fishery reserves and the MPA project (following expiration of IUCN funding) reflects the government's recognition of its critical role in supporting local communities in conserving the country's natural resources. In this regard, the government is incorporating support for an MPA coordinator in annual treasury funding as of the 2009/10 financial year, instead of relying on short-term external project funds to support this key role.

Ongoing support and encouragement for village-based programmes will be the key to maintaining current conservation initiatives, as well as to increasing Samoa's reserve estate. The process of reserve establishment maintains momentum, with new villages expressing interest in establishing VFMPs for reserves (e.g. Poutasi and Vaovai). There is also potential support for conservation initiatives from the GEF Small Grants Programme (GEF-SGP), through which community-based organizations can access funding for conservation (under the climate change and biodiversity focal areas of the community-based adaptation programme). Activities identified for potential funding include coral and mangrove planting to prevent further coastal erosion, and reintroduction of giant clam stocks that are near complete extirpation. The UNDP is also supportive of these initiatives, and they will be linked to MPA development and maintenance initiatives (through the Fisheries Extension Programme).

Samoa's goal is to establish 15 percent of its total coastal area as reserve, and to achieve full representation of Samoa's ecosystems within the reserve estate (Government of Samoa, 2001; Spalding, Fish and Wood, 2008; Wood *et al.,* 2008). The current, locally managed village fishery reserves and area MPAs provide the foundation for attaining these national targets, and it could be argued that 17 percent of the coastline of Samoa is already under some form of conservation management. However, given that less than 5 percent is currently protected under a no-take arrangement, and the limited marine environment of Samoa is already heavily affected by past fishing activities and natural bioturbation, the task ahead is a large one.

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This document presents case studies of the policy, governance and institutional issues of marine protected areas in Japan, Mauritania, the Philippines and Samoa. It is the second of four in a global series of case studies on MPAs. An initial volume provides a synthesis and analysis of all the studies.

The set of global MPA case studies was designed to close a deficit in information on the governance of MPAs and spatial management tools, within both fisheries management and biodiversity conservation contexts. The studies examine governance opportunities in and constraints on the use of spatial management measures at the national level.

They were also designed to inform implementation of the FAO Technical Guidelines on marine protected areas (MPAs) and fisheries, which were developed to provide information and guidance on the use of MPAs in the context of fisheries.