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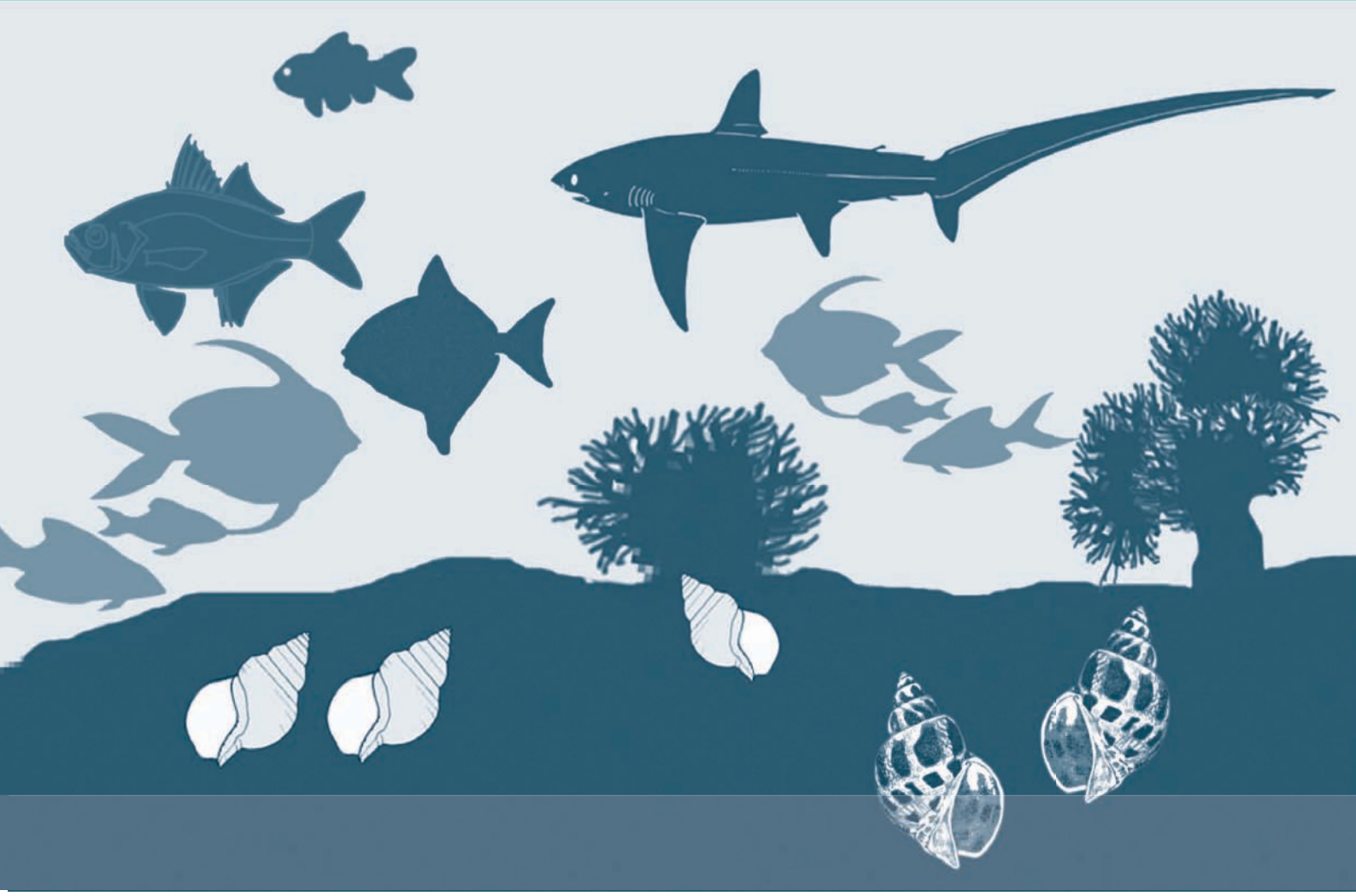
Marine protected areas

Country case studies on policy, governance and institutional issues



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

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Preparation of this document

The four case studies from Brazil, India, Palau and Senegal 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. Final editing of the case studies was provided by Lynn Ball and Sacha Lomnitz.

The maps of each country were prepared by Fabio Carocci using the following sources: (i) the Centenary Edition of the General Bathymetric Chart of the Oceans (GEBCO) Digital Atlas; (ii) the Database on Protected Areas (WDPA); and (iii) the FAO Global Administrative Unit Layers (GAUL).[2]

The case studies were funded by the Government of Japan through the projects "Promotion of sustainable fisheries: support for the Plan of Implementation of the World Summit on Sustainable Development" (GCP/INT/942/JPN) and "Fisheries management and marine conservation within a changing ecosystem context" (GCP/INT/253/JPN).

[1] FAO. 2011. *Fisheries management. 4. Marine protected areas and fisheries.* FAO Technical Guidelines for Responsible Fisheries No. 4, Suppl. 4. Rome. 199 pp.

[2] (i) IOC, IHO and BODC, 2003. Centenary Edition of the GEBCO Digital Atlas, published on CD-ROM on behalf of the Intergovernmental Oceanographic Commission and the International Hydrographic Organization as part of the General Bathymetric Chart of the Oceans, British Oceanographic Data Centre, Liverpool, UK. (ii) UNEP-WCMC. 2011. Data Standards for the World Database on Protected Areas. Cambridge, UK, UNEP-WCMC (available at: www.protectedplanet.net, accessed 20 April 2011). (iii) FAO. 2009. Global Administrative Unit Layers (GAUL). Rome.

Abstract

This Fisheries and Aquaculture Technical Paper presents case studies of the policy, governance and institutional issues of marine protected areas in Brazil, India, Palau and Senegal. It is the first of four in a global series of case studies on marine protected areas (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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Contents

Senegal (in English)

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1. 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)

Recently, 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 or types of gear 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 (the Code) 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. the 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. The 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; and
- 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. In review *Marine protected areas: a global overview of national approaches*. 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:

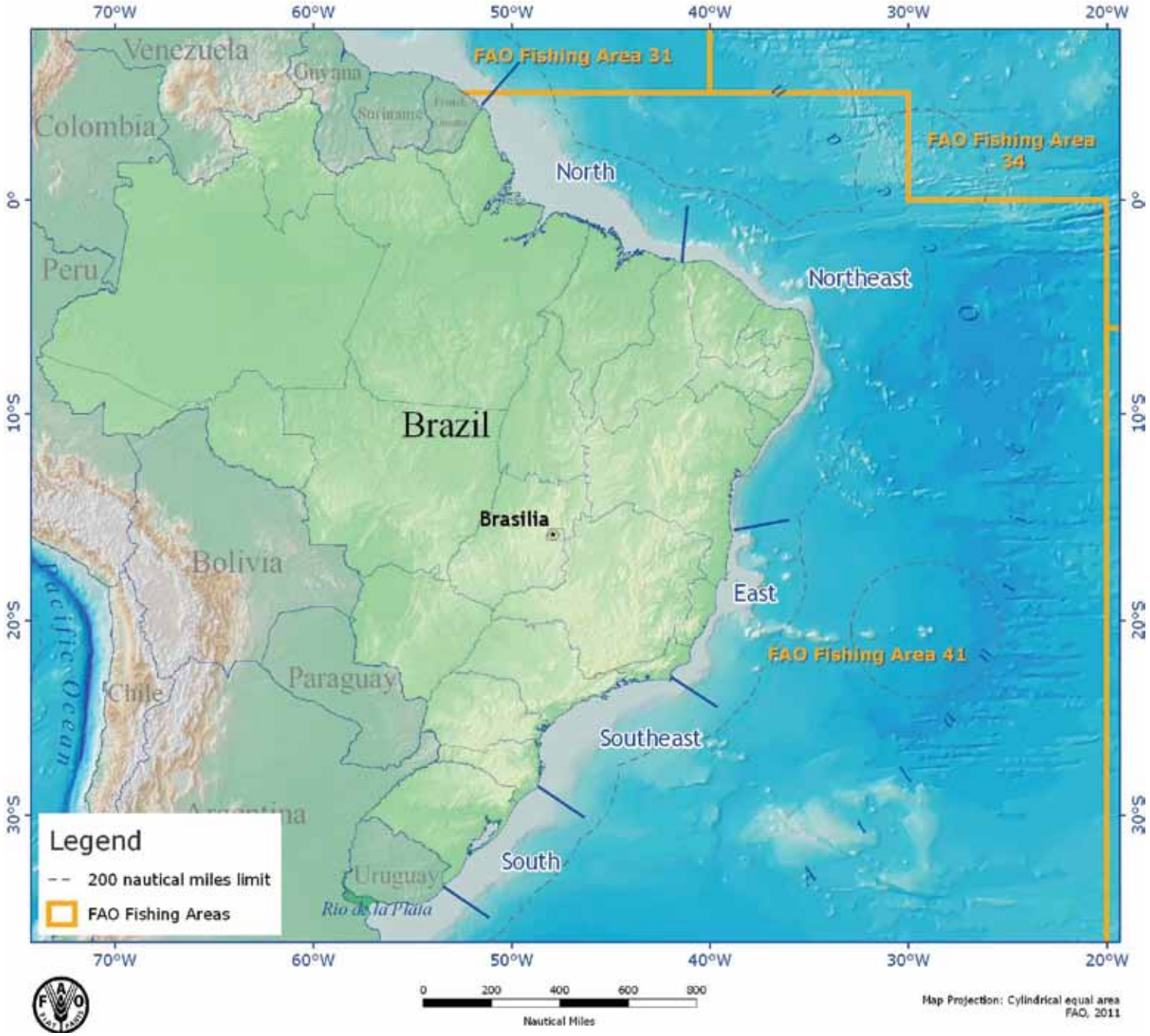
- is intended to contribute to achieving conservation and sustainability objectives of fisheries management, while contributing to biodiversity and habitat conservation (with intended or unintended social and economic consequences);
- is temporally and geographically specified in three dimensions for 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; and
- 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 first four case studies: Brazil, India, Palau and Senegal. Three 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
Map of Brazil and FAO Fishing Areas



Brazil

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1. INTRODUCTION

The use of protected areas as tools in the conservation of biodiversity is not new in Brazil. It dates back to the first half of the twentieth century, when the first territorial park was created. The country now presents a relatively extensive system of protected areas covering about 8 percent of the national territory (Brito, 2003; Prates *et al.*, 2007). However, the use of protected areas in aquatic environments is more recent (Atol das Rocas, the first marine biological reserve, was created in 1979). The first marine protected areas (MPAs) were created mainly with the goal of conserving biodiversity and protecting essential marine habitats. More recently, protected areas have also been proposed and implemented as tools for managing fisheries, particularly in areas of conflict over the use of coastal and sea spaces. Currently, two categories of terrestrial and marine protected areas are recognized in the legislation: those for total protection, aimed at protecting fragments of ecosystems from any human interference; and those for sustainable use, where the controlled exploitation of resources is permitted. There are examples of both types of protected areas in the marine environment.

This paper focuses on the dual role of MPAs – for fisheries and for conservation. It starts by highlighting the differences and objectives of the two categories in Brazil and provides a brief history of their implementation. Discussion follows of the lessons learned from a few examples of MPAs, and the main challenges, impacts and opportunities in Brazil for their effective implementation.

2. FISHERIES AND SPATIAL MANAGEMENT

2.1 General condition of marine fisheries

Two main fish production systems coexist in Brazil: industrial and artisanal. Industrial fisheries are defined as fish-harvesting undertaken by large boats belonging to a fishing company. The social and technical division of labour is high, and catches are sold to processing companies operating within highly commercialized global markets. Industrial fisheries concentrate their harvesting on high-market-value species such as lobster, shrimp and tuna, or on highly abundant stocks such as sardine. Another type of industrial fishery that has gained importance in recent years is fishing in slope waters for deeper-water species such as monkfish and crab. This fishery is mainly operated by foreign vessels under license agreements with Brazil.

Artisanal fisheries are operated by independent fish harvesters, whose livelihoods are based on fishing on a part- or full-time basis. They use labour- and knowledge-intensive fishing techniques, and employ family or community labour for harvesting in coastal habitats, often on a sharing basis. The fish caught are normally sold in local markets, usually through intermediaries, although some of the catch is kept for home consumption. The artisanal fisheries sector has a long-standing tradition in Brazil. Before governmental incentives to develop industrial fisheries in 1967, artisanal fisheries accounted for more than 80 percent of fish production in the country. Now, they are responsible for approximately half of the 540 000 tonnes of marine species landed annually in Brazil (IBAMA, 2007).

2.2 Socio-economic aspects and conditions

Socio-economic data on coastal fisheries are generally scarce. There are several reasons for this. One is the wide dispersion of fishing communities along the coast, which makes the task of collecting information extremely difficult. Another factor that has hampered the development of programmes to evaluate the socio-economic status of artisanal fisheries is the Government of Brazil's priority on and support to industrial fisheries, to the detriment of the artisanal sector. Among the main data deficiencies are those concerning economic aspects of the fishery, such as employment and income levels, types of technologies employed, and organizational aspects of fishing communities. Some small improvements in data availability have been observed in recent years, as government welfare programmes have begun to collect and disseminate information on the fishers who apply for state benefits, such as the unemployment benefit received during fishing closures.

The number of active fishers is uncertain. It is estimated that fisheries generate some 800 000 jobs. Of this total, 540 000 are artisanal fishers (Vasconcellos, Diegues and Kalikoski, 2010). Taking into account direct and indirect jobs, it is estimated that approximately 4 million people depend on the fisheries sector (MMA, 1997).

The infrastructure for landing, storage and commercialization of fish in the artisanal sector is precarious. Large ports generally have no infrastructure to accommodate landings from artisanal fisheries. In many fishing communities, especially in the northeast, fish are landed on the beach and from there enter a long chain of dealers, until they arrive at local and regional markets. The situation seems to be even worse in fishing communities close to urban centres, because they lack adequate structures to land and process fish in urban conditions. Production facilities for landing and cold-storage associated with cooperatives – funded during the 1980s by the Inter-American Development Bank (IDB) and constructed in the northeast – did not work satisfactorily. The vast majority of these facilities ended up in the hands of intermediaries. At the same time, many cooperatives failed because they were formed in a hurry, without proper evaluation of the administrative capacity of fishing communities or of market demand.

More recent experiences in the northeast with the government's Pro-Renda programme, which aims to increase the income level of poorer communities, seem to be more successful than the previous experiences with cooperatives. The programme is based on strengthening existing fishers' guilds, improving techniques to maintain the quality of fish on board through the use of freezers, and developing new markets for artisanal fishery production. Marketing, improved product quality and processes of intermediation within the market chain continue to be the critical points in development of artisanal fisheries and in increased income levels for their fishers.

Fishing livelihoods are not homogeneous along the coast (Vasconcellos, Diegues and Salles, 2007). Along the north coast, many fishers combine fishing with agriculture. In the northeast, most fishers depend exclusively on fisheries. Their livelihoods are under threat from the rapid expansion of shrimp aquaculture, tourism and urban development, as well as from overfishing of important stocks. Along the south and southeast coasts, there are clear signs of depletion of most stocks, as well as environmental degradation requiring mechanisms of control and regulation. In the past, many fishers living in coastal villages also maintained other activities, such as small-scale agriculture, forestry and the production of hand-made arts and crafts. Given the increasing level of conflict with industrial fisheries, and the expansion of urbanization and tourism, many artisanal fishers have turned to aquaculture or to working in general services in the cities.

The move of artisanal fishers from rural to urban areas is a phenomenon evident in many states, but particularly in the southeastern and southern regions. Even in the 1970s, approximately 70 percent of fishers in these regions lived in or around urban

centres, whereas in the northern and northeastern states, most fishers lived in coastal villages, with only 44 percent found in urban centres. Although there is a general lack of information, it is probably correct to assume that today most coastal artisanal fishers live in or close to urban areas, with the exception of fishing communities in northern Brazil and in the states of Maranhão and Piaui. According to data available in the Brazilian Institute of Geography and Statistics (IBGE) database for 1991, the level of urbanization reaches 22 percent in certain areas of Maranhão, 48.5 percent in Ceará, 62.5 percent in Paraíba, 70 percent in Rio de Janeiro, 83.5 percent in Santa Catarina and 98 percent in São Paulo.

The increasing level of urbanization of artisanal fisheries has many drivers, including: mounting economic pressure from the tourism industry, which has led to appropriation of coastal areas from fishing communities; a shift from agriculture and other extractive activities; lack of basic infrastructure to support fishing activities (e.g. supply of ice and diesel); lack of access to basic social services (e.g. health and education) in coastal villages compared with urban centres; proximity to markets in cities; and implementation of environmental conservation units along the coast, which expelled many fishers from traditional fishing areas. Fishers who have moved to cities are often involved in urban activities (construction, general services, tourism, etc.) to complement their earnings during fishing closures.

Fishers' access to infrastructure and social services is normally as tenuous in coastal communities as it is in urban zones. For example, access to treated water varies from less than 5 percent of the households in fishing communities of the northern state of Maranhão to 71 percent in São Paulo. The educational level of fishers is extremely low and well below the national average. The illiteracy rate is 44.6 percent among men and 53.5 percent among women. Only 9 percent of men and women have completed elementary-level education and only approximately 1 percent have completed high school.

Most of the frozen fish sold in supermarkets in large cities is imported or is supplied by commercial fishing industries. Artisanal production is generally traded in coastal towns and regional centres. The network of fish trade in artisanal fishing villages is complex, often involving intermediaries on several levels, from the beach to the neighbouring cities and the central markets in state capitals. Most of the crabs, mussels, oysters and other shellfish originate from artisanal fisheries, and marketing is sometimes done through cooperatives.

2.3 Fishery production and status of stocks

Fishing is conducted in a variety of marine and coastal ecosystems, including estuaries, coastal lagoons, shelf and slope waters. The characteristics of habitats, fauna, productivity and oceanography of these ecosystems greatly influence the way fishing activities are developed. The Brazilian coastline can be divided into regional ecosystems with distinct environmental characteristics of importance to capture fisheries (Matsuura, 1995; Vasconcellos, 2000, and Map 1). Biological production is high along the north coast as a result of continental runoff from the Amazon River. The wide continental shelf and the rich benthic community have favoured the development of industrial trawling activities in this region, mostly for shrimps and demersal fishes.

The northeastern and eastern regions present oligotrophic conditions related to the influence of tropical waters from the Brazil Current. These regions enclose the only coral reef formation in the South Atlantic. Rocky bottoms and a mostly narrow continental shelf led to the development of hook-and-line and longline fisheries for rockfishes, sharks and tunas. In the southeast, primary production is mainly driven by seasonal welling up of nutrient-rich, cold subtropical waters, while the southern part of the Brazilian coast is under the influence of the subtropical convergence between the southward Brazil Current and northward Falkland (Malvinas) Current. The confluence

of water masses and the high volume of continental runoff provide the physical and chemical conditions for high biological production on the shelf. Trawling is the main type of industrial fishing activity in the southeastern and southern regions, although the presence in the southeast of highly abundant pelagic stocks, mainly sardines, has also led to the development of an important purse seine fishery since 1950.

Within each of these major ecosystems, there are a variety of inshore and coastal ecosystems in which diverse fishing communities live and work. Coral reefs, mangroves, estuaries and coastal lagoons are particularly important ecosystems. Coral reefs occur along 3 000 kilometres (km) of the northeast and east coasts and off oceanic islands. Mangroves extend along almost the entire coast of Brazil, from Oiapoque (Amapá) to Laguna (Santa Catarina), occupying an area of about 25 000 km^2. The most extensive areas of mangrove are associated with the mouth of the Amazon River in the north of Brazil. Coastal lagoons are found in the southern, southeastern and northeastern regions, and are especially important in the states of Alagoas, Rio de Janeiro, Santa Catarina and Rio Grande do Sul. The Patos Lagoon, located in Rio Grande do Sul, southern Brazil, is recognized as one of the most important centres in the country for artisanal fisheries.

Fisheries present distinct regional characteristics. Artisanal fisheries account for a higher proportion of marine catches in the northern and northeastern regions. In contrast, in the southern regions, it is the industrial fisheries that sustain the largest part of marine capture fishery production (Vasconcellos, Diegues and Salles, 2007). Since 1980, the regions also present diverse trends in production, with an increase in artisanal landings observed in the north and northeast and a decrease in the southeast and south (Table 1). On the other hand, industrial fisheries show a decrease in production in all regions.

The status of major fishery resources – such as sardine, lobster, shrimp, croaker, weakfish and tuna – has been assessed regularly since the 1980s through technical working groups created by the government. There has been little systematic and continuous assessment of the status of the various less-abundant fish stocks targeted by artisanal fisheries. This is in part owing to a lack of data, but also to lack of attention by government agencies. However, some localized research initiatives have been carried out by universities and research institutes. Table 2 summarizes available information on the status of stocks targeted by industrial and artisanal fisheries in each of the coastal regions. Analysis of the development stage of stocks targeted by artisanal fisheries – carried out by Vasconcellos, Diegues and Salles (2007) – further indicated

TABLE 1
Catches by artisanal and industrial fisheries in Brazil in 1980 and 2007

Region		Industrial		Artisanal	
		Tonnes	%	Tonnes	%
North	1980	19 424	18.0	88 427	82.0
	2007	18 882	8.9	193 120	91.1
Northeast[a]	1980	20 182	29.6	48 014	70.4
	2007	8 203	3.7	215 919	96.3
Southeast	1980	202 150	87.2	29 734	12.8
	2007	99 125	62.0	60 742	38.0
South	1980	163 728	74.1	57 334	25.9
	2007	151 154	85.5	25 576	15.5
Total	1980	405 484	64.5	223 509	35.5
	2007	277 364	35.4	505 812	64.6

[a] Statistics for states in the northeast and east are merged under northeast.

Sources: Freire, 2003; IBAMA, 2007.

TABLE 2
Exploitation status of marine stocks assessed previously in Brazil

Region/stock	Exploitation status	Classification IN No. 5/2004
North		
Pink shrimps, *Farfantepenaeus* spp.	Intensively exploited; decreasing production	II
Seabob shrimp, *Xyphopenaeus kroyeri*	Underexploited	II
Catfish, *Brachyplatystoma vaillantii*	Recovering	II
Lobsters, *Panulirus* spp.	Fully exploited	II
Southern red snapper, *Lutjanus purpureus*	Risk of overfishing	II
Mangrove crab, *Ucides cordatus*	Unknown; decreasing production	II
Northeast		
Lobsters, *Panulirus* spp.	Overexploited; decreasing production	II
Yellowtail snapper, *Ocyurus chrysurus*	Overexploited	II
Vermilion snapper, *Rhomboplites aurorubens*		II
Dog snapper, *Lutjanus jocu*, and silk snapper, *L. vivanus*	Fully exploited	–
Mutton snapper, *Lutjanus analis*, and lane snapper, *L. synagris*	Overexploited	I
Groupers, Serranidae	Overexploited	I, II
Mackerels, *Scomberomorus* spp.	Moderately exploited	–
Mangrove crab, *Ucides cordatus*	Probably overexploited; decreasing production	II
Seabob shrimp, *Xyphopenaeus kroyeri*	Moderately exploited	II
Southeast		
Sardine, *Sardinella brasiliensis*	Collapsed	II
Broadband anchovy, *Anchoviella lepindentostole*	Overexploited	–
White croaker, *Micropogonias furnieri*	Fully exploited or overexploited	II
Royal weakfish, *Macrodon ancylodon*	Fully exploited or overexploited	II
Weakfish, *Cynoscion jamaicensis*	Fully exploited or overexploited	–
Grey triggerfish, *Balistes capriscus*	Moderately exploited or fully exploited	II
Skipjack tuna, *Katswonus pelamis*	Moderately exploited	–
Anchovy, *Engraulis anchoita*	Unexploited	–
Seabob shrimp, *Xyphopenaeus kroyeri*	Overexploited	II
South		
White croaker, *Micropogonias furnieri*	Fully exploited or overexploited	II
Longspine drum, *Umbrina canosai*	Fully exploited or overexploited	II
Royal weakfish, *Macrodon ancylodon*	Overexploited	II
Mullets, *Mugil* spp.	Fully exploited	II
Catfish, *Genidens barbus*	Collapsed	II
Black drum, *Pogonias cromis*	Collapsed	–
Guitafish, *Rhinobatus horkelii*	Collapsed	I
Anchovy, *Engraulis anchoita*	Unexploited	–
Pink shrimp, *Farfantepenaeus paulensis*	Overexploited	II
Seabob shrimp, *Xyphopenaeus kroyeri*	Overexploited	II

Note: Species are classified according to IN No. 5/2004, 'I' being species threatened by extinction and 'II' being species that are overexploited or threatened by overexploitation.

Source: Adapted from Vasconcellos, Diegues and Salles, 2007.

that the percentage of collapsed stocks increases from north to south. They estimate these percentages at 3 percent in the north, 12 percent in the northeast, 29 percent in the southeast and 32 percent in the south.

2.4 Fisheries management and conservation

The management of fisheries in Brazil is mainly the responsibility of the federal government, which is tasked with assessing the status of stocks and setting and enforcing regulations for the use of aquatic living resources. Government institutional arrangements for regulating fisheries activities have been changing over the years. The role of the federal government in marine fisheries management became particularly influential in the mid-1960s with the creation of the Bureau for the Development of the Fishing Industry (SUDEPE), an agency of the Ministry of Agriculture, with sole responsibility for the development and management of fisheries. In 1989, fisheries came under the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA), a subsidiary of the Ministry of the Environment. As the IBAMA focuses its attention mostly on environmental issues, legislation and enforcement, there has been little attention given to the sustained development of fishing communities.

In 1998, the government shifted a large part of the responsibility for the fisheries sector from the IBAMA to the Ministry of Agriculture, creating the Department of Fisheries and Aquaculture (DPA). The main responsibility of the DPA was to promote and execute programmes and projects for the development of industrial fisheries (so as to promote development of the sector and manage unexploited fishery resources). The IBAMA, on the other hand, was responsible for executing national policies on the environment and, in particular, for managing endangered and overexploited species, as well as encouraging the sharing and decentralization of decisions through co-management and community-based management initiatives. The development policies put forth by these two agencies were oppositional and conflictive in their approach to resource management. According to Dias-Neto (1999), such a change represented "one of the most anarchical moments in fisheries management in Brazilian history".

Dias-Neto and Marrul-Filho (2003) highlighted the three main institutional conflicts that were created with the division of responsibilities between the IBAMA and the DPA. The first was of a legal nature, relating to the division of competencies in fisheries management and to the organization and maintenance of the national system of control and licensing of fishing activities. The second conflict was conceptual: as stocks are intrinsically linked in the marine environment through ecological and technological interactions and in multispecies fisheries, the same fishing activity often targets stocks with different exploitation levels. Further, a stock that is considered unexploited at a given moment could eventually be overfished, and thus the same species could be under the responsibility of two different agencies at different moments in time. As stated by Dias-Neto and Marrul-Filho, "IBAMA and DPA were trying to divide the indivisible". The third conflict emerged from the transfer of responsibility from the IBAMA to the DPA for management and control of foreign fleets fishing under joint-venture arrangements, and the consequent changes in the regulatory regime.

In 2003, a new fisheries agency was created at the ministerial level: the National Secretariat for Aquaculture and Fisheries (SEAP), which has broader authority than the previous agencies. Its priority is the development of the aquaculture sector, particularly of shrimp cultivation for export, freshwater aquaculture and industrial fisheries. In spite of official speeches, the artisanal sector has not been a top priority for this agency.

With the enactment of the Law 11.958 of June 2009, SEAP was transformed into the Ministry of Fisheries and Aquaculture (MFA). The same law put an end to the division of responsibilities in the management of fish stocks stated above, making mandatory the joint work of MFA and IBAMA/Ministry of Environment in the design of rules and the governance for sustainable use of resources. This work is to be carried out

under the general coordination of MFA. However, this new institutional arrangement has not yet contributed to the implementation of policies and measures to revert the critical situation of the main fish stocks.

The governance of protected areas in Brazil is currently under the responsibility of the Chico Mendes Institute of Biodiversity Conservation (ICMBio). This agency was created in 2007, taking on part of the mandate that had belonged to the IBAMA. While the ICMBio assumed responsibility for the creation, establishment and management of protected areas in the national territory, the responsibilities of the IBAMA became limited to environmental licensing and enforcement outside protected areas.

According to the Brazilian Constitution, in terms of property rights, the fishery resources in the coastal zone and the exclusive economic zone (EEZ) are considered common resources under a state property regime (MMA, 2002; Dias-Neto and Marrul-Filho, 2003). The Constitution also asserts that state and society should construct the means to collaborate and participate in the process of decision-making for the sustainable use of environmental resources, and in the formulation of norms and rules to that effect (Dias-Neto and Marrul-Filho, 2003). This constitutional mandate leaves ample scope for the sharing of responsibilities between government and society in the management of fisheries.

The weakening role of the state in fostering the development of artisanal fisheries during the last two decades, mainly after the termination of the SUDEPE, has contributed to the general lack of organization in this sector. On the other hand, the institutional void favoured action by social movements and non-governmental organizations (NGOs) in the development of projects and initiatives for the sustainable management of fisheries. Many of these initiatives were born out of a crisis that triggered the increased participation of fishers as new protagonists in decision-making. Within the National System of Conservation Units (SNUC – discussed in detail in Section 3), the growing involvement of local people in fisheries management is most clearly evidenced by the establishment of protected areas for sustainable use (i.e. areas of environmental protection, marine extractive reserves and sustainable development reserves). This has given fishing communities exclusive rights to exploit and manage resources within the boundaries of the protected areas.

Two other initiatives include the 'fishing accords' and 'fishing fora'. The fishing accords, regulated by Norm No. 29/03 of the IBAMA, aim to define and legitimize access rules and norms elaborated by fishing communities to regulate the use of fishery resources in a given region. Examples of fishing accords can be found in the Amazon floodplain region. This type of instrument does not necessarily involve the expropriation of land (as does the SNUC), but has been shown to be a strong mechanism for regulating the exploitation of resources. The fishing fora, although not controlled by the government, have been created by a crisis that has motivated communities to organize themselves, and to discuss their problems and seek solutions in partnership with governmental and non-governmental organizations.

The objective of these initiatives is to fashion co-management regulatory/governance arrangements. Fishing fora are composed of institutions directly and indirectly involved in decisions that affect small-scale fisheries in a specific ecosystem. Elected representatives of the participating institutions attend meetings and have the right to vote on the decisions made (for example, management decisions that involve fishery closures, net sizes, etc.). These institutions represent the main stakeholders (governmental and non-governmental organizations and civil society) in the management of fishery resources in a given area. Some examples are the Forum of Patos Lagoon in southern Brazil, the Forum Agenda 21 in Ibiraquera, Santa Catarina, and the Forum Terramar in Ceará, among others (Kalikoski, Seixas and Almudi, 2009).

The government has adopted a fisheries committee model in the management of some industrial fisheries (e.g. sardine, lobster and demersal fisheries committees). The

main role of these committees is to: (i) discuss, propose and monitor the application of measures for sustainable management of the fishery, including maintenance of systems of analysis and information regarding relevant biostatistical and socio-economic data; (ii) draft fisheries management proposals for presentation at international meetings; and (iii) monitor implementation of work by the scientific subcommittees and state management groups that advise committees and support their decisions. This type of arrangement involves institutions that represent the fisheries sector at the national level (governmental, non-governmental and civil society) and that are associated with management decisions for a particular marine species.

In all of the above processes, specific spatial management measures have been used as tools for fisheries management. The most common measures are establishment of closed areas for certain gear types and fisheries. Examples include the trawling ban within three miles of shore (effective for almost the entire coastline), the ban of industrial purse seine fisheries in the mouth of the Patos Lagoon in southern Brazil, and protected areas for the monkfish fishery in slope waters of southern Brazil (Perez and Maida, 2007).

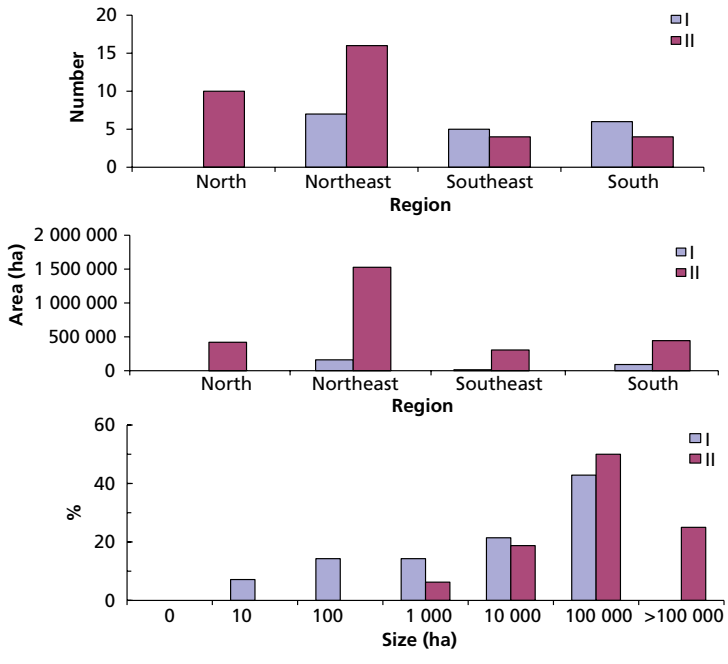
3. MPA DESIGN, MANAGEMENT AND GOVERNANCE

Both terrestrial and aquatic protected areas are established under the umbrella of the SNUC, and regulated by Federal Law 9.985/2000 (Benjamin, 2001a). Two main categories of protected areas are defined by the SNUC: (i) areas under total protection (no-take); and (ii) areas for sustainable use. The main difference relates to permission to extract natural resources and to live inside the boundaries of the protected area, which is forbidden in the first category and allowed in the second. The SNUC defines different types of no-take and sustainable-use protected areas, each with specific objectives (Table 3). All of these areas can be established by and governed at federal, state or municipal levels.

Table 4 and Figure 2 show the number and areas under different types of protection in each of the coastal regions of Brazil. It is worth noting that in compiling the protected

FIGURE 2

Number (upper), area (middle) and distribution of frequency of sizes (lower) under two categories[a] of marine protected areas



[a] I: Total protection or no-take; II: Sustainable use.

TABLE 3
Types of marine protected areas and their main purposes in Brazil

Category	Goal	Types[a]	Objectives
Group I: total protection	Environmental preservation, without direct use of natural resources	(1) National parks (IUCN category II)	(1) Preservation of ecosystems of high ecological significance and scenic beauty, allowing for scientific research, environmental education, recreation and ecological tourism. Visits by tourists are allowed.
		(2) Biological reserves (IUCN category I)	(2) Integral preservation of biota and other attributes that exist within reserve boundaries, without direct human interference or environmental changes, except for recovery of its ecosystems to maintain natural balance, biological diversity and natural ecological processes. Very restricted in terms of permitting entry of people. Only those taking part in research or environmental education are allowed, depending on authorization by government.
		(3) Ecological stations (IUCN category IV)	(3) Preservation of natural ecosystems and development of scientific research. Very restricted in terms of permitting entry of people. Only those taking part in research or environmental education are allowed, depending on authorization by government.
Group II: sustainable use	Environmental conservation, combined with sustainable use	(1) Areas of environmental protection (IUCN category V)	(1) Protection of biological diversity, control of process of human occupation, and maintenance of sustainability of use of natural resources.
		(2) Marine extractive reserves (IUCN category V)	(2) Conservation and sustainable use of natural renewable resources by traditional fishing communities.
		(3) Sustainable development reserves (IUCN category V)	(3) Natural areas that are home to traditional populations, whose existence is based on sustainable systems for exploitation of natural resources developed over generations and adapted to local ecological conditions. Fishing is not the only economic activity, and local communities are also involved in activities such as crafts production, attending to tourists, cultivating the land or gathering forest products.

[a] Equivalence with the categories of protected areas proposed by the IUCN is indicated.

Sources: Government of Brazil, 2000; Diegues, 2008.

areas, only those established by the federal government were readily accessible on institutional Web sites, whereas information about state and municipal protected areas was not always available or easily accessible. The lack of a national database of protected areas, integrating all federal, state and municipal areas, is an important limitation that hinders a more comprehensive analysis of the use of protected areas in Brazil. With few exceptions, therefore, the data presented here are mostly based on the protected areas established by the federal government – and all results presented can be considered an underestimation of the real situation.

Despite the fact that some protected areas listed have no marine component, it is important to include them here because of their direct impact on fisheries and marine conservation. For instance, the displacement of fishing communities away from their traditional coastal location and other negative socio-economic impacts on communities have actually been causes of conflict in the establishment of some coastal protected areas; thus, these are not necessarily two distinct consequences. On the other hand, some coastal protected areas have been designed to protect components of marine fauna, such as beaches that have been protected because of their importance as sea turtle nesting grounds. Failing to account for these types of situations would give an incomplete picture of the use of spatial measures in fisheries and marine conservation.

The protected areas include several coastal and marine ecosystems such as coastal and oceanic islands (including archipelagos), reefs, dunes, mangroves, lagoons and salt marsh habitats. A number of protected areas were established for coral reef ecosystems.

The majority of the protected areas for sustainable use (category II) are in the northern and northeastern regions, while no total protection areas (category I) are present on the north coast. The northeastern region concentrates both categories of protected areas in terms of the total number – area under protection and overall area under protection in Brazil. In terms of sizes of individual MPAs, there is a tendency for no-take areas to be smaller than sustainable-use areas (Figure 2). In total, less than 1 percent of the total marine areas of Brazil (some 360 million hectares [ha]) are under some type of protection.

Because of their particular relevance to fisheries management, the situation of marine extractive reserves (MERs) is discussed here in more detail. As shown in Table 4, there are 19 MERs in the four coastal regions of Brazil, encompassing approximately 835 000 ha of coastal and sea space. Existing MERs include an approximate population of 61 500 small-scale fishers, which represents between 1 and 2 percent of the total estimated number of these fishers in Brazil.

Table 4
Coastal and marine protected areas in Brazil

Category	Type	Region	Area (ha)	Types of ecosystems and uses
I. Total protection	**National parks**			
		North		
		–	–	–
		Northeast		
		Abrolhos	88 249	Marine insular, reefs
		Timbebas	11 000	Marine, reefs
		Fernando de Noronha	11 270	Marine insular, reefs
		Parcel do Manuel Luiz	10 800	Marine, reefs
		Areia Vermelha	230	Coastal, marine, reefs
		Southeast		
		Laje de Santos (State Park)	5 000	Marine, reefs
		South		
		Lagoa do Peixe	34 400	Coastal lagoons, marine
		Superagui	33 928	Atlantic forest, coastal
	Biological reserves			
		North		
		–	–	–
		Northeast		
		Santa Isabel	2 766	Coastal
		Atol das Rocas	36 249	Marine, reefs
		Southeast		
		Comboios	823	Coastal
		South		
		Arvoredo	17 600	Marine insular
		Ilha dos Lobos	2	Marine insular
	Ecological stations			
		North		
		–	–	–
		Northeast		
		–	–	–
		Southeast		
		Tupinambas	28	Coastal, marine
		Tamoios	8 450	Coastal, marine
		Tupiniquins	43	Coastal, marine
		South		
		Carijos	619	Coastal
		Guaraqueçaba	4 835	Coastal

TABLE 4 (Continued)

Category	Type	Region	Area (ha)	Types of ecosystems and uses
II. Sustainable use	**Areas of environmental protection**			
		North		
		–	–	–
		Northeast		
		Boipeba	43 300	Marine insular
		Jericoacoara	207	Coastal
		Fernando de Noronha	93 000	Marine insular, reefs
		Delta do Parnaiba	313 800	Coastal
		Costa dos corais	413 563	Coastal, marine, reefs
		Barra do Rio Mamanguape	14 640	Coastal
		Recifes de Corais	180 000	Marine, reefs
		Ponta da Baleia	34 600	Marine, reefs
		Southeast		
		Cananéia-Iguapé-Peruíbe	234 000	Coastal
		Guapi-Mirim	13 961	Coastal
		South		
		Guaraqueçaba	283 014	Coastal
		Baleia Franca	156 100	Coastal, marine
		Anhatomirim	3 000	Coastal
	Marine extractive reserves			
		North		
		Soure	27 464	Artisanal fisheries (1 300)
		Chocoaré-Mato Grosso	2 786	Artisanal fisheries (600)
		Maracanã	30 019	Artisanal fisheries (5 000)
		Mãe Grande de Curuçá	37 062	Artisanal fisheries (6 000)
		São João da Ponta	3 203	Artisanal fisheries (600)
		Araí-Peroba	11 480	Artisanal fisheries (1 300)
		Caeté-Taperaçu	42 069	Artisanal fisheries (6 000)
		Gurupi-Piriá	74 082	Artisanal fisheries (6 000)
		Tracuateua	127 154	Artisanal fisheries (1 500)
		Northeast		
		Baia do Iguape	8 118	Artisanal fisheries (4 515)
		Corumbau	89 500	Artisanal fisheries (7 000)
		Delta do Parnaíba	27 022	Artisanal fisheries (3 600)
		Lagoa do Jequiá	10 204	Artisanal fisheries (2 500)
		Batoque	601	Artisanal fisheries (700)
		Cururupu	185 047	Artisanal fisheries (5 615)
		Canavieiras	100 646	Artisanal fisheries (Unknown)
		Southeast		
		Arraial do Cabo	56 769	Artisanal fisheries (3 000)
		Mandira	1 176	Artisanal fisheries (100)
		South		
		Pirajubaé	1 444	Artisanal fisheries (600)
	Sustainable development reserves			
		North		
		Itatupã-Baquiá	64 735	Timber, forest products, fisheries (802)
		Northeast		
		Ponta do Tubarão	12 960	Artisanal fisheries, tourism (7 000)
		Southeast		
		–	–	–
		South		
		–	–	–

Note: Numbers in brackets indicate the estimated number of people living inside protected areas for sustainable use.

Source: Centro Nacional de Desenvolvimento Sustentado das Populações Tradicionais (CNPT/IBAMA);
Web site: www.ibama.gov.br/resex/cnpt.htm accessed 12/12/2008.

The northern and northeastern regions concentrate the largest number of MERs: 47 percent in the north and 37 percent in the northeast. The southeastern and southern regions have only 11 and 5 percent, respectively. The largest area under MERs is in the northeast (421 137 ha or 50 percent of the total), followed by the north (355 318 ha, 42.5 percent), the southeast (57 945 ha, 7 percent) and the south (1 444 ha, <1 percent).

The present geographical distribution of protected areas for sustainable use (including MERs) contrasts with the status of fishery resources targeted by small-scale fishers in coastal regions. As shown in Section 2, the proportion of fisheries in a collapsed situation increases from north to south, being as high as 32 percent in the southern region. That indicates that the establishment of these protected areas has not been driven solely by concerns about the conservation status of resources. Other factors are at play, such as conflicts over the use of coastal areas between fishing communities and other sectors, for example shrimp farming, tourism and oil exploration. These conflicts are particularly relevant in the northeastern region of Brazil, where most MERs are located (Vasconcellos, Diegues and Salles, 2007; Diegues, 2008).

Other possible reasons for the unbalanced distribution of MERs along the coast were discussed by Kalikoski, Seixas and Almudi (2009). They put forward two hypotheses. The first is that the higher level of community organization in the northern and northeastern regions of Brazil makes these communities better prepared to engage in participatory management processes than are communities in other regions of Brazil. According to the authors, two factors support this hypothesis: (i) the social mobilization promoted by the Catholic Church in these regions since the 1960s; and (ii) the higher cohesion of communities, particularly in the north, where they have not yet been disrupted by the cultural and socio-economic impacts of tourism development and the environmental degradation observed in other regions of Brazil, including in the northeast. The second hypothesis is that there is an inexplicit government political goal to create more sustainable-use protected areas in the northeast to give some level of protection to communities in less-favourable economic situations.

All of the above factors were probably important in determining the current location of MERs. One must also consider the different models of community organization adopted in the southern region to empower these communities to face conflicts over resource use and overfishing. For example, the fishing forum type of co-management arrangement was established in many fishing communities of southern Brazil (Kalikoski, 2002; Kalikoski, Seixas and Almudi, 2009).

Unlike MERs, fishing fora are non-regulated instruments that emerged from within communities, which organized themselves to discuss problems and solutions regarding the sustainability of fisheries. Another important distinction between the fora and protected areas for sustainable use is that fora do not provide fishing communities exclusive use rights to marine spaces. The efficacy of fishing fora are undermined by a lack of formalized authority over their respective areas, and because of this, they have been unable in some cases to stop the 'race for fish' that drives overfishing of resources.

3.1 A historical perspective on MPA design and implementation in Brazil

The implementation of protected areas classified under group I (total protection) historically follows a 'parks-no-people' approach that emphasizes the establishment of protected areas independent of direct human interference, with the objective of conserving examples of untouched ecosystems. A command-and-control management style is applied, with a view to separating people from nature. Local populations living inside the protected areas are mandated to be transferred elsewhere, creating a huge conflict between government and the local people who have historically lived in these areas and relied on their natural resources for maintenance of their livelihoods. As

Pinto da Silva (2002) put it: "… by alienating local people, these strategies have turned residents into squatters, hunters into poachers, and gatherers into trespassers in the newly established protected areas".

In these restrictive types of MPAs, many national parks, biological reserves and ecological stations were effectively implemented on paper, but had little success in protecting natural resources owing to the government's organizational constraints, such as inappropriate management structure and lack of staff and financial resources (Brito, 2003). For example, there are often resource users with close ties to nature, such as indigenous peoples and artisanal fishers (among others), who are already living in areas set aside for conservation, and there is insufficient organizational capacity or funding to provide incentives for relocation or to finance resettlement schemes.

The 'total protection' conservation approach, absorbed by the SNUC and thus still in use today, dates back to 1937 and the creation of the first national park (Itatiaia Park, located in the State of Rio de Janeiro). Here, national parks were defined by law as "natural public monuments that perpetuate the primitive forest composition of those areas of the country which, because of their unique and outstanding value, are worthy" (Quintão, 1983). At the time, the establishment of protected areas was seen as the mechanism for implementing environmental policy. It was during the military regime that most no-take conservation areas in Brazil were created – mainly in the Amazonian region. According to Diegues (1998), the motive was to compensate for the destruction of forests by large projects implemented under the government's policy on economic development (roads and dams, mining, agroindustries and cattle ranching).

During this period, the creation of no-take areas was also influenced by the entry of many environmental NGOs into Brazil, such as the World Wide Fund for Nature (WWF), Conservation International and The Nature Conservancy (TNC). Protected areas were created by decree, leaving little room for civic participation in the process, owing to the government's policy of transferring local people out of protected areas and resettling them elsewhere, causing them to lose access to important resources. According to Diegues (2008), "until the 1980s, only no-use protected areas were accorded priority, in terms of funds and personnel, by IBAMA and the environmental NGOs, who exerted great influence on the government". It was the Amazon's rubber tappers who first proposed, through the National Council of Rubber Tappers, that extractive reserves be set up. This proposal received the backing of international groups and social organizations within the country, building up political pressure for their creation.

Protected areas for sustainable use (group II) were first implemented in the late 1980s. They combine the idea of sustainable use with the aim of conserving natural resources: "Unlike the no-take reserves, which were created by the government and backed mainly by NGOs, sustainable-use reserves were an outcome of pressure from traditional communities, such as rubber tappers in the Amazon, who wanted to save the resources that afforded them a livelihood before they were completely destroyed" (Diegues, 2008). The appearance of these socio-environmental movements has had an enormous impact on changing traditional assumptions about the role of local resource users in protected area planning and management. Much of this pressure also originated in the debate and the resulting documents signed at the 1992 Rio Earth Summit,[1] which emphasized the importance of local participation in the conservation process.

In 1990, the National Environmental Programme was set up by the IBAMA and the new state environmental agencies. It was (officially) thought that decentralization of environmental control from federal to state level would make this process more effective. New policies officially recognized, for the first time, the need to promote

[1] United Nations Conference on Environment and Development (UNCED) Summit in Rio de Janeiro, Brazil, in June 1992.

sustainable forms of natural resource use to benefit local populations. Specifically, one type of federal conservation category created during this period, the 'extractive reserve' category, allows not only for the presence of populations within the units' boundaries, but actually encourages permanent occupation by traditional populations. Indeed, the creation of a protected area in this category is only warranted in areas where these groups are present.

According to Diegues (2008): "Marine extractive reserves and sustainable development reserves can be considered a 'new commons' in the sense that they have defined boundaries and that the fisheries are co-managed by the government and users' associations. Rules and regulations are framed by the users' associations, which can impose penalties on those who disobey them." After extractive reserves were created in Amazonia, the IBAMA established a department within the organization dedicated to these direct-use protected areas, and to expanding them into other regions. This arm of the IBAMA is called the Center for the Sustainable Development of Traditional Populations (CNPT). Through the CNPT, the extractive reserve regimes were expanded to other areas in the north of the country; the concept was also applied to aquatic areas.

In 2000, after more than ten years of discussion among groups of researchers, local communities, policy-makers and conservationists, the new framework for protected areas in Brazil was approved by the Congress, creating the SNUC (Law No. 2.892/92). The SNUC brought about a change in the paradigm of conservation management in Brazil, because it demanded recognition of: (i) the rights of traditional populations to protect their livelihoods, instead of protecting the environment only; and (ii) the importance of using a participatory approach to designing, implementing and monitoring protected areas. This was a political response to the broader global movement towards recognizing the rights of indigenous and other traditional populations, as well as the importance of their knowledge in conservation management (Brito, 2003).

3.2 Brazilian national plan for coastal and marine protected areas

In accordance with decisions made at the Seventh Ordinary Meeting of the Conference of the Parties (COP 7) to the CBD, the Brazilian Government has undertaken the responsibility of implementing a national plan for coastal and marine protected areas as part of the Working Programme of Protected Areas assumed by all parties. The main purpose of this plan was to establish a representative and effective network of terrestrial protected areas by 2010 and marine protected areas by 2012. According to Prates (2007), the design took into account the contributions of diverse stakeholders (for example, government, NGOs, universities and research institutes). The plan, recognized by Decree No. 5758 of 04/12/2004, is based on the following premises (Prates, 2007):

- Marine and costal protected areas must be designed for biodiversity conservation and as fisheries management tools.
- The system must be representative.
- The final percentage of each coastal and marine ecosystem to be protected will be defined after completion of representative studies.
- Network design must include pressures, threats and conflicts from the coast to the EEZ, with a priority map.
- The representative network must be composed of: highly protected areas, where extractive uses are prevented and other significant human pressures are removed to enable the integrity, structure, functioning and exchange of processes of, and between, ecosystems to be maintained or recovered; and an ancillary network of protected areas, where specific perceived threats are managed sustainably.
- The design must specify sustainable management practices to be applied over the wider coastal and marine environment.

3.3 Decision-making processes

The decision-making processes through which MPAs are designed and located are very broad and vary according to the specific category and typology of a particular MPA. It is important to note that MPAs can be managed by the federal, state or municipal government, depending on the administrative level at which they were established. Their management can also be facilitated through partnerships with the private sector. With the exception of MPAs for sustainable use (MERs, areas of environmental protection and sustainable development reserves [SDRs]), the creation and management of MPAs under total protection has been top-down and state-based (i.e. the ICMBio is responsible for their creation, establishment, management and enforcement).

However, there are cases of nested institutional linkages in MPA implementation. For instance, Almudi (2008) recognizes different types of institutional interplay in the governance of the National Park of Peixe Lagoon: (i) the National Advisory Council and the Peixe Lagoon Fishing Forum, multistakeholder bodies responsible for advising the federal government; (ii) horizontal linkages between the multistakeholder bodies and other community groups; (iii) vertical linkages with municipal, state and federal government, NGOs, universities and labour unions; and (iv) 'invisible' linkages among national and international organizations, which, although not readily recognized by local people and organizations, can influence the decision-making process.

The criteria for governing a protected area are rather broad and generic (Brito, 2003). According to the SNUC, the creation of an MPA is to be based on scientific research criteria, together with public consultation, and should indicate which areas are to be preserved in terms of their importance, under which category, the best location, dimension and appropriate boundaries. During public consultation, the government should inform the local population of the importance of creating such an area, and of the criteria guiding MPA implementation and management. In the case of biological reserves and ecological stations, the government does not need to engage in public consultation and the process is basically top-down. In general, the government has the power to create, change and enforce rules within MPA boundaries, particularly no-take MPAs. All MPAs should have a management plan for governing the protected area within five years of its creation. The plan should consider management of buffer zones and ecological corridors, including measures that will promote the integration of protected areas with the social and economic aspects of local communities. At present, however, community participation in the design and implementation of the management plan is only allowed within the category of sustainable-use MPAs.

The relevant legislation mandates that each MPA shall have an advisory council to promote dialogue between the state and the diverse interested parties within the local population, in order to further public participation in the decision-making. According to the SNUC, advisory councils do not have power to make decisions; rather, their objective is to serve as a platform for dialogue to guide decisions of the environmental agency responsible for managing the protected area. The administrative body of each MPA is responsible for leading the MPA advisory council.

While the creation of MPAs under total protection is part of a governmental programme, the establishment of most MPAs for sustainable use began as pressure from organized local communities, who felt marginalized and had their livelihoods threatened by economic development in coastal areas. According to Diegues (2008), MERs represented a radical departure from setting up and managing no-take MPAs, because they "acknowledged that the environment and society stand to benefit from helping the coastal poor secure access to their traditional sea territories and livelihood". A description follows of the implementation process for two types of protected areas for sustainable use: MERs and SDRs.

Three phases are involved in the case of MERs. First, a formal request must be made to the CNPT/ICMBio by local communities, fishers' cooperatives and other

associations, with a description of the setting and an approximate indication of the area traditionally used. The request should also describe the social, economic, cultural, institutional and biological importance of the setting, along with arguments in support of the proposal. The CNPT/ICMBio, through research institutes and NGOs, then carries out an interdisciplinary assessment study that evaluates the biological and socio-economic potential of the proposed reserve and the limiting factors that constrain its creation. Once the proposal is accepted, the coastal and marine area is declared state (public) land (areas of environmental protection excepted), and a concession is given to the users' association. Finally, the MER must be officially created in law by the federal or state government.

Second, in the implementation phase, a management plan is developed – rules, rights and responsibilities of resource use – in essence representing a social contract among resource users. This plan must then be approved by the CNPT/ICMBio and published in the federal register to codify the rights and responsibilities of the government and resource users. Diegues (2008) further describes the process of implementation as follows:

> *A director is appointed for the MER by ICMBio/CNPT and he or she plays a crucial role in mobilizing financial and technical resources. The members of the MER have to be organized into a legal entity that will act as an intermediary between the State (ICMBio) and the users of the resource. In most cases, a new association has to be created. Once it is officially registered, a contract is signed whereby ICMBio gives the association usufruct rights as a concession for a period of 50 to 60 years. Although the State maintains ownership of the physical area, the members have rights of access to resources in the MER. These rights cannot be traded or sold and can only be passed on through inheritance, something that makes it an incentive for sustainable resource use. A utilization plan for the MER has to be compiled and implemented by the association, and officially approved by ICMBio in a co-management process. This temporary plan establishes the activities and practices that are permitted in the area. It also defines penalties for those who do not obey the rules. If the association's activities deviate from the utilization plan in a way that causes environmental degradation, the contract can be cancelled. Next comes the co-management plan, which replaces the utilization plan and has to be completed in the first five years of the MER's existence. It defines the type of use–restricted access to some areas, multiple use of other areas for activities such as aquaculture and tourism and non-use of certain areas. Authorized fishing techniques and penalties as well as the role of each institution in the governing council are specified. Monitoring and surveillance measures are also agreed on and the local fishermen are requested to participate in these activities. Decisions over establishing rules are taken by the MER's members in a public forum, where they have the right to vote on decisions made. An important process at this stage is setting up the MER's deliberative council. This body was created in 2002 for all extractive reserves, even for those established before that date. It is the highest decision-making level in an MER and its decisions are very crucial, more so because only half its seats are occupied by local fishers' representatives, NGOs and tourism associations. The other half is occupied by government (federal, State, municipal) institutions. It is the deliberative council's task to resolve conflicts among different users of the sea space and their associations. The operational aspects of the MER are taken care of by the members' association. The deliberative council has to approve the co-management and the sustainable development plans formulated.*

Third, in the consolidation phase, the MER must be self-sufficient (i.e. it must depend on funds generated by its members). According to Diegues (2008), very few MERs have achieved economic self-sufficiency, mostly relying on funds provided by the federal government. In the very few cases of self-sufficiency, funds come from the associated members: a percentage on fish traded by members (when there is no cooperative), fees paid by industrial fishing craft to transit MERs, and operations of commercial harbours

within them (Diegues, 2008). As identified by Pinto da Silva (2004), this final phase is clearly the most challenging, as it requires robust, locally derived institutions sustained by long-term community participation and government support.

In the case of SDRs, the decision-making process is similar. The main difference between SDRs and MERs relates to land/sea tenure – in the case of MERs, property rights are to be vested in the state. Thus, one main responsibility of the government is dealing with issues of land tenure, which usually entails the legislative transformation of private into state-owned land. In the case of SDRs, however, there is no obligation by the state to expropriate land. The management plan designed for the SDR should define within its boundaries the areas of: (i) total protection; (ii) sustainable use; (iii) buffer zones; and (iv) ecological corridors. These parameters should be decided on and approved by the advisory council (composed of representatives of governmental agencies, civil society and local traditional communities) that is responsible for administration of the SDR (SNUC article 20, paragraph 6).

The entire process of creating MPAs in Brazil may take from a few years to nearly a decade, depending on political pressures at all levels (for example, resistance from municipal and state governments, legal charges by people directly affected by the protected areas, conflicting government policies). In the case of the National Park of Peixe Lagoon, the park was created in 1986, but effective closure of the areas for different uses (fisheries and agriculture) and relocation of the communities living in the area have never taken place (Almudi, 2008).

3.4 Perception of MPAs

According to Derani (2001), MPAs governed under the SNUC are important in three ways: first, they may trigger a more sustainable use of nature by society; second, they serve as a planning instrument within the national territory; and, finally, they can be seen as an important area for scientific development in Brazil.

In the Ministry of the Environment's view, the implementation/management of protected areas faces two main problems: (i) the total area protected per biome is not enough to maintain biodiversity conservation;[2] and (ii) protected areas already created have not yet fully achieved the goals that prompted their creation.

Pádua (2001) presents some criticisms of the SNUC, some of them relevant to MPAs:

- superficial mention of the creation of ecological corridors in some categories of protected areas (in SNUC article 25);
- absence of a central goal for the SNUC, or even disharmony between its preservation objectives and the sustainable use of natural resources;
- too many categories of protected areas – some of them unnecessary, too similar or presenting an unclear definition (e.g. MERS and SDRs, national parks, ecological stations and biological reserves);
- absence of a funding mechanism for administration of the protected areas in order to meet the goals of the SNUC;
- absence of formal national incentives (e.g. fiscal incentives) for creating and managing protected areas;
- insufficient administrative autonomy for each protected area, given that the centralized administration (previously by the IBAMA and currently by the ICMBio) has been extremely inefficient.

Finally, there is a consensus among academics, civil society, NGOs and government that some categories of protected areas under the SNUC have been copied from other countries without any concern for their adaptability, and are thus inappropriate to Brazilian reality. This has been the source of many conflicts between fishers and

[2] A minimum of 10 percent of full protection per biome is needed, according to the conclusions of the IV World Congress on National Parks and Protected Areas, Caracas, 1992.

administrators, such as those documented in relation to various no-take MPAs (Diegues, 2008; Almudi, 2008; Parada, 2004; Furquim, 2000; Diegues, 2005; Oliveira, 1993; Prado, 2005; Adamoli, 2002).

In the case of the National Park of Peixe Lagoon, Almudi (2008) shows that maintaining access rights to fishing resources is the most important priority for fishing communities, and that they therefore perceive the national park as a threat to their livelihoods. Fishers are also deeply concerned about the fishing access rights of their children, and the maintenance of their livelihood in the future. Living inside the protected area (or at least in close proximity to it) is another priority for this community – in order to have easy access to fishing spots and to be able to closely observe the conditions of the environment and of marine species on a daily basis. Fishing communities also perceive that the relocation compensation they are to receive from the state will be insufficient to sustain them and their families. Even if they were to get sufficient monetary compensation to meet their basic needs, some fishers would still be unwilling to leave their territory. Fishers also protest that many restrictions are imposed on them, while industrial vessels causing a far higher level of environmental impact continue to fish illegally within the sea space of the park, without any visible opposition from the government.

4. IMPACTS AND CHALLENGES TO EFFECTIVE MPA IMPLEMENTATION

As discussed in previous sections, implementation of the SNUC was a response to many of the challenges identified in the governance of protected areas in Brazil. Despite the progress observed since its implementation, some important challenges remain. An assessment of the performance of protected areas (terrestrial and marine) established at the federal level indicated that about 50 percent still have low management effectiveness (Pavese, 2008). Low effectiveness implies that a protected area has not been able to achieve the objectives for which it was established, such as protection of biodiversity and sustainable use of resources.

TABLE 5
Selected studies of the impacts of implementing MPAs in Brazil

MPA type	Social and economic impacts	Ecological impacts
Peixe Lagoon National Park (Almudi, 2008)	- Conflicts between community and park authority due to mandatory closed access to territory and resources - Civil disobedience and physical violence - Deterioration of living conditions inside park - Decreased fishing effort in lagoon owing to closing of access to outsiders - Increasing erosion of traditional knowledge - Absence of compensation for fishers that have migrated from park area - Irregular occupation of surrounding areas of park - Loss of fishing access rights of fishers' children - Crisis-triggered fisheries co-management	- Impeding traditional practice of opening connection between lagoon and ocean threatens ecological resilience and productivity of lagoon - Decrease in fishing effort inside lagoon favours conservation of stocks - Lack of surveillance and enforcement in coastal protected area threatens conservation efforts - Mismatch between MPA boundaries and stock area threatens conservation efforts
Environmental Protection Area "Costa do Coral" (Ferreira and Maida, 2007)	- Increase in tourism, leading to increase in income of fishing communities - Improvement in local fish trade and increase in price paid to fishers	- Rapid recovery of fish density in experimental no-take area related to attraction of fish from surrounding areas
Abrolhos National Park, Biological Reserve of Arvoredo, Timbebas National Park, State Park of Laje de Santos (Floeter, Ferreira and Gasparini, 2007)		- Highly targeted species of top predators and large herbivores significantly more abundant and larger in size within areas with a higher degree of protection. In contrast, lightly fished and unfished species showed opposite trend, indicating indirect effect of removing top predators from reefs

TABLE 5 (continued)

MPA type	Social and economic impacts	Ecological impacts
MER of Corumbau (Moura *et al.,* 2007; Diegues, 2008)	- Lack of capacity (funds, training, experience) impeding an efficient and effective system for collaborative resource governance - Little improvement in living conditions of traditional populations due to lack of funds to improve marketing system and fish-landing areas, and to ensure better functioning of schools and hospitals - Lack of basic infrastructure for storing and commercializing catch - Community empowerment and consolidation of co-management - Boundaries of protected area include only coastal/marine area and not adjacent land on which fishers live. As a result, fishers suffer pressure from real estate market to sell their land. Some are being forced to live farther away from protected area - Fragility of social institutions as villagers are organized into three users' associations, but only small percentage of them are aware of norms that regulate MER - Strong dependence on intermediaries remains, lowering incomes of fishers - Increasing importance of tourism in many villages - Southern part of Bahia State is seriously threatened by expansion of shrimp cultivation farms. Corumbau MER has been encouraging area fishers to resist expansion of these farms and create more MERs in region	- Increase in abundance of commercially important fish species inside and near no-take zone implemented within MER - By keeping trawlers away from protected area, more fish are available for artisanal fishers within it - Broadening of network of reef areas under protection in region (integration with Abrolhos and Timbebas National Parks) has created conditions for effective conservation of reef stocks - MER considered important protection against expansion of large shrimp farms now threatening to engulf entire Bahia coast
MER of Arraial do Cabo (Pinto da Silva, 2002)	- Lack of capacity (funds, training, experience) impeding an efficient and effective system for collaborative resource governance - Fishers given opportunity to participate and influence management decisions. However, few fishers have taken advantage of this opportunity because of power imbalances within community - Incentives for collective action to protect resources on which fishers' livelihoods depend - User rights defined for all artisanal fisheries in protected area	- Reduction of fishing pressure on resources by limiting industrial and illegal fisheries inside protected area - Mismatch between MPA boundaries and stock area threatens conservation efforts
MER of Mandira (Diegues, 2008)	- Creation of a cooperative that benefited 40 oyster-cultivating families belonging to five communities, including from villages outside MER (outside communities were accepted as long as they complied with established rules) - Before MER, market chain for oysters was dominated by intermediaries. Cooperative and MER members now receive twice as much for oysters as they used to receive from selling to intermediaries - Success of cooperative has made neighbouring communities interested in idea of creating MERs - Mandira's oysters have enhanced appreciation of artisanal production, and locally available high-quality seafood has encouraged tourism - Before MER, outside fishers tended to 'invade' region, with little regard for local traditions. With establishment of MER, members have developed strong commitment to protect its boundaries	- Before MER, most families depended on extracting adult oysters from mangrove by cutting roots of vegetation and overexploitation of stocks. After MER, the community adopted a new technique for raising oysters in which they would not have to harm mangrove and which made possible three harvests a year

A comprehensive analysis of the effectiveness of MPAs in Brazil has not yet been done. Table 5 compiles examples of studies of the socio-economic and ecological impacts of selected protected areas.

Some conclusions can be derived from comparing the examples in Table 5. First, the experience in Peixe Lagoon shows that no-take MPAs can trigger conflicts by eroding the livelihoods of traditional communities. These conflicts can jeopardize the conservation benefits of MPAs. Second, sustainable-use MPAs do not guarantee positive socio-economic or ecological outcomes when communities are not strongly organized, and government and communities are not prepared to engage in a co-management process. Moreover, independently of the category of MPA, if the means for effective implementation (human and financial capacity) are not in place, failure will prevail. Cases of positive ecological impacts were more evident with more-sedentary species (reef fish and oysters), which are less dependent on inflows from outside of protected areas. Cases such as the Peixe Lagoon and the MER of Arraial do Cabo – where there is a clear mismatch between the boundaries of the MPA and the distribution area of the stocks (shrimp and mullet, respectively) – call for coordinated strategies across levels of governance to achieve conservation benefits (Kalikoski and Pinto da Silva, 2007). The following sections discuss these and other challenges that affect the successful implementation of MPAs in more detail, as well as responses to these challenges.

Land regularization

With few exceptions (such as the areas of environmental protection), implementation of protected areas can only be fully accomplished when the area to be protected is converted to state property. Historically, the government has lacked the resources to pay for the regularization of land. Assessments carried out in the early 1990s of the land tenure status of areas under total protection indicated that 14–58 percent had not yet become state property (Brito, 2003). In 1992 it was estimated that about US$1.8 billion would be needed to resolve the situation. Making adjustments in the land tenure system is one of the biggest challenges in managing protected areas. New tools such as the Environmental Compensation Scheme have been used to tackle the shortage of financial resources (Ferraz, 2004). Environmental compensation is governed by the SNUC and requires that every development project, private or public, that may have significant environmental impact must be licensed by the federal or state environmental agency before project start-up. In July 2000, the Congress signed a law stating that, as a condition of licensing, developers are obliged to financially support the establishment and/or maintenance of an area under total protection.

Protected areas for sustainable use also benefit from this process when directly affected by a development project. The volume of resources directed to protected areas must be at least 0.5 percent of total project cost, the actual percentage defined by the environmental agency, based on the projected impact of the development. The establishment of new protected areas may also benefit from this scheme; in fact, this mechanism has been an important source of funds to allow expansion of the protected areas system. The resources allocated in this process are destined primarily for solving land tenure issues, preparation of management plans, acquisition of equipment, and construction of facilities in the conservation units. Although environmental compensation laws have significantly improved the land-purchasing process by resolving bottlenecks, a considerable amount of land is still to be regulated.

Lack of human and financial resources

According to Pavesi (2008), the SNUC requires structural investments on the order of US$700 million and projected annual expenses of about US$450 million, the majority of which is to be spent employing more staff. It is estimated that there is a deficit of at least 7 000 staff members for the management of protected areas. There are many

infamous cases of understaffing. For example, the Jaú National Park covers an area of 2.2 million hectares and reported only four permanent employees (WWF, 2004). In addition, staff face serious shortfalls in skills and training. Limited financial resources are also a barrier to enabling communities and officials to engage in collaborative management processes.

Conflicts associated with no-take MPAs

Although there is growing recognition that effective environmental protection is only possible if local communities support protected areas because they see the benefit of doing so (Pimbert and Pretty, 1995), the creation and management of no-take MPAs is still predominantly top-down and state-based. The model of the no-take MPA considers humans to be predatory, and thus premises the ecological health of a protected area on the complete removal of resource users. This undermines the possibility of achieving successful ecological and social outcomes. When MPAs are created with little involvement of – and therefore little acceptance by – the local population, they tend to become illegitimate and ineffective. Since creation of the Peixe Lagoon National Park, for instance, there have been conflicts between the environmental agency and the local population, with periods of higher and lower tension (for example physical violence and government officials setting boats on fire – Almudi, 2008). Tensions have diminished since the creation of an informal multistakeholder body for fisheries management in the lagoon (the Peixe Lagoon Fishing Forum), which involves fishers in decision-making processes related to fishing practices inside the boundaries of the park.

Nevertheless, Almudi argues that this type of participatory process has been ineffective: it lacks legitimacy among local people because this category of national park implies that people are a threat and should be removed. While this type of no-take protected area is in place and the legislation is not modified, artisanal fishers will be considered a problem, rather than part of the solution (Almudi, 2008). In other instances, it has been noted that the relocation of traditional peoples may disorganize the habitats to which populations are transferred (Colchester, 1997) and increase the number of people living in poverty in urban centres (Arruda, 2000).

Losing traditional ecological knowledge, cultural diversity and identity

The removal of traditional populations from their territory may cause the irreplaceable loss of a unique and complex body of knowledge and practices accumulated over generations (Berkes, 2008). Although in many MPAs fishers have rich ecological knowledge and traditional management strategies that represent valuable tools for environmental resource management, their knowledge is marginalized by governmental officials (Pinto da Silva, 2002; Almudi, 2008; Diegues, 2008; Kalikoski, Seixas and Almudi, 2009). When communities are removed from their territory, they will not only lose their means of survival but also their cultural identity. Thus, the establishment of protected areas should carefully consider the recognition that cultural diversity and traditional knowledge have important roles to play in the maintenance of biological diversity (Diegues, 2000) and in the reconciling of fisheries management with conservation (Kalikoski, 2008; Kalikoski and Vasconcellos, 2008).

Conflict between the communities inside the reserves and communities left outside

The creation of MPAs is not strongly associated with strengthening social cohesion by motivating fishers to self-organize at the local level. Along the Brazilian coast, not all communities organized to request a protected area that could provide mechanisms for their empowerment (such as MERs and SDRs). Some communities have been alienated from the decision-making process for so many years that they do not have the capacity to participate in management functions without assistance. Fishing communities that have self-organized are guaranteed a territory-use concession and control of

decisions over fishing resources. Communities that have not organized have become marginalized, as they do not have the rights enabling them to claim the creation of co-management regimes.

Unwillingness of the government to share management power

According to Diegues (2005), the Brazilian Government has considered the creation of no-take MPAs as a sign of international prestige, even if it comes with social marginalization and conflicts with local people, which is often the case. Almudi (2008) feels that reluctance to share decision-making power and a strict preservationist mentality are two of the reasons for this policy. On the one hand, it is easier to make top-down decisions instead of sharing power with lay people, which entails engaging in a difficult and arduous process of joint decision-making. Several examples of co-management demonstrate readiness on the government's part to attribute responsibilities to resource users, but a lack of enthusiasm for genuinely sharing power when making decisions (Kalikoski, Almudi and Seixas, 2006). On the other hand, as discussed by Diegues (2005), the vast majority of professionals and scientists dealing with MPAs have a background in natural sciences, lack ongoing support in participatory management, and are not trained in conflict-resolution processes. The historical marginalization of small-scale fishers in the decision-making process and prejudice against their traditional knowledge are compounding factors that constrain their involvement in decisions regarding MPA creation and management.

Lack of an adaptive management approach to MPAs

One response to some challenges identified above would be to change the category of protected areas from total protection to sustainable use. However, such a change is not straightforward. Although the SNUC acknowledges that a protected area under the sustainable-use category can be transformed into an area of total protection, the legislation is blurred in the case of transforming no-take protected areas into areas for sustainable use. Nevertheless, switching categories could be as bureaucratic and time-consuming as creating a new MPA.

Cross-scale management of MPAs

The specific characteristics of the environment and the resources to be protected must be considered when planning MPAs for conservation and fisheries management. The size of resource stocks, access to them, their mobility and the level of exploitation are all examples of factors that determine the structure needed to carry out resource management (Adger, Brown and Tompkins, 2005). A misfit between institutions and the level at which resources actually occur has been the cause of failure in several management systems (Folke, Berkes and Colding, 1998; Kalikoski, Vasconcellos and Lavkulich, 2002; Cash *et al.,* 2006). Two examples illustrate the misfit of protected areas of relevance to fisheries. The coastal lagoons of southern Brazil, including the area under the protection of the Peixe Lagoon National Park, are highly dependent on stocks that migrate in and out of lagoons for feeding and reproductive purposes (for example, pink shrimp). While shrimps receive a protected status inside the lagoon, they are heavily overfished by industrial trawlers in the coastal waters of southern Brazil. Compliance would be higher if fishers had some indication that the stock was also being conserved in its other areas of distribution, and that the benefits of conservation would be felt in the years to come.

A similar problem has been identified in the MER of Arraial do Cabo, southeast Brazil. Artisanal fishers depend on migratory stocks such as mullet, which are managed inside the boundaries of the MER by traditional rules that became legalized when the MER was created. However, management rules are absent outside the limits of the reserve, where stocks are highly exploited by industrial fleets (Pinto da Silva, 2002). To

address these mismatches between MPAs and resource boundaries, the various policies, management strategies and actions must be integrated across the diverse scales within the boundaries. That means, for instance: ensuring that proposed broad-scale policies have explicit links to management at the MPA level; promoting ways to connect local management experiences in a region through networks of protected areas; establishing national and regional sustainability benchmarks around which local communities can organize their management programmes, as well as the zoning of marine and coastal areas.

Community participation in sustainable-use protected areas

The success of MPAs for sustainable use hinges on the premise that fishers are prepared to engage in fisheries co-management. According to Kalikoski, Seixas and Almudi (2009), important impediments to effective implementation of participatory approaches to fisheries management in Brazil include: lack of or weak community organization; difficulty in accessing the market directly due in large part to the control of local trade by intermediaries; lack of legitimacy of the formal rules among fishing communities; and lack of microfinance schemes to support community financial self-sufficiency. Almudi (2008) identified the main internal factors in communities that hinder the establishment of a participatory arrangement for managing a protected area:

- *Fishers are not a monolithic entity:* They are rather rarely homogeneous, usually consisting of diverse subgroups and individuals with different interests and worldviews, but competing for the same resources.
- *Difficult community organization:* Fisher communities are poorly educated, little motivated to act in a group, and appear to have a lack of trust in other fishers (both from inside and outside their own communities). They have little information about their rights and about possible ways of modifying the problems their communities face.
- *Lack of self-trust and self-confidence:* Beyond not trusting the environmental agency nor other fishers, individual fishers have been shown to have little trust in what they themselves are able to do to improve their own lives. This is a subtle issue, which could be easily overlooked, but which has major implications for the success of participatory endeavours. Kalikoski, Almudi and Seixas (2006) demonstrate that several successful cases of co-management involving fisher communities have included efforts to increase self-esteem and broaden the worldview of the population. Building trust may take a few years. For instance, Charity and Masterson (1999) argue that organizations involved in the implementation of the Mamirauá Sustainable Development Reserve were able to gain the trust of the local community only over a period of two years.
- *Community mindset is not quite appropriate for participation:* Participating in formal meetings and sitting down for hours discussing and planning environmental conservation (or any other issue) is not part of fishers' usual activities. According to Pinto da Silva (2004), fishers in Brazil live on the margins of organizational life, where even basic participation in local formal institutions is extremely limited. Although some would be willing to contribute to fisheries and protected area management, most believe that planning and decision-making that does not directly affect them should be done by those trained and paid to do it.
- *Lack of basic relevant knowledge about laws and fishers' rights:* Almudi (2008) demonstrates in his study that a considerable part of the fishers in the Peixe Lagoon had very fundamental doubts about the national park (for example, they still do not believe that they should be relocated from their territory simply because it became a national park).

5. CONCLUDING REMARKS

No-take MPAs are an institutional arrangement for fisheries management that has particular implications for property rights, resource use and exclusion. Fishing exclusion is a delicate issue in fisheries management, because it may directly affect the traditional livelihoods and capacity for subsistence of local fishing communities, undermining their human security. It is the assumption of this paper that MPAs will have a role in fisheries conservation if this mechanism does not pose a threat to fishing livelihoods and the human security of the communities that depend on them. Thus the SNUC approach of implementing no-take MPAs has to be reviewed and revised in favour of MPAs that are more inclusive of local people: as argued above, an important flaw of fisheries management in Brazil has been the use of top-down, centralized forms of governance.

Factors that can play a key role in facilitating the establishment of a participatory approach for the management of MPAs include: (i) support for community organization and development of participatory projects, for example of NGOs, churches, donor agencies and the government; (ii) design of fishing accords that aim to exploit resources sustainably and that devise specific roles and responsibilities for fishing communities to help secure sustainability; (iii) creation of alternative sources of livelihoods; (iv) investment in capacity-building and access to information; (v) incentives for self-management and the development of community leadership; (vi) building of the legitimacy of informal rules and informal community-based institutions by the government; (vii) restriction of access and use rights to local communities; (viii) creation of mechanisms to add value to fish resources; and (ix) community participation in fisheries research.

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REFERENCES

Adamoli, G. 2002. *Trabalho, meio ambiente e conflito: um estudo antropológico sobre a construção da identidade social dos pescadores do Parque Nacional da Lagoa do Peixe.* Federal University of Rio Grande do Sul, Porto Alegre, Brazil. (RS Dissertação de Mestrado em Antropologia Social)

Adger, W.N., Brown, K. & Tompkins, E.L. 2005. The political economy of cross-scale networks in resource comanagement. *Ecology and Society*, 10(2): 9.

Almudi, T. 2008. *Opportunities and problems for participatory management in the Peixe Lagoon National Park, southern Brazil.* University of Manitoba, Winnipeg, MB, Canada. 188 pp. (Ph.D. dissertation)

Arruda, R.S.V. 2000. "Populações Tradicionais" e a Proteção dos Recursos Naturais em unidades de Conservação. *In:* Diegues, 2000.

Benjamin, A.H. 2001a. Introdução à Lei do Sistema Nacional de Unidades de Conservação. *In:* Benjamin, 2001b.

Benjamin, A.H., comp. 2001b. *Direito ambiental das áreas protegidas – o regime jurídico das unidades de conservação.* Rio de Janeiro, Brazil, Forense Universitária. 291 pp.

Berkes, F. 2008. *Sacred ecology.* 2nd ed. New York, Routledge.

Brito, M.C.W. 2003. *Unidades de Conservaçao: intenções e resultados.* 2nd ed. São Paulo, Brazil, Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) [São Paulo Research Foundation]. 230 pp.

Cash, D.W., Adger, W., Berkes, F., Garden, P., Lebel, L., Olsson, P., Pritchard, L. & Young, O. 2006. Scale and cross-scale dynamics: governance and information in a multilevel world. *Ecology and Society,* 11(2): 8.

Charity, S. & Masterson D. 1999. Mamirauá Sustainable Development Reserve, Brazil. *In:* S. Solton & N. Dudley. *Partnerships for protection: new strategies for planning and management for protected areas*, pp. 109–117. London, Earthscan Publications.

Colchester, M. 1997. *Guyana: fragile frontier – loggers, miners and forest peoples.* London, Ian Randle Publishers for Latin America Bureau, World Rainforest Movement.

Derani, C. 2001. A estrutura do Sistema Nacional de Unidades de Conservação – a Lei nº 9.985/2000. *In:* Benjamin, 2001b, pp. 232–247.

Dias-Neto, J. 1999. *A pesca marinha no Brasil.* Brasília, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) [Brazilian Institute of Environment and Renewable Natural Resources].

Dias Neto, J. & Marrul-Filho, S. 2003. *Síntese da situação da pesca extrativa marinha no Brasil.* Brasília, IBAMA / Diretoria de Fauna e Recursos Pesqueiros (DIFAP)/ Coordenação Geral de Gestão de Recursos Pesqueiros (CGREP). 53 pp.

Diegues, A.C. 1998. *The myth of untamed nature in the Brazilian rainforest.* São Paulo, Brazil, Research Center on Human Populations and Wetlands in Brazil (NUPAUB), University of São Paulo.

Diegues, A.C., ed. 2000. *Etnoconservação: novos rumos para a proteção da natureza nos trópicos.* São Paulo, Brazil, Editora Hucitec.

Diegues, A.C. 2005. *Traditional fisheries knowledge and social appropriation of marine resources in maritime anthropology in Brazil.* São Paulo, Brazil, Research Center on Human Populations and Wetlands in Brazil (NUPAUB), University of São Paulo.

Diegues, A.C. 2008. *Marine protected areas and artisanal fisheries in Brazil.* Samudra Monograph. Chennai, India, International Collective in Support of Fishworkers. 68 pp.

Ferraz, C.F. 2004. *Institutional solutions for the financing of protected areas in Brazil.* Paper presented at the Vth World Parks Congress: Sustainable Finance Stream, Durban, South Africa, September 2003 (also available at www.ecosynapsis.net/ranpa_en/services/documentation_en.Htm).

Ferreira, B.P. & Maida, M. 2007. Characteristics and perspectives for fishery management in the Coral Coast Marine Protected Area. *In:* Prates & Blanc, 2007, pp. 39–50.

Floeter, S.R., Ferreira, C.E.L. & Gasparini, J.L. 2007. The effects of fishing and protection through marine protected areas: three case studies and implications to reef fish functional groups in Brazil. *In:* Prates & Blanc, 2007, pp. 189–206.

Folke, C., Berkes, F. & Colding, J. 1998. Ecological practices and social mechanisms for building resilience for sustainability. *In:* F. Berkes & C. Folke, eds. *Linking social and ecological systems*, pp. 414–436. Cambridge, UK, Cambridge University Press.

Freire, K.M.F. 2003. A database of landings data on Brazilian marine fisheries, 1980-2000. *Fisheries Centre Research Report*, 11(6): 181–190.

Furquim, A. 2000. *A ilha do Cardoso: O parque Estadual e os Moradores. Dissertação de Mestrado em Ciências Florestais.* São Paulo, Brazil, Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ).

Government of Brazil. 2000. Sistema Nacional de Unidades de Conservação (SNUC) [National System of Conservation Units]. Lei nº 9.985 de 18 de Julho de 2000. Brasília, Presidência da República.

IBAMA. 2007. *Estatistica da Pesca – Ano 2007.* Brasília, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis [Brazilian Institute of Environment and Renewable Natural Resources].

Kalikoski, D. 2002. *The Forum of the Patos Lagoon: an analysis of co-management arrangement for conservation of coastal resources in Southern Brazil.* University of British Columbia, Vancouver, BC, Canada. 257 pp. (Ph.D. dissertation)

Kalikoski, D.C. 2008. Session summary: Reconciling fisheries with conservation and protected areas/times. *In:* J.L. Nielsen, J.J. Dodson, K. Friedland, T.R. Hamon, J. Musick & E. Verspoor, eds. *Reconciling fisheries with conservation: Proc. Fourth World Fisheries Congress*, pp. 1209–1210. Symposium 49. Bethesda, MD, USA, American Fisheries Society.

Kalikoski, D.C., Almudi, T. & Seixas, C.S. 2006. O estado da arte da gestão compartilhada e gestão comunitária da pesca no Brasil. *Revista Jirau* (ProVárzea / IBAMA), 15: 14–16.

Kalikoski, D.C. & Pinto da Silva, P. 2007. Avanços e desafios na implementação de gestão compartilhada no Brasil: liçoes comparativas do Fórum da Lagoa dos Patos (RS) e da Resex Marinha de Arraial do Cabo (RJ). *In:* A.L. Costa, ed. *Nas redes da pesca artesanal costeira*, pp. 115–154. Brasília, Edições IBAMA. 210 pp.

Kalikoski, D.C., Seixas, C.S. & Almudi, T. 2009. Shared and community management of fisheries in Brazil: progress and challenges. *Ambiente & Sociedade*, 12(1): 151–172 (also available at www.scielo.br/scielo.php?script=sci_arttext&pid=S1414-753X2009000100011&lng=en&nrm=iso). (accessed 19 October 2010)

Kalikoski, D.C. & Vasconcellos, M.C. 2008. Marine protected areas and reconciling fisheries with conservation: insight from the common property theory. *In:* J.L. Nielsen, J.J. Dodson, K. Friedland, T.R. Hamon, J. Musick & E. Verspoor, eds. *Reconciling fisheries with conservation: Proc. Fourth World Fisheries Congress*, pp. 1211–1220. Symposium 49. Bethesda, MD, USA, American Fisheries Society.

Kalikoski, D.C., Vasconcellos, M.C. & Lavkulich, L. 2002. Fitting institutions to ecosystems: the case of artisanal fisheries management in the estuary of Patos Lagoon. *Marine Policy*, 26: 179–196.

Matsuura, Y. 1995. *Os ecossistemas brasileiros e os principais macrovetores de desenvolvimento: Subsidio ao Planejamento da Gestao Ambiental,* pp. 39–104. Projeto Cenarios para o Planejamento da Gestao Ambiental. Brasília, Programa Nacional do Meio Ambiente (PNMA), Ministério do Meio Ambiente.

MMA. 1997. *Diretrizes ambientais para o setor pesqueiro. Diagnostico e diretrizes para a pesca maritma.* Brasília, Ministério do Meio Ambiente, dos Recursos Hídricos e da Amazônia Legal. 124 pp.

MMA. 2002. *Avaliação e identificação de áreas e ações prioritárias para a conservação, utilização sustentável e repartição dos benefícios da biodiversidade nos biomas brasileiros.* Brasília, Secretaria Nacional de Biodiversidade e Florestas (SBF), Ministério do Meio Ambiente. 404 pp.

Moura, R.L., Dutra, G.F., Francini-Filho, R.B., Minte-Vera, C.V., Curado, I.B., Guimarães, F.J., Oliveira, R.F. & Alves, D.C. 2007. Fisheries management in the Marine Extractive Reserve of Corumbau – Bahia. *In:* Prates & Blanc, 2007, pp.175–188.

Oliveira, E.R. 1993. *Populações Humanas na Estação Ecológica de Juréia-Itatins.* São Paulo, Brazil, Research Center on Human Populations and Wetlands in Brazil (NUPAUB), University of São Paulo.

Pádua, M.T.J. 2001. Análise crítica da nova lei do Sistema de Unidades de Conservação da Natureza do Brasil. *Revista de Direito Ambiental*, 6(22): 52–61.

Parada, I. 2004. Mundanças socioambientais de comunidades caiçaras do Parque Estadual da Ilha do Cardoso. *In:* A. Diegues, comp. *Enciclopédia Caiçara.* Vol. 1. *O Olhar do Pesquisador.* São Paulo, Brazil, Editora Hucitec / Research Center on Human Populations and Wetlands in Brazil (NUPAUB), University of São Paulo.

Pavese, H.B. 2008. *Assessing protected areas management effectiveness in Brazil: progress, challenges and opportunities.* Paper presented at a training workshop for participants in the Ad Hoc Open-Ended Working Group on Protected Areas, Rome, February 2008. Nairobi, World Conservation Monitoring Centre, United Nations Environment Programme (UNEP).

Perez, J.A.A.P. & Maida, M. 2007. No-take areas for demersal fishery in deepwaters of the Brazilian coast. *In:* Prates & Blanc, 2007, pp. 207–222.

Pimbert, M.P. & Pretty, J.N. 1995. *Parks, people and professionals: putting 'participation' into protected area management.* Discussion Paper No. 57. Geneva, United Nations Research Institute for Social Development (UNRISD) / International Institute for Environment and Development (IIED) / WWF-International.

Pinto da Silva, P. 2002. *Common property to co-management: social change and participation in Brazil´s first marine extractive reserve.* London, London School of Economics. (Ph.D. dissertation)

Pinto da Silva, P. 2004. From common property to co-management: lessons from Brazil's first maritime extractive reserve. *Marine Policy*, 28: 419–428.

Prado, D. 2005. Os caiçaras em áreas protegidas. *In:* A. Diegues, comp. *Enciclopédia Caiçara.* Vol. 4. *História e Memória Caiçara.* São Paulo, Brazil, Editora Hucitec / Research Center on Human Populations and Wetlands in Brazil (NUPAUB), University of São Paulo.

Prates, A.P.L. 2007. National plan for protected areas: marine and costal areas context. *In:* Prates & Blanc, 2007, pp. 17–24.

Prates, A.P.L. & Blanc, D. comps. 2007. *Aquatic protected areas as fisheries management tools.* Protected Areas of Brazil Series 4. Brasília, Ministry of the Environment, Secretariat for Biodiversity and Forests, Marine and Costal Zone Division. 267 pp.

Prates, A.P.L., Cordeiro, A.Z., Ferreira, B.P. & Maida, M. 2007. Coastal and marine sustainable use protected areas as tools for fisheries management. *In:* Prates & Blanc, 2007, pp. 25–38.

Quintao, A.T.B. 1983. Evoluçao do conceito de Parques Nacionais e sua relaçao com o processo de desenvolvimento. *Brasil Florestal*, XIII (54): 13–28.

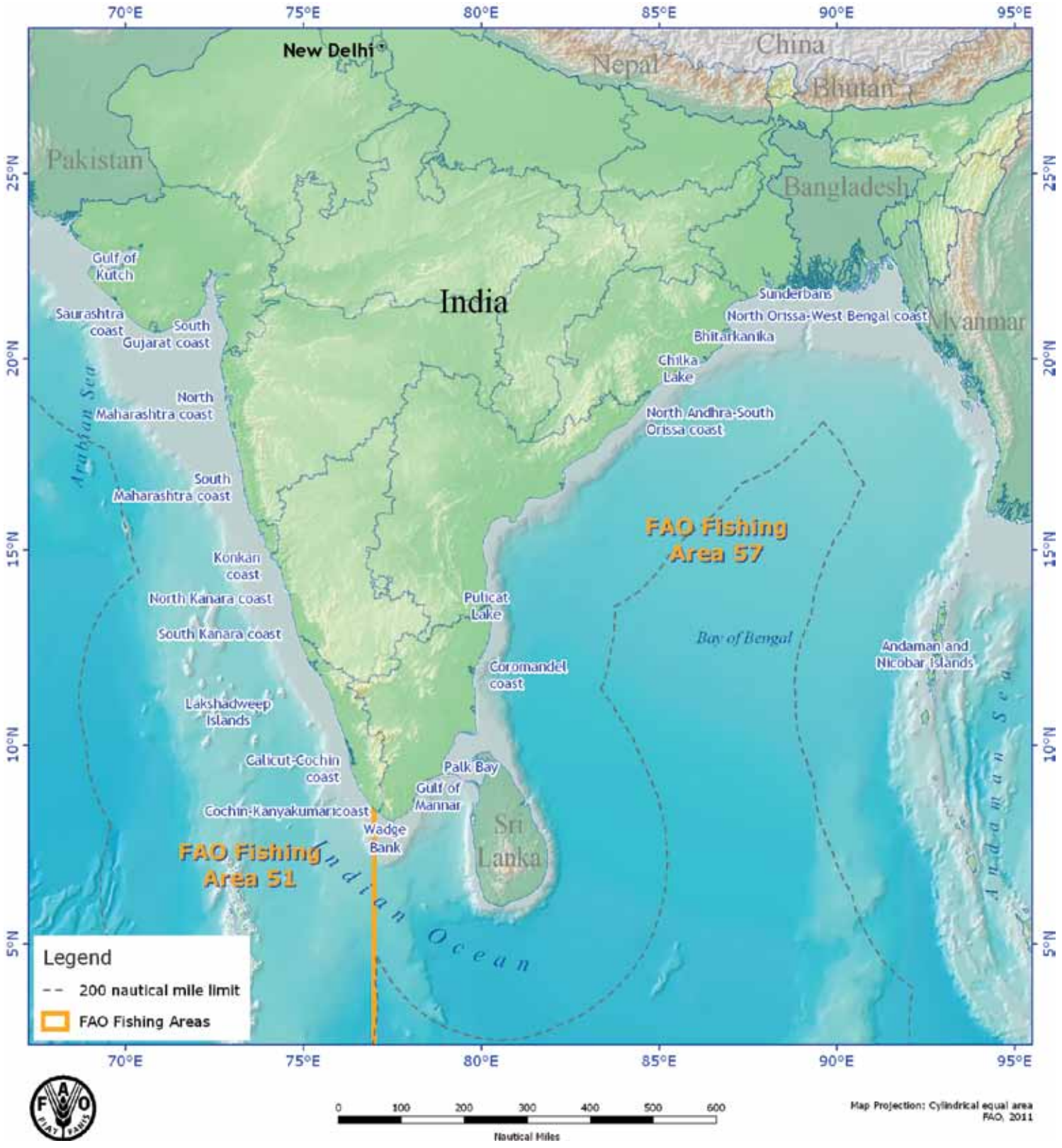
Vasconcellos, M. 2000. *Ecosystem impacts of fishing forage fishes: an analysis of harvest strategies for the Brazilian sardine.* University of British Columbia, Vancouver, BC, Canada. (Ph.D. dissertation)

Vasconcellos, M., Diegues, A. C. & Salles. R. 2007. Limites e posibilidades na gestão da pesca artesanal costeira. In: A. L. Costa., Ed. *Nas redes da pesca artesanal costeira*, pp. 15-83. Edições IBAMA, Brasília.

Vasconcellos, M., Diegues, A.C. & Kalikoski, D.C. 2010. Coastal fisheries of Brazil. In S. Salas, R. Chuenpagdee, A. Charles & J.C. Seijo (eds). Coastal fisheries of Latin America and the Caribbean. FAO Fisheries Technical Paper. No 544. Rome, FAO. pp. 72-115.

WWF. 2004. *Are protected areas working? An analysis of forest protected areas by WWF.* Gland, Switzerland, World Wide Fund for Nature (also available at www.ecosynapsis.net/RANPA_EN/Services/documentation_EN.htm). 32 pp.

Map 1
Map of India and FAO Fishing Areas



India

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1. INTRODUCTION

Rules and customs governing the use of marine areas exist on the Indian coast, often closely integrated with the local governance structures of traditional fishing communities. Moreover, in recent decades, spatial management measures have gained international and national attention as a means of promoting biodiversity conservation and managing fishery resources. This has ushered in new frameworks and terminology for both understanding and promoting the use of such measures. While there is no single definition for spatial management, it can be seen as a process of analysing and allocating parts of three-dimensional marine spaces for specific uses, with the goal of achieving ecological, economic and social objectives that are specified through political processes (Maes, 2008).

This paper looks at spatial management measures used for fisheries and wildlife conservation in India.[1] Section 2 provides an overview of spatial management measures in fisheries management. It then introduces spatial measures in the conservation of coastal and marine resources, focusing in particular on certain elements of biodiversity. It is the latter set of measures that are considered by the Government of India to include 'marine and coastal protected areas' (MCPAs). Section 3 describes marine and coastal protected areas in further detail, while Section 4 explores the legal/institutional framework for MCPAs, as well as the management processes that underpin them. Section 5 discusses available information on the ecological and socio-economic impacts of current spatial management measures, both for fisheries management and for protection of wildlife. Section 6 discusses the extent to which coordinated approaches to the management and conservation of marine living resources are in place, and Section 7 provides suggestions for strengthening such approaches in order to achieve both fisheries and wildlife conservation/management objectives. Section 7 also discusses future directions in marine and coastal resource management.

2. FISHERIES AND SPATIAL MANAGEMENT

2.1 General condition of marine fisheries

Fisheries and fishery resources

India has a coastline of 8 118 kilometres (km) and an exclusive economic zone (EEZ) of 2.02 million km^2. Within these areas are diverse marine and coastal ecosystems, ranging from mangroves, creeks, tidal flats and mud flats to coral reefs. Considering the structure, function and processes that occur between as well as within such ecosystems, the Indian coastline can be delineated in the following zones: (a) Gulf of Kutch; (b) Saurashtra coast; (c) South Gujarat coast; (d) North Maharashtra coast; (e) South Maharashtra coast; (f) Konkan coast; (g) North Kanara coast; (h) South Kanara coast; (i) Calicut-Cochin coast; (j) Cochin-Kanyakumari coast; (k) Wadge Bank; (l) Gulf of Mannar; (m) Palk Bay; (n) Coromandel coast; (o) Pulicat Lake; (p) North Andhra-

[1] 'Wildlife' in the Indian legal context is defined as "any animal, [or] aquatic or land vegetation which forms part of any habitat" (Wild Life [Protection] Amendment Act of 2002).

south Orissa coast; (q) Chilka Lake; (r) Bhitarkanika; (s) North Orissa-West Bengal coast; (t) Sunderbans; (u) Andaman and Nicobar Islands; and (v) Lakshadweep Islands (Vivekanandan, 2002).

India ranks eighth in global marine capture fish production, with a catch of 3.1 million tonnes, providing a source of livelihood to millions of people dependent on fish resources (FAO, 2008a). The bulk of the catch consists of Indian oil sardine (*Sardinella longiceps*), followed by penaeid and non-penaeid shrimps, Indian mackerel (*Rastrelliger kanagurta*), Bombay duck (*Harpadon nehereus*), croakers (*Micropogonias* spp.), smaller quantities of cephalopods, other sardines and threadfin breams. Indian fisheries usually target hundreds of species, and the daily catch in major landing centres regularly includes about 200 species, belonging to about 50 groups (though only two or three groups contribute up to 50 percent of the catch) (Vivekanandan, 2002).

In 2007, pelagic finfish constituted 57 percent of total landings, while demersal fish contributed 25 percent, crustaceans 14 and molluscs 4. According to marine capture fisheries statistics for 2007, 68 percent of landings were from the mechanized sector, followed by 28 percent from the motorized sector and 4 from the artisanal sector (CMFRI, 2008). Vivekanandan (2003) notes that 75 percent of India's marine capture fish production is from coastal waters, with 58 percent of the fishery resource potential within 0–50 metres of depth. The fisheries sector constitutes 1.04 percent of national gross domestic product (GDP). From 2006 to 2007, India exported 0.60 million tonnes of fish and fish products to as many as 90 countries, for a value of US$1.8 billion (MPEDA, 2008).

The tremendous growth in the fisheries sector is, in large part, due to technological advances in both the production and export sectors. While there are no estimates to describe the overall status of fishery resources, a study by the Central Marine Fisheries Research Institute (CMFRI) shows overall decreases in the landings of major individual species and groups from 2006 to 2007 (including non-penaeid shrimps, ribbonfishes, Bombay duck, threadfin breams and cuttlefishes). However, the same study reports an increase in the landing of Indian oil sardine, penaeid prawns, Indian mackerel, croakers, lesser sardines, silverbelly (*Parequula melbournensis*) and other clupeids during the same period (CMFRI, 2008). CMFRI data from 1996 show a decreasing trend in landings of commercially important species such as Indian oil sardine, Bombay duck, other sardines, silverbelly and penaeid prawns.

Fishing communities

The population of marine fishers totals 3.57 million and is distributed throughout 3 305 marine fishing villages spread across the coastal states and union territories (including islands). Of these, 0.90 million are active fishers and another 0.76 million are involved in other fisheries-related activities (CMFRI, 2006; FSI, 2006). Most of these communities have long histories of fishing and associated governance and traditional knowledge systems, and fisheries are as much a cultural as a social and economic activity.

According to the 2005 national census, total fishing vessels number 243 939 (including those of the Andaman and Nicobar Islands and the Lakshadweep Islands). This includes 59 743 mechanized vessels and 76 372 motorized vessels, while the rest are non-motorized vessels (CMFRI, 2006; FSI, 2006). It is important to note that available figures describe only the *number* of vessels – not their actual power.

2.2 Spatial management in fisheries

The Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act of 1976 recognizes sovereign rights to conserve, manage, explore and exploit living resources in the Indian EEZ. Section 15(c) of the act gives power to the central government to make rules, *inter alia*, for conservation and management of the living resources of the EEZ, and Section 15(e) for protection of the marine environment.

Basic fisheries legislation enacted following the act includes the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act of 1981 and the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Rules of 1982. There is no mention of fisheries management and conservation in the act, and there are still no designated protected areas declared in the Indian EEZ. Moreover, there is no comprehensive fisheries management legislation for the EEZ – only guidelines governing the fishing activities of fishing vessels of foreign origin operating within it (leased and operated with the participation of Indian companies).[2]

Fisheries within the 12-mile territorial limit are managed under the Marine Fishing Regulation Act (MFRA) of the Maritime States of India. This act is based on a model piece of legislation prepared by the Indian Ministry of Agriculture in 1979. The legislation was created in response to demands from fishers operating unpowered fishing vessels, who sought to protect their fishing space and equipment from bottom trawlers. It was drawn up at a time of tremendous conflict between the two subsectors over access to fishing space and resources, sometimes even leading to destruction of life and property (Kurien and Mathew, 1982).

Fisheries management is undertaken mainly through licensing, prohibitions on certain fishing gear, regulations on mesh size and establishment of closed seasons and areas. Spatial management measures in fisheries can include permanent or temporary bans on fishing through measures such as declaring no-fishing areas and demarcating fishing zones for mechanized and non-mechanized vessels. Under the MFRA, zones are demarcated by each state based on distance from the shoreline (5–10 km) or on depth. These inshore zones, where trawling and other forms of mechanized fishing are not permitted, are perhaps the most important spatial fisheries management measure in place. The closed season, or monsoon fishing ban, is another important spatial-temporal management measure implemented on both the east and west coasts of India for a period of 47 and 65 days, respectively (coinciding with what is considered to be the spawning and breeding season).

There are several state-specific management measures. In Orissa, for example, the State Fisheries Department adopted fishing regulations under the MFRA to restrict and regulate fishing activities in territorial waters, and designate no-fishing and no-trawling areas to protect the nesting and breeding grounds of turtles (both within and outside the Gahirmatha [Marine] Wildlife Sanctuary [hereafter Gahirmatha Sanctuary]). In some states, there is also a mandatory requirement under the MFRA that trawlers use turtle excluder devices (TEDs) (Rajagopalan, 2009). These measures were introduced even though: (i) the MFRA's definition of 'fish' does not include turtles; (ii) there are no provisions in the MFRA to address bycatch issues; and (iii) turtles are not a targeted fishery in the State of Orissa (Mathew, 2004; Sridhar, 2005).

Implementation and enforcement of formal fisheries management measures and legislation are often considered weak. Incursions by trawlers and other mechanized vessels into inshore traditional fishing zones are common. The monsoon fishing ban is perhaps the most effectively implemented management measure, as will be discussed in later sections.

Systems for co-management or community-led management are yet to be widely adopted, though the report of the working group on fisheries for the Government of India's Eleventh Five-Year Plan (2007–2012) calls for community participation in the implementation of the FAO Code of Conduct for Responsible Fisheries. The report also calls for establishment of marine protected areas (MPAs) and sanctuaries for stock recovery purposes, as well as the continuance of optimal levels of fish production through community participation and co-management (Government of India, 2006).

[2] Available at www.dahd.nic.in

It is important to draw attention to the fisheries management initiatives of local fishing communities, many of which are 'space-based'. Communities living along the coast often have a spatial perception of their rights, where fishing by outsiders or the use of certain gear is regulated. Traditional fishing communities around Pulicat Lake in Tamil Nadu practise a rotational system of access to resources, called the *padu* system, which serves to reduce conflicts and overexploitation. A similar system of rotational access to resources is practiced in Kerala, which defines groups of rights holders, resource boundaries and fishing sites (Lobe and Berkes, 2004). However, these systems of self-governance are not legally recognized for management purposes.

2.3 Spatial management in conservation

Spatial management approaches to conservation are also implemented throughout the country. National parks, sanctuaries and tiger reserves are declared in coastal and marine areas under the India Wildlife (Protection) Act of 1972 (WLPA) (Government of India, 1972). While in the Indian context MCPAs are not a specific legal category, national parks, sanctuaries and community, conservation or tiger reserves declared in coastal and/or marine areas under the WLPA are categorized as MCPAs, according to reports by the Government of India to the Convention on Biological Diversity (CBD) (SCBD, 2006).

Other legislation regulating the use of coastal areas is the Coastal Regulation Zone (CRZ) Notification of 1991, issued under the provisions of the Environment (Protection) Act (EPA) of 1986. This legislation outlines a zoning scheme to regulate development in a defined coastal strip. The notification defines the CRZ as coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters influenced by tidal action up to 500 metres inland from the high tideline, as well as the land between the low and high tidelines. The CRZ is subdivided into four categories for the purpose of regulating development activities, with maximum restrictions applying to the ecologically sensitive areas of CRZ-I.

The Ministry of Environment and Forests (MoEF) is the nodal agency at the central level, responsible for the conservation and protection of biodiversity and wildlife and for implementation of environmental legislation (including the WLPA and the EPA). Sections 3 and 4 discuss spatial management measures for conservation in greater detail.

2.4 Institutional framework

Both the union (federal) government and state (provincial) governments are involved in fisheries management. While state governments have the power to legislate on fisheries issues in territorial waters, the union government has the authority to legislate on fisheries issues in the EEZ (according to the provisions of the Constitution of India).

Responsibility for fisheries and marine habitat management is shared among several agencies and ministries at the central level. Various departments under the Ministry of Agriculture (MoA) are responsible for fisheries in the EEZ, including surveying and assessment of fishery resources, exploration of resources in the EEZ, fishery technology, and fisheries development and management, as well as education, research, training, extension and aquaculture development. The tasks of the recently formed National Fisheries Development Board, under the MoA, include coordinating the fisheries activities of various ministries/departments in the central government and acting as liaison between the union and state territory governments. The board also aims to achieve sustainable management and conservation of natural aquatic resources (including fish stocks).

The Coast Guard, under the Ministry of Defence, provides protection to fishers and assistance to them when in distress at sea. It also regulates fishing by foreign fishing vessels in maritime zones, and preserves and protects the marine environment from

pollution. The Coast Guard has a mandate to protect endangered marine species under the WLPA. At the state level, some state police departments (for example, that of Kerala) have a marine police wing to help patrol areas within five nautical miles of the coast. The MoEF protects and preserves coastal and marine ecology and environments (excluding the marine environment in the EEZ). The Earth Commission, under the Ministry for Earth Sciences, is responsible for the preservation, protection and conservation of the marine environment in the EEZ, the development of technology and mapping of resources, and establishment of the ocean commission (which will draft policies and legislation relating to oceans and ocean resources).

Community-level institutions also play a role in fisheries governance along the coast. Documented examples include the *kadakodi* system of northern Kerala, *pedhaloo* in southern Orissa, and the federated structure of the traditional panchayat system of the Pattanavars community of the Tamil Nadu/Andhra Pradesh coast (Vivekanandan, 2009; Koshy, 2007). These traditional governance systems, while important, are not officially recognized or involved in resource management. However, a recent project of the FAO United Nations Team for Tsunami Recovery Support (UNTRS) and the South Indian Federation of Fishermen Societies (SIFFS) – Towards Developing a New Co-Management Regime in India – noted the potential of traditional panchayat structures to contribute to fisheries management (FAO, 2008b). The project helped establish resource management councils to explore options for community-based co-management arrangements at the local level. The councils include representatives of traditional village panchayats and Fisheries Department officials.

The government formulates five-year plans to regulate fisheries development and planning (a process under way since 1951). While initial five-year plans focused more on development of the sector and on increasing production, more recent plans (such as the Ninth and Tenth Five-Year Plans) explicitly articulate a need for conservation and management (ICSF, 2003).

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

3.1 MPA terminology

Marine and coastal protected areas are a spatial management measure used for conservation purposes. Numerous local terms refer to MPAs/MCPAs, including marine park, marine reserve, marine sanctuary, national park, wilderness area, marine extractive reserve, ecological reserve, marine managed area, sanctuary, fisheries closed area, coastal preserve, no-take area, sensitive sea area and biosphere reserve.

As previously mentioned, 'marine and coastal protected areas' is not a specific category in an Indian legal context, and legal frameworks do not use the terms 'MPA' or 'MCPA'. Instead, national parks, sanctuaries or tiger reserves declared in coastal and/or marine areas under the WLPA are *considered* MCPAs. Such protected areas are declared if deemed to have "adequate ecological, faunal, floral, geomorphological, natural or zoological significance", and are designated for the purpose of "protecting, propagating or developing wildlife or its environment" (Government of India, 1972). In addition to these categories, the central government also recognizes marine 'biosphere reserves' designated under the Man and Biosphere Programme of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

According to the WLPA, national parks are afforded the highest degree of protection, and all human activities are banned unless they contribute to conservation (i.e. tourism is permitted). Protection regulations for sanctuaries are less stringent, and fishing activities may be regulated, controlled or prohibited. Tiger reserves are the first protected-area category to explicitly recognize the need for coexistence of wildlife and humans, and consideration is given to the livelihoods, development and sociocultural rights of local communities living in buffer zones and surrounding areas (Rajagopalan, 2008).

3.2 Key design objectives

The goals and objectives for MCPAs are as diverse as the terms used: habitat protection, endangered species protection, environmental protection, ecosystem protection, biodiversity conservation, multi-use management, sociocultural preservation, archaeological/historic site protection, scientific research, fisheries management and sustainable extractive use (Agardy *et al.,* 2003; World Bank, 2006; Christie and White, 2007). In India, the key goals and objectives for MCPAs are to protect either specific habitat or endangered species.

3.3 General description of MPAs and decision-making processes

Marine and coastal resource protection measures were first initiated in India in 1967, pre-dating the existence of any specific legal frameworks for protected areas. Most notable was the designation of the Point Calimere Wildlife Sanctuary in Tamil Nadu, set up to protect the wetland habitat of waterfowl (Singh, 2002). This was eventually followed by the creation of other national parks and sanctuaries in marine and coastal areas, created under the WLPA of 1972 (amended in 2002 and 2006) and designed to protect flora, fauna and associated habitats.

According to the Government of India's third national report to the CBD (SCBD, 2006), there are 31 MCPAs designated in the country, of which 18 are fully in the marine environment. The remaining 13 have both terrestrial and marine components (see Table 1). All MCPAs are located within territorial waters and include coastal and landward components – there are no protected areas declared in the EEZ. The report also indicates that another 100 protected areas have terrestrial or freshwater ecosystems that border on seawater or partially contain coastal and marine environments. The 31 MCPAs cover an area of 6 271.21 km^2, comprising 18.50 percent of the islands and 6.16 percent of the coastal biogeographic zones. According to the Wildlife Institute of India, however, there are only 26 MCPAs, covering an area of 4 745.53 km^2 (not including protected areas of the Andaman and Nicobar Islands) (Wildlife Institute of India, 2007). On the other hand, the MoEF noted in a 2007 press release (Government of India, 2007a) that there are only five designated MCPAs in the country: Gulf of Mannar National Park, Gulf of Kutch Marine National Park and Wildlife Sanctuary, Mahatma Gandhi National Park and Gahirmatha Sanctuary. The lack of a precise definition for MPAs/MCPAs and a specific legal designation clearly makes it difficult to determine the actual number of designated MCPAs in the country.

In the third CBD report, the Government of India described the establishment of national targets, strategies and programmes to facilitate the creation of new MCPAs. It proposed to increase the area under MCPAs from 18.50 percent of the island area to 36.14 percent, and in the case of coastal biogeographic zones, from 6.16 to 7.12 percent. The Eleventh Five-Year Plan specifically calls for more protected areas for the conservation of coral reefs.

Most of the MPAs/MCPAs listed in Table 1 are designated to protect and preserve flora and fauna and their habitats, and they are located in intertidal waters, estuaries, mangroves, creeks, wetlands, marshes, mud flats, coastal dunes, seaweed and seagrass beds, delta plains, lagoons and coral reefs. The Gahirmatha Sanctuary is one of the few MCPAs designated to protect and preserve the nesting and breeding habitat of the olive ridley turtle *(Lepidochelys olivacea)*, while the Sundarban Tiger Reserve is designated to protect tigers in intertidal waters (which includes areas covering mangroves and estuarine waters). Most of the protected areas were declared between 1975 and 1995, with very few changes in designations or size since. It is notable that most protected areas were established for habitat or species protection, not for fisheries management. Protected areas can be classified based on the five categories of the International Union for Conservation of Nature (IUCN) (Table 2).

TABLE 1
Marine and coastal protected areas in India

Name of MPA	Type	Year of designation	Area (km^2)
Gulf of Mannar	National park	1986	560.00
Sundarban	National park	1984	1 330.10
Bhitarkanika	National park	1988	145.00
Gulf of Kutch	National park	1980	162.89
Rani Jhansi (marine)	National park	1996	256.14
Mahatma Gandhi (Wandoor-marine)	National park	1983	281.50
North Button	National park	1987	0.44
Middle Button	National park	1987	0.64
South Button	National park	1987	0.03
Malvan (marine)	Wildlife sanctuary	1987	29.12
Gulf of Kutch	Wildlife sanctuary	1980	295.03
Khijadiya	Wildlife sanctuary	1981	6.05
Sajnekhali	Wildlife sanctuary	1976	362.04
Lothian	Wildlife sanctuary	1976	38.00
Haliday	Wildlife sanctuary	1976	5.95
Bhitarkanika	Wildlife sanctuary	1975	672.00
Gahirmatha (marine)	Wildlife sanctuary	1997	1 435.00
Chilika	Wildlife sanctuary	1987	15.53
Coringa	Wildlife sanctuary	1978	235.70
Pulicat	Wildlife sanctuary	1976	500.00
Krishna	Wildlife sanctuary	1999	194.81
Point Calimere	Wildlife sanctuary	1967	17.26
Pulicat (TN)	Wildlife sanctuary	1980	153.67
Lohabarrack	Wildlife sanctuary	1987	100.00
North Reef Island	Wildlife sanctuary	1987	3.48
South Reef Island	Wildlife sanctuary	1987	1.17
Cuthbert Bay	Wildlife sanctuary	1987	5.82
Cingue	Wildlife sanctuary	1987	9.51
Galathea	Wildlife sanctuary	1997	11.44
Parkinson Island	Wildlife sanctuary	1987	0.34
Mangroves Island	Wildlife sanctuary	1987	0.39
Blister Island	Wildlife sanctuary	1987	0.26
Sandy Island	Wildlife sanctuary	1987	0.26
Pitti	Wildlife sanctuary	2000	0.01
Sundarban	Tiger reserve	1973	2 585.00
Gulf of Mannar	Biosphere reserve	1989	10 500.00
Sundarban	Biosphere reserve	1989	9 600.00
Great Nicobar	Biosphere reserve	1989	885.00

TABLE 2
Protected areas in India

Categories in WLPA	Corresponding IUCN category and governance type	Definition
National park	Protected Area Category II	Protected area managed mainly for ecosystem protection and recreation
Wildlife sanctuary	Protected Area Category IV	Habitat/species management area: protected area managed mainly for conservation through management intervention
Conservation reserve	Shared Governance type, while protected area category depends on objectives of individual reserves	Complex institutional mechanisms and processes employed to share management authority and responsibility
Community reserve	Shared Governance type, while protected area category depends on objectives of individual reserves	Complex institutional mechanisms and processes employed to share management authority and responsibility
Tiger reserve	Core area comes under Protected Area Categories II and IV, while buffer comes under Category VI	Area managed to protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial

Sources: Dudley, 2008; www.unep-wcmc.org/protected_areas/categories/index.html

Apart from protected areas designated under the WLPA, there are three biosphere reserves designated under UNESCO's Man and Biosphere Programme that can also be classified as MCPAs (Table 1). Designated by the central government with the approval of state governments, these biosphere reserves were established to conserve representative samples of ecosystems, ensure the long-term conservation of genetic diversity *in situ*, and promote basic and applied research, monitoring and information dissemination. In most cases, the core zones of biosphere reserves are national parks or sanctuaries, under the management of the state forest department. The reserves do not have official legal designations, and are not a specific protected area category under the WLPA.

As mentioned earlier, development activities are regulated under the CRZ Notification of 1991 in ecologically sensitive areas all along the coast (CRZ-1). Though several violations of the notification have been documented, the designation of areas such as CRZ-1 has provided some measure of protection to vital and sensitive coastal habitats.

3.4 Perception of MPAs

In general, fishing communities perceive MCPAs as tools to 'keep people out'. Communities are sceptical of conservation measures that ban all types of fishing activities (including low-impact fishing gear and operations), especially given that industrial and development activities within the vicinity of MCPAs are often allowed to continue (and even expand in some cases). A lack of participation and consultation with communities, combined with a lack of recognition of communities as rights holders in the decision-making process, threaten the legitimacy and outcomes of the protected area creation process.

Finally, the lack of recognition of and support for community-based management initiatives represents a lost opportunity for meeting conservation and livelihood goals, including spatial-temporal management measures such as restricted harvesting days and the regulation of non-destructive gear in the case of seaweed collection by women in the Gulf of Mannar National Park.

4. MPA GOVERNANCE

4.1 Legal basis for MPA establishment

The WLPA of 1972, as amended in 2002 and 2006, forms the legal basis for the designation of protected areas. Its objectives include "protection of wild animals, birds and plants, and for matters connected therewith or ancillary or incidental thereto, with a view to ensuring the ecological and environmental security of the country". Under the act, the definition of animals includes "mammals, birds, reptiles, amphibians, fish, other chordates and invertebrates, and also includes their young and eggs". Wildlife is defined to include "any animal, [or] aquatic or land vegetation which forms part of any habitat". This has been interpreted to imply that the destruction of habitat amounts to destruction of wildlife itself.

The WLPA provides two kinds of protection for specific endangered species listed in Schedules I, II, III and IV (especially against hunting): (i) protection regardless of location, and (ii) protection of all species in designated protected areas. Protected area categories include national parks, wildlife sanctuaries and community, conservation and tiger reserves. This forms the basis for the designation of protected areas in marine and coastal ecosystems, often categorized by the Government of India as MCPAs for reporting to the CBD. The emphasis of the wildlife legal framework is more on protection of resources, while the fisheries management legal frameworks discussed earlier have more of a development and management focus.

The WLPA is essentially a terrestrial framework applied to protect coastal and marine environments (Sridhar and Shanker, 2007). However, there are some provisions

specific to the coastal and marine context. The WLPA mentions that if any part of territorial waters is to be included within a sanctuary or national park, prior agreement must be obtained from the central government. Moreover, such inclusion is possible only provided that the limits of the area of the territorial waters are determined in consultation with the chief naval hydrographer of the central government, and that adequate measures are taken to protect the occupational interests of local fishers. The WLPA also mentions that the right of innocent passage of any vessel or boat travelling through territorial waters should not be affected by designation of a sanctuary. In relation to the prevention and detection of offences, the WLPA states that if fishers residing within 10 km of a sanctuary or national park inadvertently enter the territorial waters of a sanctuary or national park (on a boat not used for commercial fishing), their boat will not be seized.

Other important legislation relevant to wildlife and forest resource management includes: the Biological Diversity Act (2002) and Rules (2004); the Indian Forest Act (1927); the Forest (Conservation) Act (1980, as amended in 1988); the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act (2006) and Rules (2008), known as the Forest Rights Act (FRA); and the Environment (Protection) Act (EPA) (1986). The MoEF is the nodal agency for implementation of the WLPA and the above legislation (excepting the FRA, which is under the Ministry of Tribal Affairs).

In addition, there are policy documents, guidelines and action plans that influence the designation and management of protected areas in India, including the National Conservation Strategy and Policy Statement for Environment and Sustainable Development (1992); the National Environment Policy (2006); the Wildlife Conservation Strategy (2002); guidelines for an integrated management action plan for wetlands, mangroves and corals; guidelines for protection, maintenance, research and development in the biosphere reserves of India (1999); and the recently adopted National Biodiversity Action Plan (2008). For the first time, National Environment Policy objectives include protection and conservation of critical ecological systems and resources essential to life support, livelihoods, economic growth and the livelihood security of present and future generations, and reflect a broad conception of human well-being.

The National Wildlife Action Plan (2002–2016) calls for the revision of fishing laws and their implementation procedures, acknowledging the need to link with fisheries management efforts. There are, however, no real linkages between spatial management measures adopted under fisheries management and the legal framework for wildlife preservation and protection. What is also critically lacking is a holistic ecosystem framework for conservation and management that recognizes the human dimensions of the ecosystem, in particular the human rights obligations of the state.

4.2 Description of institutions

The MoEF is the nodal agency at the central level, responsible for biodiversity and wildlife conservation and preservation. At the state level, the Department of Forests is the nodal agency under the MoEF, responsible for managing protected areas. In a marine and coastal context, the Coast Guard (under the Department of Defence, Ministry of Defence) is responsible for enforcement of some of the regulations in national parks and sanctuaries, especially in territorial waters. Moreover, research institutes under the Ministry of Science and Technology and the MoA are responsible for research on coastal and marine ecosystems.

4.3 Examples of nested institutional design

The 2002 amendments to the WLPA led to the formation of the National Board of Wildlife (NBWL) and the State Boards of Wildlife (SBWLs). These entities are required to work with other government departments, elected representatives, local

self-government institutions and non-governmental organizations (NGOs) on the designation and management of protected areas (among other processes). One of the functions of the NBWL is to make recommendations on the establishment and management of national parks, sanctuaries and other protected areas. Fisheries departments are also represented on the SBWLs.

There are several other ministries that have jurisdiction in marine and coastal areas and/or whose activities have implications for management and conservation. The Ministry of Petroleum and Natural Gas, for example, provides permits for oil refineries and other petrochemical industries (including in offshore areas), and the Ministry of Shipping is responsible for developing ports and other related infrastructure.

4.4 International MPA-related instruments and benchmarks

As a signatory to a number of legally binding instruments on the conservation and protection of environments and biodiversity, India has certain obligations to fulfil. It is party to the CBD, the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora, the Convention on Wetlands – formerly entitled the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention), the Convention Concerning the Protection of the World Cultural and Natural Heritage (WHC), the International Convention for the Regulation of Whaling and the Convention on the Conservation of Migratory Species of Wild Animals (CMS).

In India's third national report to the CBD, it was proposed to increase the area under MCPAs from 18.50 percent of the island area to 36.14 percent, and in the case of coastal biogeographic zones, from 6.16 to 7.12 percent (SCBD, 2006). The report also emphasized that a number of activities have been initiated to implement the CBD Programme of Work on Coastal and Marine Biodiversity: management plans for MCPAs are developed with the involvement of stakeholders; effective management, with monitoring and enforcement, has been put in place; and a national system or network of MCPAs is under development. However, these are still in the process of implementation. India has fulfilled some of its obligations under these instruments by amending its national legal instruments. In reality, however, it does not necessarily fulfil its obligations under the CBD Programmes of Work on Protected Areas and on Coastal and Marine Biodiversity, as there are not many changes at the ground level.

As a party to the United Nations Convention on the Law of the Sea (UNCLOS) and the United Nations Fish Stocks Agreement (UNFSA),[3] India also has an obligation to appropriately manage and conserve fishery resources. In addition to the aforementioned statutes and legislation, India is a signatory to important human rights instruments that focus on civil, political, economic, social and cultural rights.

4.5 Management processes and implementation

Under the WLPA, marine and coastal protected areas have typically been implemented in a top-down fashion, with a focus on keeping people out. In general, fishing communities have not been part of the process of designating and implementing such areas, and, in some cases, have been deprived of their means of livelihood following their establishment.

However, there is now increased focus on community participation and livelihoods as evidenced by recent legislation, policy and practices. This is due both to global movements in this direction and to local developments. Examples include recent decisions reached under the CBD programme on protected areas, as well as the 2002

[3] 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).

and 2006 amendments to the WLPA, which created new protected area categories – community, conservation and tiger reserves – all of which have participatory provisions and acknowledge the principle of sustainable use. The tiger reserve is the first category to address the coexistence of wildlife and human activities, with due recognition of livelihoods, development and the social and cultural rights of local communities in buffer/peripheral areas (e.g. communities living inside the Sundarbans Tiger Reserve). Though the categories of community and conservation reserves have been introduced, they have yet to be applied in the marine space. It is unclear whether the category of community reserves can be applied in coastal and marine contexts, however, as this designation is only applicable to community or privately owned lands. An amendment to this WLPA provision must be considered, in order to develop a more inclusive approach for use in marine and coastal ecosystems.

One of the 2002 amendments to the WLPA calls for creation of an advisory committee for each sanctuary, including representatives of local government (Panchayat Raj institutions), to provide advice on better conservation and management (to date implemented only in Gahirmatha and Sundarbans Sanctuaries). The amendment also contains provisions that allow state governments to establish management committees for community and conservation reserves. Such committees should include government representatives and village panchayats (in whose jurisdiction the reserve is located), among others, and would advise the chief wildlife warden on conserving, managing and maintaining the area.

The management framework for protected areas, elaborated in the National Wildlife Action Plan (2002–2016), calls for the constant revision or adaptation of management plans, based on emerging scientific knowledge, field data and traditional knowledge/expertise. The plan stresses the need to set up participatory management committees for each protected area, and provides guidelines for local community involvement in the various management zones of protected and adjacent areas. However, with the exception of the Gahirmatha Sanctuary and Gulf of Mannar National Park, protected areas do not have updated management plans (ICSF, 2009). And even if such plans existed, barriers still remain: in Gulf of Mannar National Park, communities claim they were only marginally consulted during the process of preparing the plan, while in the Gahirmatha Sanctuary, communities were neither consulted nor involved in the management plan (Rajagopalan, 2008, 2009).

In conclusion, though recent amendments to the WLPA provide for community participation in the designation and management of protected areas, implementation remains weak, resulting in major repercussions on the livelihoods and well-being of local communities. Clear guidelines must be developed for community participation in all decision-making processes, with a view to effective implementation of the amendments' provisions. Such guidelines will enable forest department personnel to formulate and implement the necessary regulations.

Moreover, in order to reduce conflicts with communities, officials in implementing agencies should be trained in social processes. Local communities must be seen as rights holders in the implementation of MCPA provisions – in particular considering their livelihood requirements – and should be given equal responsibility in the conservation of marine and coastal resources. This would help foster long-term partnerships of communities and institutions.

5. SOCIO-ECONOMIC AND ECOLOGICAL CONSIDERATIONS AND IMPACTS

Spatial management measures are currently in use for both fisheries and conservation purposes. This section discusses some of the documented ecological and socio-economic impacts of such measures.

5.1 Ecological impacts and considerations

Although India's first national parks and sanctuaries date from the late 1960s, there are relatively few data on reported ecological impact. In the case of Gulf of Mannar National Park, some recent studies show an increase in coral cover of 4.5 percent from 2003 to 2007 (Malleshappa and Naganathan, 2009). In the case of the Gahirmatha Sanctuary, although turtle protection measures have been in place for several years, information on positive impacts on turtle populations is unavailable.

Information on ecological impacts of protection measures is generally scarce, due mostly to a lack of time-series data and consistent monitoring. Information on impacts on fisheries is equally unavailable, perhaps because the objectives in setting up MCPAs are not within a fisheries management framework, and fisheries data is not collected for protected areas. These realities reflect a lack of integrated planning for the ecosystem as a whole.

Information on ecological criteria for selecting and demarcating marine and coastal areas for protection is also unavailable, and existing MCPAs do not coincide with clear ecosystem boundaries. There is no transparent ecological planning and analysis carried out before setting the objectives of MCPAs.

According to available data, development and industrial activities near MCPAs cause negative ecological impacts on biodiversity (including fisheries), given the fluid and interconnected nature of marine ecosystems. Such impacts recently came to light in the Gulf of Kutch (Marine) National Park and Wildlife Sanctuary, where petroleum-based industries, chemical industries and ship-breaking units are responsible for significant pollution and habitat degradation (Biswas, 2009). This indicates that regulation solely of fisheries activities within the boundaries of a protected area, by itself, is often inadequate if the broader objectives of a protected area are to be achieved. Different approaches, appropriate to the marine context, need to be explored.

There is some information available on the impacts of spatial management measures in the context of a fisheries management framework. More specifically, scientific studies indicate positive impacts on fishery resources of the closed-season monsoon ban on the east and west coasts. Expert committees set up in Kerala to evaluate impacts of the monsoon ban recommended continuation of this measure to allow for the recruitment and regeneration of stocks. In particular, a positive impact on demersal species and benthic communities was observed (Government of India, 2007b; Vijayan, Edwin and Ravindran, 2000).

There are no studies to date gauging the ecological impacts of artisanal zones (where trawling and other mechanized forms of fishing are prohibited). As mentioned previously, these zones are often not well managed due to poor enforcement. Workers within the fisheries sector consistently maintain that if prohibitions on trawling and other destructive gear in inshore zones were in fact enforced, ecological benefits would be significant, and there would be little need for other conservation measures (such as setting up protected areas under the WLPA).

5.2 Socio-economic impacts of MPAs

Before describing MPA socio-economic impacts, it is important to understand the context of the communities in question: many coastal fishing villages are located in remote areas and characterized by high levels of poverty, often with no access to paved roads, transportation facilities, electricity, health or education.

The restrictions, regulations and prohibitions imposed on fishing in MCPAs under the WLPA and MFRA affect fishing communities dependent on these areas for their livelihoods – in many instances violating their basic human rights. More specifically, these regulations decrease the actual area available for fishing, reduce the number of fishing days, and limit access to fishing grounds.

In the Gahirmatha Sanctuary in Orissa, for example, MFRA and WLPA restrictions and regulations not only reduce access to fishing grounds for mechanized and motorized vessels by almost 50 percent, but also cut the number of fishing days from 240 to fewer than 100 (Mathew, 2004; Rajagopalan, 2009). This occurs within a context of high poverty, with about 43 percent of the affected fishers (some 11 000) living below the poverty line.[4] Further challenges are posed by the proximity of certain landing centres to the boundaries of the sanctuary. Specifically, fishers sometimes pass through the sanctuary to reach fishing grounds and, as a result, are often arrested and fined, with their boats and catch confiscated. The restrictions on access to fishing grounds also affect women from fishing communities, who are actively involved in seaweed collection in Gulf of Mannar National Park, as well as those involved in crab collection and fishing in creeks (e.g. in the Gahirmatha Sanctuary) (ICSF, 2009).

Restrictions and regulations on fishing in protected areas have reduced fishers' incomes, leading to livelihood crises and high levels of indebtedness. Fishers are often unable to repay loans they take out through informal credit systems, and many of those affected do not have access to long-term alternative sources of livelihood or to short-term remedies. Similarly, no systematic initiatives are taken by state governments to compensate active fishers for these losses of income.

Moreover, while restrictions and regulations under the MFRA are seasonal and/or gear-specific (based on principles of 'sustainable use'), those under the WLPA are more stringent, and include closing large fishing grounds to extractive use (i.e. establishing no-take zones). Communities point out that small-scale, traditional fishers operating non-motorized and small motorized vessels are often the worst affected by no-take protected area regulations under the WLPA, even though their fishing activities tend to be low impact. Larger vessels, by contrast, are typically able to shift their operations to more distant areas, thereby minimizing negative socio-economic impacts.

Other socio-economic issues include impact on the rights of affected communities. Though the 2002 amendment to the WLPA required that state governments settle issues concerning the rights of affected individuals within a two-year period following the first notification of a sanctuary or national park, issues remain unresolved in several cases. Fishing communities adjacent to WLPA protected areas have also expressed concern over arbitrary confiscation of vessels, gear and catch; levying of fines; arrest of fishers and lengthy legal processes with the associated financial burdens; and violence and harassment (Rajagopalan, 2009). Moreover, it is often difficult for such fishers to establish their innocence with respect to their actual fishing location, given the lack of boundary lines delimiting MCPAs.[5]

Though there are no conclusive estimates of the number of people negatively affected by MCPAs, studies suggest that approximately 10 percent of active marine fishers are affected in some way by MCPAs in India (ICSF, 2009).[6] Large numbers of individuals dependent on marine-related activities are also undoubtedly affected, but again no clear estimates are available.

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[4] In India, the criterion 'below the poverty line' is estimated using the following scorable, socio-economic parameters: operational landholdings, housing, clothing, sanitation, ownership of consumer durables, literacy, status of households in labour force, means of livelihood, status of children (5–14 years of age), type of indebtedness and migration.

[5] A case was filed by the Judicial Magistrate First Class, Pattamundai, against fishers. It was filed under U/S 148 IPC, U/S 307 IPC, U/S 161 Cr.p.c, U/S 141 of IPC. S.T. Case No.62 of 2006 arising out of G.R.Case No. 2 of 2006, corresponding to Rajnagar P.S. Case No. 1 of 2006.

[6] It is estimated that roughly 35 000 active fishers are affected in Gulf of Mannar National Park (including 5 000 seaweed collectors, mainly women); 26 682 active fishers in the Gahirmatha Sanctuary; 9 000 active fishers in Gulf of Kutch Marine National Park and Sanctuary; and another 7 000 in the Malvan (Marine) Wildlife Sanctuary area.

6. COORDINATED APPROACHES TO MPAs FOR FISHERIES MANAGEMENT AND CONSERVATION

6.1 MPAs embedded within other larger spatial management regimes

As mentioned earlier, protected areas are declared under the WLPA as national parks, sanctuaries or tiger reserves. While there are a few cases of protected areas with a coastal or marine component as part of larger biosphere reserves (e.g. Gulf of Mannar National Park and Biosphere Reserve), there are still no cases of established conservation or community reserves in coastal/marine contexts. Coastal and marine protected areas are not specifically linked to coastal zone or fisheries management frameworks, nor are they linked to larger spatial management regimes. Moreover, existing spatial fisheries management measures are not linked to the conservation/protected area frameworks implemented by environment and forest departments (such as traditional fishing zones or the closed-season bans implemented by fisheries departments).

6.2 Institutional cooperation or overlap

Though both fisheries and forest departments share a mandate for management and conservation of marine/coastal areas and resources, coordination remains weak overall. There are a few notable instances of collaboration, however, including joint patrolling efforts in the Gahirmatha Sanctuary and Gulf of Mannar National Park. In the sanctuary, the Coast Guard is also involved in patrolling and in enforcement of fishing and forest regulations. Also notable are the recent amendments to the WLPA providing that representatives of state fisheries departments join the state wildlife boards.

Coordination is also weak between the MoEF and other ministries with jurisdiction/activities in coastal and marine spaces. These include the Ministry of Petroleum and Natural Gas, Ministry of Shipping, and Ministry of Commerce and Industry, all of which oversee activities with possible implications for the effectiveness of spatial management approaches.

6.3 Challenges and opportunities

There is little doubt that establishing better coordination between the MoA, MoEF and relevant departments at the state level can significantly improve the management and conservation of coastal and fishery resources. It is essential that such opportunities be further explored, perhaps by the National Fisheries Development Board, which specifically lists interdepartmental coordination as one of its objectives. The requirement to include representatives of fisheries departments on the state wildlife boards represents such a step, and similar mechanisms for coordination should be investigated. Challenges remain, however, especially given the differing mandates of many departments with jurisdiction/activities in coastal zones.

7. FUTURE DIRECTIONS

It is evident that much needs to be done in the coming period to improve overall marine management in the country, and to adopt a comprehensive approach to managing and conserving coastal and marine resources. It is also important that such an approach articulate the environmental, human rights and social justice imperatives for future marine and coastal resource management in India.

7.1 Institutional collaboration for better design and implementation

Improved collaboration and coordination are critical, in particular between the MoA and the MoEF, as well as among the various boards at the national level, and between departments of fisheries and forests at the state level. Better cross-sectoral coordination is also critical among the ministries with jurisdiction over coastal and marine spaces, as well as between research institutions and NGOs.

Opportunities should be identified to complement and strengthen the spatial management approaches currently adopted by diverse governmental departments. Similarly, there is a need to recognize and expand existing spatial-temporal practices used by traditional fishing communities and local governance groups. Spatial management measures need to be brought under a broader framework of integrated coastal and marine ecosystem management.

7.2 Improving stakeholder participation

A holistic ecosystem framework is needed for the conservation and management of marine and coastal resources that recognizes the human dimensions of ecosystems. Measures to protect the rights of fishing communities dependent on marine resources are essential. To minimize the socio-economic impacts of spatial management measures (particularly MCPAs), the fishing rights of small-scale fishers that use sustainable fishing gear and practices should be protected. If fishing activities are regulated and those regulations have a negative effect on fishers or communities, adequate compensation must be provided, and a systematic and participatory approach should be adopted to enhance and diversify the livelihoods of affected communities.

Strengthening the enforcement of the artisanal fishing zone – a spatial management measure that exemplifies the principle of 'sustainable use' and where the preferential access rights of small-scale fishers are recognized – should also be seriously considered. If well implemented, this single measure can have significant and large-scale ecological and socio-economic benefits. Such a measure would also enjoy the backing of large numbers of small-scale fishing communities.

The importance of co-management approaches and of the full and active participation of fishing communities in decision-making processes cannot be overemphasized. Participation should occur at all stages of such processes: identification, planning, designation, implementation and the review/evaluation of management measures. There is also a need to recognize the legitimacy of, and explore options for, devolving management power to the traditional governance structures of fishing communities. Nested approaches to the spatial-temporal management of coastal and marine resources must also be considered – exploring options that allow communities to manage resources either on their own or with support from the state (depending on context). Finally, there must be willingness to accept feedback and modify management measures based on scientific research, traditional knowledge and customary practices/experience.

7.3 Increasing scientific studies and monitoring

Further scientific studies are needed to identify selection criteria for the areas/species to be conserved (and which include participatory processes). Detailed studies are also needed to identify appropriate management and conservation measures. Such studies might answer questions such as: (i) are permanent, rotational or other dynamic forms of zonation/closures the most effective for conservation of target species; and (ii) is there a need to regulate non-fishing activities within protected areas to achieve effective conservation? While individual species recovery plans are essential, these should be placed within a larger ecosystem context and ecosystem recovery plans. Finally, measures adopted for conservation and management must be periodically reviewed and evaluated to determine if they still fulfil ecological, social and management objectives.

7.4 Conclusions

Threats to coastal and marine resources are growing and well documented. An ecosystem-based approach is needed to prevent further degradation of marine and coastal habitats. Stringent measures should be adopted to prevent pollution/habitat degradation caused by non-fishery sources (such as ports, shipping lanes, tourism

development and other related activities). Unless such regulations are introduced, spatial management measures such as protected areas will remain ineffective. Basically, the need is to develop a management and conservation regime for the entire Indian EEZ for living resources – including fisheries – that is consistent with India's international legal obligations.

REFERENCES

Agardy, T., Bridgewater, P., Crosby, M., Day, J., Dayton, P., Kenchington, R., Laffoley, D., McConney, P., Murray, P., Parks, J.E. & Lelel, P. 2003. Dangerous targets? Unresolved issues and ideological clashes around marine protected areas. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 13: 353–267.

Biswas, N. 2009. *Gulf of Kutch Marine National Park and Wildlife Sanctuary: a case study.* Chennai, India, International Collective in Support of Fishworkers (ICSF). 46 pp.

CMFRI. 2006. *National marine fisheries census 2005.* Vol. I. New Delhi, Government of India, Ministry of Agriculture, Central Marine Fisheries Research Institute.

CMFRI. 2008. *CMFRI research highlights 2007–2008.* Kochi, India, Central Marine Fisheries Research Institute (available at www.cmfri.org.in).

Christie, P., & White, A. 2007. Best practices in governance and enforcement of marine protected areas: an overview. *In* FAO. *Report and documentation of the Workshop on Marine Protected Areas and Fisheries Management: review of issues and consideration, Rome, 12–14 June 2006*. FAO Fisheries Report No. 825. Rome, FAO. 332 pp.

Dudley, N., ed. 2008. *Guidelines for applying protected area management categories.* Gland, Switzerland, International Union for Conservation of Nature (IUCN). 86 pp.

FAO. 2008a. *FISHSTAT Plus: universal software for fishery statistical time series.* Version 2.3. Fisheries Department, Fishery Information, Data and Statistics Unit. Rome.

FAO. 2008b. *Setting directions for sustainable fisheries and coastal livelihoods in the post tsunami context, India.* Report of the interventions by the Food and Agriculture Organization of the United Nations under the United Nations team for Tsunami Recovery Support (UNTRS), 2006–2008. Chennai, India, FAO-UNTRS. 50 pp.

FSI. 2006. *National marine fisheries census 2005: union territories of Andaman and Nicobar, and Lakshadweep Islands.* Mumbai, India, Fishery Survey of India.

Government of India. 1972. *India Wildlife (Protection) Act (as amended up to 1993).* Chapter IV. *Sanctuaries, national parks, and closed areas.* New Delhi (also available at http://envfor.nic.in/legis/wildlife/wildlife1.html).

Government of India. 2006. *Report of the working group on fisheries for the Eleventh Five-Year Plan, 2007–2012.* New Delhi, Planning Commission.

Government of India. 2007a. *More marine protected areas with well-developed management to be set up for marine species conservation.* Press release, 1 November. New Delhi, Press Information Bureau (available at http://pib.nic.in/release/release.asp?relid=32348). (accessed 2 November 2007)

Government of India. 2007b. *Report of the Committee to Study the Impact of the Closed Season on the Fisheries*. New Delhi.

ICSF. 2003. *Report on coastal fisheries and poverty: the case of India*, for the International Fund for Agricultural Development (IFAD). Chennai, India, International Collective in Support of Fishworkers.

ICSF. 2009. *Proc. ICSF Workshop on Social Dimensions of Marine Protected Area Implementation in India: Do fishing communities benefit?*, 21–22 January. Chennai, India, International Collective in Support of Fishworkers.

Koshy, N. 2007. *Orissa case study.* Paper presented at ICSF workshop on Asserting Rights, Defining Responsibilities: Perspectives from Small-Scale Fishing Communities on Coastal and Fisheries Management in Asia, Siem Reap, Cambodia, 3–5 May 2007. Chennai, India, International Collective in Support of Fishworkers (ICSF) (available at http://rights.icsf.net/icsf2006/jspFiles/rights/staticPages/casestudies.jsp).

Kurien, J. & Mathew, S. 1982. *Technological change in fishing: its impact on fishermen.* ICSSR monograph. Thiruvananthapuram, India, Centre for Development Studies.

Lobe, K. & Berkes, F. 2004. The *padu* system of community-based fisheries management: change and local institutional innovation in south India. *Marine Policy,* 28(3): 271–281.

Maes, F. 2008. The international legal framework for marine spatial planning. *Marine Policy,* 32(5): 797–810.

Malleshappa, H. & Naganathan, V. 2009. GOMBRT [Gulf of Mannar Biosphere Reserve Trust] – A pioneering people: participatory initiatives in marine resources management. *In* ICSF 2009, p. 18. Comments presented at ICSF workshop.

Mathew, S. 2004. Socio-economic aspects of management measures aimed at controlling sea turtle mortality: a case study of Orissa, India. *In: Papers presented at the Expert Consultation on Interactions between Sea Turtles and Fisheries within an Ecosystem Context, Rome, 9–12 March 2004.* FAO Fisheries Report No. 738, Suppl. Rome, FAO. 238 pp. (also available at www.fao.org/docrep/007/y5750e/y5750e0d.htm).

MPEDA. 2008. Marine Products Export Development Authority Web site (www.mpeda.com/).

Rajagopalan, R. 2008. *Marine protected areas in India.* SAMUDRA monograph. Chennai, India, International Collective in Support of Fishworkers (ICSF). 69 pp.

Rajagopalan, R. 2009. *Social dimensions of sea turtle protection in Orissa: case study of Gahirmatha (Marine) Wildlife Sanctuary and the nesting beaches of Rushikulya and Debi.* Chennai, India, International Collective in Support of Fishworkers (ICSF). 29 pp.

SCBD. 2006. *Third national report: India.* Montreal, Canada, Secretariat to the Convention on Biological Diversity (also available at www.cbd.int/doc/world/in/in-nr-03-en.doc). (accessed 15 December 2007)

Singh, H.S. 2002. *Marine protected areas in India: status of coastal wetlands and their conservation.* Ahmedabad, India, Gujarat Ecological Education and Research Foundation (GEER).

Sridhar, A. 2005. *Sea turtles and fisheries in Orissa, India.* SAMUDRA monograph. Chennai, India, International Collective in Support of Fishworkers (ICSF). 40 pp.

Sridhar, A. & Shanker, K. 2007. Lessons from marine paradigms. *Seminar web edition*, 577 (September) (available at www.india-seminar.com/2007/577/577_aarthi_sridhar,_shanker.htm).

Vijayan, V., Edwin, L. & Ravindran, K. 2000. Conservation and management of marine fishery resources of Kerala State, India. *ICLARM Quarterly*, 23(3): 6–9.

Vivekanandan, E. 2002. *Ecosystem considerations for managing fisheries in the Indian Ocean.* Paper presented at the ICSF/IOI conference on Forging Unity: Coastal Communities and the Indian Ocean's Future, IIT Madras, Chennai, India, 9–13 October 2001 (available at http://icsf.net/icsf2006/jspFiles/forgingUnity/docs/presentation/evivek.pdf).

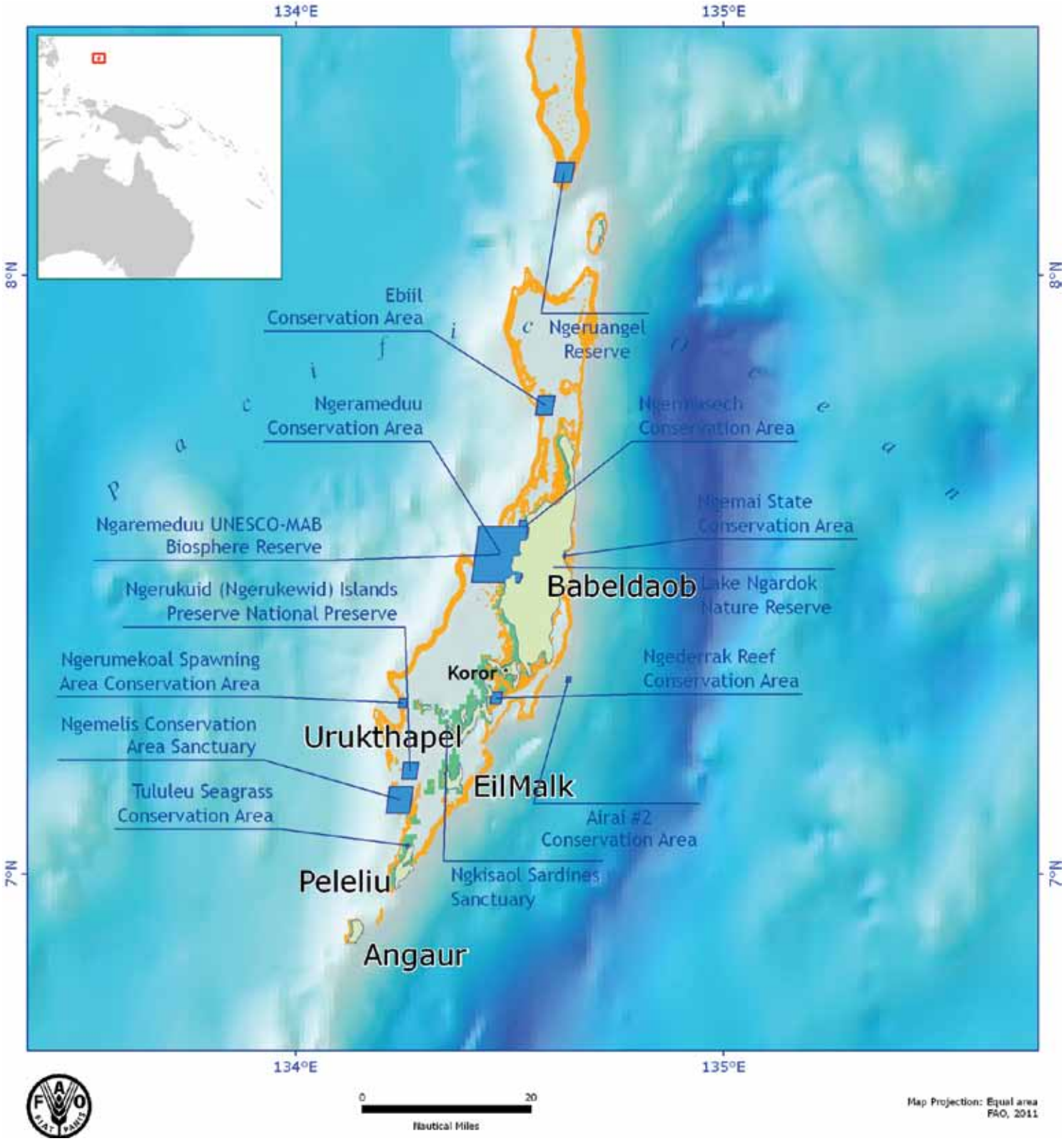
Vivekanandan, E. 2003. Marine fisheries and fish biodiversity in India. *In* K. Venkataraman, ed. *Natural aquatic ecosystems of India: thematic biodiversity strategy and action plan*, pp. 171–185. Prepared under the National Biodiversity Strategy and Action Plan – India. New Delhi, Ministry of Environment and Forests. 272 pp.

Vivekanandan, V. 2009. Fishing community institutions: role in conserving marine living resources. *In* ICSF 2009, pp. 33–34. Presentation made at ICSF workshop.

Wildlife Institute of India. 2007. Protected areas database. Environmental Information System (ENVIS), wildlife and protected areas. Dehradun, Uttarakhand, India (available at www.wii.gov.in/envis/pa_database.html). (accessed 3 October 2007)

World Bank. 2006. *Scaling up marine management: the role of marine protected areas.* Document No. 36635-GLB. Washington, DC.

Map 1
Map of Palau and marine protected areas



Palau

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1. INTRODUCTION

The Republic of Palau lies at the western end of Micronesia (Map 1), 800 kilometres (km) east of the Philippines and 800 km north of Papua New Guinea. By virtue of its position near the Philippines, the recognized centre of biodiversity (Carpenter and Springer, 2005), Palau has a more-varied species list than other islands in the Oceania group.

The 586 islands of the Palau archipelago stretch over 700 km in a north-south direction, although only 12 of the islands are continuously inhabited. Located at the point where the Pacific tectonic plate is subducting under the Philippine plate, Palau has both extensive areas of shallow reef and some of the deepest waters on earth.

Palau has been inhabited for over 4 000 years, and the shallow-water coastal reefs (see Figure 1) have a long history of exploitation (Fitzpatrick and Donaldson, 2007). In the last decade or so, communities in Palau have noted a decline in the abundance and size of target species as a result of overexploitation and development (Davis and Kearns, 2003). Despite the extended list of pressures acting on the coastal system, the marine environment of Palau remains relatively intact, with only moderate population pressure (46 people/km^2). Communities still have a traditional focus on environmental conservation and this provides various options for protection through spatial management (Kelty *et al.,* 2004).

FIGURE 1
Ngederrak reef

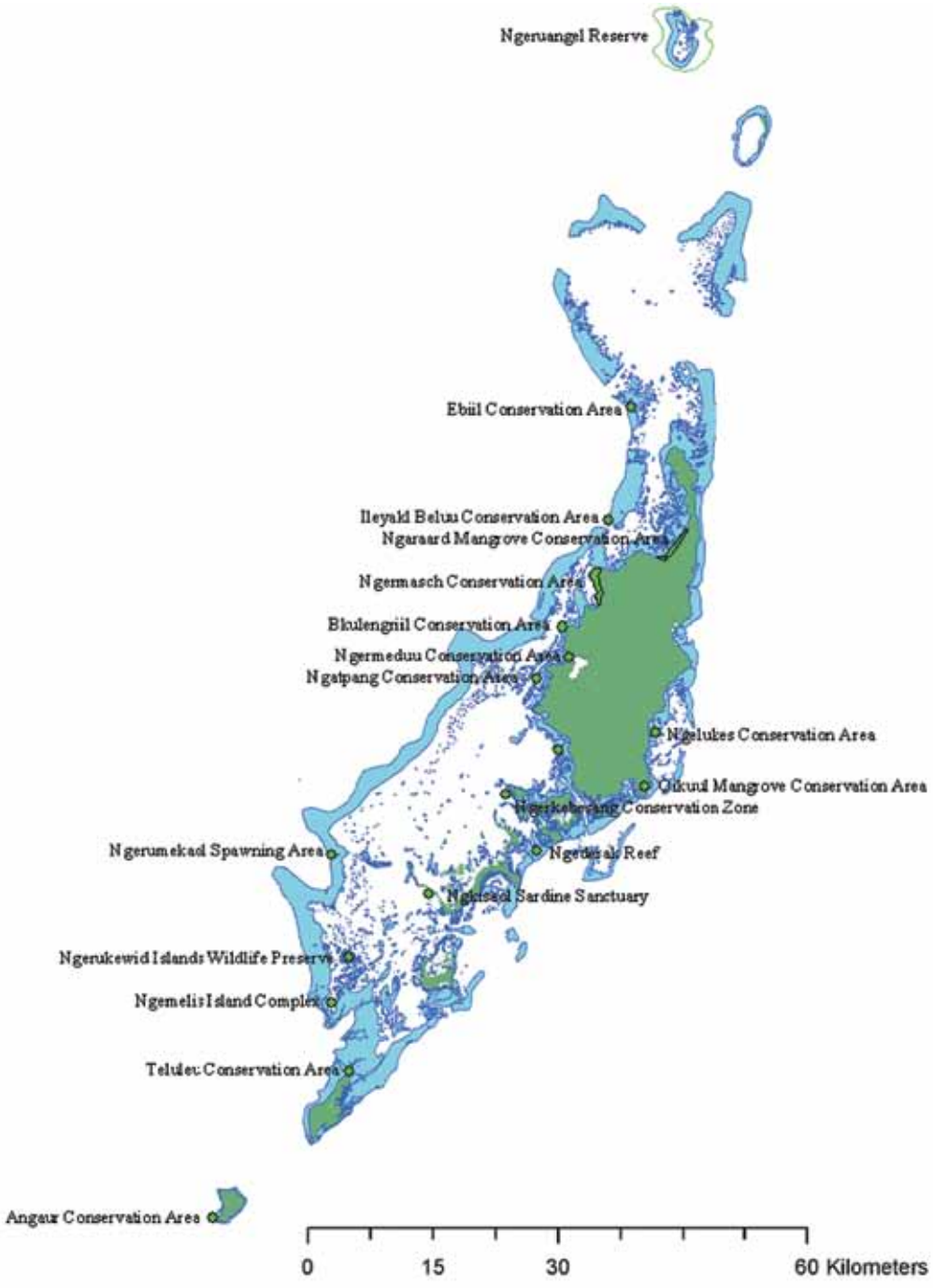
PHOTO: YIMNANG GOLBUU

2. FISHERIES AND SPATIAL MANAGEMENT

2.1 General condition of marine fisheries

The Palauan archipelago is predominantly volcanic in origin, with a total land area of 444 km^2 (Figure 2). It incorporates 1 034 km^2 of shallow tropical lagoon and an exclusive economic zone of 629 000 km^2 (SPC, 2008a; Fitzpatrick and Donaldson, 2007). With a small, but ageing population of 20 279 people (SPC, 2008a), Palau has one

FIGURE 2
Map of Babeldaob with smaller islands to the north and south



Note: The position of marine protected areas is noted, although Sonsorol and Hatobohei States in the south are not represented.

Palau's biological significance

- high number of diverse marine environments (habitats) present;
- highest diversity of reef fish in Micronesia, with >1 278 species (Myers, 1999);
- more than 350 species of hard and 200 species of soft corals (northeast margin of the 'coral triangle');
- estimated >500 sponge species (Kelly-Borges and Valentine, 1995);
- extensive list of opisthobranchs, with >185 species;
- twenty-one species of crinoid fauna (Meyer and Macurda, 1980);
- home to seven of the nine species of giant clams;
- an endemic nautilus, *Nautilus belauensis*;
- home to the most isolated *Dugong dugon* population in the world;
- the only hawskbill turtle, *Eretmochelys imbricata,* breeding site in Micronesia;
- the largest number of resident bird species in Micronesia.

of the region's lowest unemployment rates (2.3 percent in 2000) and a large presence of foreign workers (Asian Development Bank, 2005).

Three ocean currents converge in Palau's waters, bringing diversity to coastal marine habitats dominated by coral reefs (outer reef 265 km^2, inner reef 187 km^2 and mangrove 45 km^2). Lying outside the typhoon belt, Palau has a high density of relatively intact tropical marine habitats and related communities (see box). In addition to coral reefs, mangroves and seagrass beds, there are deep algal beds, mud basins, current-swept lagoon bottoms, rich tidal channels and anoxic basins (Turgeon *et al.,* 2002; Kelty *et al.,* 2004; Fitzpatrick and Donaldson, 2007).

The fisheries contribution to gross domestic product (GDP) remained stable at ~2.2 percent from 2002 to 2006 (Palau Office of Planning and Statistics). Although Gillett and Lightfoot (2001) highlighted a decline in the fisheries contribution (from ~8 percent in the late 1990s), it was mostly due to variations in the number of locally based oceanic fishery vessels and strong growth in the tourism sector.

As is the case with other island countries in the region, inshore fishing is critical to Palau's domestic food supply. The reef fishery is a multispecies, multigear fishery with a range of species targeted (Nichols, 1991; Hinchley *et al.,* 2007). Approximately 80 species of reef fish from 13 families are typically taken, although rabbitfishes (Siganidae) comprise the dominant composition of landings. Parrotfishes (Scaridae) are also an important part of the artisanal sector, with groupers (Serranidae) and humphead wrasse (*Cheilinus undulatus*) important in both subsistence and semi-commercial fisheries. Heavy exploitation of groupers and humphead wrasse in the 1980s and 1990s for the live reef food fishery affected these populations (Graham, 1996, 2001; Kitalong and Oiterong, 1992; Davis and Kearns, 2003). Efforts to control the fishery were slow in coming, although a national ban on the live reef food fishery was instituted in 2008.

The deep-water fish resource is also important; catches are dominated by 13 species of the families Lutjanidae, Lethrinidae and Serranidae (Nichols, 1991). Invertebrates of commercial importance include the native topshell trochus, *Trochus niloticus* (Maragos *et al.,* 1994; Matthews, 2003). Giant clams are a traditional food and are regularly taken for subsistence purposes, although surplus is offered for sale at local markets and exportation of the meat or whole shell collected from the wild is controlled. Pearl oyster (*Pinctada margaritifera*) fishing was important during the Japanese administration, but wild stock collection ceased as stock became depleted (Maragos *et al.,* 1994). Three species of spiny rock lobster (family Palinuridae) are important in subsistence and commercial fisheries, while mudcrab (or mangrove crab, *Scylla serrata)* is an important catch in the semi-commercial sector. Some 22 commercial species of sea

cucumber offer potential for export (Friedman *et al.,* 2010) and past records show that at least eight have been exported (Fitzpatrick and Donaldson, 2007). While exportation of six commercial sea cucumber species is currently prohibited, at least four species are eaten locally (Friedman *et al.,* 2010; Kitalong, 2008). Lastly, there is a long history of marine aquarium trade (from the mid-1980s), with the participation of the Palau Mariculture Demonstration Center, and one private company, Belau Aquaculture, operating in Palau (Graham, 1996).

It is important to note that tourism is still the single most important industry, with an increase of 63 percent in the past six years, from 54 000 visitors in 2001 to 88 175 visitors in 2007 (Palau Visitors Authority data, 2008). A main attraction for visitors is the spectacular diversity of the marine environment, including the protected 'rock islands' and marine 'jellyfish lake'.

The immediate threats to Palau's biodiversity stem from inappropriate use of natural resources owing to fisheries development, tourism activities (Davis and Kearns, 2003), population growth and economic development (Hinchley *et al.,* 2007). Additionally, the construction of a 52-mile road around the largest island, Babeldaob, threatens coastal environments through greater access, the wider ramifications of beach and foreshore development, run-off, siltation, waste disposal and habitat loss (Golbuu *et al.,* 2003; Victor *et al.,* 2004). Longer-term, climate-induced changes also threaten biodiversity, with coral bleaching having repeated impact: high levels of coral bleaching and mortality followed an El Niño Southern Oscillation (ENSO) event in 1998. These ENSO-driven events are expected to increase in frequency and intensity in coming years.

2.2 Spatial management in fisheries and conservation

The challenge of inshore fisheries management in Palau centres on balancing exploitation of resources for subsistence and commercial activities with the maintenance of a healthy ecosystem with high biodiversity. Subsistence and small-scale commercial fishing ranges from simple hand collection to hook-and-line fishing, underwater spear-fishing, net fishing and trolling. Fishing typically involves small fishing craft, generally 4.8–7.6 m in length and powered by an outboard motor. At least 25 percent of households own fishing boats, and through the extended family system most fishers have access to boats.

Traditionally, Palau has had strong community control (tenure in Palau is determined through matrilineal descent) that allows areas to be closed to fishing through implementation of traditional moratoriums, or *bul*, prohibiting all use for a restricted period, but usually not indefinitely. The majority of community marine protected areas (MPAs) have been designated to address local concerns regarding decreased commercial fish populations, and to manage the needs of tourism effectively. Although the Palau community system of management is strong, intermarriage among communities and a more westernized approach to life are slowly making more and more areas 'open access' for fishing (Mersai, 2007). This is particularly true for commercial fisheries, which operate outside rapidly eroding traditional controls.

Palau's main fisheries law regulates both foreign and domestic fishing through the Palau National Code, Title 27. Other relevant legislation relates to environmental protection through the Palau National Code, Title 24. These domestic controls for coastal fisheries concentrate primarily on controlling the exploitation of groupers, wrasses, parrotfishes, turtles, giant clams, pearl oysters, sea cucumbers, crabs and dugongs.[1] Further legislation in Chapter 13 of the code specifies "illegal methods of capture", and seeks to protect stocks and habitats through the banning of destructive fishing practices.

[1] Palau National Code, Title 24, Division 2, Chapter 12: Protected Sea Life, and the 1994 Marine Protection Act.

Recognizing the difficulty of enforcing national input and catch controls, Palau's communities, non-governmental organizations (NGOs) and government have instituted numerous MPAs, emerging as leaders of spatial management for conservation in the Pacific. This includes protection of grouper spawning aggregation sites, the Ngerukeuid Islands Preserve, and multiuse protection of other rock islands and surrounding waters, including key tourist sites such as the marine jellyfish lake.

2.3 Institutions

Traditional community management (the Council of Chiefs and Council of Women) and civil society are engaged in conservation in Palau (Ridep-Morris, 2004; Table 1). Communities and civil groups advocate marine resource management through spatial controls. However, the influence of the traditional system is declining (Mersai, 2007), with traditional chiefs being integrated into more-centralized state and national government roles.

NGOs play an important role in advocating protection of the marine environment. They conduct a range of activities, starting with community consultation and development of local structures for community-based management, with ongoing research and monitoring (Table 1). The Palau Conservation Society (PCS), the Palau International Coral Reef Centre (PICRC), the Coral Reef Research Foundation (CRRF) and The Nature Conservancy (TNC) are the most prominent groups supporting conservation through spatial management in Palau.

Government control is distributed in national and state institutions. Article IX, Section 5.12 of Palau's Constitution states that marine resource conservation in the national interest falls within the purview of the national government, whereas Article I, Section 2 confers on the country's 16 states the ownership of all marine resources found within 12 nautical miles of state boundaries. This charges national and state government agencies with marine resource management, giving both a legislative role in marine conservation (Table 1).

TABLE 1
Institutions and their responsibility for coastal environment and fishery resource management in Palau

Agency	Planning/ management	Research	Monitoring	Education/ outreach	Training	Surveillance/ enforcement
Civil Society: Council of Chiefs and Council of Women	X		Various projects			
Palau Community College		X		X		
Coral Reef Research Foundation crrf@palaunet.com		X	Temperature, marine lakes			
The Nature Conservancy micronesia@tnc.org	X	X			X	
Palau Conservation Society PCS@palaunet.com			MPAs	X		
Palau International Coral Reef Center www.picrc.org		X	MPAs, fish, corals, watersheds	X	X	
Koror State Department of Conservation and Law Enforcement	X	X	Marine lakes, rock islands	X	X	X
Palau Mariculture Demonstration Center		X	Restocked fauna	X	X	
Palau Fishing Authority	X					
Environmental Quality Protection Board	X		Water quality	X		X
Bureau of Marine Resources and Ministry of Natural Resources, Environment and Tourism	X	X	Stock status, fish markets and exports	X	X	X
Division of Fish and Wildlife				X		X

The national Palau Maritime Authority (mandated under the Palau National Code, Title 27) licenses fishing activity within the offshore fisheries zone (from 24 to 200 miles). Within coastal waters (territorial waters: shoreline to 12 miles and the contiguous zone out to 24 miles) a number of agencies are active, including the state government of each of the 16 states of Palau. The Ministry of Natural Resources, Environment and Tourism (formed January 2009), which includes the Bureau of Marine Resources (BMR), is supported by the Fisheries Act of 1975 and its regulations under the Palau National Code (see Sisior, 2007). Its mandate includes marine research and development, resource management, technology transfer, technical advisory and extension services, statistical monitoring and recommendations for legislation. In addition, the BMR is responsible for promoting the commercialization of certain mariculture species carried out by the Palau Mariculture Demonstration Center. Other agencies, also in charge of conservation and monitoring, such as the Division of Fish and Wildlife (previously the Division of Conservation and Entomology), are shown in Table 1.

Through intergovernmental agencies – such as the Secretariat of the Pacific Community (SPC), the Forum Fisheries Agency and the South Pacific Regional Environmental Programme – Palau also participates in greater regional programmes that deal with fisheries and environmental issues.

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

Most MPAs in Palau are established to provide protection for marine resources, or occasionally to protect tourist sites, rather than to conserve a proportion of representative habitats or environments. The designation of MPAs has generally been instigated by communities, with the assistance of NGOs, and enacted by both national and state government bodies.

3.1 MPA terminology

Results of initial rapid ecological assessments in the early 1990s led to 50 prospective sites for conservation being proposed by state leaders. The sites were selected on the basis of their outstanding ecological or biological value. Maragos and Cook (1995) suggested seven types of management areas for the marine environment in Palau, including national park, ecological reserve, marine preserve, coastal conservation area, fishery conservation area, tourism site and special management area. Through discussion, leaders of the 16 states of Palau classified the 50 sites into 28 fishery conservation areas, 7 marine reserves, 4 forest preserves, 4 ecological reserves and 2 coastal conservation areas, with the remaining 5 including a national park (e.g. rock islands) and special management areas.

This characterization of MPAs was further adapted by the Government of Palau into four national heritage categories (national heritage area, national heritage preserve, national heritage reserve and special management area), which took advantage of the content of the 1991 National Heritage Reserve Systems Act.[2] This framework for designating MPAs went through a final iteration in 2003, when the National Heritage Reserve Systems Act was repealed and replaced by the Protected Areas Network (PAN) Act (Table 2).

The PAN Act applies two types of categories in characterizing protected areas in Palau: management categories and use categories (Table 2). The first type follows the guidelines for protected area management of the International Union for Conservation of Nature (IUCN) and consists of six levels of protection (IUCN, 1994). The second reflects traditional local and/or national uses of protected areas: (A) restricted non-

[2] Palau National Code, Title 24, Division III, Chapter 32.

TABLE 2
Palau marine management matrix, under the Protected Areas Network (PAN) Act

	A Restricted non-extractive uses	B Non-extractive uses	C Sustainable uses	D Others
IUCN Ia	Ia-A	n.a.	n.a.	Ia-D
IUCN Ib	Ib-A	Ib-B	n.a.	Ib-D
IUCN II	II-A	II-B	II-C	II-D
IUCN III	III-A	III-B	III-C	III-D
IUCN IV	IV-A	IV-B	IV-C	IV-D
IUCN V	V-A	V-B	V-C	V-D
IUCN VI	VI-A	VI-B	VI-C	VI-D

Note: IUCN categories (1994): (Ia) strict nature reserve, protected for science; (Ib) wilderness area, preserve in an unmodified condition; (II) ecosystem protection and recreation; (III) conservation of specific natural features; (IV) habitat-species management area; (V) landscape and seascape, conservation and recreation; and (VI) sustainable-use area.

extractive uses (permission or permit required; recreation or extractive use not allowed; education, monitoring or research with permission); (B) non-extractive uses (permission or permit may be required; education, monitoring and/or research use allowed; extractive uses not allowed); (C) sustainable uses (permission or permit may be required; education, monitoring and/or research use allowed; sustainable and/or subsistence extractive uses may be allowed); and (D) 'other' uses.

Categorizations for protected areas available through intergovernmental agencies and the World Conservation Monitoring Centre do not list the current situation of marine spatial management in Palau effectively. However, a number of researchers have documented from 28 to 30 reserve areas of various types, ranging from traditional closures to protected state and national conservation areas (Verheij and Aitaro, 2007 and Table 3; Verheij and Austin, 2008; Hinchley *et al.*, 2007).

TABLE 3
MPA with related institution and definitions

Name	State	Size (km^2)	Use	Comments
Imul Mangrove Conservation Area	Aimeliik	0.4	A	Protection of mangroves
Ngchesechang Mangrove Conservation Area	Airai	1.0	C	Protection of mangroves
Ngeream Conservation Area	Airai	1.6	C	Protection of mangroves
Oikul Mangrove Conservation Area	Airai	0.8	C	Protection of mangroves
Helen Reef	Hatohobi	163.0	B and C	Protection of fish, turtles, birds, clams and marine habitats. Atoll, patch reefs, channel, lagoon
Ngeruangel Reserve	Kayangel	35.0	C	Protection of fish populations, turtles, birds and marine habitats. Atoll
Ngerukewid Islands Wildlife Preserve*	Koror	11.0	A	Preservation of marine habitat biodiversity and wilderness. Rock islands with important plant, bird and marine attributes, including critical breeding sites for hawksbill turtles and giant clams (70 islands, inner reef flats, lagoon, patch reefs)
Ngerumekaol Spawning Area*	Koror	2.1	B	Protection of reef fish aggregations in Ulong Channel year round. Outer reef wall, reef flat, reef channel
Ngemelis Islands Complex*	Koror	40.0	B	Protection of marine habitat diversity. Sharks, turtles, rays and pelagic fish with link to dive tourism. Rock islands on outer reef, blue holes, reef flats, lagoon, patch reefs
Ngkisaol Sardine Sanctuary*	Koror	0.1	A	Protection of sardine aggregations (goldspot herring, blue sprat and other baitfish). Inner patch and fringing reefs
Ngederrak Conservation Area*	Koror	6.0	A	Protection of dugong, commercial reef fish and invertebrate species populations. Reef flats, inner reef slope, seagrass beds, lagoon

TABLE 3 (Continued)

Name	State	Size (km^2)	Use	Comments
Ngerkebesang Conservation Zone*	Koror	0.1	B	Protection of diverse marine flora and fauna for tourist use close to Palau Pacific Resort. Fringing reef
Rock Islands Southern Lagoon Management Area	Koror	840.6	A, B, C	Protection of marine habitat diversity. Protection of island landforms, fish, invertebrates, turtles and birds
Ngaraard Mangrove Conservation Area	Ngaraard	1.4	A	Protection of mangroves
Ngaraard Beach Conservation Area	Ngaraard	12.1	C	Protection of fish and invertebrates, fringing reef
Ebiil Conservation Area	Ngarchelong	19.1	A	Preservation of grouper spawning aggregations. Reef slopes, reef flats, channel, patch reefs, lagoons
Ngarchelong 'Closure'	Ngarchelong	n.a.	n.a.	Fishing by all non-residents declared *bul* by Ngarchelong within its jurisdiction in 2008
Ngermasech Conservation Area	Ngardmau	3.5	A	Protection of important nursery areas for fish and invertebrate species: rabbitfish, snappers, surgeonfish, giant clams and sea cucumbers. Seagrass beds, fringing reefs
Reef of Ileyakl Beluu (Ileakelbeluu)	Ngardmau	0.5	B	Protection of fish and marine habitats, patch reef
Ngermeduu Conservation Area	Ngeremlengui Ngatpang Aimeliik	167.0	A and C	Protection of marine habitat biodiversity. First UNESCO biosphere reserve in Pacific Islands region. Largest estuary in Micronesia, including mangroves, mudflats, seagrass beds, fringing reefs, reef channel, inner reef flats, reef slope
Ngelukes Conservation Area	Ngchesar	1.0	A	Inshore sea cucumber[a] and fish protection[b] identified in 1999 through a PCS rapid survey. Patch reef
Tululeu Conservation Area	Peleliu	0.8	A	Protection of fish and sea cucumbers. Seagrass area
Ngatpang Conservation Area	Ngatpang	0.5	A	Protection of fish and invertebrates. Fringing reef, seagrass beds
Angaur Conservation Area	Angaur	0.4	A	Protection of fish, invertebrates and marine habitats. Fringing reef
Bkulengriil Conservation Area	Ngeremlengui	0.7	A	Protection of fish and invertebrates. Fringing reef, seagrass beds
Ngerang Clam Area	Melekeok	1.0	C and B	Protection of fish and giant clams. Fringing reef
Airai Reef Conservation Area	Airai	4.0	C	Protection of wetlands and marine habitat diversity and related resource species. Mangrove, seagrass, reef flat and lagoon
Ngerchebal Island Wildlife Conservation Area	Aimeliik	1.0	C	Protection of wildlife on island and surrounding reefs. Island and fringing reef
Melekeok Management Area	Melekeok	n.a.	C	Protection of reef fish. Fringing reef
Trochus Sanctuaries (21 nationwide)	Various	n.a.	C	Protection of important commercial stocks. Fringing and barrier reef

Source: Adapted from Verheij and Aitaro, 2007.
Note: All names denoted with * are within the Rock Islands Southern Lagoon Management Area.
[a] Carmin Pipit, with Palau Community College, studies sea cucumber abundance.
[b] Nestor *et al.*, 2008.

The scale of these MPAs in Palau varies greatly, with the largest being the Rock Islands Southern Lagoon Management Area (hereafter Rock Islands Area), which includes A and B use categories (restricted non-extractive uses and non-extractive uses). The single largest management category area is Helen Reef Reserve, at 163 km^2, although there are open seasons for selected commercial resources. Despite the larger areas under spatial control, there are numerous small reserves in Palau with areas of less than 1 km^2 under no-take management. The smallest MPAs in Palau are found within the Rock Islands Area: the Ngkisaol Sardine Sanctuary and Ngerkebesang Conservation Zone, both with a size of 0.1 km^2. The smallest stand-alone no-take MPA in Palau is the Angaur Conservation Area, with a size of 0.4 km^2. However, these figures are not always good descriptors of conservation status, as some MPAs in Palau often encompass several different levels or types of management, whereas other, traditionally managed areas, which have no designation, support various area and input controls that are not well documented.

3.2 Objective and description of MPAs

In the past, the designation of reserves was generally in response to community concern over declining resources. Community instigation of management controls arose to ensure protection of locally important marine resource populations, although spatial controls were also instituted to respond to the recognized need for conserving sites important to the tourism industry. In few cases were spatial controls driven by biodiversity objectives. It is hoped that the PAN Act of 2003 will encourage the designation of MPAs with a greater biodiversity focus, in order to ensure that a comprehensive, adequate and representative (CAR) approach to MPA planning is achieved, in which all elements of biodiversity are effectively considered, and not just those where species are under heavy fishing pressure.

3.3 Decision processes

Traditionally, relatively decentralized and exclusive tenure systems lent themselves to better maintenance and application of *beluu* (village) controls (Ridep-Morris, 2004). Village councils were responsible for managing public domain, and conservation practices including *bul* and taboos were implemented. *Bul* were instituted by the village *rubak* (traditional chiefs) to help maintain resources.

Legislation protecting species and limiting destructive fishing methods (e.g. the Marine Protection Act of 1994) was not achieving its aim of protecting resources, and spatial controls were seen as a way to improve conservation. After the severe bleaching event of 1998, conservation policy was taken more seriously (Verheij and Aitaro, 2007). There was increased formalization of the rules for *bul*, and a general, Pacific-wide push to implement more-formalized spatial management.

In Palau, traditional spatial controls were often instituted through temporal closures (typically in blocks of three years) and extended if deemed necessary. For example, a reef would be closed for a couple of years to allow it to recover from overfishing, while other areas, such as spawning aggregation sites would be closed for from three to five years. In recent times in Palau, many such closures have become permanent after the lapse of the interim closure. For example, the Ebiil Conservation Area was initially closed for three years, but the closure was made permanent after the first three years of protection expired. In a second case, Ngederrak Conservation Area was initially closed for one year, extended for three years at the end of the first year, and finally closed permanently at the end of that three-year period.

This is not always the case: a *bul* to ban fishing from eight channels, declared in 1994 by chiefs from two states (Ngarchelong and Kayangel), ended after an initial period of successful protection. In 2000, however, a *bul* for one of these eight channels remained (Ebiil and its adjacent reefs), and state legislation supporting the closure followed. Similarly Ngemai Reserve in Ngiwal State, which was closed from 1997 to 2002, was opened again to fishing when the control expired. The process of spatial closures in Palau has typically operated with relatively short time frames, although important areas are now receiving more-permanent protection. Despite this, some areas continue to open and close in a temporal rotation, or have restrictions on resource extraction on a permanent basis for specific times of the year.

Although monitoring of the status of MPAs has been conducted (mainly by NGOs), there is limited quantitative information on the performance of MPAs and their effects on the general environment (Nestor *et al.*, 2008). However, there is still a general community realization that pressures and threats to marine resources and environments are growing, and today there is a greater push to ensure that legislation for spatial controls is in place to protect key reserves in perpetuity.

3.4 Perceptions of MPAs

Community surveys on perceptions of spatial controls have shown that existing MPAs receive high support from community members. For instance, in Ngchesar, 94 percent of community members interviewed supported the state MPA, the Ngelukes Conservation Area (Mersai, 2007). Not only did they support the existing MPA, but 63 percent supported the idea of adding additional areas to the existing no-take reserve (Mersai, 2007). In Ngarchelong, the state with jurisdiction over the Ebiil Conservation Area, 91 percent of the people surveyed supported its establishment, 63 percent supported making it permanent and 60 percent supported establishment of additional MPAs (Palau International Coral Reef Center, unpublished data, 2003). The trend is similar in Kayangel, with 92 percent supporting establishment of the Ngeruangel Reserve, 72 percent supporting making it a permanent reserve and 60 percent supporting establishment of additional MPAs (ibid.). It is interesting to note that while the majority of the people surveyed were not totally supportive of the current management of the existing MPAs, they still supported establishment of MPAs.

One important result reported by Mersai (2007) was that 86 percent of respondents to the Ngelukes Conservation Area survey stated that the reserve should not be permanently closed, but be opened on occasion (e.g. when monitoring data showed there were sufficient stocks for harvesting). This is a recurring theme in the Pacific Islands, with communities often happy to close areas for conservation goals, but once those goals have been attained, seeing little merit in leaving areas untouched. This sentiment is possibly due to a lack of understanding of the potential spillover effects to nearby fishing areas that could arise from leaving MPAs closed for extended periods of time.

The biggest concern of community members is the change in land use affecting coastal areas (Mersai, 2007), and the lack of enforcement or need to improve enforcement at existing MPAs. In Ngelukes Conservation Area, 74 percent of community members recommended strengthening surveillance and enforcement. In Airai State, community visits (villages of Ngetkib and Ngeruluobel) indicated support for the protected areas and for additional MPAs, yet there was a lack of awareness regarding the boundaries or even the existence of areas under protection (A.H. Kitalong, personal communication, 2008). In 2008, boundary markers were placed at these sites and conservation officers in Airai have upgraded their management.

Environmental NGOs also support the establishment of MPAs and most have programmes to promote, strengthen and/or monitor them. The PCS marine programme focuses on building capacity at the community level for better monitoring and management of MPAs, while PICRC's programme concentrates on assessment and evaluation to aid in adaptive management of MPAs. State governments in Palau support the use of MPAs to conserve their resources, and this is evidenced by the fact that 14 of the 16 states in Palau have established at least one (Mersai, 2007). The national government and its agencies also support MPA establishment, particularly after the 1998 coral bleaching incident (approximately 30 percent mortality nationally), which focused government attention on conservation measures (Verheij and Aitaro, 2007), and more recently through the development and institution of the PAN Act. This includes the establishment of a PAN office to support states and communities in the management of their MPAs.

4. MPAs FOR FISHERIES AND CONSERVATION: GOVERNANCE

4.1 MPA legal basis and institutional frameworks (examples of nested institutional involvement)

Prior to the establishment of Palau as a constitutional democracy, some United States federal legislation and Trust Territory legislation were applicable to fisheries and conservation in Palau. However, neither the government nor the Environmental

Protection Board of the time specifically enacted rulings to demarcate and control protected areas. This was despite the introduction in 1975 of an endangered species act that allowed acquisition of land (Public Law No. 6-55), and the availability of various pollution and housing acts, which supported spatial controls.

After Palau's constitutional government was formed in 1981, and it became an independent nation in 'free association' with the United States of America in 1994, there was greater potential for instituting protected areas. The first legislatively recorded perennially protected natural area was established in 1998 (IUCN, 1992). It gave formal protection[3] to the Ngerukewid Islands Wildlife Preserve, which had originally been established in 1956. This reserve of over 70 islands in the south of the main lagoon is one of the longest-standing legislated protected areas in the Pacific Islands region (Idechong and Graham, 1998).

The creation of MPAs in Palau has been a mix of bottom-up (community-initiated) and top-down (government-driven) activity. Before Palau became independent, two MPAs were established using the top-down approach (Ngerukewid Islands Wildlife Preserve and Ngerumekaol Spawning Area), which contrasts with the many cases of bottom-up community-led and comanagement initiatives instituted since Palau's independence in 1994.

The Ebiil Conservation Area is a good example of the nested involvement of institutions in the design and maintenance of reserves. In the north of the lagoon, this reserve was initially an initiative of the chiefs. It was then formally established in 2000 by Ngarchelong State (State Public Law No. 87). Pressure from NGOs and community groups ensured that the area was made a permanent conservation area in 2003. The Ngarchelong state government manages the area with monitoring assistance provided by the Palau Conservation Society and Palau International Coral Reef Center. The Ebiil Society, a community group, works with community members to promote the conservation of resources at Ngarchelong, including the Ebiil Conservation Area, but does not have any formal agreement with the state government to manage Ebiil.

Since Palau became independent and state authority was recognized, there have been a number of state ordinances issued to protect important resource stocks and areas of important habitat. A fuller listing of legal instruments for protection, including related legislation (e.g. the Palau National Code for cultural and sunken resource areas) can be found in Bureau of Natural Resources and Development documents (Bureau of Natural Resources and Development, 1989) and through other agencies (FAO, 2008; IUCN, 1992).

4.2 International MPA-related instruments and international and national benchmarks

The Marine Resources Pacific Consortium (MAREPAC), which comprises representatives from nine island groups in Micronesia (Palau and other United States-affiliated Pacific Islands), develops regional capabilities and collaborations for sustainable use of marine resources. It is funded by the United States Department of the Interior. The MAREPAC's main aim is to adapt traditional management principles and practices to modern resource management challenges.

The Apia Convention for the safeguarding of intangible cultural heritage also provides for the establishment of protected areas. This is one of the oldest conventions in the Pacific, although Palau only became a party in 2009 (with the technical support of the United Nations Educational, Scientific and Cultural Organization [UNESCO]). Palau is also one of the signatories to the South Pacific Regional Environmental Convention, and a member of the Convention on International Trade in Endangered Species (CITES)

[3] Under the Palau National Code, Title 24 (Division 3, Reserves and Protected Areas, Chapter 30, Sections 3001–3004).

of Wild Fauna and Flora. It is part of the Global Island Partnership, which assists islands in conserving and sustainably using their natural resources in support of people, cultures and livelihoods around the world. Palau is a signatory to the Convention on Biological Diversity (since 1999), and a partner in advancing 2010 biodiversity targets. Its PAN Act provides a framework for implementing the Convention's Programme of Work on Protected Areas. Palau also became a contracting party to the Convention on Wetlands (Ramsar Convention) in 2003, and currently has a single site designated as a wetland of international importance (Lake Ngardok Nature Reserve), although this is predominantly not a marine feature.

Other mechanisms are being considered at present, such as UNESCO Man and Biosphere reserves and networks of MPAs. The Ngermeduu Conservation Area is the first biosphere reserve in Palau. It is uncertain how much these international instruments, agreements and legislation are driving the process of marine protection in Palau. However, they undoubtedly help support the process of management by laying out frameworks for adoption, and by stimulating uptake through shared strategizing among regional neighbours. Lastly, the financial assistance gained through these arrangements helps fill the recognized shortfall in funding for work to establish and maintain protected areas.

4.3 Management process

Prior to independence, a conservation officer was hired to work under the Chief of Agriculture for the whole Trust Territory, of which Palau was just a part. Since 1981, management and administration of MPAs has been the responsibility of diverse institutions.

Since their inception, administration of MPAs such as the Ngerukewid Islands has been overseen by both national and state agencies. The Bureau of Marine Resources and the Division of Fish and Wildlife have both played defining roles. In addition, these areas and *Trochus* breeding sanctuaries within them, fall under the active control and protection of the governors of each state (Bureau of Natural Resources and Development, 1989). Despite this multilayered management process, ongoing surveillance and patrolling activities have generally been hindered by a lack of staff and resources. In reality, most of the responsibility for this activity at Ngerukewid Islands falls to a permanent force of marine park rangers, run by Koror State, which is the most populous. Koror manages many key MPAs, using a sustainable financing mechanism based on levies placed on general tourist visitors and divers, which supplements management and surveillance activities for the entire southern lagoon.

In the case of other states, conservation officers are also sometimes funded, although the funding base is more limited. Usually, a state government cannot afford to have a full-time conservation officer, so they also work on other state requirements, for example, public works (Mersai, 2007). State support of a full-time conservation officer usually requires outside funding, often in the form of grants (e.g. the German Government, through the LifeWeb grant, funds a project officer for northern reef management). Many states are now exploring options to be more independent and sustainable. For example, with assistance from the PICRC, Airai State is funding capacity-building and training for its officers. Fuel costs are a major limitation for these officers, and a permit fee system similar to that used in Koror State has been considered.

The passage of the PAN Act means extra funding through the full-time implementation of a visitor levy. Effective 1 April 2009, the Minister of Finance should authorize a US$30.00 environmental protection fee for tourists, of which US$20.00 is to be used for the sole purpose of operating the protected areas network. This 'green fund' is to be managed by an independent non-profit organization and will help support MPA management. From 2005 to 2008, there was a 31 percent increase in visitors from China (Palau Visitors Authority). The rise of affluence in Asia, especially in China, offers

the prospect of greater numbers of incoming tourists, which will directly (the PAN green fund) and indirectly fund the maintenance of MPAs and of Palau's biodiversity heritage, which is a major drawing card for visitors.

4.4 Key challenges

With such a range of national and state bodies legislated to establish controls and manage the marine environment, jurisdiction is blurred (Government of Palau, 1996). The national constitution and the conflicting mandates of government agencies for marine resource conservation and management result in overlapping responsibilities and confusion over jurisdiction, obligations and accountability. In general, most agencies also have insufficient resources to conduct the management tasks required.

As mentioned previously, although marine resource conservation activity in the national interest clearly falls within the purview of the national government (Article IX, Section 5.12), the constitution also states that: "Each state shall have exclusive ownership of all living and non-living resources, except highly migratory fish, from land to twelve nautical miles seaward from the traditional baselines" (Article I, Section 2). Thus agreement is needed to draft clear legislation specifying the rights of each party (Government of Palau, 1996).

Palau's development plan to the year 2020 (Government of Palau, 1996) also recognizes the inadequacy of operating budgets and of surveillance and enforcement capability. Surveillance is minimal in most MPAs and this is reflected in the low rates of prosecution outside of Koror (e.g. only one citation for Ngarchelong in 2008). The Division of Fish and Wildlife has prosecuted several cases in Koror and also in Babeldaob for specific resources, but capacity at the state level is limited. Airai State recently hired officers, who have confiscated catches (rabbitfish and turtles harvested during closed season) and equipment. A well-publicized case in late 2007 saw traditional chiefs of Ngarchelong State impose a fine on a Palauan for operating a commercial fishery in their waters. In this case, 20 foreign fishers employed by the company, using a mother ship and 19 single-engine 'banana boats', were caught by Ngarchelong police with live fish in protected state waters. The commercial fishery owner agreed to pay a US$10 000 fine set by the traditional chiefs.

Successful management of MPAs requires strategic monitoring of ecological assets, in addition to enforcement of reserve controls. Research and monitoring activities for MPAs are usually the preserve of NGOs, and in some cases of the BMR. The BMR has on occasion approached these tasks in partnership with regional agencies (Friedman *et al.,* 2010; SPC, 2008b). The challenge is great: monitoring methods need to be standardized, and feedback of the quantitative results needs to reach park managers and coastal communities. Extra capacity is also needed at the state level to manage and implement changes in response to the results of monitoring and assessments (active adaptive management). In Airai State, researchers have been working to monitor pre-spawning aggregations of rabbitfish, selected invertebrates and mangrove crab and clam (A.H. Kitalong, personal communication, 2008). The focus in Airai has been on community participation and collection of baseline information for the state (Kitalong, 2008).

At this time, only Koror State has a sustainable financing mechanism to support such work. The only way that other states will improve enforcement and management is to find a sustainable financing mechanism, so that management is not dependent on outside donors and grants. The PAN green fund might help address this issue.

4.5 Key incentives and disincentives for implementing MPAs and for collaborating with other institutions in MPA design and implementation

One key outcome often ignored when institutions focus on conservation of resources is the increase in community activity engendered through developing MPA initiatives. The sharing of experience and increased communication and empowerment that result

from developing and managing one's own marine area is felt not only by fishers but also by NGO and state participants. This may result in young community members learning from older fishers, or even researchers sharing monitoring protocols and designs among government and NGO agencies. Such collaborative efforts help reinforce what all agencies are trying to do, although realistic objectives need to be set. Communities and agencies that are overcommitted and have unrealistic time horizons can jeopardize the prospect of a successful outcome. It is important that goals are simple and the time frame sufficient to establish community trust.

5. SOCIO-ECONOMIC AND ECOLOGICAL CONSIDERATIONS AND IMPACTS

5.1 Impacts on fisheries

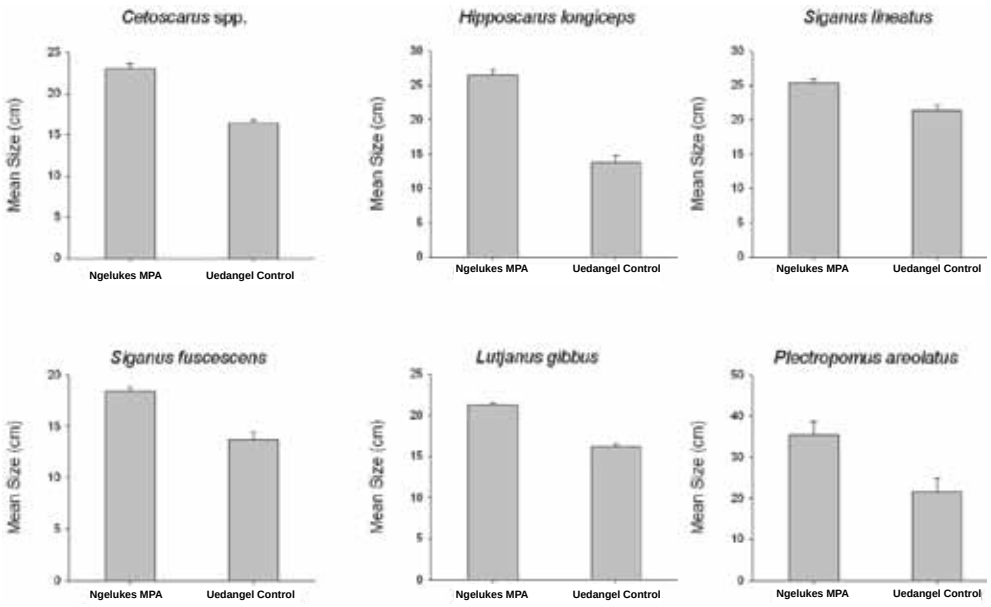
Fishing is a popular activity in Palau. In 2001, 16 percent of the population sold their catch to local fish markets at least once during the year (Government of Palau, 2004). A 2003 survey of subsistence fisheries indicated that 87 percent of households were involved in fishing for subsistence or commercial purposes (Palau International Coral Reef Center, unpublished data, 2003).

In the case of the important and fragile grouper stocks, where spawning aggregations are vulnerable to fishing in channels around the full moon during the May and June spawning periods (Johannes 1981; Johannes *et al.* 1999), the initial implementation of seasonal protection of specific channel areas had an important ongoing conservation effect. For example, at the Ngerumekaol Spawning Area, commercial grouper fishing was primarily prohibited from 1 June to 31 August (Palau National Code, Sections 3101–3103). Koror State then expanded the ban to include all fish and extended the period of protection to the full year (State Public Law No. K6-101-99). It later extended the boundaries of Ngerumekaol Spawning Area to protect pathways for groupers coming into the aggregation (State Public Law No. K6-118-2001). In Ngarchelong State, the Ebiil Conservation Area protected the Ebiil Channel (a spawning aggregation site for groupers) and adjacent reefs (migratory pathways for groupers) to ensure that these key food fish stocks were not targeted when they aggregated to spawn.

In 2002, a socio-economic study showed that 31 percent of fishers perceived that the inshore fisheries were being harvested unsustainably and that catches were at least three times smaller than a decade ago (A.H. Kitalong, personal communication, 2008). Due to this perception and the large amount of reef area that remains open to fishing, there is reportedly a higher level of compliance by fishers in reserves of Palau than is reported for reserves in other parts of the Pacific. However, it is difficult to characterize a single level of compliance across Palau. Koror State has the largest enforcement regime, yet distant states with less ability to monitor their reefs are less populated and thus under less pressure.

Stiff penalties for fishers found in closed areas help decrease the level of poaching from reserves. The Ebiil Conservation Area, predominantly a protection area for groupers, where fishers were fined US$10 000 for poaching, now supports elevated levels of invertebrate stocks such as giant clams (K. Friedman, personal communication, 2008). In the case of the Ngelukes MPA, which was closed in 2002, poaching exists, but is thought to be minimal owing to its proximity to the village. Boats stopping there can be seen by community members. When fish abundance from this area is compared to a control site where fishing pressure is quite high by standards in Palau, PICRC surveys indicate that fish are increasing in number and are more abundant (Nestor *et al.,* 2008; Merep *et al.,* 2008). Fish abundance (mean ±SE) at the Ngelukes Conservation Area was 57.2 ± 10.5, compared with 30.2 ± 4.3 at the control site (Nestor *et al.,* 2008). Not only were there more fish inside Ngelukes MPA, but they were significantly bigger than the fish outside (Figure 3).

FIGURE 3
Average fish size inside an MPA (Ngelukes) and at a control site (Uedangel)



Source: Palau International Coral Reef Center, unpublished data, 2003.

This result is mirrored at the Ngerumekaol Spawning and Ebiil Conservation Areas, where surveys reveal that the three grouper species (*Plectropomus areolatus*, *Epinephelus polyphekadion* and *Epinephelus fuscoguttatus*) accounted for 78 percent of the number and 85 percent of the biomass of all species surveyed, but comprised less than 1 percent of the total number and biomass at control sites (Merep *et al.*, 2008).

In most cases, it is difficult to estimate the spillover effects of MPAs on resource numbers outside the reserve. However, as these results show increased biomass for those fish species that have migrated to aggregations within the MPA to spawn, they are indicative of the status of resources both inside the MPA and on neighbouring reefs that are currently not protected from fishing.

5.2 Critical socio-economic or ecological considerations and socio-economic impacts of MPAs

Fishers are often knowledgeable about habitats and about the natural variations in abundance and size of resource species within them. Community involvement is needed in all phases of management. However, in cases in which fishers are offered compensation for their knowledge and for time devoted to formulating strategies or helping in surveys, the amount of time needed is usually underestimated. It has to be their MPA if long-term goals of conservation are to work, and careful consideration should be given to ensuring that the community is the main driver of the process.

Community involvement is also critical in the sense that enforcement by government agencies is often inadequate. Despite the penalties that can be imposed and the moderate level of pressure, ten of the 16 states of Palau already report problems in enforcing their marine laws, and a further seven report problems with poachers (Government of Palau, 1996). As an example, surveys of turtle nest disturbance at extremely visible reserves such as the Rock Islands Area have found a high degree of poaching. The same is true of the Ngerukewid Islands. This research also notes that although poaching was recorded, the proportion of nests disturbed was less than for nesting areas outside the reserves (Guilbeaux, Davis and Tonne, 1994, cited in Idechong and Graham, 1998).

5.3 The role of the natural and social sciences in design and monitoring

As Palau has a long history of establishing MPAs, it may be time to shift focus to strengthening the management of existing ones, rather than concentrating on designating new MPAs. Natural science can guide the establishment of MPAs and placement, but it is only in partnership with social science that MPAs will continue to have success. The PICRC MPA research programme focuses on both ecological and social studies to assist states and communities in identifying weaknesses in and constraints on current management, so that steps can be taken to improve MPA management (Mersai, 2007).

In Airai, work has focused on collecting baseline information with community groups and then asking participants to share this information with the villages (A.H. Kitalong, personal communication, 2008). Community members see for themselves the changes that no graphs or charts can effectively replace. Elders share information with young people and the community about declines in their favourite fishing areas, and in a village setting this style of awareness-raising is powerful.

6. COORDINATED APPROACHES TO MPAs FOR FISHERIES MANAGEMENT AND CONSERVATION

6.1 MPAs embedded in other fisheries management on a larger spatial scale

The signing of the PAN Act into law by the Palau National Congress offers scope for the dual objectives of protecting biodiversity and natural resource management. This is predominantly a state-based system, supported by national government (Verheij and Aitaro, 2007). It provides a framework for Palau's government agencies to collaborate in establishing a resilient nationwide network of terrestrial and marine protected areas. Recent assessments of the current distribution of MPAs indicate that they adequately serve biodiversity goals, despite being established with resource conservation in mind. When the current MPA layout was overlaid onto biodiversity priority maps, existing MPAs (of which 26 were established with a natural-resource management objective) were well distributed over biodiversity priority areas (Hinchley *et al.*, 2007; Verheij and Austin, 2008).

6.2 Examples of links to fisheries management

The Government of Palau (1996) states that reserves are seen as an alternative to catch and effort controls and are proving successful in protecting stocks of large fish. Ongoing monitoring to assess the efficacy of several MPAs by the PICRC and the PCS (with the TNC) is highlighting the protection and decline of some key resource species. In Ngelukes Conservation Area, for example, fish abundance and sizes are much higher than in adjacent control sites. In Ngerumekaol and Ebiil, the abundance of groupers is much higher than in non-protected channels, and in Ngeruangel, fish such as parrotfish and snappers are much bigger than in the control site. Regarding invertebrates, giant clams are also much more abundant in Ngeruangel Reserve than in the non-reserve Kayangel. The same result is registered in Ngarchelong, at the Ebiil channel.

Results on the increase of fish at Ngelukes, Ngerumekaol, Ebiil and Ngeruangel help reveal the depleted status of resources and habitats in fished areas across Palau. In addition to detecting these resource depletions, the PICRC is currently looking at a more holistic picture of conservation management by considering watershed issues and links between land and marine management authorities, in order to ensure that effective land-use regulations manage downstream effects on coastal systems. This has led to communities taking action to decrease the amount of sediment flowing to lagoons from watersheds and placing a moratorium on the cutting of mangroves (Richmond *et al.*, 2007). For example, Airai State stopped leasing mangrove areas and passed a state law "to protect, conserve, and manage the cutting and/or harvesting of the trees and vegetation below the high tide line, in mangroves, wetlands, and marine and coastal areas" (Public Law No. A-5-01-07).

Regional comparisons of the status of resources and habitats are also possible through DMR activity. In collaborative studies with the SPC, the BMR recently participated in a comparative assessment across 17 countries and territories in the Pacific (the four sites selected in Palau were Ngarchelong, Ngatpang, Koror and Airai). This presents quantitative data on the comparative high status of resources in Palau compared with other countries in the Pacific (Friedman *et al.*, in press).

6.3 Institutional overlap

There are a number of overlaps between institutions working on designing, implementing and managing fisheries spatial controls in Palau. In the field, community groups have had success in liaising with each other. For example, the institution of the Ngermeduu Conservation Area used a multiple-community approach, requiring that people from three states be involved in preparing the nomination. This MPA protects mangroves, mudflats, seagrass beds, fringing reefs, reef channels, inner reef flats and reef slope across state boundaries, including crab, fish and clam species that are economically important to a number of communities.

Equally complicated is the overlap of formal government agencies and NGOs managing MPAs. The Ngerukewid Islands Wildlife Preserve is a good example, as this MPA is protected under both the Palau National Code and Koror State zoning laws, with additional legal instruments working in parallel. The enabling legislation states that the preserve is to be retained "in its present primitive condition where the natural plant and animal life should be permitted to develop undisturbed". Problems in managing this MPA and reserves in neighbouring Rock Islands are complicated by the multilevel approach, including a state border dispute between Koror and neighbouring Peleliu State. In some cases specific memoranda of understanding (MOUs) are developed. For example, Koror State has an MOU with the national Division of Fish and Wildlife to protect nesting turtles, while Airai and Ngchesar are currently both managing a conservation area along their common border.

In practice, the overriding institutional overlap in Palau is between national and state agencies. As mentioned previously, the BMR, Palau Fishing Authority, national Division of Fish and Wildlife, the Ministry of Justice, and the relevant state governments all have responsibilities for implementing policies to conserve marine coastal resources and environments.

6.4 Challenges and opportunities

Palau still has much work to do to rationalize agency controls of its inshore environment – and to strengthen its basic fisheries management by registering commercial fishers that operate in coastal areas (Koror is the only state to have a boat registration act). In addition to an understanding of fishing activity, greater surveillance and enforcement is needed of legislation already in place.

Palau has a vulnerable economy, with aid currently comprising 20.6 percent of GDP (Hanich and Tsamenyi, 2009) and with the funding period for the Compact of Free Association Agreement with the United States of America having reached completion (1994–2009). With this change, there is likely to be a decline in work opportunities and income for the people of Palau. This, and the prospect of greater capacity of Asian markets for marine products, is likely to mean increased pressure on marine resources. Such a scenario will require greater efforts from management, and more vigilant enforcement of compliance, with greater protection of MPAs in particular. Developers are projecting increases of over 300 000 visitors from China, with proposed charter flights in the near future. To date this has not been realized, and the increase in visitors has been manageable.

7. FUTURE DIRECTIONS

7.1 Institutional collaboration for better design, implementation and stakeholder participation

Palau has some of the best baseline data of any Pacific Island country on the status of its reserves. It also has a highly regarded framework of spatial and other management controls to work with, which will help ensure good biodiversity outcomes for the future. Communities, NGOs and government authorities need to continue collaboration in identifying gaps in the current conservation approach and in implementing a more strategic CAR approach to biodiversity protection.

In 2005, the then-President of Palau, Thomas Remengesau Jr, committed his nation to preserving 30 percent of their nearshore marine resources and 20 percent of their terrestrial resources by 2020. This '2020 Micronesia Challenge' is supported by the new President of Palau, Honourable Johnson Toribiong, and a further four Micronesian governments (the Federated States of Micronesia, Republic of the Marshall Islands, Guam and Commonwealth of the Northern Mariana Islands). Spanning 6.7 million km^2, the Micronesia Challenge represents more than 5 percent of the Pacific Ocean and 61 percent of the world's coral species. It includes 66 threatened species, more than 1 300 species of reef fish, 85 species of birds and 1 400 species of plants, 200 of which are found only in Micronesia (Hinchley *et al.,* 2007). The key now is to ensure implementation of these goals and to upgrade management of the MPAs already legislated.

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REFERENCES

Asian Development Bank. 2005. *Country economic report: the Republic of Palau*, by K. Taniguchi. Manila.

Bureau of Natural Resources and Development. 1989. *Palau country review 10.* Fourth South Pacific Conference on Nature Conservation and Protected Areas, Port Vila, Vanuatu, 4–12 September. Nouméa, New Caledonia, South Pacific Commission. 12 pp.

Carpenter, K.E. & Springer, G.S. 2005. The center of the center of marine shore fish biodiversity: the Philippine Islands. *Environmental Biology of Fishes,* 72: 467–480.

Davis, P.Z.R. & Kearns, C.M. 2003. *Baseline surveys and threat assessment of dive sites in Koror State.* Koror, Palau, Koror State Government, Department of Conservation and Law Enforcement.

FAO. 2008. Fishery and Aquaculture Country Profiles. Palau. *In: FAO Fisheries and Aquaculture Department [online].* Rome. www.fao.org/fishery/countrysector/FI-CP PW/S/en

Fitzpatrick, S.M. & Donaldson, T.J. 2007. Anthropogenic impacts to coral reefs in Palau, Western Micronesia, during the Late Holocene. *Coral Reefs,* 26(4): 915–930.

Friedman, K., Eriksson, H., Tardy, E. & Pakoa, K. 2010. Management of sea cucumber stocks: patterns of vulnerability and recovery of sea cucumber stocks impacted by fishing. *Fish and Fisheries*, no. doi: 10.1111/j.1467-2979.2010.00384.x.

Friedman, K., Kronen, M., Pinca, S., Lasi, F., Awira, R., Pakoa, K., Boblin, P., Magron, F., Tardy, E. & Chapman, L. In press. *Palau country report: profiles and results from survey work at Airai, Koror, Ngarchelong and Ngatpang.* Pacific Regional Oceanic and Coastal Fisheries Development Programme. Nouméa, New Caledonia, Secretariat of the Pacific Community, Reef Fisheries Observatory.

Gillett, R.D. & Lightfoot, C. 2001. *The contribution of fisheries to the economies of Pacific Island countries.* Manila, Asian Development Bank / World Bank / Forum Fisheries Agency / Secretariat of the Pacific Community.

Golbuu, Y., Victor, S., Wolanski, E. & Richmond, R.H. 2003. Trapping of fine sediments in a semi-enclosed lagoon, Palau, Micronesia. *Estuarine, Coastal and Shelf Science,* 57: 941–949.

Government of Palau. 1996. *National Master Development Plan: issues, options and strategies for Palau's development.* Final Report, The Foundation for Development. Prepared for the Government of Palau by SAGRIC International Pty Ltd. Adelaide, SA, Australia, SAGRIC. 631 pp.

Government of Palau. 2004. *Marine resources database.* Koror, Palau, Bureau of Marine Resources.

Graham, T. 1996. Managing Palau's aquarium life fishery. *SPC Live Reef Fish Information Bulletin*, 1 (March): 13–18.

Graham, T. 2001. *The live reef fisheries of Palau: history and prospects for management.* Asia-Pacific Coastal Marine Program Report No. 103. Honolulu, Hawaii, USA, The Nature Conservancy.

Guilbeaux, M.D., Davis, S. & Tonne, P. 1994. *Survey of hawksbill nesting activity on selected Rock Island beaches.* Report prepared for the Division of Marine Resources, Government of Palau, by the Georgia Sea Turtle Cooperative, University of Georgia. *Cited in:* Idechong and Graham, 1998.

Hanich, Q. & Tsamenyi, M. 2009. Managing fisheries and corruption in the Pacific Islands region. *Marine Policy,* 33: 386–392.

Hinchley, D., Lipsett-Moore, G., Sheppard, S., Sengebau, F.U., Verheij, E. & Austin, S. 2007. *Biodiversity planning for Palau's protected areas network: an ecoregional assessment.* TNC Pacific Island Countries Report No. 1/07. Honolulu, Hawaii, USA, The Nature Conservancy.

Idechong, N. & Graham, T. 1998. The Ngerukewid Islands of Palau: 40 years of managing a marine protected area. *Parks* (IUCN), 8(2): 17–22.

IUCN. 1992. *Protected areas of the world: a review of national systems.* Compiled by the World Conservation Monitoring Centre, in collaboration with the IUCN Commission on National Parks and Protected Areas, for the IVth World Congress on National Parks and Protected Areas, Caracas, Venezuela, 10–21 February 1992. 384 pp.

IUCN. 1994. *Guidelines for protected area management categories.* IUCN Commission on National Parks and Protected Areas, with the assistance of the World Conservation Monitoring Centre. Gland, Switzerland and Cambridge, UK, International Union for Conservation of Nature. x+261 pp.

Johannes, R.E. 1981. *Words of the lagoon: fishing and marine lore in the Palau district of Micronesia.* Berkeley, University of California Press. 245 pp.

Johannes, R.E., Squire, L., Graham, T., Sadovy, Y. & Renguul, H. 1999. *Spawning aggregations of groupers (Serranidae) in Palau.* TMC Marine Research Series Publication No. 1. Honolulu, Hawaii, USA, The Nature Conservancy. 144 pp.

Kelly-Borges, M. & Valentine, C. 1995. The sponges of the tropical island region of Oceania: a taxonomic status review. *In:* J.E. Maragos, M.N.A. Peterson, L.G. Eldredge, J.E. Bardack & H.F. Takeuchi, eds. *Marine and coastal biodiversity in the tropical island Pacific region.* Vol. 1. *Species systematics and information management priorities*, pp. 83–120. Honolulu, Hawaii, USA, East-West Center.

Kelty, R., Kuartei, J., Abraham, T., Beger, M., Burdick, D., Cochrane, E., Craig, P., Didonato, G., Fenner, D., Green, A., Golbuu, Y., Guiterrez, J., Hasurmai, M., Hawkins, C., Houk, P., Idip, D., Jacobson, D., Joseph, E., Keju, T., Palik, S., Penland, L., Pinca, S., Rikim, K., Starmer, J., Trianni, M., Victor, S. & Whaylen, L. 2004. Status of the coral reefs in Micronesia and American Samoa. *In:* C. Wilkinson, ed. *Status of coral reefs of the world: 2004*. Vol. 2, pp. 381–409. Townsville, QLD, Australia, Australian Institute of Marine Science.

Kitalong, A.H. 2008. *Invertebrates, communities, and reef health in Airai, the Republic of Palau.* Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, USA, 7–11 July 2008. Vol. 2, pp. 864–869 (Session no. 18).

Kitalong, A.H. & Oiterong, E. 1992. Quantification of spawning aggregations of three grouper species, *Plectropomus areolatus* (*tiau*), *Epinephelus fuscoguttatus* (*temekai*) and *Epinephelus microdon* (*ksau*), at Ngerumekaol and Denges Passes, 1991–1992. Technical Report 92.4. Koror, Palau, Marine Resources Division, Government of Palau.

Maragos, J.E., Birkeland, C., Cook, C., Des Rochers, K., Di Rosa, R., Donaldson, T.J., Geermans, S.H., Guilbeaux, M., Hirsh, H., Honigman, L., Idechong, N., Lobel, P.S., Matthews, E., McDermid, K.J., Meier, K.Z., Myers, R., Otobed, D., Richmond, R.H., Smith, B. & Smith, R. 1994. *Marine and coastal areas survey of the main Palau Islands.* Part 2. *Rapid ecological assessment synthesis report.* Honolulu, Hawaii, USA, Coastal, Ocean, Reef and Island Advisors Ltd (CORIAL) and The Nature Conservancy.

Maragos, J.E. & Cook, C.W. 1995. The 1991–1992 rapid ecological assessment of Palau's coral reefs. *Coral Reefs,* 14: 237–252.

Matthews, E. 2003. Nearshore invertebrates decline as coastal development increases around Palau. *SPC Women in Fisheries Information Bulletin*, 13: 2–4.

Merep, G., Merep, A., Friedlander, A. & Golbuu, Y. 2008. *Species composition and abundance at two protected spawning aggregation sites in Palau with different length of closure.* Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, USA, 7–11 July 2008.

Mersai, C. 2007. Community perceptions of legislated marine protected areas in Palau: Ngelukes Conservation Area case study. *In:* H. Kayanne, M. Omori, K. Fabricius, E. Verheij, P. Colin, Y. Golbuu & H. Yukihira, eds. *Coral reefs of Palau*, pp. 141–149. Koror, Palau, Palau International Coral Reef Center. 238 pp.

Meyer, D.L. & Macurda Jr., D.B. 1980. Ecology and distribution of shallow-water crinoids of Palau and Guam. *Micronesica*, 16(1): 59–99.

Myers, R.F. 1999. *Micronesian reef fishes*, 3rd ed. Barrigada, Guam, Coral Graphics.

Nestor, V., Mersai, C., Merep G. & Golbuu, Y. 2008. *Effectiveness of a small MPA in conserving fish resources.* Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, USA, 7–11 July 2008.

Nichols, P.V. 1991. *Republic of Palau marine resources profiles.* Honiara, Solomon Islands, Forum Fisheries Agency.

Richmond, R.H., Rongo, T., Golbuu, Y., Victor, S., Idechong, N., Davis, G., Kostka, W., Neth, L., Hamnett, M. & Wolanski, E. 2007. Watersheds and coral reefs: conservation science, policy and implementation. *BioScience,* 57: 598–607.

Ridep-Morris, A. 2004. Traditional management of marine resources in Palau. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin,* 17: 16–17.

Sisior, K. 2007. Annual Report – Part 1, Information on fisheries, research and statistics: Republic of Palau. In: *Report of the Third Regular Session of the Scientific Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean*, 13–24 August 2007, Honolulu, Hawaii, USA. Pohnpei, Federated States of Micronesia, Western and Central Pacific Fisheries Commission.

SPC. 2008a. *2008 demographics and population indicators.* Nouméa, New Caledonia, Secretariat of the Pacific Community, Statistics & Demographic Programme (also available at www.spc.int/sdp/index.php?option=com_content&task=view&id=52&lang=EN). (accessed 22 December 2008)

SPC. 2008b. *PROCFish/C project.* Nouméa, New Caledonia, Secretariat of the Pacific Community (available at www.spc.int/coastfish/en/projects/procfish.html).

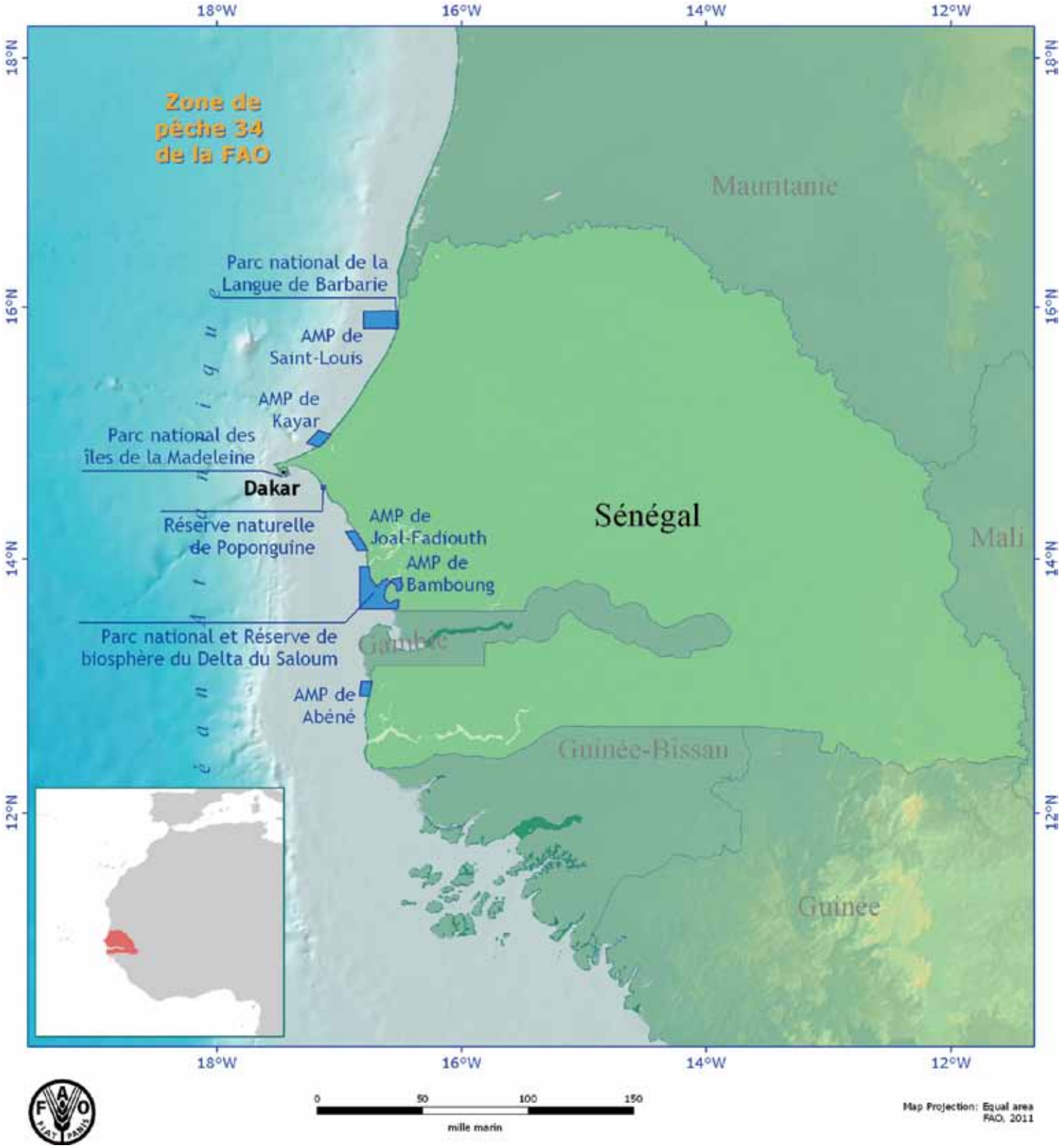
Turgeon, D.D., Asch, R.G., Causey, B.D., Dodge, R.E., Jaap, W., Banks, K., Delaney, J., Keller, B.D., Speiler, R., Matos, C.A., Garcia, J.R., Diaz, E., Catanzaro, D., Rogers, C.S., Hillis-Starr, Z., Nemeth, R., Taylor, M., Schmahl, G.P., Miller, M.W., Gulko, D.A., Maragos, J.E., Friedlander, A.M., Hunter, C.L., Brainard, R.S., Craig, P., Richmond, R.H., Davis, G., Starmer, J., Trianni, M., Houk, P., Birkeland, C.E., Edward, A., Golbuu, Y., Gutierrez, J., Idechong, N., Paulay, G., Tafileichig, A. & Vander Velde, N. 2002. *State of coral reef ecosystems of the United States and Pacific Freely Associated States: 2002.* Silver Spring, MD, USA, National Oceanic and Atmospheric Administration, National Ocean Service, National Centers for Coastal Ocean Science. 265 pp.

Verheij, E. & Aitaro, J. 2007. Marine protected areas within the context of a nationwide protected areas network in Palau. *In:* H. Kayanne, M. Omori, K. Fabricius, E. Verheij, P. Colin, Y. Golbuu & H. Yukihira, eds. *Coral reefs of Palau*, pp. 136–140. Koror, Palau, Palau International Coral Reef Center. 238pp.

Verheij, E. & Austin, S. 2008. *Designing a resilient network of protected areas in the Republic of Palau, Micronesia.* Symposium abstract. Proceedings of the 11th International Coral Reef Symposium, Ft. Lauderdale, Florida, USA, 7–11 July 2008.

Victor, S., Golbuu, Y., Wolanski, E. & Richmond, R.H. 2004. Fine sediment trapping in two mangrove-fringed estuaries exposed to contrasting land-use intensity, Palau, Micronesia. *Wetlands Ecology and Management,* 12(4): 277–283.

Carte 1
Carte du Sénégal et des zones de pêche de la FAO



Sénégal

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Note: The English translation appears on page 97 of this document.

1. INTRODUCTION

Le Sénégal est un pays de forte tradition halieutique, caractérisé notamment par un secteur de la pêche artisanale important et toujours animé de dynamiques de développement malgré le phénomène de raréfaction de la ressource observé depuis de nombreuses années. Les stratégies mises en œuvre par les acteurs de la pêche artisanale ont inclus un allongement de la durée des marées, des prises de risques toujours plus grandes pour élargir les rayons de pêche, l'utilisation d'engins de moins en moins sélectifs et des migrations pour certains d'entre eux vers les pays voisins (Guinée-Bissau et Mauritanie en particulier). Mais ces stratégies ont montré leurs limites compte tenu des limitations naturelles des ressources halieutiques dans les eaux sénégalaises et du renforcement des systèmes de gestion dans la sous-région qui rend de plus en plus difficile l'exportation des surcapacités de la pêche artisanale sénégalaise vers les pays voisins. La situation alarmante de nombreux stocks côtiers, la dégradation avancée de certains écosystèmes côtiers et l'émergence d'une situation de crise halieutique profonde a conduit, depuis le début des années 2000, les pouvoirs publics et la société civile, notamment des ONG nationales et internationales de conservation, à agir pour préserver l'intégrité des écosystèmes marins et côtiers.

Au début, l'administration de la pêche a privilégié les actions visant à réguler l'accès aux ressources, à maîtriser les capacités de pêche et à renforcer les mesures techniques de l'aménagement des pêches, en privilégiant par ailleurs une approche centralisée. L'administration en charge de l'environnement, avec l'appui d'ONG de conservation, a quant à elle privilégié, conformément à son mandat, les actions visant à classer des milieux sensibles sur le littoral en vue de restaurer la biodiversité. Devant le constat des politiques dites classiques et trop centralisées de l'aménagement des pêches, et dans le sillage des recommandations du Sommet mondial de Johannesburg sur le développement durable, l'administration des pêches, avec l'appui de partenaires au développement, s'est également engagée dès la fin 2004 dans des actions visant à soutenir la création et le développement d'un réseau d'aires marines protégées (AMP), mais à des fins d'aménagement des pêches.

Progressivement, la question des AMP s'est ainsi invitée dans tous les débats ayant trait à la gestion durable des milieux marins et côtiers et de la pêche au Sénégal, souvent sous l'impulsion des partenaires au développement. La création et le développement des AMP, supposées apporter de nombreuses réponses aux problèmes de l'aménagement des pêches, notamment en zone côtière, sont ainsi devenus un enjeu de premier plan aussi bien pour l'administration des pêches que pour l'administration en charge de l'environnement.

Dans la pratique, le Sénégal en est encore toutefois aux premiers stades de développement des AMP, ce qui ne permet pas de tirer beaucoup d'enseignements sur les modes de gestion des AMP et leur impact sur l'aménagement. De plus, le manque de clarté concernant la vocation des AMP et les imprécisions du cadre juridique et institutionnel relatif à leur gestion se traduisent par de nombreux conflits de compétence

et donnent lieu à l'émergence de stratégies dont les acteurs agissent souvent en ordre dispersé et privilégient telle ou telle approche en fonction du bailleur de fonds. Les systèmes de suivi des AMP sont par ailleurs très succincts, tandis que l'on assiste à une certaine dispersion des compétences et de l'information relative au processus des AMP. Dans un tel contexte, et aussi en raison du manque de recul nécessaire à l'évaluation des approches, il paraît difficile de tirer des leçons et des enseignements sur la gouvernance dans les AMP et sur leur rôle en tant qu'outil de l'aménagement des pêches.

Le Sénégal se révèle être en revanche un cas d'étude intéressant pour d'autres aspects liés directement ou indirectement à la problématique des AMP. L'étude de cas apporte en particulier de nombreux enseignements sur le processus de création de nouvelles AMP à des fins de conservation de la biodiversité et de régulation de l'accès aux ressources pour la pêche artisanale, en mettant en avant la nécessité d'impliquer étroitement les communautés. Elle montre également de quelle manière la problématique AMP peut stimuler le processus de changement de la gouvernance dans les pêches, en plaçant au centre de la politique sectorielle deux aspects: d'une part, l'individualisation d'unités de gestion de petite taille le long du littoral, pour lesquelles la question de la cohérence territoriale et de la cohésion sociale a autant de poids que les considérations bioécologiques, et, d'autre part, le partage et le transfert de responsabilités en matière de gestion des pêches dans ces espaces entre l'administration et des groupes d'usagers (c'est-à-dire que la cogestion tend à devenir le mode de gouvernance privilégié dans le cas de la pêche artisanale).

Le terme d'AMP peut paraître galvaudé dans certain cas dans le contexte du Sénégal. Mais il participe dans tous les cas aux efforts menés afin de mieux réguler l'accès aux ressources en zone côtière pour le bénéfice de la pêche et également des écosystèmes. À quel prix? Et pour quel impact si on considère que les hypothèses scientifiques concernant le rôle des AMP dans la restauration des stocks surexploités n'ont pas encore été validées, et que l'une des conséquences pourrait être d'augmenter la pression de pêche et les conflits dans les zones côtières ne faisant pas l'objet d'une AMP? Il est encore top tôt pour le dire. La réponse pourrait aussi dépendre de la capacité des autorités à réformer le système de gestion des pêches dans sa globalité, car l'AMP ne constitue aujourd'hui qu'un outil technique destiné à faciliter la mise en œuvre de politiques plus globales comme le traitement des surcapacités dans la pêche artisanale et la promotion de plans d'aménagement par pêcheries reposant sur des considérations écosystémiques.

2. AMÉNAGEMENT DES PÊCHES

2.1 Situation actuelle

Le Sénégal dispose d'une zone économique exclusive (ZEE) d'environ 200 000 km², pour une façade maritime longue de près de 700 km. Le littoral sénégalais se caractérise par une grande diversité de milieux, avec notamment à partir du sud de Dakar (Petite Côte, Saloum et Casamance) des conditions particulièrement riches en biodiversité au niveau des zones estuariennes.

Trois grandes catégories de ressources peuvent être distinguées: les stocks pélagiques côtiers (sardinelles et chinchards), les stocks démersaux côtiers (poissons démersaux, céphalopodes et crevettes côtières) et les stocks démersaux profonds (merlus et crevettes profondes). La production halieutique totale oscille autour de 380 000 tonnes/an, dont 300 000 tonnes/an sont capturées par la pêche artisanale et 80 000 tonnes/an par la pêche industrielle.

À l'exception des stocks pélagiques côtiers, des stocks démersaux profonds, et de quelques stocks démersaux côtiers considérés comme modérément à pleinement exploités, les stocks démersaux côtiers sont dans la plupart des cas surexploités. Les recommandations scientifiques du CRODT (Centre de recherches océanographiques de Dakar Thiaroye) concernant les stocks démersaux côtiers convergent au mieux vers un gel de l'effort de pêche et pour la plupart des poissons démersaux (sparidés et scianidés notamment) vers une réduction de l'effort de pêche. Par ailleurs, d'autres indicateurs

attestent d'une situation inquiétante concernant l'état des stocks côtiers: diminution de la taille moyenne des poissons capturés, réduction des rendements de capture, diminution de la biomasse. La situation alarmante des stocks démersaux côtiers résulte de la combinaison de l'inefficacité du système d'aménagement des pêcheries (absence de contrôle des capacités et de l'accès aux ressources pour la pêche artisanale, faible application de la réglementation, etc.) et de la culture de pêche jugée peu responsable de la part de nombreux acteurs et notamment les pêcheurs artisans migrants.

La flotte industrielle cible les espèces démersales ou pélagiques par chalutage, senne, canne ou palangre. En 2003, il a été estimé que la flotte nationale chalutière active était composée de 122 navires: 77 congélateurs (dont 36 crevettiers) et 45 glaciers (dont 1 crevettier) – documents de travail du projet FAO/TCP/SEN/2909). Selon cette source, une centaine de chalutiers de nationalité étrangère ont opéré dans la ZEE sénégalaise en 2002. Il faut toutefois noter que le protocole de l'accord de pêche 2002-2006 entre le Sénégal et l'Union européenne a expiré le 30 juin 2006 et n'a pas été reconduit.

La flotte industrielle nationale se caractérise par une grande mobilité (avec parfois des déplacements temporaires vers les pays voisins) et par une certaine vétusté des outils de production avec un âge moyen supérieur à 25 ans. Un groupe de 6 espèces (crevette blanche, crevette profonde, poulpe, sole, seiche et rouget) représente environ 40 pour cent du volume des débarquements et 75 pour cent de la valeur de ces derniers.

La pêche artisanale a connu une croissance exponentielle entre les années 50 et la fin des années 90. Depuis 1999, les captures de la pêche artisanale en ressources démersales sont supérieures à celles de la pêche industrielle nationale. Par ailleurs, au cours des vingt dernières années, l'effort de la pêche artisanale (mesuré en nombre de sorties) affiche une hausse continue alors que celui de la pêche industrielle (mesuré en nombre de jours de mer) est relativement stable. Trois zones de fortes concentrations de la pêche artisanale sont observées: en face de Saint-Louis, en face de Dakar et au large d'une zone allant de Mbour au Saloum (Petite Côte).

Le parc actuel est composé d'environ 12 000 pirogues de pêche artisanale[1]. La longueur des pirogues est relativement homogène selon la zone maritime et varie entre 9 et 10 m. Les pirogues de sennes tournantes ont cependant des longueurs comprises entre 14 et 19 m. Le taux de motorisation avoisine les 75 pour cent. Plus de 98 pour cent du parc piroguier sénégalais est détenu par des propriétaires de nationalité sénégalaise et 90 pour cent des capitaines de pêche opèrent dans les eaux sénégalaises. Les engins de pêche utilisés sont très différents et comprennent les sennes de plage, les filets maillants, les sennes tournantes, les lignes à main, les nasses, les casiers, les pots, etc. Selon le ministère en charge de la pêche (MinPêche) – le Ministère de l'économie maritime, des transports maritimes, de la pêche et de la pisciculture – on constate depuis 2000 une relative stagnation du niveau de captures totales de la pêche artisanale, malgré l'augmentation des débarquements de petits pélagiques, ainsi qu'une diminution constante des rendements par unité d'effort.

Sur le plan économique et social, le secteur de la pêche maritime joue un rôle très important au Sénégal. Les chiffres clés du secteur pour l'année 2006 ont été les suivants: 1,4 pour cent du PIB national; 123,5 milliards de francs CFA (environ 188 millions d'euros) de chiffre d'affaires à la production pour un volume de captures de 373 000 tonnes; 154,2 milliards de francs CFA (environ 235 millions d'euros) de chiffre d'affaires à l'exportation; et 600 000 emplois directs et indirects. Le secteur de la pêche joue par conséquent un rôle clé dans l'économie nationale, pour l'équilibre de la balance commerciale (37 pour cent des exportations en valeur sur la période 1997-2002), la sécurité alimentaire et la fourniture d'emplois et de moyens d'existence pour une grande partie de la population littorale.

[1] Cf. Rapport du dernier recensement national de la pêche artisanale maritime sénégalaise réalisé par le CRODT et l'ISRA (Institut sénégalais de recherches agricoles) en 2006.

Le secteur de la pêche traverse aujourd'hui une crise majeure, notamment liée à la dégradation des ressources halieutiques, dont les conséquences pourraient être très graves. Le Conseil présidentiel sur la pêche, tenu en mars 2008, estime que la crise pourrait menacer la survie des communautés de pêche, compromettre l'approvisionnement en poisson des populations et de l'industrie halieutique, et, de manière plus générale, affecter la contribution du secteur à la croissance économique, à la lutte contre la pauvreté et à la sauvegarde des emplois.

En janvier 2004, des assises associant l'ensemble des acteurs de la pêche (administration, organisations professionnelles, ONG et bailleurs de fonds du secteur) ont été organisées. Ces assises ont marqué un tournant important de la politique des pêches en consacrant la priorité à l'aménagement des ressources. Il a par exemple été demandé que les choix prioritaires de programmation des actions de l'État et des bailleurs de fonds soient désormais orientés vers les deux axes stratégiques suivants: (i) traitement prioritaire des questions relatives à la réduction des surcapacités, au contrôle de l'accès aux ressources, à la maîtrise de l'effort de pêche et au renforcement du degré de responsabilisation des pêcheurs; et (ii) développement d'une politique publique visant à «placer le pêcheur au cœur de la réforme».

Une «Lettre de politique sectorielle des pêches et de l'aquaculture» (LPS-PA) a été préparée en 2007 par le MinPêche. L'un des axes stratégiques de ce document de politique vise «la gestion durable et la restauration des ressources halieutiques et de leurs habitats». Cet axe stratégique se décline autour des sous-axes suivants:

- maîtrise et gestion des capacités de pêche maritime (ajustement des capacités de pêche maritime, immatriculation des pirogues, consolidation du registre national des navires de pêche, élaboration d'un plan national de gestion de la capacité de pêche);
- contrôle de l'accès aux ressources halieutiques (permis de pêche artisanale, mise en place d'un système de concessions de droits d'accès aux ressources halieutiques);
- instauration de plans d'aménagement des pêcheries;
- promotion d'une politique de conservation de l'habitat marin et de la ressource dans le cadre d'une gestion intégrée des zones côtières (immersion de récifs artificiels, création d'un réseau d'aires marines protégées);
- renforcement et adaptation de la recherche halieutique;
- optimisation des moyens de suivi, de contrôle et de surveillance des pêches.

2.2 Cadre et instruments de l'aménagement

Le cadre général en vigueur pour l'aménagement des pêches repose sur la loi n° 98-32 du 14 avril 1998 instituant le Code de la pêche maritime et son décret d'application (décret n° 98/498 du 10 juin 1998). Conformément à la loi, «les ressources halieutiques des eaux sous juridiction sénégalaise constituent un patrimoine national». Le droit de pêche appartient à l'État qui peut en autoriser l'exercice grâce à l'octroi d'une licence pour la pêche industrielle, et, depuis 2005, d'un permis pour la pêche artisanale.

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 du Conseil national consultatif des Pêches maritimes et des Conseils locaux de pêche artisanale (CLPA) qui peuvent être institués par arrêté.

Le système d'aménagement en vigueur est un système de gestion basé sur la recherche d'un effort de pêche compatible avec les capacités de renouvellement des ressources en fonction des résultats et recommandations de la recherche. Dans le cas de la pêche industrielle, ce système est appliqué partiellement à travers la limitation du nombre de licences. Ainsi, une mesure portant sur le gel des licences de pêche démersale côtière a été prise récemment pour tenir compte des recommandations de la recherche. Pour la pêche artisanale, aucune mesure particulière visant à réguler l'effort de pêche n'est en revanche en application. Depuis 2005, l'accès aux ressources pour la pêche artisanale n'est toutefois, en théorie, plus gratuit, suite à l'instauration d'un système de permis de pêche.

Jusqu'à présent, les modes de gestion mis en œuvre au Sénégal ont été plutôt de type centralisé. Depuis quelques années, la cogestion tend à être de plus en plus encouragée par l'administration des pêches, avec l'appui de différents partenaires (par exemple avec la Coopération française pour le développement de systèmes de concession de droits d'accès, avec la Banque Mondiale dans le cadre du projet GIRMAC[2], avec le Japon pour la mise en place de mesures pilotes à Nianing: récifs artificiels, repos biologique). L'approche préconisée est de promouvoir des initiatives communautaires et d'accompagner leur réalisation à travers des expertises spécifiques, des activités de recherche, de l'appui-conseil, etc.

La LPS-PA introduit le concept de cogestion et préconise une approche visant à définir des unités de gestion reposant sur des considérations territoriales et à promouvoir des relations contractuelles entre l'administration et les communautés pour la gestion de ces espaces via des contrats de concession. Cette notion de territorialisation et d'introduction de règles différenciées en fonction de l'unité de gestion, élaborées et mises en œuvre en étroite collaboration avec les communautés, est assez proche de la notion d'AMP dans le contexte sénégalais comme nous le verrons par la suite.

Pour l'administration, la communauté de base est le Conseil local de pêche (CLP). Le CLP est une entité reconnue juridiquement en tant qu'association de pêcheurs. Dans le cas où une unité de gestion concernerait plusieurs CLP, l'administration prévoit de fédérer les CLP au sein des CLPA (des organismes paritaires comprenant des représentants de l'administration, des pêcheurs, des élus locaux et de notables) en vue d'élaborer un plan de gestion local. Les plans de gestion locaux ont également pour vocation d'appuyer la mise en œuvre des plans d'aménagement par pêcheries qui sont en cours d'élaboration.

Il faut souligner que la question du choix et de la légitimité de la communauté de base devant servir d'interlocuteur à l'administration fait encore aujourd'hui débat. L'administration, avec l'appui de projets (par exemple le projet de gouvernance locale financé sur des fonds Stabex, projet GIRMAC), promeut le niveau CLP qui met en avant la notion de métier et peut inclure les pêcheurs allochtones[3] dans les mécanismes de cogestion. Les organisations syndicales regroupées au sein du CONIPAS, structure faîtière assez influente au Sénégal, encouragent plutôt le niveau CLPA qui reflète davantage l'esprit du Code de la pêche maritime et de la décentralisation.

Le montage institutionnel prévu pour appuyer la cogestion devrait être précisé dans le cadre du processus de révision en cours du Code de la pêche maritime.

Depuis quelques années, une innovation dans le système d'aménagement des pêches au Sénégal tend par ailleurs à se développer avec l'élaboration de plans d'aménagement des pêcheries prévus par la loi[4]. Les plans d'aménagement en cours de préparation portent sur les pêcheries suivantes: crevette côtière et cymbium (avec le soutien de la Banque Mondiale dans le cadre du projet GIRMAC), poulpe (sur fonds du Stabex) et crevettes profondes et merlus (avec le soutien de la coopération française).

Pour ce qui est des mesures techniques de l'aménagement, plusieurs types de mesures destinées à réduire l'impact de la pêche sur les espèces exploitées et les milieux sont prévus par le décret d'application du Code de la pêche maritime. Ces mesures portent notamment sur:

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[2] Composante «Pêche» du Projet de gestion intégrée des ressources marines et côtières (GIRMAC).

[3] À titre d'exemple, dans certaines zones du Saloum ou de la Casamance, la quasi-totalité des pêcheurs sont des pêcheurs résidents sur place mais d'origine étrangère. Dans d'autres zones de pêche comme celles situées sur la Petite Côte (par exemple à Mbour ou à Joal), le rapport entre les pêcheurs autochtones et allochtones est plus ou moins équilibré.

[4] Selon le Code de la pêche maritime, le terme pêcherie désigne un ou plusieurs ensembles de stocks d'espèces et les opérations fondées sur ces stocks qui, classés sur la base de caractéristiques géographiques, économiques, sociales, scientifiques, techniques ou récréatives, peuvent être considérés comme une unité aux fins de conservation, de gestion et d'aménagement.

– les engins de pêche (par exemple l'interdiction du monofilament) et le maillage des filets;
– les tailles et poids minima des espèces, pour tenir compte de la taille à la première maturité des espèces;
– le zonage dont l'objectif est de protéger les espaces sensibles contre la pratique du chalutage par la pêche industrielle (interdit dans une zone allant de 6 à 7 milles ou de 12 à 15 milles de la côte selon la catégorie de bateau). Cette zone côtière, protégée du chalutage de fond, n'est en revanche pas réservée exclusivement à la pêche artisanale car les sardiniers utilisant le chalutage pélagique peuvent par exemple opérer jusqu'à 3 milles de la côte;
– le repos biologique.

Les textes sur la pêche ne prévoient pas explicitement de mesures visant la préservation des habitats sensibles comme les AMP. Mais la promotion des AMP en tant qu'outil de l'aménagement tend à être de plus en plus encouragée par l'administration des pêches comme nous le verrons plus loin.

La mission de surveillance relève de la compétence de la Direction de la protection et de la surveillance des pêches (DPSP). Pour la pêche industrielle, le dispositif de surveillance a été renforcé au cours des dernières années avec la mise en place du système VMS. La DPSP manque toutefois encore de moyens navigants (six vedettes de surveillance au total). Si elle en avait davantage, elle pourrait intervenir plus rapidement et avoir un effet plus dissuasif sur la pêche illicite, et notamment pour le respect du zonage par les chalutiers. Pour la pêche artisanale, les moyens mis en œuvre pour la surveillance sont très insuffisants pour tout un ensemble de raisons (logistiques, économiques, juridiques et aussi sociopolitiques). On notera que sur certains sites, au niveau des stations de surveillance côtière (dix au total réparties le long de la côte), des «brigades de cogestion de la surveillance» ont été mises en place (par exemple à Kayar), ce qui semble avoir permis de réduire de manière appréciable les infractions. Mais les missions de la DPSP concernant la zone littorale, et la pêche artisanale en général, sont principalement centrées sur la sécurité en mer. De ce fait, la réglementation concernant les engins de pêche (par exemple l'interdiction du monofilament), et dans une moindre mesure la taille minimale des captures, est faiblement appliquée.

Les principales problématiques de l'aménagement des pêches, telles qu'énoncées dans la LSP-PA, sont les suivantes:

- surexploitation et dégradation des principaux stocks démersaux avec risque d'effondrement pour certains et pleine exploitation pour d'autres;
- régime d'accès insuffisamment contrôlé de la pêche artisanale, avec pour conséquence une expansion non maîtrisée du parc piroguier;
- accroissement des conflits entre les différents types de pêche dans un contexte de raréfaction de la ressource halieutique;
- dégradation continue des habitats marins et des zones côtières en raison de la pollution et de l'érosion des côtes;
- faiblesse du système de gestion des pêches, avec notamment l'absence de plans d'aménagement des pêcheries;
- faibles capacités de la recherche;
- faible efficacité du dispositif de surveillance des pêches.

2.3 Description des régimes d'accès

Les règles régissant l'accès aux pêcheries sont précisées dans le décret d'application du Code la pêche maritime de 1998, complété par une disposition en 2005 relative à l'instauration d'un permis pour la pêche artisanale. Le système de licences fonctionne dans le cas de la pêche industrielle. Il est basé sur l'engin de pêche principal et les grandes catégories de ressources ciblées (démersaux côtiers, démersaux profonds, pélagiques côtiers, pélagiques profonds). Dans le cas de la pêche artisanale, la mise en

place effective du système de permis rencontre en revanche beaucoup de difficultés en raison de l'impopularité de la mesure et de blocages d'ordre sociopolitique. Ainsi, l'accès aux ressources demeure de fait libre et gratuit pour la pêche artisanale.

Dans le même temps, les autorités sénégalaises accordent une attention particulière au traitement de la surcapacité de pêche, aussi bien artisanale et qu'industrielle. Un Programme national d'immatriculation des pirogues (12 000 pirogues au total) est par exemple en cours d'exécution depuis quelques années. Un programme national d'ajustement des capacités de pêche maritime (PACM) est par ailleurs en cours de mise en œuvre. Le PACM a été initié avec l'appui technique de la FAO en 2003[5]. Il est mis en œuvre depuis 2005-2006 avec l'appui financier de la Banque africaine de développement (BAD).

Des initiatives ont également été menées depuis le début des années 2000 en matière de développement de systèmes de concession de droits d'accès aux ressources halieutiques, avec le soutien de la coopération française puis de l'Union européenne. Un plan d'action pour la mise en œuvre des concessions de droits d'accès a été formulé en 2005, à l'issue de la tenue de plusieurs ateliers de travail. Les définitions se rapportant au concept de concession de droits d'accès sous-entendent la notion de contrat entre l'État (propriétaire des ressources) et un groupe d'usagers (par exemple groupe de pêcheurs) pour l'exploitation d'un territoire donné à des fins de gestion durable ou de conservation des ressources halieutiques en liaison avec d'autres usages (par exemple le tourisme ou la pêche récréative), et selon un cahier des charges précis. Il est envisagé que les concessions territoriales pour la pêche artisanale devront prévoir des mécanismes de régulation des capacités et de contingentement des captures[6].

Ces différentes initiatives attestent de la volonté politique de réformer le régime d'accès aux ressources, notamment dans le cas de la pêche artisanale, dans un contexte de crise halieutique de plus en plus avéré. Mais cela relève d'un processus long, complexe et sensible en raison de l'importance, de la dispersion et de la mobilité des unités de pêche artisanale, et aussi compte tenu du fait que la pêche artisanale est l'un des secteurs qui compte aujourd'hui le plus d'emplois sur le littoral.

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

La seule mesure de gestion spatiale en vigueur concerne le zonage. En parallèle, de nombreuses initiatives visant à promouvoir une gestion des pêches spatialisée (par exemple la concession de droits d'accès ou la mise en place d'AMP pêche avec ou sans récifs artificiels), sont soutenues par l'administration des pêches, avec l'appui de différents projets, dont notamment du projet GIRMAC[7], et/ou d'ONG.

La réglementation relative au zonage a pour but la protection des frayères et des nourriceries situées dans la frange côtière, la limitation des conflits entre les différents acteurs et l'allocation spatiale des ressources selon les différentes catégories de licences de la pêche industrielle. Les chalutiers démersaux côtiers de moins de 250 TJB, qui constituent l'essentiel de la flotte nationale, peuvent opérer jusqu'à 6 milles (au niveau de la Petite Côte, la limite est fixée à 7 milles). La zone inaccessible à ces navires ne représente qu'environ 15 pour cent de la superficie du plateau sur la Petite Côte et 10 pour cent en Casamance.

[5] Projet FAO/TCP/SEN/2909 «Appui à l'élaboration d'un programme de redressement du secteur de la pêche et de l'aquaculture» (PRSPA).

[6] IDDRA (2005) Rapport final: Plan d'action pour la mise en œuvre des concessions de droits d'accès aux ressources halieutiques de la ZEE du Sénégal. Réf. IDDRA/UE/R003.

[7] À cet égard, on peut noter qu'un projet complémentaire au GIRMAC, le projet GIRMAC+, inscrit dans le cadre du Partenariat stratégique pour les pêches en Afrique et soutenu notamment par la Banque Mondiale et le Fonds pour l'environnement mondial (FEM), est actuellement en cours de préparation. Ce projet d'envergure sur le plan financier devrait diriger son soutien vers le développement de la cogestion et le renforcement du réseau national d'AMP en tant qu'outil de gestion durable de la pêche.

Une étude récente sur le zonage conduite par le CRODT et l'ISRA[8] a toutefois recommandé que «considérant l'état de dégradation de la ressource démersale côtière et pour atténuer les risques de conflits, les navires avec option poissons et céphalopodes de moins de 250 TJB devraient opérer seulement jusqu'à 10 milles de la ligne de base tout au long de la côte». Cette étude scientifique a également précisé que le recours à d'autres mesures comme le repos biologique et les aires marines protégées était une option à encourager, tout en rappelant qu'il était illusoire de réguler les pêcheries démersales côtières sans une réelle maîtrise de la pression de pêche artisanale.

L'immersion de récifs artificiels[9] est une autre mesure de gestion spatiale en relation avec la question des AMP qui retient particulièrement l'attention depuis quelques années. Un «Plan stratégique national d'immersion des récifs artificiels» (PSNIRA) le long des côtes sénégalaises a du reste été élaboré en 2006 par la Direction des pêches maritimes du MinPêche. Ce document de stratégie a été préparé sur la base de réflexions conduites en relation avec tous les acteurs concernés, y compris la Fédération sénégalaise de pêche sportive qui a été un précurseur en la matière. Un Colloque international sur la gestion des récifs artificiels pour l'aménagement des pêches et la conservation des ressources marines a été organisé à Dakar en novembre 2008. Le but de ce colloque était de renforcer la mise en place du plan stratégique, de favoriser les échanges entre les divers acteurs nationaux et internationaux concernés et de veiller à la définition d'un cadre de régulation et de suivi scientifique adapté au contexte national.

3. ÉTAT DES LIEUX CONCERNANT LA CRÉATION ET LA GESTION DES AMP

3.1 Terminologie, principaux objectifs et description générale des AMP

Au Sénégal, le sens attribué à la notion d'AMP continue de faire l'objet de nombreux débats en fonction de leur objectif, de leur genèse, du statut juridique qui les caractérise, des institutions qui les supportent et de l'approche mise en œuvre pour leur développement. Conformément au cadre juridique sénégalais (jurisprudence créée par le décret présidentiel n° 2004-2460 du 17/11/04), le rôle assigné aux AMP est un rôle de «protection sur des bases scientifiques des ressources naturelles et culturelles importantes des écosystèmes représentatifs de l'environnement marin au bénéfice des générations actuelles et futures».

Au-delà de ce rôle générique attribué par le décret présidentiel de 2004, deux constantes caractérisent les AMP au Sénégal. La première est que la vocation des AMP est de contribuer au maintien de la biodiversité marine et côtière. La deuxième est que l'AMP sous-entend une démarche visant à délimiter une unité de gestion présentant un intérêt particulier, sur la base de considérations bioécologiques, territoriales et/ou socio-économiques, et de mettre en place dans ces espaces des systèmes différenciés de gestion impliquant les usagers (groupes socioprofessionnels ou communautaires) et ayant pour objet d'améliorer la préservation et la valorisation de milieux sensibles et/ou de ressources localisées dans l'espace considéré ainsi que les conditions de vie des usagers concernés.

Dans le Code des Pêches, qui est en cours de révision et dont la version définitive n'est pas encore approuvée, une section intitulée «Des mesures de gestion et de conservation des écosystèmes marins» prévoit la création d'instruments de gestion tels que les Aires marines protégées, les Dispositifs de concentrations de poissons et les Récifs artificiels dans le cadre d'une approche intégrée et écosystémique de la gestion des ressources halieutiques.

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[8] Samb *et al.* (2007) Impacts de la législation sur la ressource et les systèmes de pêche - CRODT/ISRA.

[9] Parmi les réalisations, l'expérience de Yenne, avec la construction d'un récif artificiel artisanal entièrement réalisé, posé et contrôlé par le comité de gestion des pêches de l'AMP, et celle de Nianing, pour l'élaboration d'un modèle de gestion des ressources de poulpes (habitats - nurseries sous forme de pots), sont souvent citées en exemple. Cf. aussi *C. Senne et K. Sane (2008) Programme d'immersion de récifs artificiels pour une gestion durable des pêches au Sénégal – Ministère de l'économie maritime et des transports maritimes internationaux/projet GIRMAC.*

L'article 19 de cette section précise que «Les aires marines protégées sont des espaces maritimes délimités géographiquement et protégés pour permettre le libre jeu des processus, des services et des fonctions écologiques des habitats et des espèces en vue d'assurer la conservation et l'utilisation durable des ressources halieutiques qui se trouvent dans les espaces concernés». L'article 16 de cette section indique par ailleurs que, «Aux fins de gestion intégrée fondée sur l'écosystème, le Ministre chargé de la pêche maritime est habilité à créer, par arrêté, des Aires marines protégées, des Dispositifs de concentration de poissons, des Récifs artificiels, et tout autre système pouvant participer à la gestion et à la conservation des écosystèmes marins».

Néanmoins, la révision du Code étant en cours, l'énoncé de ces articles est encore sujet à modification avant validation et adoption par le gouvernement sénégalais.

Pour le moment, cinq AMP ont fait l'objet d'une création par décret présidentiel: l'AMP de Saint-Louis, l'AMP de Kayar (grande côte), l'AMP de Joal-Fadiouth (Petite Côte), l'AMP d'Abéné (en Casamance) et l'AMP de Bamboung (dans le Saloum). La vocation précise de ces AMP n'a pas été clairement définie. Mais on peut les rattacher à la catégorie 6 des AMP selon les critères de l'UICN, à savoir la catégorie des aires protégées à des fins d'utilisation durable des écosystèmes naturels et gérées de façon à assurer la protection et le maintien à long terme de la biodiversité tout en garantissant la durabilité des fonctions et des produits naturels nécessaires au bien-être de la communauté. L'AMP du Bamboung, qui englobe l'ensemble d'un bolong (bras de fleuve d'eau salée) dans le Saloum, peut toutefois s'apparenter à une AMP de catégorie 2 (Parc national) dans la mesure où la pêche y est strictement interdite pour le moment.

Pour le Programme régional de conservation marine (PRCM - cf. & 4.2), les AMP se définissent comme «des espaces permettant d'assurer la conservation de certaines parties névralgiques de la zone côtière, qui constituent des milieux d'importance critique pour la régénération des ressources halieutiques et de la biodiversité. Les AMP protègent en outre des habitats sensibles tels que les herbiers marins ou les mangroves en même temps qu'elles abritent des populations qui ont développé, au fil des siècles, des valeurs culturelles directement liées à l'environnement qui s'avèrent précieuses pour la gestion actuelle et future de celui-ci. Enfin, les AMP jouent un rôle vital dans la reproduction des ressources côtières et marines et dans la conservation de la biodiversité tant à l'échelle nationale, régionale et mondiale, ainsi que la pérennité des cultures des sociétés du littoral.»

Pour le RAMPAO (Réseau régional d'aires marines protégées en Afrique de l'Ouest), une institution sous-régionale créée en 2007 dans le cadre des activités du PRCM (cf. & 4.2), une AMP doit disposer de statuts juridiques, être dotée d'une structure de gestion et s'appuyer sur un plan de gestion actualisé pour être reconnue en tant que telle. Sur la base de ces critères, le RAMPAO ne reconnaît actuellement que quatre AMP au Sénégal, différentes par ailleurs des AMP créées par décret en 2004[10]: le Parc national de la langue de Barbarie (Saint-Louis), le Parc national des îles de la Madeleine (Dakar), la Réserve naturelle de Poponguine (Petite Côte) et le Parc national et réserve de biosphère du delta du Saloum (région de Fatick). La responsabilité administrative de ces quatre AMP relève du ministère en charge de l'environnement, le MinEnv (Ministère de l'environnement, de la protection de la nature, des bassins de rétention et des lacs artificiels) par l'intermédiaire de la Direction des parcs nationaux (DPN).

On notera par ailleurs que d'autres AMP sont en cours de création, notamment dans le cadre d'initiatives du MinPêche visant à la création d'un réseau national d'aires protégées à des fins d'aménagement des pêches. Ainsi, trois nouvelles AMP pêche sont en cours de création: l'AMP du Cap Manuel (Dakar), l'AMP de la Petite Côte (Mbour)

[10] Les cinq AMP créées par décret en 2004 sont encore en cours de développement et la plus aboutie d'entre elles, l'AMP de Bamboung, ne possède pas encore de plan de gestion, ce qui ne lui permet pas d'être encore reconnue par le RAMPAO.

TABLEAU 1
Liste des AMP reconnues sur le plan juridique au Sénégal

	Statut	Objectifs de l'AMP	Superficie	Autorité de tutelle
Parc national de la langue de Barbarie	Décret (1976)	Conservation de la biodiversité du bas delta, protection des tortues marines	Flèche sableuse + zone maritime: 20 km² au total	DPN
Parc national des îles de la Madeleine	Décret (1976)	Conservation du milieu et de la biodiversité	15 ha d'îles + zone maritime de 30 ha	DPN
Réserve naturelle de Poponguine	Décret (1986)	Réhabilitation d'un milieu dégradé	Partie terrestre 10 km² + frange maritime (1/2 milles)	DPN
Parc national et Réserve de biosphère du delta du Saloum	Décret (1976), Classé RB en 1981 Classé site Ramsar en 1984	Conservation des écosystèmes deltaïques, conservation de la biodiversité, restauration des écosystèmes	Parc: 730 km² RB: 4 500 km²	DPN
AMP de Saint-Louis	Décret (2004)	Protection des ressources naturelles et culturelles	496 km²	DPN / DPM
AMP de Kayar	Décret (2004)	Protection des ressources naturelles et culturelles	171 km²	DPN / DPM
AMP de Joal-Fadiouth	Décret (2004)	Protection des ressources naturelles et culturelles	174 km²	DPN / DPM
AMP d'Abene (Casamance)	Décret (2004)	Protection des ressources naturelles et culturelles	119 km²	DPN / DPM
AMP de Bamboung (delta du Saloum)	Décret (2004)	Protection des ressources naturelles et culturelles	70 km² (dont environ 30 km² de bolong)	DPN / DPM

et l'AMP du fleuve Casamance (pointe Saint-Georges). La définition de ces AMP pêche, dans le contexte sénégalais, sous-entend la délimitation d'un espace dont une partie seulement est mise en réserve. La partie mise en réserve vise à assurer la conservation de la capacité productive et reproductive des stocks halieutiques dans l'espace considéré en interdisant toutes formes d'extraction alors que la partie adjacente à la réserve est aménagée de manière à promouvoir des pratiques de pêche responsable[11]. Cette définition générique permet d'envisager plusieurs types d'aménagement de l'AMP, comme l'immersion de récifs artificiels dans la zone mise en réserve.

Aujourd'hui, seuls les petits parcs, les réserves naturelles et l'AMP de Bamboung peuvent être considérés comme des AMP opérationnelles. Ce n'est en effet que dans ces espaces qu'il existe des règles contraignantes pour la pêche qui vont au-delà de ce que prévoit la réglementation nationale régissant l'exercice de la pêche.

Mais dans le cadre du présent rapport, seules les AMP créées par décret présidentiel et les AMP en cours de création feront l'objet d'une analyse. Les expériences et enseignements pouvant être tirés de la gestion des petits parcs nationaux et des réserves naturelles ne présentent en effet pas un grand intérêt pour l'étude de cas dans la mesure où ces aires protégées relèvent de logiques de conservation stricto sensu. Le Parc du delta du Saloum, qui couvre un espace deltaïque très riche sur le plan de la biodiversité et dont les dimensions sont conséquentes, n'est quant à lui soumis à aucune réglementation locale particulière concernant l'accès aux ressources halieutiques. Le statut de réserve de biodiversité ne constitue en fait qu'un cadre incitatif à la création d'AMP, comme cela a été le cas avec la création de l'AMP de Bamboung située dans le Parc du Saloum.

3.2 Processus de prise de décision

Au Sénégal, la pratique qui consiste à ce qu'une AMP doive être créée par décret présidentiel trouve son origine dans les récents développements internationaux dans le domaine de la protection de la biodiversité (Sommet mondial pour le développement durable de Johannesburg, en 2002, et Cinquième congrès des parcs, à Durban en 2003,

[11] Ces définitions sont extraites d'un document technique préparé en août 2006 par le Ministère en charge de la pêche, intitulé «Cahier des charges pour les Aires marines protégées», pour aider la réflexion interministérielle sur la problématique des AMP.

notamment). L'acte présidentiel qui a créé les cinq premières AMP en 2004 correspondait en effet à une traduction de la déclaration d'intention exprimée lors de la présentation de la Stratégie régionale pour les AMP en Afrique de l'Ouest élaborée dans le cadre du PRCM au Congrès de Durban. Cette stratégie avait fait l'objet auparavant d'une adoption par les ministres en charge des pêches et/ou de l'environnement de la sous-région. En juillet 2005, à l'occasion de la cérémonie du Don à la terre organisée par le WWF, le Président de la République sénégalaise s'est par ailleurs engagé à créer dix nouvelles AMP en application des recommandations du Sommet de Johannesburg.

Le processus de sélection des cinq premières AMP créées par décret présidentiel a été différent. Pour quatre d'entre elles, il a reposé sur une étude conduite à l'initiative du WWF et de la DPN, entre 2002 et 2003 visant à évaluer 33 sites pouvant potentiellement être érigés en AMP. Pour ce faire, l'étude a utilisé un système de notation se rapportant à plusieurs critères d'éligibilité (écologiques, biologiques, géographiques, socio-économiques et socioculturels). Elle a été conduite par une expertise pluridisciplinaire et a impliqué l'ensemble des parties prenantes[12]. Au cours du processus de sélection, qui a duré deux ans, les quatre sites ayant obtenu les notes les plus élevées ont été retenus (parmi les onze sites finalement présélectionnés). Des réunions de sensibilisation avec les communautés ont également été organisées à la fin de l'étude. Les objectifs spécifiques assignés à ces quatre AMP n'ont pas été précisés. Développé à l'initiative du MinEnv, ce processus de sélection a récemment donné lieu à l'élaboration par le MinPêche d'un Guide pour la création des futures AMP pêche[13].

Pour la cinquième AMP, à savoir celle du Bamboung, la genèse a été différente car cette AMP faisait l'objet d'un processus de création depuis 2001, avec l'appui technique d'une ONG sénégalaise, l'Océanium, et financier du FFEM (cf. encadré 1). Sa création par décret présidentiel a correspondu en fait à une reconnaissance officielle de son existence en 2004. L'objectif de cette AMP, précisé lors des consultations avec les populations, est un objectif de conservation de la biodiversité (protection des mangroves et des écosystèmes aquatiques du bolong). Le développement social des communautés résidentes est considéré comme un moyen de parvenir à cet objectif de conservation. Sur le plan environnemental, on espère que la fermeture à la pêche de l'ensemble du bolong de l'AMP du Bamboung va permettre la reconstitution des stocks et de la biodiversité dans le bolong dans un premier temps, puis dans les zones avoisinantes.

Afin de favoriser la concertation entre les deux ministères les plus directement concernés par les AMP, un Comité technique chargé de la gestion des AMP a été créé en 2005 par arrêté interministériel entre le MinPêche et le MinEnv (arrêté n° 1654 du 03/03/05). Ce comité a pour mandat de «faciliter la coordination de la mise en place des AMP et la définition des procédures de gestion concertée des AMP». Dans ce cadre, il est notamment chargé d'élaborer des procédures générales pour la création et la coordination de la gestion des AMP, d'élaborer un programme de mise en place d'AMP, de créer un réseau d'AMP, d'assurer le suivi-évaluation des AMP et d'examiner les projets de création de nouvelles AMP. Le comité ne s'est jamais réuni.

Le besoin de renforcer les processus de coordination pour la création d'un réseau d'AMP au Sénégal a été souligné à la suite d'une mission d'appui technique conduite par la Commission océanographique intergouvernementale (COI) de l'Unesco[14]. La création d'un comité national de coordination assurant la synergie entre les différentes

[12] P.S. Diouf et P. Siegel (2003), Processus participatif de sélection de sites d'aires marines protégées au Sénégal. Document interne WWF.

[13] C. Senne et K Sane Diouf (2008), Guide de création et de gestion d'aires marines protégées pour la gestion de la pêche au Sénégal (Rapport provisoire). Ministère de l'économie maritime et des transports maritimes internationaux/Programme GIRMAC.

[14] Mission technique conjointe conduite à la demande du Gouvernement du Sénégal en mars 2009 afin d'examiner le programme sénégalais pour les aires marines protégées.

structures nationales concernées par les questions liées à la mer (y compris les AMP) a été fortement recommandée par le Secrétaire exécutif de la COI et accueillie favorablement par les autorités sénégalaises. Un Comité interministériel de la mer (CIM) a ainsi été institué par arrêté en février 2010 (Arrêté n°01656 du 22.02.2010). Le Comité a été placé sous l'autorité du Premier Ministre. Il est chargé de coordonner, d'harmoniser et de promouvoir les politiques et les stratégies maritimes de l'État. Il est assisté dans ses missions par un organe technique intitulé «Comité consultatif d'experts» et par un «Secrétaire permanent» placé sous l'autorité du ministre chargé de l'économie maritime. Chaque département concerné sera représenté au niveau du Secrétariat permanent par un point focal qu'il aura désigné.

En ce qui concerne les autres AMP en gestation, le processus de création semble se caractériser par une plus forte demande exprimée par la base à la suite du travail de sensibilisation mené par les ONG, notamment l'Océanium, à l'aide de la projection de films suivie de débats avec les populations. Des requêtes communautaires auraient ainsi été adressées à la Présidence en 2006 pour la création de trois nouvelles AMP (Cap Manuel, Mbour, pointe Saint-Georges), qui aurait ensuite instruit le MinPêche du suivi du dossier. Un projet d'arrêté ministériel a été préparé, suivi d'un projet de décret présidentiel afin de bien respecter les pratiques en matière de création de nouvelles AMP, mais aucun de ces deux projets n'a encore été adopté.

Le MinPêche conduit également des activités de cogestion sur des sites pilotes qui

ENCADRÉ 1
Genèse de l'AMP du Bamboung

Le processus de création de l'AMP du Bamboung a duré environ quatre ans à partir du début des années 2000. Impulsé par l'Océanium, et bénéficiant d'un financement du FFEM, il a impliqué 14 villages situés à la périphérie du bolong de Bamboung (population de 30 000 personnes au total) et la communauté rurale de Toubacouta. Les principales étapes ayant marqué la création de l'AMP sont les suivantes:

- pré-sélection du site de Bamboung sur la base de différents critères, et notamment: richesse des peuplements de poisson, abondance de thiof (Epinephelus aenus), une espèce de mérou emblématique au Sénégal, forte pression de pêche, présence de lamantins, mangrove relativement bien conservée et riche en avifaune et faune terrestre, facilité de contrôle du bolong (une seule entrée, présence d'agents chargés de la conservation puisqu'il se trouve dans la réserve de biosphère du Saloum), valeur esthétique du site;
- préparation et discussion autour d'un avant-projet d'AMP avec l'administration (Sous-préfecture, DPN, service pêche) et les usagers (représentants des 14 villages concernés);
- prganisation de campagnes de conscientisation des problèmes liés à la surpêche et à la dégradation des écosystèmes marins et côtiers au Sénégal, notamment sous la forme de projection de films suivis de débats directement dans les 14 villages;
- adoption d'un texte (octobre 2002) portant création de l'AMP au niveau de la Communauté rurale de Toubacouta, qui regroupe entre autres les 14 villages situés à la périphérie du bolong;
- décision des villageois de fermer l'accès à la pêche dans le bolong (avril 2003): création d'un comité de gestion, balisage à l'entrée du bolong, construction d'un mirador, achat d'une vedette, mise en place d'une surveillance par des bénévoles selon un système de rotation;
- réalisation d'un état de référence des peuplements piscicoles dans le bolong (IRD) - 2003;
- emergence de différends entre les secteurs de la pêche et de l'environnement au sujet du caractère légal ou non de l'interdiction d'accès à la pêche dans le bolong (période 2003-2004);
- création du comité de gestion et de surveillance (élections des représentants et membres);
- reconnaissance officielle de l'AMP du Bamboung dans le cadre du décret présidentiel de novembre 2004;
- affectation d'un agent de la DPN chargé de la surveillance de l'AMP;
- développement des activités génératrices de revenus pour compenser le manque à gagner suite à l'interdiction de la pêche dans le bolong (diminution du nombre de pêcheurs migrants dans plusieurs villages), notamment à travers l'écotourisme, depuis 2005.

pourraient à terme être reconnus en tant qu'AMP. On peut notamment citer les sites soutenus par le projet GIRMAC: Betenti, Foundioune, Ouakam, Ngaparo. Dans le même temps, le MinEnv a proposé la création de 10 nouvelles AMP. Un projet de décret présidentiel a été préparé à cet effet en 2007. Il a été retiré après plusieurs tentatives d'arbitrage au niveau interministériel.

3.3 Perception des AMP

Un consensus semble se dégager au Sénégal quant au rôle important que peuvent jouer les AMP dans le maintien de la capacité productive et de la biodiversité des écosystèmes marins et côtiers, non seulement pour le bénéfice de la pêche mais aussi pour celui d'autres usagers directement concernés par la préservation du capital naturel (conservation et tourisme notamment). Ce consensus peut s'expliquer par le constat d'échec, quasi-unanimement partagé, des politiques «classiques» de gestion de la pêche au Sénégal qui n'ont pas su endiguer, jusqu'à présent, les processus de dégradation des habitats sensibles et de surexploitation et de fragilisation des ressources halieutiques. Dans ce contexte, les AMP sont parfois perçues comme une solution 'miracle' et incontournable qui permettra notamment, à condition qu'elles soient judicieusement choisies et conçues, de réensemencer les zones avoisinantes et ainsi de prévenir l'effondrement des stocks.

Deux visions institutionnelles s'opposent toutefois en ce qui concerne la vocation première et les modes de gestion des AMP. Pour le MinEnv, qui est par ailleurs le point focal biodiversité pour le Sénégal, la vocation première des AMP est de protéger des milieux sensibles et leur biodiversité en réduisant au maximum les activités humaines susceptibles d'avoir des effets négatifs sur le capital naturel (par prélèvement ou par pollution). Dans cette vision, et à condition qu'elle soit responsable, la pêche ne constitue qu'une activité génératrice de revenus parmi d'autres pour les communautés, au même titre que l'écotourisme par exemple. C'est donc un moyen de contribuer à la réalisation de l'objectif de conservation.

Pour le MinPêche, les AMP constituent avant tout un outil de la gestion des pêches, dont la vocation première est de faciliter la mise en place de systèmes de gestion plus vertueux que ceux qui caractérisent la pêche au Sénégal en général, et dont tout le secteur va profiter indirectement. Avec le concept d'AMP, c'est aussi une manière de faciliter la mise en place de mécanismes de concession de droits d'accès et de promouvoir la cogestion dans le cas de la pêche artisanale.

Au-delà de ces différences de perception quant à leur finalité, les AMP au Sénégal sont perçues en général et quelle que soit l'administration, comme des AMP à dominante conservation susceptibles néanmoins de contribuer à la préservation des ressources halieutiques dans un contexte de surexploitation des stocks côtiers et de déficience des politiques d'aménagement des pêches. On peut également ajouter à cet égard que la Stratégie régionale sur les AMP présentée au Congrès de Durban en 2003, précise que celles-ci, outre leurs fonctions essentielles dans le cadre de la biodiversité marine et côtière, constituent une «assurance-vie» pour la pêche.

Pour la plupart des professionnels, les AMP sont souvent perçues comme une opportunité de mettre un terme au régime de libre accès aux ressources dans certaines zones de pêche. Le régime de l'AMP permet en effet d'introduire des mécanismes de contrôle de l'accès aux ressources et de permettre une certaine appropriation de l'espace à des fins de conservation mais également de gestion. Mais cette vision sous-entend que cela se fera au détriment des pêcheurs migrants, majoritaires dans certaines zones, ce qui n'est pas sans poser des problèmes au niveau de nombreuses communautés littorales.

Enfin, pour de nombreux observateurs, le processus de développement des AMP au Sénégal s'est emballé depuis quelques années. Il semble faire l'objet de plus en plus de conflits de compétence institutionnelle aux niveaux local et national et de stratégies

opportunistes, qui s'avèrent finalement préjudiciables au développement des AMP. Il semble par ailleurs que l'on n'ait pas suffisamment pris le temps de mener une réflexion sur les objectifs poursuivis par les AMP et l'articulation de celles-ci avec les autres outils de gestion des ressources halieutiques et des écosystèmes marins et côtiers.

4. GOUVERNANCE DANS LES AMP (PÊCHE ET CONSERVATION)

4.1 Bases légales concernant la création et la gestion des AMP

Compte tenu de la prise de conscience relativement récente de la nécessité de protéger le milieu marin, il n'existe pas encore au Sénégal de texte spécifique régissant la création et la réglementation des AMP. Les AMP tendent par conséquent à être gérées de fait comme des aires protégées terrestres. Les parcs et les réserves naturelles qui empiètent pourtant sur le milieu marin et côtier sont par exemple considérés sur le plan juridique comme des aires protégées terrestres dont les modalités de création et de gestion sont précisées dans le Code forestier de 1998.

Les AMP créées récemment par décret présidentiel ne se rattachent à aucune loi spécifique. Les lois auxquelles la gestion de ces AMP fait référence émanent en fait de dispositions pouvant découler du Code forestier (2001), du Code de la pêche maritime (1998) ou du Code des collectivités locales en relation avec la décentralisation (1996). L'analyse juridique montre que la plupart de ces lois sont souvent contradictoires et que le statut actuel des nouvelles AMP ne confère pas à ces dernières une grande stabilité juridique dans la mesure où le décret présidentiel ne précise ni les objectifs ni le mode de gestion devant être appliqué à ce type d'AMP[15]. En revanche, les AMP créées par décret introduisent une nouvelle catégorie d'AMP, distincte des parcs nationaux, dans la mesure où les objectifs et les principes d'accès, d'exploitation et de gestion doivent être définis sous forme d'arrêtés conjoints des ministres chargés de l'environnement et de la pêche. Ce nouveau type de statut confère par conséquent aux AMP une vocation pêche en plus d'une vocation conservation.

Le Code forestier prévoit que la gestion des aires protégées se fait à travers la nomination d'un conservateur, rattaché à la DPN, chargé de jouer un rôle de direction et de coordination pour l'établissement et la mise en œuvre d'un plan de gestion. Le suivi du plan de gestion est assuré par un comité de gestion associant les principales parties prenantes. Or, si ces modalités de gestion ne s'appliquent qu'au domaine forestier, la pratique a montré que les compétences du comité de gestion peuvent s'étendre jusqu'au domaine maritime (cas de l'AMP du Bamboung).

Les textes relatifs à la décentralisation prévoient que la Région (niveau le plus important dans la décentralisation) est en droit de créer une zone protégée dans sa juridiction et de déterminer les conditions de sa création, conformément à sa mission de contribution, avec l'État, de protection et de mise en valeur de l'environnement. Pourtant, dans le même temps, et malgré ce transfert de compétences, l'État reste le garant de la gestion durable des ressources halieutiques. Ainsi, le Code de la pêche maritime précise que «les ressources halieutiques des eaux maritimes sous juridiction sénégalaise constituent un patrimoine national» et que «la gestion des ressources halieutique est une prérogative de l'État». Le Code de la pêche maritime interdit par conséquent, en théorie, la possibilité pour une collectivité locale de gérer les ressources halieutiques et donc de créer une AMP, à moins de prévoir une convention entre l'État et la collectivité.

Le Code de la pêche maritime de 1998 ne fait pas explicitement référence aux AMP. Une interprétation large de la notion de plan d'aménagement des pêcheries et de l'unité de gestion à laquelle un plan d'aménagement peut se rattacher (c'est-à-dire un ou plusieurs ensembles de stocks d'espèces et les opérations fondées sur ces stocks),

[15] Voir à ce propos l'étude réalisée par C. Senne et K. Sane Diouf en avril 2008 dans le cadre du projet GIRMAC, intitulée «Proposition d'un cadre législatif et institutionnel pour la gestion des aires marines protégées au Sénégal».

peut toutefois laisser envisager la création d'AMP pêche. Le Code précise par ailleurs dans son article 21 que les «zones d'accès limité ou réservé» font partie des différentes mesures réglementaires de conservation et d'aménagement des ressources halieutiques pouvant être adoptées s'il y en a besoin.

Des réflexions sont par ailleurs conduites actuellement en vue d'une révision éventuelle du Code de la pêche maritime. Parmi les innovations qui font l'objet de débats, on notera l'introduction de la notion de Zone de pêche protégée (ZPP). Sur le fond, une ZPP ne devrait pas fondamentalement se différencier d'une AMP pêche car elle viserait à consacrer le principe de l'individualisation d'un espace côtier au sein duquel des règles spécifiques de gestion pour l'accès aux ressources halieutiques pourraient être définies dans le cadre de mécanismes de cogestion reposant, le cas échéant, sur des contrats de concession entre l'État et un groupe d'usagers. Cette nouvelle appellation pourrait en revanche permettre au MinPêche de produire des avancées sur la question de la gestion des AMP, tout en s'affranchissant de certains blocages d'ordre institutionnel puisque les ZPP ne pourraient pas être considérées d'un point de vue juridique comme des AMP.

Le flou juridique caractérisant les modalités de création, mais surtout de gestion, des AMP est identifié par de nombreux acteurs comme l'un des blocages majeurs au processus de développement des AMP au Sénégal. Dans l'attente d'une clarification du cadre juridique, la jurisprudence est qu'aujourd'hui la création d'une AMP doit se faire par décret présidentiel. En ce qui concerne la gestion des AMP, l'approche dominante est celle qui est encouragée par le chef de file sur le plan institutionnel et/ou partenarial (bailleurs et ONG) selon l'AMP considérée.

4.2 Institutions et mesures incitatives à la mise en œuvre des AMP

Conformément au décret n° 2008-1026 portant répartition des services de l'État sénégalais, la compétence en matière d'AMP concerne aussi bien le MinPêche, à travers sa Direction des pêches maritimes (DPM), que le MinEnv, à travers sa Direction des parcs nationaux (DPN).

Ce décret de 2008 crée par ailleurs une Agence nationale des aires communautaires (ANAC), placée sous tutelle du MinPêche. Ce rattachement institutionnel pourrait s'expliquer par le fait que la question des récifs artificiels, qui tend à être intégrée dans la problématique des AMP, relève de la compétence du MinPêche. Mais le décret d'application permettant la mise en place de l'ANAC n'a pas encore été promulgué.

Suite à la création des nouvelles AMP par décret en 2004, un Comité technique interministériel a été créé par arrêté interministériel. Ce dernier ne s'est jamais réuni, comme on l'a vu précédemment. Il a en revanche favorisé différentes initiatives au niveau du MinPêche dont l'élaboration d'un projet de cahier des charges techniques pour la création d'une AMP au Sénégal. Ce projet fait notamment référence aux procédures de dépôt des demandes en vue de la création d'une AMP, à la nécessité d'établir un état de référence, de préciser les objectifs de l'AMP et d'avoir un plan de gestion.

En janvier 2008, une note de service du MinPêche a mis en place un Comité d'orientation stratégique et de suivi chargé de l'impulsion et de la promotion d'un réseau d'AMP (COS-RAMP). La composition de ce comité accorde un rôle important au cabinet du Minpêche et tend à retirer le pilotage stratégique des AMP Pêche à la DPM. Le COS-RAMP ne s'est pas encore réuni.

Enfin, plus récemment, une Direction des aires communautaires (DAC) a été créée par décret (le Directeur a été nommé par décret en juillet 2009). La DAC a rang de Direction centrale nationale, ce qui devrait lui conférer, lorsqu'elle sera pleinement opérationnelle, des prérogatives et des moyens appréciables pour la promotion et la mise en œuvre des AMP.

Malgré l'ensemble des dispositions institutionnelles prises au niveau central depuis

2004-2005, le processus de développement des cinq AMP créées par décret se fait surtout sous l'impulsion des ONG de conservation. L'administration des pêches est impliquée localement, au cas par cas. Le MinEnv semble en revanche mieux doté sur le plan juridico-institutionnel dans la mesure où les textes relatifs aux aires protégés prévoient que soit recruté un conservateur (agent chargé de la surveillance) par aire protégée. Cela a été réalisé à la suite de la création des cinq AMP sur le budget régulier du MinEnv (environ 20 000 euros/an pour les cinq AMP créées par décret).

La CSRP (Commission sous-régionale des pêches) constitue un autre acteur potentiellement important sur toutes les questions ayant trait à la préservation de l'environnement marin à l'échelle de la sous-région, dont le Sénégal fait partie. La CSRP est notamment en train de développer une stratégie régionale pour les AMP en Afrique de l'Ouest. La Commission apporte également son soutien à la mise en œuvre des projets pêche du PRCM (cf. ci-dessous). La CSRP est aussi le maître d'ouvrage pour des projets à forte composante AMP, comme le projet financé par l'Agence française de développement (AFD) et en passe d'être lancé sur la cogestion et les AMP en Afrique de l'Ouest.

On peut également mentionner le RAMPAO (Réseau d'aires marines protégées en Afrique de l'Ouest), une institution sous-régionale créée en avril 2007 dans le cadre de la première phase du PRCM, en application de la Stratégie régionale pour les AMP en Afrique de l'Ouest. La finalité du RAMPAO est d'«assurer, à l'échelle de l'écorégion marine de l'Afrique de l'Ouest, constituée de la Mauritanie, du Sénégal, de la Guinée, de la Guinée-Bissau, de la Gambie, du Cap-Vert et de la Sierra Léone, le maintien d'un ensemble cohérent d'habitats critiques nécessaires au fonctionnement dynamique des processus écologiques indispensables à la régénération des ressources naturelles et la conservation de la biodiversité au service des sociétés par la mise en place et le fonctionnement d'un réseau d'AMP».

Plusieurs ONG sont impliquées, depuis de nombreuses années, dans les processus de soutien à la création et à la gestion des AMP au Sénégal. Les ONG internationales suivantes sont encore directement impliquées dans ces processus: WWF (AMP d'Abene, AMP de Kayar) et FIBA (AMP de Casamance – Pointe Saint-Georges, AMP de Bamboung). Une ONG est aussi particulièrement active dans le processus de création et de développement des AMP Au niveau national: l'Océanium. L'Océanium, qui a notamment été le principal partenaire des communautés locales pour la création de l'AMP de Bamboung, soutient aussi le développement de l'AMP de Casamance et de l'AMP de la Petite Côte (Nianing).

On doit par ailleurs mentionner le rôle important joué par le PRCM (Programme régional de conservation de la zone côtière et marine de l'Afrique de l'Ouest) dans le développement des AMP au Sénégal. Le PRCM, dont la première phase a débuté en 2004, est un programme élaboré dans le cadre d'une coalition entre plusieurs ONG internationales de conservation (UICN, WWF, FIBA, Wetlands International). L'objectif du PRCM est de «promouvoir une vision concertée des priorités de conservation régionales et de répartir les responsabilités en fonction des compétences spécifiques de chacun dans un cadre d'intervention harmonisé». Les deux principaux bailleurs du PRCM ont été au début l'Ambassade des Pays Bas à Dakar et la Fondation MAVA. Dans le cadre de la deuxième phase du PRCM (2008-2011), les partenariats ont été élargis, avec notamment l'implication de la CSRP. Les projets en cours ou en préparation dans le cadre du PRCM – phase II, avec une composante en relation avec la question des AMP au Sénégal, sont les suivants:

- soutien au renforcement institutionnel du Réseau régional d'AMP en Afrique de l'Ouest RAMPAO et à la mise en œuvre du plan de travail de celui-ci (promoteurs: FIBA/Université de Portsmouth/UICN);
- soutien à la création de nouvelles AMP et de nouveaux sites de conservation (promoteur: FIBA): Pointe Saint-Georges en Casamance;

- soutien au renforcement de l'efficacité de gestion des AMP (promoteur: FIBA): AMP communautaire de Bamboung;
- projet de soutien à la Réserve de biosphère transfrontière du delta du fleuve Sénégal (promoteur: UICN);
- gestion participative des sites et des ressources naturelles en Afrique de l'Ouest – GP SIRENES (promoteur: UICN): renforcement de la gestion des AMP et mise en place d'un réseau des AMP.

Un autre partenaire au développement ayant joué un rôle important dans le processus de développement des AMP est le Fonds français de l'environnement mondial (FFEM). Le FFEM a soutenu la création de l'AMP du Bamboung et continue de soutenir la création d'autres AMP dont l'AMP de la Petite Côte (projet Narou Heuleuk), l'AMP de la Casamance et l'AMP de Mbour. Enfin, on doit rappeler le rôle important joué par la Banque Mondiale dans le processus AMP à travers le GIRMAC (cf. & 3.2).

4.3 Modes de gestion

Sur les cinq nouvelles AMP créées par décret, seule l'AMP de Bamboung peut être considérée comme fonctionnelle et faisant l'objet de modes de gestion spécifiques. Dans les quatre autres AMP, les activités portent encore principalement sur la sensibilisation et le développement organisationnel des communautés ainsi que sur la mise en place de projets (en particulier projet GIRMAC) et de mécanismes de cogestion avec le soutien d'ONG comme le WWF et l'Océanium, et. L'approche optée pour le développement de ces quatre AMP depuis 2004 est en effet de réunir dans un premier temps les conditions juridiques et institutionnelles, y compris la formalisation de plans de gestion, nécessaires au développement, dans un deuxième temps, de l'AMP.

Pour l'AMP du Bamboung, l'approche a été assez différente car elle a consisté en premier lieu à définir les règles applicables à l'AMP et la stratégie de développement communautaire en étroite consultation avec les usagers, puis à soutenir progressivement la mise en œuvre des engagements communautaires en ajustant les activités au fur et à mesure. L'approche graduelle, adaptative et rapidement tournée vers l'action qui a été appliquée à l'AMP du Bamboung a été rendue possible par l'importance et la mobilisation rapide des fonds dédiés au processus. Il est en effet estimé que le montant alloué par l'intermédiaire du FFEM en faveur de la création d'aires protégées au Sénégal a été de l'ordre de 900 000 euros sur cinq ans.

Suite à l'officialisation de la création de l'AMP du Bamboung en novembre 2004, un comité de gestion comprenant un représentant du service des pêches, un représentant de la DPN, un conseiller rural (communauté rurale de Toubacouta) et deux représentants par village (14 villages au total), a été mis en place. Un campement écotouristique a été développé sur le site de l'AMP, dont les bénéfices servent à pérenniser le fonctionnement de l'AMP (financement de la surveillance, financement des projets de développement) et à contribuer au budget de la communauté rurale. Un plan de gestion et de développement de l'AMP est aujourd'hui en cours de préparation.

4.4 Concertation ou conflits d'ordre institutionnel

La question de la création et du développement des AMP est malheureusement encore source de nombreux conflits en termes de compétence institutionnelle au niveau central entre le MinPêche et le MinEnv notamment. La plupart des projets et des ONG de conservation s'efforcent d'associer les deux ministères, mais en l'absence de cadre de concertation efficace et de directives suffisamment claires de la part du gouvernement au sujet des compétences respectives des différents ministères, les AMP se développent le plus souvent de façon isolée les unes des autres et sous l'impulsion des bailleurs de fonds.

Le projet GIRMAC, financé par la Banque Mondiale, et dont les moyens sont considérables, a pourtant tenté dans les premières années de dépasser les clivages

institutionnels afin de promouvoir une approche réellement intégrée de la zone côtière et des pêches. Le ministère en charge de l'environnement et celui de la pêche était chacun responsable d'une composante technique et une troisième composante visait à mettre en commun les apports de chaque ministère en encourageant la concertation interministérielle. La troisième composante s'est avérée particulièrement difficile à mettre en œuvre dans la pratique. Il est possible que le projet GIRMAC+ en cours de préparation (une extension du projet GIRMAC dans le cadre du Partenariat stratégique) soit entièrement rattaché au MinPêche et qu'il entérine le retour à une approche sectorielle de la gestion des ressources halieutiques.

Sur le terrain en revanche, et malgré l'absence d'un véritable cadre de concertation interministérielle, la collaboration est effective entre les services décentrés de la pêche (administration et surveillance maritime) et les agents de la DPN affectés au niveau de chaque AMP nouvellement créée. Les actions de collaboration portent en particulier sur la sensibilisation et la concertation en vue de la préparation des plans de gestion des AMP. Des collaborations sont également mises en œuvre dans le domaine de la surveillance des AMP: la DSPM veille au respect du zonage pour prévenir l'incursion des chalutiers, elle participe à la formation des pêcheurs dans le cadre de la mise en place de brigades de surveillance participative et elle intervient en cas de litiges entre pêcheurs, alors que la DPN assure la surveillance à l'intérieur de l'AMP avec la collaboration des pêcheurs.

On peut par ailleurs souligner l'existence d'initiatives intéressantes qui, dans le cadre du RAMPAO, incitent les gouvernements à favoriser la concertation entre les ministères chargés des pêches, ceux chargés de l'environnement, la recherche, les usagers et les partenaires gouvernementaux et non gouvernementaux. Le Secrétariat du RAMPAO est principalement soutenu par la FIBA, mais les études et les activités sur le terrain impliquent différentes ONG de conservation (UICN, WWF, Wetlands International, etc.). Les documents du RAMPAO (par exemple les stratégies régionales) sont par exemple cosignés par les ministères de l'environnement et de la pêche. Le RAMPAO constitue ainsi aujourd'hui l'un des rares forums permettant d'échanger et de promouvoir les actions de collaboration pour le processus de développement des AMP.

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

5.1 Impacts des AMP sur l'aménagement des pêches

Il est très difficile d'apprécier l'impact des AMP sur l'aménagement des pêches, d'une part en raison de la jeunesse du réseau d'AMP (la majorité d'entre elles sont en outre encore en cours de mise en place), et d'autre part compte tenu de la faiblesse des mécanismes de suivi des impacts. En ce qui concerne le suivi de l'impact, seule l'AMP du Bamboung fait en effet l'objet d'un suivi scientifique avec l'appui de l'Institut français de recherche pour le développement (IRD). Ce suivi, qui a démarré en 2004, a mis l'accent jusqu'à présent sur l'évolution du peuplement piscicole dans le bolong suite à la fermeture de la pêche. Ce manque de données sur l'impact avéré des AMP en matière d'aménagement constitue un frein à l'émergence d'un véritable dialogue entre le MinPêche et le MinEnv.

La genèse des AMP au Sénégal montre par ailleurs qu'une faible attention a été accordée au choix des sites par rapport au fonctionnement des écosystèmes. L'AMP de Kayar se situe par exemple dans une zone ne présentant pas d'intérêt particulier sur le plan écosystémique compte tenu notamment de l'étroitesse du plateau continental à ce niveau de la côte. Le choix de ce site est avant tout dû à des considérations sociopolitiques liées à l'histoire récente de la pêche dans cette zone. C'est en effet au niveau de Kayar que des initiatives communautaires visant à réguler l'accès aux ressources ont commencé à se développer dès la fin des années 90 (par exemple avec l'organisation des sorties des senneurs pour éviter une saturation du marché des petits

pélagiques ou avec l'institution de règles permettant de limiter les conflits d'usage entre les engins passifs et les engins actifs). Ces initiatives, soutenues par les pouvoirs publics et les collectivités locales devaient reposer sur un cadre formel que le statut d'AMP se propose aujourd'hui d'offrir.

Les autres AMP de création récente localisées au niveau de la Petite Côte se situent dans des zones plus sensibles sur le plan écologique. Mais le critère de la taille prend surtout en compte les considérations administratives et il est ainsi davantage question de découpage territorial (domaine des collectivités locales) et de capacité de l'administration à organiser son action au niveau d'unités de gestion d'une taille raisonnable que de considérations écologiques.

Pourtant, malgré le manque de recul, on peut penser que les AMP pourront réaliser le principe d'une meilleure régulation de l'accès aux ressources côtières en tant qu'espaces dans lesquels des règles de gestion pourront être élaborées et mises en œuvre en étroite concertation avec les communautés (CLP ou CLPA). Dans le contexte actuel de libre accès pour la pêche artisanale, les AMP pourraient par conséquent contribuer à une meilleure gestion des pêches. L'impact réel ne pourra être toutefois apprécié que lorsque des contrats de type concessions auront pu être passés entre l'administration et des groupes de pêcheurs. Ces contrats devront comporter un cahier des charges minimal à respecter pour assurer, entre autres, la préservation de milieux sensibles.

D'autres mécanismes devront en outre être mis en œuvre en dehors des AMP pour assurer une gestion rationnelle des capacités de pêche (y compris pour éliminer les surcapacités) et une régulation de l'accès aux ressources côtières. Des actions isolées au sein des AMP ont en effet peu de chances d'avoir un impact significatif à l'échelle de l'ensemble des écosystèmes, dans la mesure où la mise en place de régimes d'accès limité dans les AMP se traduira inévitablement par un report de la capacité de pêche (notamment celle des pêcheurs migrants) dans les zones de pêche adjacentes aux AMP qui sont déjà fortement surexploitées.

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

En raison de la longue tradition de libre accès aux ressources et des fortes pressions sociales exercées sur le littoral de la part des pêcheurs migrants, il est fort probable que le processus de développement des AMP, qui repose sur une privatisation de l'espace littoral au bénéfice d'une communauté résidente, pourrait se traduire par l'apparition de situations conflictuelles avec les pêcheurs migrants.

Une autre conséquence prévisible est que les coûts de surveillance des AMP devraient s'avérer très élevés dans un contexte où le dispositif de surveillance de la zone côtière déployé par la DPSP est aujourd'hui minime. Dans ces conditions, deux possibilités pourraient apparaître. Elles offrent chacune des avantages et des inconvénients. La première serait de promouvoir des systèmes de surveillance impliquant les pêcheurs (par exemple des brigades de surveillance participative), avec tous les risques de dérive que cela peut entraîner sur le plan de l'ordre public. La deuxième serait de s'appuyer sur la présence du conservateur détaché par la DPN. Mais cela implique la formalisation d'arrangements institutionnels que le contexte actuel ne permet pas vu que la surveillance en mer ne relève pas de la compétence du MinEnv. Par ailleurs, les coûts liés à la surveillance des AMP devraient être élevés dans les deux cas, pour des bénéfices encore difficiles à évaluer, ce qui constitue un problème de la première importance.

Le choix des sites des AMP, évoqué précédemment, ramène à la question de la pertinence des sites du point de vue de la gestion écosystémique. Il semble en effet que la configuration actuelle du réseau des AMP au Sénégal ne reflète ni le fonctionnement global des écosystèmes marins et côtiers ni la nécessité de considérer que les ressources halieutiques font partie d'un continuum à l'échelle du pays, voire de la sous-région. On peut par ailleurs noter que, hormis le cas de l'AMP du Bamboung dont les délimitations correspondent à une certaine logique écosystémique puisqu'elles

englobent l'ensemble d'un bolong, les autres AMP correspondent en fait à des portions du littoral, d'une taille par ailleurs limitée, qui ne correspond pas réellement à une entité écologique clairement identifiée. Le réseau d'AMP au Sénégal est en fait constitué de la juxtaposition de plusieurs espaces côtiers soumis à des règles de gestion spécifiques, sans interrelation évidente entre eux du point de vue écosystémique.

Le système de suivi de l'AMP du Bamboung développé par l'IRD a montré que l'AMP a eu un impact important sur la composition du peuplement piscicole[16]. Le changement majeur survenu suite à la fermeture de la pêche dans l'AMP réside en fait dans la modification de la structure trophique, avec l'augmentation du pourcentage de prédateurs. L'impact de l'AMP sur les zones adjacentes qui sont en régime de libre accès, et de manière générale sur la productivité des écosystèmes aquatiques dont l'AMP fait partie (par exemple le recrutement de certaines espèces), n'a pour le moment pas encore été suffisamment étudié. Le système de suivi mis en place jusqu'à présent ne permet pas de mesurer l'impact socioéconomique. Aussi est-il difficile d'apprécier de manière objective si les populations directement concernées par l'utilisation du bolong (6 des 14 villages membres du comité de gestion) se retrouvent dans une situation plus ou au moins identique à celle qui prévalait avant la création de l'AMP. Avant la création de l'AMP, l'économie locale dépendait en effet en grande partie des retombées directes ou indirectes liées à la pêche (accueil des pêcheurs migrants, commerce, exploitation des huîtres). Aujourd'hui les activités génératrices de revenus proviennent essentiellement de l'écotourisme (une vingtaine d'emplois directs ont été créés au niveau du campement).

5.3 Rôle des sciences naturelles et des sciences sociales

Le CRODT est régulièrement associé aux initiatives menées par les ONG ou l'administration des pêches en soutien au processus de création et de gestion des AMP. Le CRODT intervient sur le choix des sites du point de vue bioécologique et sur la mise en place de systèmes de suivi biologique et socioéconomique. Mais cela se fait au cas par cas, en ce sens que le CRODT ne dispose pas encore de programme de recherche régulier sur la question des AMP. Le CRODT participe aussi aux travaux du RAMPAO en appui à la mise en place d'un réseau des AMP.

Par ailleurs, le CRODT figure parmi les quatre équipes de recherche d'Afrique de l'Ouest mobilisées dans le cadre du projet AMPHORE (AMP et gestion halieutique par optimisation des ressources et des écosystèmes), qui est un programme de recherches financé par le programme Biodiversité de 2007 de l'Agence nationale de la recherche française. Le projet AMPHORE porte sur l'étude d'AMP situées en France, en Mauritanie (AMP du Parc national du banc d'Arguin) et au Sénégal (AMP du Bamboung). Il vise à définir des indicateurs qui aident la gestion écosystémique des AMP, à analyser les mécanismes de la gouvernance des AMP et à tester l'efficacité et l'impact des AMP.

On a vu précédemment que l'IRD était intervenu au niveau du suivi scientifique de l'AMP du Bamboung, sur financement du FFEM. Les résultats des recherches ont servi à étayer l'hypothèse que les AMP ont effectivement un impact sur la biodiversité (en servant de zone refuge) et sur la structure des peuplements piscicoles. On peut penser dans le cas présent que la recherche a contribué, et contribue encore, au processus de développement de l'AMP en validant l'hypothèse du bien-fondé des AMP sur le plan de la préservation de la biodiversité. Le domaine d'investigations scientifiques devrait toutefois aussi englober les sciences sociales, de manière à mesurer l'impact de l'AMP

[16] Lors de la réalisation de l'état de référence en 2003, 51 espèces de poissons avaient été recensées lors de pêches expérimentales. Trois ans après la création de l'AMP, les principaux résultats issus des campagnes de pêche expérimentale (les dernières ont eu lieu en 2007) ont été les suivants: 23 nouvelles espèces capturées, dont le thiof, diminution du nombre et de la biomasse des espèces de taille moyenne (tilapias, mulets, ethmaloses, etc.), augmentation de la proportion d'individus de petite taille et de grande taille, augmentation de la biomasse moyenne et réapparition de grands prédateurs (par exemple le requin-taureau et les barracudas).

sur les dynamiques socioéconomiques et sur le bien-être des populations, et élargir le champ de l'étude du rôle de l'AMP à l'échelle des écosystèmes du Delta du Saloum.

6. PERSPECTIVES

6.1 Intégration des AMP dans les politiques plus globales de gestion écosystémique des ressources marines et côtières

Le processus de planification côtière est peu avancé au Sénégal alors des besoins urgents se font sentir en la matière compte tenu des conflits d'usage sur la majeure partie du littoral entre l'industrie, l'urbanisme, le tourisme, la pêche et l'environnement pour ne citer que les plus importants. À titre d'exemple, on estime que le tourisme (le deuxième secteur économique après la pêche aujourd'hui) a multiplié sa capacité d'accueil par cinq et son chiffre d'affaires par dix entre 1974 et 1994. La pression exercée par la pêche artisanale sur le littoral peut être évoquée quant à elle à partir de la comparaison d'indicateurs simples entre le Sénégal et la Mauritanie: 12 000 pirogues de pêche artisanale pour 700 km de côtes au Sénégal, 4 000 pirogues pour également 700 km de côtes en Mauritanie. La pêche est en outre le principal pourvoyeur d'emplois sur le littoral avec de nombreux emplois induits à terre. Ce secteur représente en effet près de 600 000 emplois directs et indirects.

Au-delà des conflits d'ordre institutionnel qu'elle génère actuellement, la question des AMP au Sénégal pourrait favoriser une meilleure prise de conscience de la nécessité de promouvoir une gestion intégrée de la zone côtière qui soit respectueuse de la préservation des milieux marins et côtiers, qui tienne compte des différents usages et qui privilégie l'intérêt commun en termes économiques, sociaux et environnementaux. Dans cette perspective, les AMP constituent peut-être une étape intermédiaire et complémentaire par rapport à d'autres initiatives promues par l'administration centrale et les collectivités locales, en vue d'une gestion intégrée et durable de la zone côtière.

Si le processus de planification côtière est peu avancé au niveau national, on remarque que les collectivités locales disposent de prérogatives importantes en matière d'aménagement du littoral relevant de leur juridiction, y compris en matière de création d'AMP. Dans un contexte où la cohérence du point de vue écosystémique ne constitue peut-être pas la priorité pour les collectivités locales au moment de la création d'une AMP (parce que d'autres considérations de politique locale sont susceptibles de primer dans la décision), n'y a-t-il pas un risque pour certaines AMP de passer à côté de leur vocation qui est de contribuer à la préservation de la biodiversité? Aussi conviendrait-il, afin de prévenir d'éventuelles dérives, de clarifier dès que possible la notion de réseau d'AMP en privilégiant la dimension écosystémique et d'élaborer en parallèle un cadre d'orientation générale à l'attention des collectivités locales pour la création et le développement des AMP.

Un autre enseignement de l'étude de cas au Sénégal est que les partenaires au développement, bailleurs et ONG, influencent fortement le processus des AMP. Dans de nombreux cas, ceux-ci se substituent de fait à l'administration en raison de la disproportion des moyens mis à disposition pour les projets par rapport aux moyens de fonctionnement financés par le budget de l'État. Il est également notoire que les projets emploient des ressources humaines précieuses non seulement au niveau de l'administration, mais aussi de la recherche, ce qui accentue encore le déséquilibre entre, d'un côté, les projets et les ONG et, de l'autre, l'administration. Cette situation est peu propice à la mise en place d'un réseau cohérent des AMP dont le processus devrait être piloté par l'administration sur la base de considérations scientifiques. Or, en l'absence de cadre de planification côtière à l'échelle du pays, voire de la sous-région, le processus de création des AMP pourrait relever encore trop souvent de logiques opportunistes sur certaines portions du littoral, sans qu'une attention suffisante soit consacrée au bien-fondé du projet sur le plan écologique, de la connectivité entre les AMP et de la cohérence d'ensemble du réseau d'AMP.

6.2 Développement de la concertation pour la création et la gestion des AMP

En l'absence de certitudes scientifiques sur le rôle des AMP dans l'aménagement des pêches, dans la préservation de la biodiversité et dans le développement humain et social des populations, et aussi compte tenu du flou juridique et institutionnel concernant la responsabilité de la gestion des AMP, le climat actuel est peu propice à la concertation. Chacun des acteurs clés, que ce soit l'administration ou les ONG, développe des stratégies personnelles, souvent par opportunisme suivant les enjeux financiers associés, sans réellement prendre en compte la nécessité d'ancrer le processus des AMP dans une vision concertée et intégrée. Aussi semble-t-il, au vu de la situation actuelle, que l'on ne se situe pas dans des logiques de recherche de situation gagnant/gagnant entre les différents protagonistes. Dans ce contexte, le développement de la concertation constitue l'un des principaux enjeux dans le processus de développement des AMP.

Pourtant, des mécanismes visant au renforcement de la concertation existent aujourd'hui, du moins en théorie. Il s'agit notamment du Comité technique interministériel chargé de la gestion des AMP, voire de l'Agence nationale sur les aires communautaires du MinPêche. L'activation de ces mécanismes devrait constituer une priorité dans les années à venir avec, à terme, la perspective de mettre en place des mécanismes officiels de concertation et de collaboration entre le MinPêche, le MinEnv et la société civile sur la base de relations contractuelles, dans un souci non seulement d'échange des savoirs et des enseignements mais aussi de rationalisation des dépenses et de mutualisation de certains coûts liés à la gestion des AMP.

Une autre priorité pourrait consister à élaborer une typologie des AMP en fonction de leur vocation (conservation ou aménagement des pêches) et de préciser, en fonction du type d'AMP, quel est le statut juridique le plus approprié et quel est le chef de file le plus indiqué pour animer la concertation dans le cadre du Comité technique interministériel. À titre indicatif, si l'objectif d'une AMP est de protéger des espaces sensibles et d'y interdire la pêche, le plus pertinent serait alors de confier le leadership de la gestion de cette AMP au MinEnv sur la base de considérations scientifiques dûment justifiées, à l'instar de la gestion des réserves naturelles. S'il s'agit de mettre en place des règles spécifiques en matière d'accès aux ressources et de gestion des pêches dans une AMP sur la base de considérations bioécologiques et socioéconomiques, le plus pertinent serait par contre de confier le leadership de la gestion de cette AMP au MinPêche.

Enfin, il semble que l'un des principaux enjeux liés à la concertation dans le cas des AMP serait de clarifier le cadre juridique pour la gestion des AMP. Le flou juridique actuel constitue en effet d'une part un réel frein au développement des AMP et empêche d'autre part l'établissement de relations de concertation et de collaboration entre le MinPêche et le MinEnv. Tant que les questions ayant trait à la nature et aux modalités de gestion des AMP resteront en suspens, il est de fait fort probable que les stratégies individuelles primeront au détriment de l'intérêt général. Dans le même ordre d'idée, il serait important de veiller à ce que les modalités de gestion donnent une importance particulière à la mise en place de mécanismes de concertation car la réussite des AMP dépendra aussi de la capacité des gestionnaires à mettre en place des systèmes de gestion intégrée capables de transcender les clivages sectoriels traditionnels.

D'autres domaines techniques relatifs à la gestion des AMP nécessiteront par ailleurs la mise en place de cadres de concertation formels. À cet égard, il paraît important de mettre en place un cadre de concertation et de coordination entre la DPSP et la DPN afin de rationaliser le dispositif de surveillance des AMP et de dégager des synergies entre les deux institutions.

6.3 Pertinence de l'AMP pêche en tant que mesure technique de l'aménagement

Les AMP sont perçues par le MinPêche comme des outils de l'aménagement. Au-delà des incertitudes concernant les retombées positives réelles des AMP sur la durabilité des ressources, il convient de reconnaître que les coûts associés à la création et à la

gestion des AMP sont importants: coûts institutionnels (mécanismes de cogestion, surveillance, recherche), coûts politiques (arbitrages avec le MinEnv) et coûts sociaux (par exemple les risques de conflits d'accès avec les pêcheurs migrants). Sur cette base, on peut se demander si, du point de vue des politiques publiques, il convient de mobiliser autant de fonds provenant de l'aide publique au développement en faveur du développement des AMP, comme cela semble être le cas aujourd'hui, que pour le renforcement du dispositif global d'aménagement des pêches (contrôle des capacités, plans d'aménagement, surveillance côtière, etc.)?

L'AMP ne peut en aucun cas constituer un palliatif aux problèmes de gouvernance actuelle des pêches en zone côtière (dérégulation des marchés, développement incontrôlé des capacités de la pêche artisanale, dégradation des ressources, faible régulation de l'accès aux ressources, etc.). En revanche, l'AMP peut constituer une mesure technique complémentaire à un dispositif renforcé d'aménagement des pêches dans des zones dites «protégées» en rendant concret le principe mise en œuvre de règles de gestion plus contraignantes que ce que prévoient les textes sur la pêche, au bénéfice des habitats côtiers et des ressources halieutiques.

Ces AMP seront par ailleurs d'autant plus efficaces qu'elles prendront en compte la dimension écosystémique de l'aménagement. Si on considère les coûts importants associés à la création et à la gestion des AMP, la promotion des AMP situées dans des zones particulièrement stratégiques pour des raisons bioécologiques et/ou socio-économiques devrait être une priorité. La délimitation précise de celles-ci devrait reposer sur des fondements scientifiques ou sur des intuitions étayées par des expertises objectives.

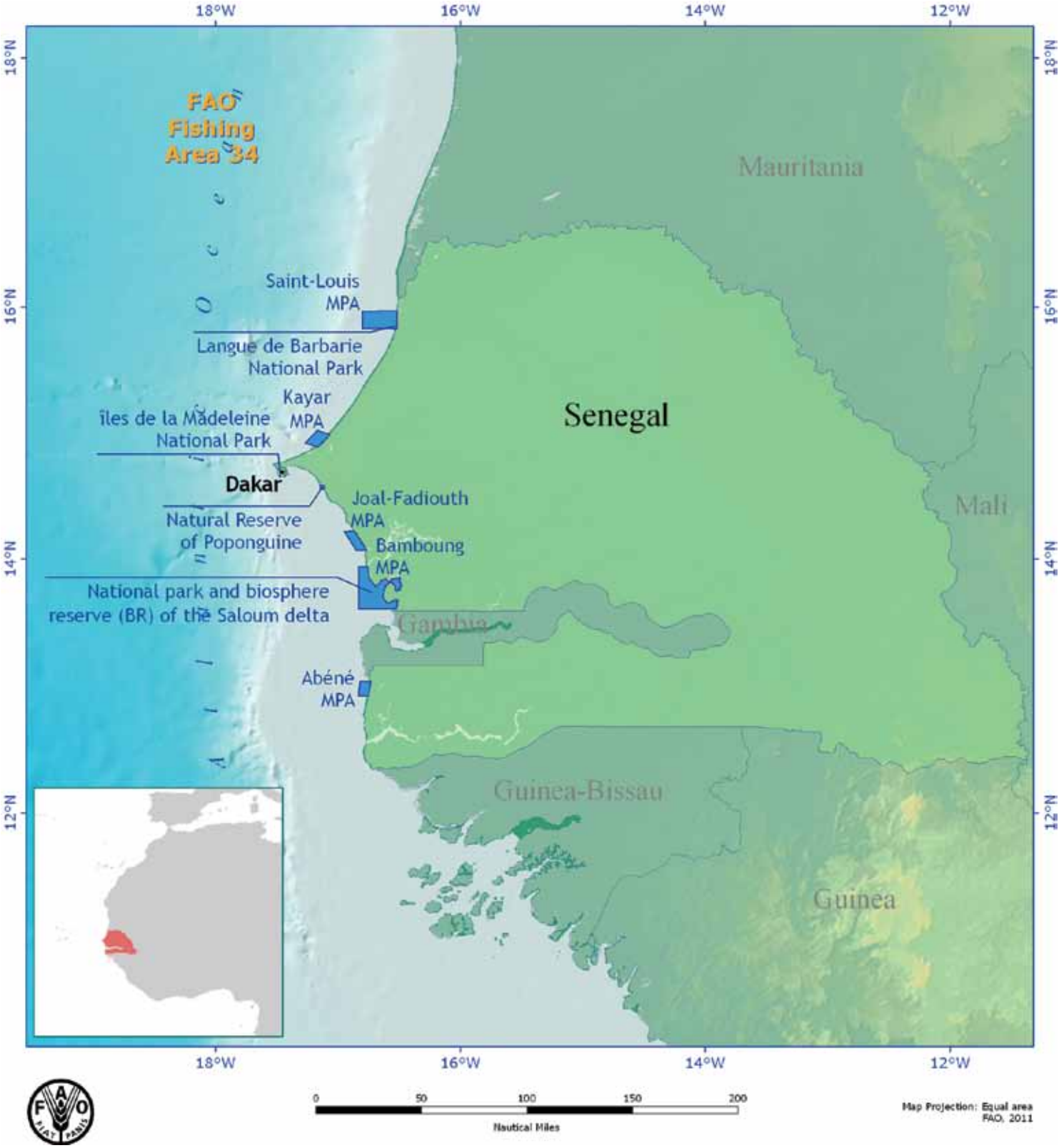
6.4 Développement des AMP pêche dans un processus plus global de renforcement du dispositif de gestion de la pêche en zone côtière

De nombreux problèmes demeurent en qui concerne la régulation de l'accès à la ressource, notamment pour la pêche artisanale, et l'application de la réglementation sur la pêche malgré les initiatives du MinPêche qui, depuis le début des années 2000, cherchent à améliorer la situation (immatriculation, permis de pêche artisanale, réflexions sur les systèmes de concession de droits d'accès, sur les plan de gestion des capacités, etc.) Les freins au changement sont toutefois nombreux en raison de l'importance des enjeux et des coûts sociaux et politiques associés à certaines mesures de l'aménagement concernant la pêche artisanale. Cependant, en l'absence de décisions courageuses, il est à redouter un enlisement de la situation avec une dégradation accentuée des ressources halieutiques. Dans cette éventualité, les AMP pourraient être de moins en moins en mesure d'apporter des compléments de réponse aux problèmes de la gestion des pêches et, à terme, se résumer à des sanctuaires destinés à protéger certains milieux particulièrement sensibles sur le plan écologique.

Autrement dit, la question des AMP devrait s'inscrire dans le cadre d'une politique plus globale de renforcement ou de réforme du système de gestion de la pêche artisanale (plans d'aménagement des pêcheries, plans de gestion des capacités, application effective de la réglementation sur les pêches, etc.), de changement des mentalités au sein des populations de pêcheurs (via la sensibilisation notamment) et de promotion de politiques ambitieuses de développement économique sur le littoral pour offrir des alternatives d'emplois à ceux qui sont prêts à abandonner cette activité.

Le développement d'AMP pêche consacrant le principe de la cogestion au sein de sous-unités de gestion, suffisamment cohérentes sur le plan bioécologique et/ou socio-économique, pour appuyer la mise en œuvre des plans d'aménagement des pêcheries, pourrait effectivement s'avérer très pertinent. Là encore, le concept d'AMP pourrait constituer une étape en vue de l'instauration de modes de gouvernance plus adaptés, reposant sur la participation active des usagers concernés par la gestion durable des écosystèmes côtiers et marins. Le concept d'AMP constitue en effet sans conteste une alternative à l'approche centralisée qui a caractérisé les modes de gestion des pêches au Sénégal et qui a montré ses limites dans l'application des mesures d'aménagement.

Map 1
Map of Senegal and FAO Fishing Areas



Senegal

Translated from the original French.

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1. INTRODUCTION

Senegal is a country with a strong fisheries tradition, characterized, in particular, by a significant artisanal sector that continues to be driven by development processes despite a scarcity of resources that has been observed for many years. Strategies implemented by artisanal fishers have included lengthening fishing trips, taking ever-greater risks in order to broaden fishing range, using less and less selective fishing gear, and, for some of them, migrating to neighbouring countries (in particular, Guinea-Bissau and Mauritania). However, such strategies have reached their limits given the natural limits of the fish resources in Senegalese waters and the strengthening of management systems in the subregion, which makes it increasingly difficult to export Senegalese artisanal fishing overcapacity to neighbouring countries. The alarming state of many coastal fish stocks, the advanced degradation of some coastal ecosystems and the emergence of a profound fisheries crisis have, since the beginning of the 2000s, resulted in the public authorities and civil society, in particular national and international conservation non-governmental organizations (NGOs), acting to preserve the integrity of marine and coastal ecosystems.

Initially, the fisheries authorities focused on actions aiming to regulate access to resources, control fishing capacity and strengthen technical fisheries management measures through, incidentally, the promotion of a centralized approach. For their part and in line with their mandate, the authorities in charge of the environment, with the support of conservation NGOs, favoured actions towards classifying sensitive coastal environments with a view to restoring biodiversity. Given the results of so-called classical and overcentralized fisheries management policies and in the wake of the recommendations of the Johannesburg World Summit on Sustainable Development, the fisheries authorities, with the support of development partners, committed themselves from the end of 2004 to actions for the creation and the development of a network of marine protected areas (MPAs) for fisheries management purposes.

Gradually, the issue of MPAs has become a part of all discussions concerning the sustainable management of marine and coastal environments and of fishing in Senegal, often under the impetus of development partners. The creation and development of MPAs, which are supposed to bring numerous answers to fisheries management problems, especially in coastal zones, have thus become a primary challenge for both the fisheries and the environment authorities.

In practice, however, Senegal is still in the initial stages of MPA development, so that very few lessons can be learned about MPA management methods and their impact on fisheries management. Furthermore, their purpose lacks clarity, and the imprecision in the legal and institutional framework for their management has resulted in numerous conflicts over competency, leading to strategies where actors often lack a common line of action and favour different approaches depending on the donor agency. Monitoring systems for MPAs are also very basic while competencies and information concerning the MPA process tend to be dispersed. In this context, and also because of the lack

of the perspective necessary for the evaluation of approaches, it seems difficult to draw lessons and insights on the governance of MPAs and their role as a fisheries management tool.

However, Senegal is an interesting case study for other aspects directly or indirectly related to the issue of MPAs. This case study gives, in particular, numerous insights into the process of MPA creation for the purposes of biodiversity conservation and of resource access regulation in artisanal fisheries, highlighting the need to involve communities closely. It also shows how the MPA issue can stimulate the process of fisheries governance reform by putting two aspects at the heart of the sectoral policy: first, the identification of small-sized management units along the coast where territorial coherence and social cohesion are as important as bioecological considerations; and second, the sharing and transfer of fisheries management responsibilities in these areas between the authorities and the user groups (which means that comanagement tends to become the preferred governance system in the case of artisanal fisheries).

The term MPA may seem inappropriate in some cases in the Senegalese context. However, it always contributes to efforts made to improve resource access regulation in the coastal zones for the benefit of both fishing and the ecosystems. At what price? And for what level of impact, if it is accepted that scientific hypotheses about the role of MPAs in the restoration of overexploited stocks have not yet been confirmed and that one consequence could be an increase in fishing pressure and conflicts in the coastal zones that are not part of an MPA? It is still too early to say. The answer may also depend on the capacity of the authorities to reform the fisheries management system as a whole, as currently the MPA is simply a technical tool meant to facilitate the implementation of broader policies such as dealing with artisanal fisheries overcapacity and promoting fisheries management plans on the basis of ecosystem considerations.

2. FISHERIES MANAGEMENT

2.1 Current situation

Senegal has an exclusive economic zone (EEZ) of about 200 000 km^2 for a coastline about 700 km long. The Senegalese coast is characterized by a great diversity of environments with, in particular from the south of Dakar (Petite Côte, Saloum and Casamance), a very rich estuarine biodiversity.

Three main resource categories can be distinguished: coastal pelagic stocks (sardinellas and horse mackerels), coastal demersal stocks (demersal fish, cephalopods and coastal shrimps), and deep demersal stocks (hakes and deep-water shrimps). Total fisheries production fluctuates around 380 000 tonnes per annum, of which 300 000 tonnes are caught by artisanal fishers and 80 000 tonnes by industrial fishers.

Unlike coastal pelagic stocks, deep-water demersal stocks and a few coastal demersal stocks that are considered to be reasonably or fully exploited, coastal demersal stocks are generally overexploited. The scientific recommendations of the Centre de recherches océanographiques de Dakar Thiaroye (Dakar Thiaroye Oceanographic Research Centre [CRODT]) concerning coastal demersal stocks are at best to freeze effort, and for most demersal fish (Sparidae and Sciaenenidae in particular) to reduce fishing effort. Moreover, other indicators reveal a worrying situation as regards the state of coastal stocks: the average size of the fish harvested is decreasing, catch rates are falling, and biomass is decreasing. This worrying state of coastal demersal stocks results from the combination of ineffective fisheries management systems (lack of control over capacity and resource access in artisanal fisheries, poorly implemented regulations, etc.) and the absence of a responsible fishing culture on the part of numerous actors, in particular migrant artisanal fishers.

The industrial fleet targets demersal or pelagic species using trawl, seine, hook and line and longline. In 2003, the active national trawler fleet was estimated to comprise 122 vessels: 77 freezer trawlers (including 36 shrimp vessels) and 45 wet-fish (fresh fish)

trawlers (including one shrimp vessel) (sourced from working documents from the FAO/TCP/SEN/2909 project). According to this source, some 100 foreign trawlers operated in the Senegal EEZ in 2002. However, it should be noted that the 2002–06 fishing agreement protocol between Senegal and the European Union expired on 30 June 2006 and has not been renewed.

The national industrial fleet is characterized by its great mobility (including occasional temporary trips to neighbouring countries) and by somewhat outdated vessels that are more than 25 years old on average. A group of six species (white shrimp, deep-water shrimp, octopus, sole, cuttlefish and red mullet) represent about 40 percent of the landings by weight and 75 percent of their value.

Artisanal fisheries grew exponentially between the 1950s and the end of the 1990s. Since 1999, artisanal catches of demersal resources have exceeded those of the national industrial fishery. Moreover, in the last 20 years, artisanal fishing effort (measured in number of trips) has risen continuously while industrial fishing effort (measured in number of days at sea) has been relatively stable. There are three areas with high concentrations of artisanal fishing: off the coast of Saint-Louis and of Dakar and offshore in a zone from Mbour to Saloum (Petite Côte).

There are currently some 12 000 artisanal canoes.[1] Canoe length is relatively homogeneous according to the marine zone and varies between 9 and 10 m, although purse seine canoes are from 14 to 19 m long. About 75 percent of the canoes are motorized. More than 98 percent of the Senegalese canoe fleet is owned by Senegalese nationals, and 90 percent of the fishing captains fish in Senegalese waters. The fishing gear used is very diverse and includes beach seines, gillnets, purse seines, handlines, fishing baskets, and pots. According to the ministry in charge of fisheries – the Ministry for Maritime Economy, Maritime Transport, Fisheries and Aquaculture (MinFish) – total artisanal catches have levelled off since 2000, despite an increase in small pelagic landings and a constant decline in catch per unit of effort.

The marine fisheries sector plays a very significant economic and social role in Senegal. Some key figures for the sector in 2006 were: 1.4 percent of national gross domestic product (GDP); CFA francs 123.5 billion (about €188 million, or about USD 240 million) landed value for a catch volume of 373 000 tonnes; CFA francs 154.2 billion (about €235 million, or about USD 300 million) export value; and 60 000 direct and indirect jobs. Consequently, the fisheries sector plays a key role in the national economy for the trade balance (37 percent of export value in the period 1997–2002), food security, employment and livelihood provision for a large part of the coastal population.

The fisheries sector is currently going through a major crisis, in particular in relation to the decline in fish resources, which could have very serious implications. The Presidential Council on fishing, held in March 2008, concluded that the crisis could threaten the survival of fishing communities, compromise fish supply for the population and the fishing industry, and, more generally, affect the contribution of the sector to economic growth, poverty reduction efforts and job protection.

In January 2004, round tables were organized to bring together all fisheries actors (administrative officials, professional organizations, NGOs and sectoral donor agencies). These round tables marked a turning point in fisheries policy as they prioritized resource management. For example, it was requested that the State and donor agencies prioritize their action programmes around the following two strategic themes: (i) dealing with issues relating to reducing overcapacity, controlling access to resources, controlling fishing effort and strengthening the degree of responsibility of fishers; and (ii) developing public policies aiming to "place the fisher at the heart of the reform".

[1] See report of the latest national Senegalese artisanal maritime fisheries census carried out by the CRODT and the Senegalese Institute for Research in Agriculture (ISRA) in 2006.

A "fisheries and aquaculture sectoral policy note" (LPS-PA) was prepared in 2007 by the MinFish. One strategic axis of this policy document targets "the sustainable management and the restoration of fish resources and their habitat". This strategic axis is divided into the following subaxes:

- control and management of marine fishing capacity (adjust marine fishing capacity, register canoes, strengthen the national register of fishing vessels, develop a national fishing capacity management plan);
- control of access to fish resources (artisanal fisheries licence, concession system for access rights to fish resources);
- development of fisheries management plans;
- promotion of a policy for the conservation of marine habitat and resources within the framework of integrated coastal zone management (immersion of artificial reefs, creation of a network of MPAs);
- strengthening and adaptation of fisheries research;
- optimization of resources for fisheries monitoring, control and surveillance.

2.2 Management framework and instruments

The current general fisheries management framework is based on Law No. 98-32 of 14 April 1998, establishing the Maritime Fisheries Code and its implementing decree (Decree No. 98/498 of 10 June 1998). In accordance with the law, "the fish resources of the waters under Senegalese jurisdiction constitute a national heritage". Fishing rights belong to the State, which can exercise its authority through granting a licence for industrial fishing and, since 2005, a licence for artisanal fishing.

The decree implementing the law specifies the main rules concerning access to resources and the technical management measures. It also covers the National Consultative Council for Marine Fisheries and Local Artisanal Fisheries Councils (CLPA) that can be established by statutory instrument (arrêté).

The current management system is based on the search for a fishing effort consistent with stock renewal capacities in accordance with research results and recommendations. In the case of industrial fisheries, this system is applied partly by limiting the number of licences. A measure was implemented recently to freeze the number of coastal demersal fishing licences in line with research recommendations. As regards artisanal fishing, no particular measure aiming to regulate fishing effort exists. Since 2005, the access to resources for artisanal fishers is, in theory, no longer free following the introduction of a fishing licence system.

Until now, the management systems implemented in Senegal have tended to be of a centralized nature. In recent years, comanagement has been increasingly encouraged by the fisheries authorities, with the support of different partners (e.g. French cooperation entities for the development of concession systems for access rights, the World Bank within the framework of the Integrated Marine and Coastal Resources Management Project (GIRMAC)[2], and Japan for the implementation of pilot measures in Nianing including artificial reefs and biological rest periods). The recommended approach is to promote community initiatives and to guide their achievement through specific expert assistance, research activities, and support and advice.

The LPS-PA introduces the concept of comanagement and recommends an approach aiming to define management units based on territorial considerations and to promote contractual relationships between the authorities and the communities for the management of these areas through contractualized concessions. This notion of territorialization, and of the introduction of rules that are differentiated by management unit and developed and implemented in close collaboration with the communities, is similar to the notion of MPA in the Senegalese context, as is shown below.

[2] "Fishing" component of the Integrated Marine and Coastal Resources Management Project (GIRMAC).

For the authorities, the basic community is represented by the local fisheries council (LFC). The LFC is an entity legally recognized as a fisher association. In the case where a management unit concerns several LFCs, the authorities plan to federate the LFCs within local artisanal fisheries councils (LAFCs) (joint bodies with representatives of the authorities, fishers and locally elected bodies, as well as dignitaries) with a view to establishing a local management plan. Local management plans are also intended to support the implementation of the fishery management plans that are being developed.

It must be stressed that the issue of the choice and the legitimacy of the basic community that will be the contact point for the authorities continues to be debated. The authorities, with the support of projects (e.g. the local governance project financed with Stabex [Système de Stabilisation des Recettes d'Exportation] funds and the GIRMAC project), promote the LFC level that emphasizes the notion of métier[3] and can include foreign fishers[4] in comanagement mechanisms. Trade unions grouped together within the CONIPAS (the national interprofessional council for artisanal fisheries in Senegal, which is an influential umbrella organization in Senegal) promote the LAFC level that better reflects the spirit of the Maritime Fisheries Code and decentralization.

The institutional organization intended to support comanagement should be specified within the framework of the ongoing revision of the Maritime Fisheries Code.

In recent years, there has tended to be innovation in the Senegalese fisheries management system with the development of the fisheries management plans foreseen by the law.[5] The management plans that are being prepared concern the following fisheries: coastal shrimp and cymbium (with the support of the World Bank within the framework of the GIRMAC project), octopus (with Stabex funds), and deep-water shrimp and hake (with the support of French cooperation entities).

Several types of technical measures intended to reduce the impact of fishing on exploited species and environments are foreseen by the decree implementing the Maritime Fisheries Code. These measures concern, in particular:

- the fishing gear (for example, banning of monofilament) and mesh size;
- the minimum size and weight of species, in order to take into account the size of species at maturity;
- zoning to protect sensitive areas against industrial trawling (forbidden in a zone 6–7 nautical miles, or 12–15 nautical miles from the coast, depending on vessel category). This coastal zone, protected from bottom trawling, is not exclusively set aside for artisanal fishing. For example, sardine vessels using pelagic trawling can operate up to 3 nautical miles from the coast;
- biological rest period.

The legal fisheries texts do not provide explicitly for measures aiming to preserve sensitive habitats such as MPAs. However, the promotion of MPAs as a management tool is increasingly encouraged by the fisheries authorities.

Surveillance is under the responsibility of the Directorate for Fisheries Protection and Surveillance (DPSP). The surveillance mechanism for industrial fisheries has been strengthened in recent years with the implementation of a vessel monitoring system.

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[3] A métier is a homogeneous subdivision, either of a fishery by vessel type, or of a fleet by voyage type.

[4] As an example, in some areas of the Saloum or Casamance, nearly all the fishers are residents but of foreign origin. In other fishing areas such as those located on the Petite Côte (e.g. in Mbour or Joal), the numbers of native and foreign fishers are more or less equal.

[5] According to the Maritime Fisheries Code, the term "fishery" relates to one or more assemblages of stocks and the operations based on them. These stocks are classified on the basis of geographical, economic, social, scientific, technical or recreational characteristics and can be considered as a unit for conservation and management purposes.

However, the DPSP still lacks sufficient sea-going resources (six surveillance vessels in all). If it had more, it could intervene more quickly and have a greater dissuasive effect on illegal fishing and, in particular, ensure compliance with zoning by trawlers. The surveillance resources for artisanal fisheries are largely inadequate for a number of reasons (logistic, economic, legal and also socio-political). It should be noted that, in some sites, the establishment of "brigades for the comanagement of surveillance" in coastal surveillance stations (ten in all distributed along the coast, e.g. in Kayar) has made it possible to reduce infractions significantly. However, DPSP missions concerning the coastal zone, and artisanal fisheries in general, focus mainly on safety at sea. As a result, regulations concerning fishing gear (e.g. the monofilament ban) and, to a lesser extent, the minimum size of catches are poorly implemented.

The main issues concerning fisheries management identified in the LSP-PA are:

- overexploitation and decline of the main demersal stocks with risk of collapse for some and full exploitation for others;
- an inadequate access regime to control artisanal fishing, leading to unchecked canoe fleet expansion;
- increasing conflicts between the different types of fishing in a context of worsening fish resource scarcity;
- continuous degradation of marine habitats and coastal zones owing to pollution and coastal erosion;
- weakness of the fisheries management system and, in particular, the absence of fisheries management plans;
- weak research capacities;
- limited effectiveness of the fisheries surveillance system.

2.3 Description of access systems

The rules governing fisheries access are specified in the 1998 decree implementing the Maritime Fisheries Code – complemented in 2005 by a provision concerning the introduction of a licence for artisanal fishing. The licence system functions in the case of industrial fisheries. It is based on the main fishing gear and the main target resource types (coastal demersals, deep demersals, coastal pelagics, deep pelagics). However, in the case of artisanal fisheries, effective implementation of the licence system is proving more difficult given the unpopularity of the measure and hindrances of a socio-political nature. Hence, access to the resources remains open and free for artisanal fishing.

At the same time, the Senegalese authorities are paying special attention to fishing overcapacity in both artisanal and industrial fisheries. For example, a national programme for the registration of canoes (12 000 canoes in all) has been under way for several years. A national programme for the adjustment of marine fishing capacities (PACM) is also in the process of being implemented. The PACM was initiated with the technical support of FAO in 2003.[6] It has been implemented since 2005–06 with financial support from the African Development Bank (AfDB).

Since the beginning of the 2000s, with the support of French cooperation entities and of the European Union, some initiatives have been undertaken concerning the development of systems for the concession of access rights to fish resources. A plan of action for the implementation of access right concessions was formulated in 2005 following several workshops. The way access right concessions are defined implies the notion of a contract between the State (owner of the resource) and a group of users (e.g. a group of fishers) for the exploitation of a given territory that is granted for the purpose of sustainable management or for fish resource conservation in conjunction with other uses (for example, tourism or recreational fishing) and according to precise

[6] The FAO/TCP/SEN/2909 project "Support to the development of a recovery programme for the fisheries and aquaculture sector" (PRSPA).

specifications. It is envisaged that territorial concessions for artisanal fishing should include mechanisms for capacity regulation and catch quotas.[7]

These different initiatives demonstrate that there is a political will to reform the resource access system, particularly in the case of artisanal fishing, in the context of an increasingly obvious fisheries crisis. However, this is a long, complex and sensitive process given the number, the dispersion and the mobility of artisanal fishing units and also given the fact that artisanal fishing is one of the sectors with the highest employment rate along the coast.

2.4 Description of fishing regulations related to spatial management measures

The only spatial management measure in force concerns zoning. In parallel, numerous initiatives aiming to promote spatial fisheries management (for example, access right concession or the establishment of fisheries MPAs with or without artificial reefs) are supported by the fisheries authorities, with the backing of different projects, in particular the GIRMAC[8] project, and/or of NGOs.

The aim of the regulation relating to zoning is the protection of spawning grounds and nurseries located along the coastline, the limitation of conflicts between different actors and the spatial allocation of resources according to the different categories of industrial fishing licences. Coastal demersal trawlers of less than 250 gross register tonnage (GRT), which constitute most of the national fleet, can operate beyond 6 nautical miles (on the Petite Côte, the limit is fixed at 7 nautical miles). The area that is inaccessible to these vessels is around 15 percent of the continental shelf area on the Petite Côte and 10 percent in Casamance.

However, a recent study on zoning undertaken by the CRODT and the ISRA[9] recommends that "given the poor state of the coastal demersal resource and in order to reduce the risks of conflicts, vessels of less than 250 GRT with an option for both fish and cephalopods should only operate beyond 10 nautical miles from the baseline all along the coast". This scientific study also specified that using other measures such as closed seasons and MPAs was to be encouraged, while reiterating that it would be in vain to attempt to regulate coastal demersal fisheries without having genuine control of artisanal fishing pressure.

The immersion of artificial reefs is another spatial management measure related to the issue of MPAs that has been of particular interest for several years.[10] A "national strategic plan for the immersion of artificial reefs" (PSNIRA) along the Senegalese coast was developed in 2006 by the Directorate of Maritime Fisheries of the MinFish. This strategy document was prepared on the basis of discussions involving all the actors concerned including the Senegalese Federation for Sport Fishing, which was a pioneer in the subject. An international conference on artificial reef management for fisheries management and the conservation of marine resources was organized in Dakar

[7] IDDRA. 2005. *Rapport final: Plan d'action pour la mise en œuvre des concessions de droits d'accès aux ressources halieutiques de la ZEE du Sénégal.* Ref. IDDRA/EU/R003.

[8] In this respect, it should be noted that a complementary project to the GIRMAC project, the GIRMAC+ project, is currently being prepared within the framework of the Strategic Partnership for African Fisheries, supported by the World Bank and by the Global Environment Facility (GEF). This large-scale project from a financial viewpoint should focus on the development of comanagement and strengthening the national MPA network as a sustainable fisheries management tool.

[9] A. Samb et *al.* 2007. *Impacts de la législation sur la ressource et les systèmes de pêche*. CRODT/ISRA.

[10] Of the various achievements, two are often cited as examples: the Yenne experience, referring to the construction of an artisanal artificial reef entirely developed, installed and controlled by the MPA fisheries management committee; and Nianing, in reference to the development of a management system for octopus resources (habitats – nurseries in the form of pots). Cf. also C. Senne and K. Sane. 2008. *Programme d'immersion de récifs artificiels pour une gestion durable des pêches au Sénégal*. Ministry for Maritime Economy and International Maritime Transport/GIRMAC project.

in November 2008. The aim of this conference was to strengthen the implementation of the strategic plan, to promote discussions between the various national and international actors concerned, and to ensure the definition of a regulation and scientific monitoring framework adapted to the national context.

3. CURRENT SITUATION CONCERNING THE CREATION AND THE MANAGEMENT OF MPAs

3.1 Terminology, main objectives and general description of MPAs

In Senegal, the meaning given to the notion of MPA continues to be the subject of much debate depending on the objective of the MPAs, their origin, the legal status that characterizes them, the institutions that back them and the approach used to develop them. In accordance with the Senegalese legal framework (legal precedent set by the Presidential Decree No. 2004-2460 of 17/11/04), the role assigned to MPAs is of "protection, on a scientific basis, of important natural and cultural resources of representative marine environment ecosystems for the benefit of present and future generations".

Over and above this generic role conferred by the 2004 Presidential Decree, two permanent features characterize MPAs in Senegal. The first one is that the purpose of MPAs is to contribute to the maintenance of marine and coastal biodiversity. The second one is that an MPA implies an approach that seeks to define a management unit of particular interest, on the basis of bioecological, territorial and/or socio-economic considerations, and to put into place, in these areas, differentiated management systems involving users (socioprofessional groups or communities) in order to improve the preservation and enhance the value of sensitive environments and/or resources located in these areas as well as the living conditions of the users.

In the Fisheries Code, which is being revised with the definitive version yet to be approved, a section entitled "Measures for the management and the conservation of marine ecosystems" foresees the creation of management tools such as MPAs, fish aggregation devices and artificial reefs within the framework of an integrated and ecosystem approach to fish resource management.

Article 19 of this section specifies that "Marine protected areas are geographically defined and protected maritime spaces so as to give free rein to the ecological processes, services and functions of habitats and species to ensure the conservation and the sustainable use of fish resources found in these spaces". Furthermore, Article 16 of this section states that "For the purposes of integrated ecosystem-based management, the Minister in charge of maritime fisheries is authorized to create, by statutory instrument (arrêté), marine protected areas, fish aggregation devices, artificial reefs and any other system apt to participate in the management and the conservation of marine ecosystems".

However, as the Fisheries Code is currently being revised, the text of these articles could be modified before validation and adoption by the Government of Senegal.

To date, five MPAs have been created by Presidential Decree: Saint-Louis MPA, Kayar MPA ("Grande Côte"), Joal-Fadiouth MPA ("Petite Côte"), Abéné MPA (in Casamance) and Bamboung MPA (in the Saloum). The precise purpose of these MPAs has not been clearly defined. However, they can be linked to Category VI of MPAs, according to the criteria of the International Union for Conservation of Nature (IUCN), which is the category of MPAs concerning the sustainable use of natural ecosystems, managed in such a way as to ensure the protection and the long-term continuity of biodiversity while guaranteeing the sustainability of the functions and the natural products necessary for the well-being of the community. However, the Bamboung MPA, which comprises a whole "bolong" (a saltwater river branch) in the Saloum, can be related to a Category II MPA (national park) insofar as fishing is strictly prohibited there for the time being.

In the Regional Programme for Marine Conservation (PRCM – see Section 4.2), MPAs are defined as "spaces allowing the conservation of some key parts of the coastal zone, which are critical for the regeneration of fish resources and biodiversity". In addition, MPAs protect sensitive habitats such as seagrass meadows or mangroves at the same time as they support communities that have developed, over the centuries, cultural values directly related to the environment, values that are precious to the community for current and future management. Finally, MPAs play a vital role in the reproduction of coastal and marine resources and in biodiversity conservation at the global, national and regional levels as well as in the long-term future of the cultures of coastal societies.

For the Regional Network of MPAs in West Africa (RAMPAO), a subregional institution created in 2007 within the framework of the PRCM activities (see Section 4.2), in order to be recognized as an MPA, the designated area must have a legal status, a management structure and an up-to-date management plan. On the basis of these criteria, the RAMPAO recognizes only four MPAs in Senegal, which differ from the MPAs created by decree in 2004:[11] the Langue de Barbarie National Park (Saint-Louis), the Iles de la Madeleine National Park (Dakar), the Natural Reserve of Poponguine (Petite Côte) and the National Park and Biosphere Reserve of the Saloum Delta (region of Fatick). The administration of these four MPAs is the responsibility of the ministry in charge of the environment, the Ministry for the Environment and the Protection of Nature, Retention Basins and Artificial Lakes (MinEnv), through the Directorate for National Parks (DPN).

TABLE 1
List of legally recognized MPAs in Senegal

MPA	Status	MPA objectives	Area	Line authority
Langue de Barbarie National Park	Decree (1976)	Biodiversity conservation in the lower delta, protection of marine turtles	Sandy point + maritime zone: 20 km^2 in total	DPN
Iles de la Madeleine National Park	Decree (1976)	Conservation of the environment and of biodiversity	15 ha of islands + maritime zone of 30 ha	DPN
Natural Reserve of Poponguine	Decree (1986)	Restoration of damaged environment	Terrestrial part 10 km^2 + maritime border (1/2 nautical mile)	DPN
National Park and Biosphere Reserve of the Saloum Delta	Decree (1976)	Conservation of delta ecosystems, conservation of biodiversity, restoration of ecosystems	Park: 730 km² RB: 4 500 km²	DPN
Saint-Louis MPA	Listed as BR in 1981	Protection of natural and cultural resources	496 km²	DPN/DPM
Kayar MPA	Listed as a Ramsar site in 1984	Conservation of delta ecosystems, conservation of biodiversity, restoration of ecosystems	Park: 730 km^2	DPN/DPM
Joal-Fadiouth MPA	BR: 4 500 km^2	DPN (National Park Directorate)	174 km²	DPN/DPM
Abene MPA (Casamance)	Decree (2004)	Protection of natural and cultural resources	496 km²	DPN/DPM
Bamboung MPA (Saloum delta)	Decree (2004)	Protection of natural and cultural resources	171 km²	DPN/DPM
	Decree (2004)	Protection of natural and cultural resources	174 km²	DPN/DPM
	Decree (2004)	Protection of natural and cultural resources	119 km²	DPN/DPM
	Decree (2004)	Protection of natural and cultural resources	70 km^2 (30 km^2 of which are *bolong*)	DPN/DPM

Note: BR= biosphere reserve, DPN= National Park Directorate, DPM= Directorate of Maritime Fisheries.

[11] The five MPAs created by decree in 2004 are still being developed and the one closer to being finalized, the Bamboung MPA, does not yet have a management plan, which means that it cannot yet be recognized by the RAMPAO.

Other MPAs are also being created, in particular within the framework of MinFish initiatives, which aim to create a national network of protected areas for fisheries management reasons. Hence, three new fishery MPAs are being created: Cap Manuel MPA (Dakar), the Petite Côte MPA (Mbour) and the Casamance River MPA (Pointe Saint-Georges). In the Senegalese context, the definition of these fishery MPAs implies the delimitation of a space, only a part of which is set aside as a reserve. The part that is set aside is used to ensure the conservation of the productive and reproductive capacity of fish stocks within that space by banning all kinds of extraction, while the part adjacent to the reserve is managed so as to promote responsible fishing practices.[12] From this generic definition, several types of MPA development can be considered, such as artificial reef immersion in the zone set aside as a reserve.

At the moment, only small parks, natural reserves and the Bamboung MPA can be considered as operational MPAs. It is only in these areas that there are restrictive fishing rules, which go beyond the national fishing regulations.

However, in this report, only MPAs created by Presidential Decree and MPAs in the process of being created will be included in the analysis. Empirical evidence and lessons that can be drawn from small national parks and natural reserves are of no interest for the case study insofar as these protected areas are for conservation *stricto sensu*. The Saloum Delta Park, which covers a very biodiverse and quite large delta space, is under no particular local regulation concerning access to fish resources. The status of biodiversity reserve is in fact only an incentive to the creation of MPAs, as was the case with the creation of the Bamboung MPA located in the Saloum Park.

3.2 Decision-making process

In Senegal, the practice of creating an MPA by Presidential Decree comes from recent international developments in the field of biodiversity protection (in particular, the Johannesburg World Summit on Sustainable Development in 2002 and the Fifth World Parks Congress in Durban in 2003). The Presidential act that created the first five MPAs in 2004 translated the declaration of intent expressed during the presentation of the West Africa regional MPA strategy developed within the framework of the PRCM at the Durban Congress. This strategy had been adopted previously by ministers in charge of fisheries and/or the environment in the subregion. In July 2005, during the Gift to the Earth ceremony organized by the World Wide Fund for Nature (WWF), the President of the Republic of Senegal pledged to create ten new MPAs pursuant to the recommendations of the Johannesburg Summit.

The selection process for the first five MPAs created by Presidential Decree differed. For four of them, it was based on a study carried out at the instigation of the WWF and the DPN between 2002 and 2003 to evaluate 33 sites that could potentially become MPAs. To that end, the study used a scoring system relating to several eligibility criteria (ecological, biological, geographical, socio-economic and sociocultural). It was undertaken by a multidisciplinary team of experts and involved all the stakeholders.[13] During the selection process, which lasted for two years, the four sites with the highest scores were chosen (from the 11 sites that were eventually preselected). Awareness-raising meetings with the communities were also organized at the end of the study. The specific objectives assigned to these four MPAs were not specified. Developed at

[12] These definitions are extracted from a technical document prepared in August 2006 by the ministry in charge of fisheries entitled "Specifications for Marine Protected Areas", in order to help the interministerial thought process on the MPA issue.

[13] P.S. Diouf and P. Siegel. 2005. *Processus participatif de sélection de sites d'aires marines protégées au Sénégal*. Internal WWF document.

BOX 1

Genesis of the Bamboung MPA

The process to create the Bamboung Marine Protected Area (MPA) took about four years from the beginning of the 2000s. Spurred by Oceanium and funded by the French Fund for the Global Environment (FFEM), it involved 14 villages located at the periphery of the Bamboung *bolong* (a population of 30 000 in all) and the rural community of Toubacouta. The main stages in the creation of the MPA were the following:

- pre-selection of the Bamboung site on the basis of various criteria, in particular: diversity of fish stocks, abundance of white grouper "thiof" (*Epinephelus aenus* – an emblematic species of grouper in Senegal), significant fishing effort, presence of manatees, mangrove relatively well-preserved with a rich avian and terrestrial fauna, ease of control of the *bolong* (a single entry point, presence of conservation officers because the *bolong* is located within the Saloum biosphere reserve), beauty of the site;
- preparation of an MPA pre-project and discussion with the authorities (subprefecture, Directorate for National Parks [DPN], fisheries department) and users (representatives from the 14 villages involved in the project);
- organization of awareness-raising campaigns about problems related to overfishing and the degradation of marine and coastal ecosystems in Senegal, particularly in the form of film projection followed by debates in the 14 villages;
- adoption of a text (October 2002) pertaining to the creation of the MPA in the rural community of Toubacouta, which comprises, among others, the 14 villages located at the periphery of the *bolong*;
- decision of the villagers to close access to fishing in the *bolong* (April 2003); creation of a management committee, beacons at the entrance of the *bolong*, construction of an observation tower, purchase of a motorized boat, implementation of a surveillance system by rotating volunteers;
- establishing the fish population baseline (Research Institute for Development) (2003)
- emergence of disagreements between the fisheries and the environment sectors over the legality of the ban on access to fishing in the *bolong* (2003–04 period);
- creation of a management and surveillance committee (election of representatives and members);
- official recognition of the Bamboung MPA within the framework of the Presidential Decree of November 2004;
- appointment of a DPN official in charge of surveillance in the MPA;
- development of income-generating activities, in particular through ecotourism since 2005, in order to compensate for the loss of earnings due to the fishing ban in the *bolong* (reduction in the number of migrant fishers in several villages).

the instigation of the MinEnv, this selection process has recently led the MinFish to develop a guide for the creation of future fishery MPAs.[14]

As regards the fifth MPA, i.e. Bamboung, the origin was different as the creation process for this MPA started in 2001 with technical support from a Senegalese NGO, Oceanium, and financial support from the French Fund for the Global Environment (FFEM, see Box 1). Its creation by Presidential Decree in 2004 was in fact the official recognition of its existence. The objective of this MPA, specified during consultations with the populations concerns the conservation of biodiversity (protection of mangroves and aquatic ecosystems of the *bolong*).

The social development of resident communities is considered to be a way to achieve this conservation objective. From an environmental viewpoint, it is expected that banning fishing in the whole *bolong* of the Bamboung MPA will make it possible to restore stocks and biodiversity first in the *bolong* and then in neighbouring zones.

[14] C. Senne and K. Sane Diouf. 2008. *Guide de création et de gestion d'aires marines protégées pour la gestion de la pêche au Sénégal (Rapport provisoire).* Provisional report. Ministry for Maritime Economy and International Maritime Transports/GIRMAC programme.

In order to promote dialogue between the two ministries most directly involved with MPAs, a technical committee in charge of MPA management was created in 2005 by ministerial decree between the MinFish and the MinEnv (Decree No. 1654 of 3/3/05). The mandate of this committee is to "facilitate the coordination of MPA implementation and the definition of procedures for concerted MPA management". Within this framework, the committee's responsibility is to develop general procedures for the creation and the coordination of MPA management, develop a programme for MPA implementation, create a network of MPAs, ensure MPA monitoring and evaluation, and examine projects related to the creation of new MPAs. However, the committee has never met.

The need to strengthen the coordination process for the creation of an MPA network in Senegal was stressed following a technical support mission led by the Intergovernmental Oceanographic Commission (IOC) of UNESCO.[15] The creation of a national coordination committee ensuring the synergy between the different national structures concerned with marine issues (including MPAs) was strongly recommended by the executive secretary of the IOC and welcomed by the Senegalese authorities. An Interministerial Committee of the Sea (CIM) was established by decree in February 2010 (Decree No. 01656 of 22/2/2010). The committee was placed under the authority of the Prime Minister. It is responsible for coordinating, harmonizing and promoting the State's maritime policies and strategies. It is assisted in its missions by a technical body called the "Consultative Committee of Experts" and by a "Permanent Secretary" under the authority of the minister in charge of the maritime economy. Each department concerned will be represented at the level of the Permanent Secretary by a focal point it will have designated.

The creation process for other embryonic MPAs appears to be characterized by a stronger demand from actors on the ground following the awareness-raising work carried out by NGOs, particularly Oceanium, with the help of film projection followed by debates with the population. Thus, it seems that community requests were addressed to the presidency in 2006 for the creation of three new MPAs (Cap Manuel, Mbour, Pointe Saint-Georges), which the MinFish was then instructed to deal with. A draft ministerial decree (arrêté) was prepared, followed by a draft Presidential decree in order to comply with the guidelines for the creation of new MPAs, but neither of these drafts has yet been adopted.

The MinFish is also undertaking comanagement activities on pilot sites that could ultimately be recognized as MPAs, in particular the sites supported by the GIRMAC project: Betenti, Foundioune, Ouakam and Ngaparo. At the same time, the MinEnv has proposed the creation of ten new MPAs. The draft of a Presidential Decree was prepared to that effect in 2007. It was withdrawn after several attempts to arbitrate at interministerial level.

3.3 Perception of MPAs

There seems to be a consensus in Senegal that MPAs may play a significant role in maintaining the productive capacity and the biodiversity of marine and coastal ecosystems, not only for the benefit of fishing but also for the benefit of other users who are directly affected by the preservation of natural capital (conservation and tourism in particular). Such a consensus may be explained by the failure, almost unanimously accepted, of "classic" fisheries management policies in Senegal, which have been unable, until now, to contain the degradation process of sensitive habitats and the overexploitation and increasing fragility of fish resources. In this context, MPAs are sometimes perceived as an unavoidable "miracle" solution that will enable, provided

[15] Joint technical mission undertaken at the government of Senegal's request in March 2009 in order to examine the Senegalese programme for marine protected areas.

that they are selected and designed judiciously, the replenishment of neighbouring zones, hence preventing the collapse of the stocks.

However, two institutional visions clash concerning the primary purpose of MPAs and their management methods. For the MinEnv, which is the biodiversity focal point for Senegal, the primary purpose of MPAs is to protect sensitive environments and their biodiversity by reducing as much as possible human activities likely to have negative effects on the natural capital (harvesting or pollution). In this vision, fishing, provided it is responsible, is just another income-generating activity for the communities, in the same way as ecotourism. Hence, it is a way to contribute to achieving the conservation objective.

For the MinFish, MPAs are above all a tool for fisheries management, and their primary purpose is to facilitate the implementation of more virtuous management systems than those generally found in Senegal and that could indirectly benefit the whole sector. The MPA concept is also a way to facilitate the implementation of mechanisms for the concession of access rights and to promote comanagement in the case of artisanal fisheries.

Over and above these differences in perception of their purpose, MPAs in Senegal are usually perceived, regardless of the authorities involved, to be predominantly concerned with conservation but likely to contribute to the preservation of fish resources in a context of coastal stock overexploitation and deficient fisheries management policies. In this respect, it may also be added that the regional strategy on MPAs presented at the 2003 Durban Congress specified that, besides their essential functions within the framework of marine and coastal biodiversity, they are a form of "life insurance" for fishing.

For most people in the industry, MPAs are often perceived as an opportunity to end the system of open access to resources in some fishing zones. The MPA system enables mechanisms to be introduced to control resource access and allows some spatial appropriation for both conservation and management purposes. However, this vision implies that this will be done to the detriment of migrant fishers, a majority in some areas, which would cause problems in numerous coastal communities.

Finally, for many observers, the process of MPA creation in Senegal has accelerated in recent years. It seems to be the subject of more and more conflicts over institutional competencies at the local and national levels and of opportunistic strategies that turn out to be harmful for the development of MPAs. It also seems that insufficient time has been devoted to clarifying the objectives of MPAs and their relationship with other tools for the management of fish resources and marine and coastal ecosystems.

4. GOVERNANCE IN MPAs

4.1 Legal basis concerning MPA creation and management

Given that awareness of the need to protect the marine environment is relatively recent, there is, as yet, no specific text in Senegal governing the creation and the regulation of MPAs. Consequently, MPAs tend to be managed like terrestrial protected areas. Parks and natural reserves that encroach onto the marine and coastal environment are, for example, considered from a legal viewpoint as terrestrial protected areas whose creation and management methods are specified in the Forestry Code of 1998.

The MPAs created recently by Presidential Decree are not related to any specific law. The laws to which the management of these MPAs refer originate from instruments that may devolve from the Forestry Code (2001), the Maritime Fisheries Code (1998) or the Code for Local Authorities with respect to decentralization (1996). The legal analysis shows that these laws are often contradictory and that the current status of new MPAs does not give them great legal stability insofar as the Presidential Decree specifies neither the objectives nor the management method that must be applied to

this type of MPA.[16] On the other hand, MPAs created by decree introduce a new category of MPA, different from national parks, insofar as the objectives and principles of access, exploitation and management must be defined in the form of joint decisions by ministers in charge of environment and fisheries. Therefore, this new type of status gives MPAs a fisheries as well as a conservation purpose.

The Forestry Code states that the management of protected areas is through the appointment of a keeper, attached to the DPN, in charge of directing and coordinating the development and the implementation of a management plan. A management committee comprising the main stakeholders supervises the management plan. Yet, although these management methods apply only to forests, practice shows that the responsibilities of the management committee can extend to the sea (as in the case of the Bamboung MPA).

The texts relating to decentralization entitle the region (the highest level of decentralization) to create a protected area within its jurisdiction and to determine the conditions of its creation, in accordance with its mission of contributing, together with the State, to the protection and promotion of the environment. However, at the same time and despite this transfer of competencies, the State remains the guarantor of the sustainable management of fish resources. Hence, the Maritime Fisheries Code specifies that "the fish resources of maritime waters under Senegalese jurisdiction constitute a national heritage" and that "the management of fish resources is a prerogative of the State". Therefore, the Maritime Fisheries Code, in theory, forbids local authorities from managing fish resources and, hence, from creating an MPA unless there is an agreement between the State and the local authority.

The Maritime Fisheries Code of 1998 does not refer to MPAs explicitly. If the notion of fisheries management plan and of the management unit to which the plan relates (i.e. one stock or an assemblage of several stocks and the operations thereon) is interpreted broadly, the creation of fisheries MPAs can, however, be envisaged. Article 21 of the Maritime Fisheries Code specifies that "limited or reserved access zones" are part of the different regulatory measures for fish resource conservation and management that can be adopted if necessary.

Much thought is currently being given to the revision of the Maritime Fisheries Code. Among the innovations being debated, the introduction of the notion of a protected fishing zone (ZPP) should be noted. A ZPP is fundamentally not very different from a fisheries MPA because it seeks to establish the principle of identifying a coastal space within which specific management rules concerning fish resource access may be defined in the framework of comanagement systems relying, if necessary, on concession contracts between the State and a group of users. However, this new designation may enable the MinFish to advance on the issue of MPA management while smoothing over some of the institutional hindrances because ZPPs could not be considered as MPAs from a legal viewpoint.

Many actors feel that the legal uncertainty that characterizes the way MPAs are created and managed is a major obstacle to the process of their development in Senegal. While awaiting clarification of the legal framework, the current legal position is that an MPA must be created by Presidential Decree. The dominant approach for MPA management tends to be that which is encouraged by the institutional and/or partnership leader (donors and NGOs), depending on the MPA.

[16] In this respect, see the study undertaken by C. Senne and K. Sane Diouf in April 2008 within the framework of the GIRMAC project, entitled *Proposal for a legal and institutional framework for the management of marine protected areas in Senegal*.

4.2 Institutions and incentive measures for MPA implementation

In accordance with Decree No. 2008–1026 specifying the responsibilities of the Senegalese State services, the competency for MPAs concerns both the MinFish (through its Directorate for Maritime Fisheries [DPM]) and the MinEnv (through the DPN).

This 2008 decree also created a National Agency for Community Areas (ANAC) under the aegis of the MinFish. This institutional arrangement may be explained by the fact that the issue of artificial reefs, which tends to be integrated with the issue of MPAs, is the responsibility of the MinFish. However, the decree implementing the ANAC has not yet been promulgated.

An interministerial technical committee was created by statutory instrument (arrêté) following the creation of the new MPAs by decree in 2004. As noted above, this committee has yet to meet. However, it has nonetheless resulted in various initiatives at the level of the MinFish, including the development of a draft technical specification for the creation of MPAs in Senegal. This draft refers, in particular, to the procedures for the registration of demands for the creation of an MPA, the need to establish a baseline, to specify the MPA objectives and to have a management plan.

In January 2008, a memorandum from the MinFish established a Strategic Guidance and Monitoring Committee responsible for giving impetus to and promoting an MPA network (COS-RAMP). The composition of this committee gives an important role to the cabinet of the MinFish and tends to take the strategic management of fisheries MPAs away from the DPM. The COS-RAMP has yet to meet.

Finally, more recently, a Directorate for Community Areas (DAC) was created by decree (with the director appointed by decree in July 2009). The DAC has the rank of a national central directorate, which should give it, once fully operational, substantial prerogatives and resources to promote and implement MPAs.

Notwithstanding all the institutional arrangements implemented at the central level since 2004–05, the development process of the five MPAs created by decree has been driven mainly by conservation NGOs. The fisheries authorities are involved at the local level on a case-by-case basis. On the other hand, the MinEnv seems to be better equipped from a legal and institutional viewpoint insofar as the texts relating to protected areas provide for the recruitment of a keeper (an official in charge of surveillance) by protected area. This was achieved following the creation of five MPAs on the regular MinEnv budget (around €20 000, or about USD 26 000, per annum for the five MPAs created by decree).

Senegal is a member of the Subregional Fisheries Commission (SRFC), which is another potentially significant actor concerning issues of marine environmental conservation at the subregional level. In particular, the SRFC is currently developing a regional strategy for MPAs in West Africa. The SRFC also supports the implementation of the PRCM fisheries projects. Moreover, the SRFC manages some projects with a strong MPA component, such as the soon-to-be-launched project, funded by the French Development Agency (AFD), concerning comanagement and MPAs in West Africa.

Mention should be made of the RAMPAO (an MPA network in West Africa), a subregional institution created in April 2007 within the framework of the first phase of the PRCM, pursuant to the regional strategy for MPAs in West Africa. The purpose of the RAMPAO is to "ensure that, at the level of the marine ecoregion of West Africa, comprising Mauritania, Senegal, Guinea, Guinea-Bissau, Gambia, Cape Verde and Sierra Leone, a coherent set of critical habitats is maintained; such habitats being necessary for the dynamic functioning of ecological processes which are essential for the regeneration of natural resources and the conservation of biodiversity in order to serve societies through the implementation and operation of an MPA network".

Several NGOs have been involved for a number of years in the process of supporting the creation and the management of MPAs in Senegal. The following international

NGOs are still directly involved in this process: WWF (Abene MPA, Kayar MPA), and Foundation Internationale du Banc d'Arguin (FIBA) (Casamance MPA – Pointe Saint-Georges, Bamboung MPA). At the national level, one NGO, Oceanium, is also particularly active in the process of creating and developing MPAs. It was the main partner of local communities for the creation of the Bamboung MPA and is supporting the development of the Casamance MPA and of the Petite Côte MPA (Nianing).

The significant role played by the PRCM in the development of MPAs in Senegal must also be mentioned. The PRCM, the first phase of which started in 2004, is a programme that was developed by a coalition of several international conservation NGOs (the IUCN, WWF, FIBA and Wetlands International). The objective of the PRCM is to "promote a concerted vision of regional conservation priorities and to share responsibilities according to the specific competencies of each party within a framework of harmonized intervention". At the beginning, the two main donors supporting the PRCM were the Embassy of the Netherlands in Dakar and the MAVA Foundation. During the second phase of the PRCM (2008–2011), the partnership was broadened with the involvement of the SRFC. Projects being implemented or developed within the PRCM (Phase II), with a component concerning MPAs in Senegal, are as follows:

- the RAMPAO: support the institutional strengthening of the MPA regional network in West Africa and implement its workplan (promoters: the FIBA/ University of Portsmouth/IUCN);
- support for the creation of new MPAs and new conservation sites (promoter: the FIBA) – Pointe Saint-Georges in Casamance;
- support for the strengthening of effective MPA management (promoter: the FIBA) – Bamboung community MPA;
- project to support the transborder biosphere reserve of the Senegal River Delta (promoter: the IUCN);
- participatory management of sites and natural resources in West Africa to strengthen MPA management and establish an MPA network – GP SIRENES (promoter: the IUCN).

The FFEM is another development partner with a significant role in the process of MPA development. The FFEM supported the creation of the Bamboung MPA and continues to support the creation of other MPAs along the Petite Côte (Narou Heuleuk Project), the Casamance MPA and the Mbour MPA. Finally, it is worth reiterating the significant role played by the World Bank in the MPA process through the GIRMAC (see Section 3.2).

4.3 Management methods

Of the five new MPAs created by decree, only the Bamboung MPA can be considered to be operational and managed according to specific methods. In the remaining four MPAs, activities continue mainly to target awareness-building and the organizational development of communities together with the establishment of projects (in particular, the GIRMAC project) and comanagement mechanisms with the support of NGOs such as the WWF and Oceanium. Since 2004, the approach for developing these four MPAs has been first to establish the legal and institutional framework, including the formal management plans, necessary for the subsequent MPA development.

As regards the Bamboung MPA, the approach is quite different as it consists first of defining the rules applicable to the MPA and the strategy for community development in close collaboration with users, then to support the gradual implementation of community commitments, adjusting activities as things progress. The approach used in the Bamboung MPA, gradual, adaptive and quickly focused on implementation, was made possible by the amount and rapid availability of the funds allocated to the process. The amount allocated through the FFEM to the creation of protected areas in Senegal is estimated to have been around €900 000 (about USD 1.1 million) over five years.

Once the creation of the Bamboung MPA became official in November 2004, a management committee comprising one representative from the fisheries department, one representative from the DPN, one rural adviser (rural community of Toubacouta) and two representatives per village (14 villages in all) was set up. An ecotourism camp was developed on the MPA site, the profits from which are used to sustain the running of the MPA (surveillance and development projects) and to contribute to the rural community budget. An MPA management and development plan is currently being prepared.

4.4 Dialogue or conflicts of an institutional nature

The issue of the creation and the development of MPAs remains a source of numerous conflicts in terms of institutional competency at the central level, particularly between the MinFish and the MinEnv. Most projects and conservation NGOs attempt to include both ministries, but in the absence of an effective dialogue framework and clear guidelines from the government concerning the respective competencies of the different ministries, the MPAs usually develop independently of one another under the impetus of donor agencies.

Yet the GIRMAC project, which is funded by the World Bank and has considerable resources, tried in its early years to overcome institutional divisions in order to promote a genuinely integrated approach to the coastal zone and fisheries. The respective ministries in charge of environment and fisheries were each responsible for a technical component, and a third component sought to pool the contributions of each ministry by encouraging interministerial dialogue. This third component turned out to be particularly difficult to implement in practice. It is possible that the GIRMAC+ project, which is being prepared (an extension of the GIRMAC project within the framework of the Strategic Partnership), may be linked solely to the MinFish, signalling a return to a sectoral approach in fish resource management.

On the ground, however, and despite the absence of a genuine interministerial dialogue framework, there is effective collaboration between decentralized fisheries departments (administration and maritime surveillance) and DPN officials appointed in each newly created MPA. Collaborative actions concern, in particular, awareness-building and dialogue with a view to preparing MPA management plans. Surveillance in MPAs is also the focus of collaboration. The DPM checks compliance with zoning in order to prevent the incursion of trawlers, it participates in the training of fishers within the framework of participatory surveillance brigades, and intervenes in the case of disputes between fishers, while the DPN is responsible for surveillance within the MPA in collaboration with fishers.

Some interesting initiatives may be highlighted that, within the framework of the RAMPAO, encourage governments to promote dialogue between ministries in charge of fisheries, those in charge of environment, research, users and government and non-government partners. The RAMPAO Secretariat is mainly supported by the FIBA, but field studies and activities involve different conservation NGOs (IUCN, WWF, Wetlands International, etc.). The RAMPAO documents (e.g. regional strategies) are, for example, co-signed by the environment and the fisheries ministries. Hence, the RAMPAO is currently a rare forum where collaborative actions for MPA development can be discussed and promoted.

5. IMPACTS AND ISSUES OF AN ECOLOGICAL AND SOCIO-ECONOMIC NATURE

5.1 Impact of MPAs on fisheries management

It is very difficult to evaluate the impact of MPAs on fisheries management; first, because the MPA network is recent (most MPAs are still being established), and, second, because of the weakness of systems to monitor impacts. As regards impact

monitoring, only the Bamboung MPA is being monitored scientifically with the support of the French Research Institute for Development (IRD). This monitoring, which began in 2004, has focused on the fish population in the *bolong* following the closure to fishing. This lack of data on the effective impact of MPAs on management hinders the emergence of genuine dialogue between the MinFish and the MinEnv.

The origin of MPAs in Senegal also shows that little attention has been given to the choice of sites in relation to the functioning of ecosystems. The Kayar MPA, for example, is located in a zone presenting no particular interest from an ecosystem point of view, especially as the continental shelf is very narrow on that part of the coast. The choice of this site was based primarily on sociopolitical considerations related to the recent history of fishing in this zone. Community initiatives aiming to regulate resource access began to develop in the Kayar area at the end of the 1990s (for example, with the scheduling of seiners' fishing trips in order to avoid market saturation with small pelagics, or with the introduction of rules to limit use conflicts between passive and active fishing gear). These initiatives, supported by central and local public authorities, should be based on a formal framework, which the MPA status is now supposed to offer.

Other recently created MPAs located along the Petite Côte are situated in zones that are more sensitive from an ecological viewpoint. However, the size criterion is mainly related to administrative considerations; hence, it is more a question of territorial zoning (the domain of local authorities) and of the capacity of the authorities to organize their action at the level of a reasonably sized management unit than a question of ecology.

However, despite the lack of perspective, there are reasons to think that MPAs may enable the improved regulation of access to coastal resource in that they are spaces where management rules can be developed and implemented in close collaboration with the communities (LFCs or LAFCs). In the current context of open access for artisanal fishing, MPAs could, as a result, contribute to improved fisheries management. The real impact can only be assessed once concession-type contracts have been established between the authorities and fisher groups. These contracts should include compliance with a minimum set of specifications in order to ensure, among other things, the conservation of sensitive environments.

Other mechanisms should also be implemented outside of MPAs to ensure the rational management of fishing capacity (including eradicating overcapacity) and the regulation of access to coastal resources. Isolated actions within MPAs are unlikely to have a significant impact at the ecosystem level because the implementation of limited-access systems in the MPAs will unavoidably mean a transfer of the fishing capacity (in particular, the fishing capacity of migrant fishers) to adjacent fishing zones that are already heavily overexploited.

5.2 Major issues of a socio-economic and/or ecological nature

Given the long tradition of open access to the resources and the significant social pressure exerted on the coast by migrant fishers, it is very likely that the MPA development process, which relies on the privatization of the coastal area for the benefit of the resident community, will create conflictual situations with migrant fishers.

Another predictable consequence is that MPA surveillance costs may be very high in a context where the current coastal zone surveillance system of the DPSP is minimal. In such conditions, there are two possibilities, each of which offers advantages and disadvantages. The first possibility would be to encourage surveillance systems involving fishers (for example, participatory surveillance brigades), with all the risks of escalation that this implies for public order. The second would be to rely on the presence of the keeper seconded by the DPN. However, this implies a formalization of institutional arrangements that is impossible in the current context because maritime surveillance comes under the jurisdiction of the MinEnv. Moreover, the costs related to

MPA surveillance are likely to be high in both cases for benefits that remain difficult to evaluate, which is a problem of primary importance.

The choice of MPA sites, mentioned above, leads again to the question of site suitability from an ecosystem viewpoint. It seems that the current configuration of the MPA network in Senegal reflects neither the global functioning of marine and coastal ecosystems nor the need to take into consideration the fact that fish resources are part of a continuum at the scale of the country, perhaps even of the subregion. It should also be noted that, except for the Bamboung MPA (which is defined according to some ecosystemic logic as it encompasses a whole *bolong*), MPAs correspond to parts of the coast, of limited size, which do not really correspond to a clearly identified ecological entity. The MPA network in Senegal consists of the juxtaposition of several coastal areas subject to specific management rules, with no obvious ecosystemic interrelation between them.

The monitoring system of the Bamboung MPA, developed by the IRD, shows that the MPA has had a significant impact on the composition of the fish population.[17] The major change that occurred following the banning of fishing in the MPA was the modification of the trophic structure, with an increase in the percentage of predators. The impact of the MPA on adjacent zones, which are open access, and on the general productivity of aquatic ecosystems that include the MPA (for example, the recruitment of some species) has not yet been sufficiently studied. The socio-economic impact cannot be measured with the current monitoring system. Thus, it is difficult to assess objectively whether the populations that are directly affected by the use of the *bolong* (6 of the 14 member villages of the management committee) find themselves in a very different situation to that which existed before the creation of the MPA. Prior to the creation of the MPA, the local economy depended largely on direct or indirect benefits related to fishing (hosting migrant fishers, commerce and oyster exploitation). Now, income-generating activities relate mostly to ecotourism (some 20 direct jobs have been created at the camp level).

5.3 The role of natural and social sciences

The CRODT is regularly associated with initiatives led by NGOs or the fisheries authorities in support of the MPA creation and management process. The CRODT is involved in the choice of sites from a bioecological viewpoint and in the implementation of biological and socio-economic monitoring systems. However, this occurs on a case-by-case basis, in the sense that the CRODT does not yet have a regular research programme concerning the issue of MPAs. The CRODT is also involved in the work of the RAMPAO supporting the implementation of an MPA network.

Moreover, the CRODT is one of the four West African research teams involved in the "AMP et gestion Halieutique par Optimisation des Ressources et des Ecosystèmes" (MPAs and Fisheries Management through Optimisation of Resources and Ecosystems – AMPHORE) project, which is a research programme funded by the 2007 biodiversity programme of the French National Research Agency. The AMPHORE project focuses on the study of MPAs located in France, Mauritania (the Banc d'Arguin National Park MPA) and Senegal (the Bamboung MPA). It seeks to define indicators to assist in ecosystem-level management of MPAs, to analyse their governance systems and to test their effectiveness and impact.

[17] When the baseline was established in 2003, 51 fish species were identified during experimental fishing operations. Three years on from the MPA creation, the main findings from experimental fishing operations (the last ones were undertaken in 2007) were the following: 23 new species were caught, one of which was the "thiof"; reduction in the number and the biomass of average-sized species (tilapias, mullets, bonga shads [*Ethmalosa fimbriata*], etc.); increase in the proportion of small-sized and large-sized individuals; increase in the average biomass; and re-emergence of large predators (e.g. bull sharks and barracudas).

It was seen above that the IRD was involved in the scientific monitoring of the Bamboung MPA with FFEM funding. The research results were used to support the hypothesis that MPAs have an impact on biodiversity (serving as refuge zones) and on the structure of fish populations. In this case, research contributed, and continues to contribute, to the MPA development process, validating the hypothesis of the utility of MPAs for biodiversity conservation. Scientific investigations should also encompass social sciences in order to measure the impact of MPAs on socio-economic dynamics and the well-being of communities to broaden the field of study of the role of MPAs at the scale of the Saloum Delta ecosystem.

6. OUTLOOK

6.1 Integration of MPAs into global policies for ecosystem management of marine and coastal resources

The coastal planning process has made little progress in Senegal. Hence, it is becoming urgent given the conflicts along the greater part of the coast between industry, urbanism, tourism, fishing and the environment, to cite only the most important. For example, it is estimated that tourism (currently the second economic sector after fishing) increased its carrying capacity fivefold and its turnover tenfold between 1974 and 1994. The pressure exerted by artisanal fishing on the coast may be shown by comparing simple indicators between Senegal and Mauritania: 12 000 artisanal fishing canoes for 700 km of coastline in Senegal; 4 000 canoes for 700 km of coastline in Mauritania. Moreover, fishing is the main job provider along the coast, with numerous secondary jobs created onshore. This sector represents some 600 000 direct and indirect jobs.

Over and above the institutional conflicts that they currently generate, MPAs in Senegal may increase awareness of the need to promote an integrated approach to coastal zone management that respects marine and coastal conservation, taking account of the various uses and promoting a common interest in economic, social and environmental terms. From this perspective, MPAs may be an intermediate and complementary stage, compared with other initiatives promoted by the central and local authorities, towards the integrated and sustainable management of the coastal zone.

The coastal planning process has made little progress at the national level, but local authorities have significant rights concerning coastal management within their jurisdiction, including the creation of MPAs. In a context where ecosystem coherence is not, perhaps, the priority for local authorities at the time of MPA creation (as other considerations of a political nature are likely to take precedence in the decision-making process), is there not a risk that some MPAs will fail to achieve their goal of contributing to biodiversity conservation? Hence, in order to alleviate this risk, it would be useful to clarify the notion of an MPA network, especially the ecosystem dimension, and to develop a general framework to guide local authorities in the creation and the development of MPAs.

The Senegal case study also shows that development partners, donors and NGOs have a significant influence on the MPA process. In many cases, they replace the authorities, given the disproportion in the resources allocated to projects compared with the operational resources funded by the State budget. It is also well known that projects recruit precious human resources not only from the authorities but also from research, and this further increases the imbalance between projects and NGOs on the one hand and the authorities on the other. This situation is not very favourable to the implementation of a coherent MPA network, which should be driven by the authorities on the basis of scientific considerations. Yet, without a coastal planning framework at the national level, and even at the subregional level, the MPA creation process may remain too opportunistic along some parts of the coast – with insufficient attention given to the legitimacy of the project from an ecological point of view, the connections between MPAs and the coherence of the MPA network.

6.2 Promoting dialogue in the creation and management of MPAs

In the absence of scientific certainty on the role of MPAs in fisheries management, in biodiversity conservation and in the human and social development of populations, and given also the legal and institutional uncertainties concerning the responsibility for MPA management, the current climate is not very favourable for dialogue. Each key actor, whether the authorities or the NGOs, develops individual strategies, often opportunistic depending on related financial issues, without really taking into account the need for a concerted and integrated vision of the MPA process. Moreover, given the current situation, there seems to be no encouragement for the different protagonists to search for win-win situations. In this context, the promotion of dialogue is one of the main issues at stake in the MPA development process.

Nonetheless, there are now systems that aim to strengthen dialogue, at least in theory. The most noteworthy are the technical interministerial committee in charge of MPA management and the national agency on community areas (the MinFish). These mechanisms must be activated as a priority in the years to come, with the ultimate goal of implementing official mechanisms for dialogue and collaboration between the MinFish, the MinEnv and civil society on the basis of contractual relations, with a view to exchanging information and knowledge but also to rationalizing expenditure and pooling some costs related to MPA management.

Another priority may be to develop an MPA typology by purpose (conservation or fisheries management) and to specify, depending on the type of MPA, the most appropriate legal status and the best leader to facilitate dialogue within the framework of the technical interministerial committee. For example, if the objective of an MPA is to protect ecologically sensitive areas and to ban fishing within them, the most sensible thing to do would be to entrust the leadership of the MPA management to the MinEnv on the basis of duly justified scientific considerations, following the example of natural reserve management. If specific rules concerning resource access and fisheries management have to be implemented in an MPA on the basis of bioecological and socio-economic considerations, the most sensible thing to do would be to entrust the leadership of the MPA management to the MinFish.

Finally, it seems that one of the main issues at stake relating to dialogue in the case of MPAs is to clarify the legal framework for their management. The current legal uncertainty is a genuine hindrance to the development of MPAs and it prevents the establishment of dialogue and a collaborative relationship between the MinFish and the MinEnv. As long as these issues relating to the nature and methods of management of MPAs remain unresolved, it is very likely that individual strategies will dominate to the detriment of the public interest. Along the same lines, it is important to ensure that management methods pay particular attention to the implementation of dialogue mechanisms because MPA success depends also on the capacity of managers to implement integrated management systems capable of overcoming traditional sectoral divisions.

Moreover, other technical areas relating to the management of MPAs will require the implementation of formal dialogue frameworks. In this respect, it seems important to implement a dialogue and coordination framework between the DPSP and the DPN in order to rationalize MPA surveillance systems and generate synergies between the two institutions.

6.3 Relevance of fisheries MPAs as technical management measures

The MinFish sees MPAs as management tools. Over and above the uncertainties concerning the genuine positive benefits of MPAs on resource sustainability, it must be recognized that the costs associated with the creation and the management of MPAs are significant: institutional costs (comanagement, surveillance and research mechanisms), political costs (arbitration with the MinEnv) and social costs (e.g. risks of access

conflicts with migrant fishers). On this basis and from the public policy viewpoint, it may be asked whether it is appropriate, as seems to be the case today, for as much funding from public development aid to go towards developing MPAs as goes towards strengthening the overall management system (capacity control, management plans, coastal surveillance, etc.).

The MPA can never be a panacea for the problems currently facing coastal fisheries governance (market deregulation, unchecked development of artisanal fishing capacity, resource degradation, ineffective regulation of resource access, etc.). However, the MPA can be a complementary technical measure in a strengthened fisheries management system in the so-called "protected" zones, by implementing management rules that are more restrictive than those found in the fisheries texts, for the benefit of coastal habitats and fish resources.

Moreover, these MPAs will be all the more effective if they take into account the ecosystem dimension of management. If the significant costs associated with the creation and the management of MPAs are taken into consideration, the promotion of MPAs located in particularly strategic bioecological and/or socio-economic zones should be a priority. Their precise definition should be based on scientific foundations or on intuitions supported by objective expert evaluations.

6.4 Development of fisheries MPAs within a more global process to strengthen the coastal fisheries management system

Numerous problems remain concerning the regulation of resource access, particularly for artisanal fishing, and the implementation of fisheries regulations despite the initiative of the MinFish, which, since the beginning of the 2000s, has tried to improve the situation (registration, artisanal fishing licences, discussions on systems for access right concessions, on capacity management plans, etc.). There is, however, much resistance to change because of the high stakes and the social and political costs associated with certain management measures concerning artisanal fishing. However, unless bold decisions are made, the situation is likely to drag on with worsening degradation of fish resources. In that event, MPAs may increasingly fail to bring complementary answers to fisheries management problems and, ultimately, develop into sanctuaries for the protection of particularly ecologically sensitive environments.

In other words, the issue of MPAs should be part of a broader policy framework for strengthening or reforming the artisanal fisheries management system (fisheries management plans, capacity management plans, effective implementation of fisheries regulations, etc.) for changing mentalities within fisher populations (through awareness-building in particular) and for promoting ambitious coastal economic development policies in order to offer alternative employment to those ready to leave this activity.

The development of fisheries MPAs in line with the principle of comanagement within management subunits and sufficiently coherent from a bioecological and/or socio-economic point of view to support the implementation of fisheries management plans could, in fact, be highly appropriate. Here also, the MPA concept may be a step towards introducing more appropriate governance systems, based on the active participation of users affected by the sustainable management of coastal and marine ecosystems. The MPA concept is, without doubt, an alternative to the centralized approach that has characterized fisheries management systems in Senegal and has shown its limits when management measures have been implemented.

This document presents case studies of the policy, governance and institutional issues of marine protected areas (MPAs) in Brazil, India, Palau and Senegal. It is the first 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.

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