Chapter 2

Marine Protected Areas and Governance: Towards a Multidisciplinary Approach

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Marine Protected Areas (MPAs) occupy a special place among the actors and processes involved in the governance of protected areas. Although according to the current definition of the IUCN, MPAs apply only to marine areas[1], in this chapter we will also include in this category Marine and Coastal Protected Areas (MCPAs), which encompass both marine and terrestrial components.

Over the past 30 years, the number of marine protected areas has been increasing rapidly in inter-tropical areas, where biodiversity conservation challenges are greater than anywhere else. This number rose from 118 in 1970 to 319 in 1980 (Silva et al., 1986), and eventually exceeded 1300 in 1995 (Kelleher et al. 1995). Of these, 400 MPAs concern coral reefs exclusively (Salvat et al. 2002). In 2003, during the World Parks Congress organised in Durban by the IUCN, a resolution was adopted to classify 20% of the world's seas as MPAs within 20 to 30 years' time.

Island states are particularly involved in implementing this resolution. In Oceania, in 2005, the Fiji government undertook to convert 30% of its exclusive economic area into MPAs by 2020. In 2006, the governments of Palau, Guam, the Federated States of Micronesia, the Northern Mariana Islands and the Marshall Islands pledged to follow similar objectives within the framework of the Micronesian Challenge. In the Indian Ocean, the Indian Ocean Commission is in the process of implementing a regional network of MPAs while the government of Madagascar has also embarked on an ambitious programme to create MPAs.

While MPAs are still limited in absolute surface area compared to their terrestrial counterparts (Rodary and Milian, this publication), their expansion continues at a rapid pace. In 2005, there were 5127 marine protected areas (including 967 at an international level) representing 0.6% of the surface area of the oceans. The French government is promoting the creation of new MPAs, not only in France, but particularly in its overseas territories of Reunion Island, French Polynesia and New Caledonia. To this end, in 2007 in accordance with Article 18 of Act 2006–436

1 "Any area of intertidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Kelleher 1999).

on National Parks, Marine Parks and Regional Nature Reserves, France created a specific institutional organisation, the *Agence des aires maritimes protégées*. To date, France managed to protect less than 1% of its exclusive economic zone (which is close to 11 million km², making her the second largest maritime country in the world). However, this percentage is far from reaching international commitments undertaken within the framework of the Convention on Biological Diversity, which aims to create a complete and coherent network of marine protected areas by 2012, representing 10% of marine ecosystems falling under national jurisdiction.

Marine protected areas address the challenges of marine biodiversity erosion and increasingly inefficient fisheries management (Chaboud and Cury 1998; Pauly et al. 2003; Hilborn et al. 2004). They have effectively become a laboratory for integrated coastal zone management (Davis 1998). When an MPA is established, there are economic, legal, geographical and social side-effects, along with visible, or less overt, territorial restructuring in which local, national and international NGOs all play a major role. Consequently, the study of MPAs requires a multidisciplinary approach: the legal and economic sciences are employed in this case to initially conceive the management systems, fit them into a legal and economic context at various levels, and finally evaluate the costs and advantages of MPAs in terms of resource conservation, and in terms of the economic development of the parties involved. In addition, bio-ecology has never before been used so extensively as the basis for conceiving MPAs and perfecting the indices for their evaluation and monitoring.

On the one hand, the effects of MPAs on ecological biodiversity have been widely studied (Russ 2002; Pelletier et al. 2005), while on the other, evaluations of any socio-economic benefits are very often partial and tend not to focus on the countries of the South (Oracion et al. 2005). Moreover, we should examine just how compatible the three major – and often competing – objectives of MPAs are: conservation of biodiversity, fisheries management and the promotion of nature tourism. As such, the performance of an MPA must be measured not only in biological terms, but also by taking social, economic and institutional considerations into account, in order to evaluate the pertinence and efficiency of MPAs as systems of governance.

Nevertheless, at this stage, the constraints on the implementation of MPAs as governance systems are often not fully appreciated by the researchers, users, managers, administrators and political decision-makers concerned. They are often not clearly explained to actors within civil society or to residents (Galletti 2006). The repercussions of such systems need to be evaluated, thus opening an important area of research which has been deferred for too long. While the consequences of MPAs on biological conservation appear positive (when they can be evaluated), those for resident populations and users are often disputed and somewhat ambivalent, making MPAs difficult to both justify and defend (Pelletier et al. 2005).

In this chapter, we will deal with marine protected areas from the viewpoints of the geographical, ecological, economic and legal disciplines since each of

these disciplines offers different definitional approaches to issues regarding the governance of these marine – or semi-marine and coastal[2] – territories. In the first section, we intend to give an account of how these various scientific disciplines tackle the finer points of MPAs. We then show how the issues surrounding MPA governance require looking beyond these disciplinary approaches.

Marine Protected Area: A Specific Disciplinary Object for Geography, Ecology, Economics and Law

A Spatialised Approach to MPAs through Geography

While geography is concerned with spatial analysis, man-land relations, earth science and area studies, (Pattison 1964), only the first three concern protected areas. The landscape of an MPA differs from that of a protected terrestrial area in several ways: the presence of both a sea surface and a seabed; the absence of a permanent human component; and the lesser importance of topography in the structuring of landscape taxa[3]. In the field of coastal geography, the 40-year evolution which eventually brought the landscape concept to blend in with the geosystem concept (Richard 1989) is more complete (Corlay 1995; 1998). The geosystem therefore creates a bridge between the study of landscapes and spatial analysis.

A systematic examination of the coast makes it possible to view MPAs as a mechanism leading to the creation of various dynamic territories. These can refer for example to the space used by resident populations and their practices, and the effect this has on the resources of the MPA. They can refer to the geo-symbols[4] and representations of these populations vis-à-vis the resources, their habitat and usage. They can also refer to the regulatory dimension of zones implemented by the MPA management plan. Finally, they can refer to a territory encompassing the consequences of regulation, and the subsequent changes in use by populations residing in MPAs (David et al. 2006).

This type of territorial creation is inherent to any protected area, but due to the higher human density in coastal areas, and due to the importance of subsistence

2 In support of these analyses concerning the specifics of the marine, littoral and coastal environment, are elements from the scientific literature concerning MPAs, research conducted by the IRD on the protection of coral ecosystems in Oceania and the Indian Ocean, and elements of the research on marine areas in Madagascar supported by the trans-departmental incentive programme "Protected Areas" of the IRD, 2004–2005.

3 Indeed, knowledge of the detailed bathymetry of the shallow depths that characterise coastal MPAs remains very incomplete, due to a lack of appropriate tools for evaluation; therefore landscape taxa only include geomorphologic and bionomic information obtained through aerial or satellite remote sensing, along with ground verification.

4 J. Bonnemaison (1981) defines geo-symbols as places and itineraries appropriated by man over generations, which include culture.

and commercial fishing to the coastal economy, the creation of a protected area induces stronger reactions from local communities than it does in terrestrial areas. Geography then analyses the diachronic and synchronic dynamics between these spatial objects associated with the creation of any MPA. In addition to this are the links between the MPA and its surrounding territories, and the terrestrial territory of the resident populations within the MPA in particular, the space of exploitation that concentrates on the fringe of the MPA, and the new fishing space created by fishing aid obtained as compensation for the creation of the MPA. The geographer can appreciate the specificity of the MPAs according to the following points.

At the local level, the MPA is a territorial creation, found at the interface between coastal eco- and socio-systems. It partly modifies the direction of matter and information flows. For this reason, it constitutes a spatial-temporal discontinuity, comparable to a 'freeze' of space-time which equates to a 'freezing' of time concerning that space. This discontinuity takes on several forms. An MPA is a form of management and governance space that too often works like a closed system, having only very minimal links to the watershed and the local socio-economic environment, if only to minimise poaching or to protect any profit to be made from the environment. From the point of view of tourism, an MPA is an attractive space that sometimes generates at its fringe a concentration of hotels and sea diving clubs. From a fisherman's point of view however, an MPA is a prohibited zone that leads to the displacement of his fishing activity towards other places and species. Nonetheless it can also be an attractive space (edge effect). MPAs have complex effects on fishing grounds: exclusion in deferred fishing areas, but sometimes a reallocation within the space and according to the targeted species. They also imply a repositioning of fisheries within the coastal system of activities: activities involving the direct exploitation of marine resources within MPAs being partly or completely pushed away, to benefit tourism or non-exploitative activities. Managers networks are also being constituted as a response to a demand expressed by international conservation NGOs.

Compared to terrestrial protected areas, MPAs show a greater vulnerability vis-à-vis the local environment. In this regard, because they are less conscious of ecological concerns than hunters, fishermen are often opposed to MPAs. MPA sustainability depends on the integrated management of the coast on either side, including the consideration of watersheds, so as to reduce the terrigenous and pollutant flows generated by these areas (David et al. 2007).

A Natural Space for the Ecology

The Ecological Objectives of Conservation The Convention on Biological Diversity as well as the initiatives sponsored by major international NGOs such as the WWF or the IUCN, resulted in significant advances that led to the birth of MPAs. In addition to an increase in the number of protected spaces, the intention is also to increase the number of different habitats, paying special attention to endangered species and under-represented ecosystems, such as the open sea,

which includes the problems of migratory species. The objective is also to take into account ecologically important ecosystems which deserve efficient protection and monitoring, such as seamounts or tropical and cold-water coral reefs. The challenges of conservation can imply the protection of essential habitats, such as spawning and hatching areas, by implementing temporal or geographical restrictions. They can also enable the maintenance of the functionalities of the ecosystem and the establishment of marine corridors between MPAs, to favour the resilience of ecosystems to climate change. These challenges are often met with a lack of knowledge about ecological dynamics, particularly in highly diverse ecosystems such as coral reefs. However, these environments are subject to special attention, not only in terms of protection and the implementation of management plans, but also in terms of research. These highly diverse ecosystems face considerable anthropogenic pressures, alongside the realisation that there has been a significant degradation of these environments on a global scale (we can mention for example the request for the Coral Reef of New Caledonia to be classified as a UNESCO World Heritage Site).

The Coral Ecosystem Example The concept of 'reserve' corresponds closely to a traditional management measure used for centuries to protect coral ecosystems in the regions of South-East Asia or the Pacific Ocean, and which is increasingly being used in many other areas (Johannes 2002). Coral ecosystems are particularly exemplary of MPAs problems as they highlight bio-ecological issues. Gathering together various interconnected environments (e.g. sea grass beds, mangroves, reefs and channels), coral ecosystems constitute a network of habitats essential to the life cycle of species (i.e. reproduction, feeding, growth and refuge). This range of ecosystems also represents many potential fishing zones. This diversity of habitats explains the wide biodiversity of coral ecosystems. On a local scale, the high natural fragmentation of the habitat is due to the morphology of reef constructions. Unlike lagoons, their external slopes are more subject to the oceanic larval recruitment process and less exposed to anthropogenic pressures; they are also more interesting as far as following the impact of climate change is concerned. On a regional scale, the communities encountered from one island to another are clearly defined in spatial terms. The biodiversity of fish, plants and invertebrates depends on the geographic position of the island (the biodiversity gradient decreases eastward in the Pacific Ocean and westward in the Indian Ocean), on its type (open or closed atoll, atoll or high island), on its size, and on its degree of isolation. The natural fragmentation of coral ecosystems, which operates on a local and regional scale, is therefore one of the essential factors to be taken into consideration in designing MPAs and establishing MPA networks. The degree of protection afforded to the biological communities inside the reserves, and the degree of influence on adjacent areas, will depend on the size and spatial distribution of MPAs. Thus, the management plan implemented in 2004 for the maritime space of Moorea Island in French Polynesia, includes a network of eight MPAs, each delimited from the coast out to the barrier reef, preferably close to a

channel, as they take into account the ecological criteria used to define the size and location of the areas to be protected.

Larval Dispersion and the Exchange of Nutritive Substances Larval dispersion is an important phenomenon. In addition to the main outcome expected from an MPA, i.e. the restoration of reproductive stocks *inside* the deferred fishing area, one of the desired effects is the export of the biomass of the species for exploitation outside that area. The life cycle of the majority of marine species living in reef environments is divided into two distinct phases: the first one is a pelagic phase and concerns the eggs and/or larvae; the second one, relatively sedentary, concerns juveniles and adults. Larval dispersion explains the low rates of endemism and species extinction in marine ecosystems when compared to terrestrial environments. It also divides MPAs into two categories: those that export larvae, and those that receive them. In the first case, the local population is largely a result of self-recruitment. In the second case, it depends on the recruitment of larvae coming in from other populations (Shanks et al. 2003). Therefore the future of the MPA as an effective conservation tool requires that any coast to which it is linked through larval flow also be protected.

The exchanges of nutritive substances between adjacent ecosystems such as mangroves and coral reefs, and the interactions between pelagic and benthic zones (i.e. open and deep waters), or between coasts and coastal waters, must also be taken into consideration during the creation of MPAs, even if their management processes cannot prevent sediments, pollution or invading species to make their way into the protected area (Allison 1998; Simberloff 2000).

Ecological Implications of Temporal Variability While space represents the main factor which structures coral ecosystem communities, hence the importance of spatial management techniques, time must also constitute a key parameter. It is necessary to study the link between this parameter and geographical scale and the biological processes concerned. Inter-annual variability is dictated by climatic phenomena on a global scale, while variability over shorter time periods can be explained by nycthemeral (or daily), lunar or seasonal cycles. In 1998, the massive episode of coral bleaching in the reefs of the Indian Ocean showed that MPAs in no way constitute protection against this type of threat. Vulnerability to bleaching constitutes an important criterion for the location of future MPAs, the emphasis being placed on stocking the most resilient reefs (to shield them from anthropogenic pressures). Migrations linked to the life cycles of species must also be taken into account[5], for the same reason as all the space-time-system biological interactions, so as to include them in the location and regulation of MPAs.

5 Reproductive migrations consist of species gathering in certain sites during reproduction periods; ontogenetic migrations correspond to the movement of cohorts (groups of individuals of the same age) during growth; trophic migrations correspond to the movement of individuals between two distinct habitats in order to feed.

Which Ecological Indicators Should Be Used to Follow and Evaluate MPAs? The establishment of 'zero points' and monitoring requires one to define indicators that take into account the expected effects MPAs have on the environment, from the viewpoint of management objectives, the capacity and response time of natural communities, and the functional characteristics of species (Adjeroud et al. 2005; Pelletier et al. 2005; Clua et al. 2005; Chabanet et al. 2005). Ecological indicators recommended for MPAs monitoring usually concern emblematic species, species targeted by fishing, as well as the biodiversity and global characteristics of the community and/or the quality of the habitat. They must be defined according to the management plan of the MPA, as well as its primary objectives, and the constraints of the organisation responsible for implementing such a plan. These objectives evolve over time[6] and imply new information about the biological systems and regular reassessment of regulations and their implementation.

A Specific Territory and Place of Activity for the Economy

Boersma and Parrish (1999) explain that economic objectives are preponderant in the creation of MPAs, due to the economic value of the ecosystems hosting them. In an attempt to estimate the monetary value of the environmental services provided by the main ecosystems found on earth, Costanza et al. (1997) have allocated to the coastal ecosystems (that are the most affected by the creation of MPAs) an average value of 4,052 $/ha which, by comparison, is higher than that of tropical forests (969 $/ha). Among the coastal marine environments, the highest values have been allocated to estuaries (22,000 $/ha), sea grass beds (19,000 $/ha) and reefs (6,000 $/ha), with ecosystem services differing according to the environment concerned, such as recreational services for reefs, and nutriment recycling in estuaries and sea grass beds. MPAs can maintain or restore these environmental functions and therefore the economy to which they contribute. In a recent article, Martinez et al. (2007) confirmed the economic importance of coastal areas and oceans, in that they apparently represent between 60% and 70% of the total value of the world's ecosystems.

While MPAs are envisaged as promising for managing marine and coastal resources (Russ 2002), to what extent is the MPA more efficient than other forms of fishing regulations? Although, in the frame of the Ecosystem Approach to Fisheries, they are proposed as an alternative to conventional management methods, MPAs are not considered a panacea, but a tool which is essential to the sustainable use of resources (Cury and Miserey 2008). With regard to the economy, aside from the creation of wealth by ecosystems, major questions remain about the distribution of wealth and social justice. Since MPAs affect highly valued areas and resources, their creation causes intra- and inter-generational distribution effects,

6 Thus MPA managers are faced with the problem of assessing the impact of scuba diving or game fishing, which remain generally unappreciated, but which are more commonly practiced as efficient protection measures increase.

which consequently have an effect on their economic and social acceptability, and the requirement for a minimum equity criterion. The issue of the distribution of the economic impacts of MPAs over time is crucial: the opportunity costs that are borne when creating MPAs are immediate and certain, while the anticipated positive outcomes (economic and other advantages) are in the future and uncertain, especially when they are fundamentally linked to the maintenance or rehabilitation of environmental functions.

Finally, the MPA issue concerns the economics of institutions. The implementation of MPAs supposes that governance depends on certain conditions based on local particularism, as well as on models recommended by international environmental organisations. The success of MPAs depends largely on the quality of institutional arrangements and of collective action. In this context, economic enquiries are similar to legal enquiries: the quality of institutional constructions conditions the transaction costs during the creation of MPAs, and for their management, particularly if the MPAs rely on a consultative or participative model involving multiple stakeholders.

Moreover, tourism is experiencing a considerable boom in coastal areas. We have observed since 1990 (Hall 2001) a switch from mainly bathing tourism towards a form of tourism associating bathing activities with more sporting or adventurous activities (Chaboud et al. 2004). The establishment of an MPA results in the creation of an interface between an international market that considers the MPA to be a specific asset associated with a tourist destination, and environmental policies that try to limit the pressures of tourism on fragile ecosystems. In Madagascar for example, the development of tourism and ecotourism in particular, is considered to be a way of generating local revenues as compensation for the constraints imposed by conservation policies on more traditional uses. Some cases in the southwest of Madagascar show that a successful outcome depends on a set of economic and governance-related conditions that are rarely verified (Méral et al., this publication). We could at this point mention the governance of the international tourism industry in particular, which is not inclined towards the sharing of economic benefits equitably between local actors and operators upstream (Chaboud et al. 2004).

As far as economists are concerned, MPAs strongly crystallise the many challenges related to sustainability, and emphasise the links between the local and the international, along with the modes of governance applied to the territories concerned. Although the issues of economic evaluation and of sharing both the costs and the benefits seem crucial, they remain underdeveloped.

A Territory Governed by Law

Laws Related to the Study of MPAs Although they are legal because they are created and managed within a legal framework (Froger and Galletti 2007), MPAs have only recently been studied by the law science discipline (Chaboud and Galletti 2007); perhaps because they are situated at the intersection of the law of

the sea, coastal law (when it exists), environmental law and even economic law. The emergence of this new area of study is linked, on the one hand, to the growing status in the international law of the sea of the 'conservation' component, and to the obligations imposed on coastal states to regulate breaches in various maritime areas falling under their responsibility. On the other hand, it is linked to the interest which international environmental law (international and regional conventions) takes in marine areas that are either 'simple' or formed into networks, clusters or corridors (for more details on this notion, see Carrière et al., and Bonnin, this publication). Although environmental law came after the creation of the first protected areas, today it is one of their principle supports. Nor have MPAs developed independently of the bias of fishing regulations towards the preservation of protected areas (reservoirs of fish resources). Finally, MPAs reveal the status of modern law: they expose the existence of indigenous law and historical users of marine and coastal spaces. This concerns 'customary' or 'traditional' reserves or MPAs, as well as the related issues of the integration, opposition or recognition by 'modern' law, of pre-existing local rights concerning the coastal marine space.

The Role of the State and the Juxtaposition of Legal Competences On a national scale, marine ecosystems and MPAs are not spaces without rights or regulations. They contain legal systems such as the 'maritime public domain' that are different from those of the terrestrial 'public domain' or 'private domain of the state'. Marine ecosystems also accommodate many sectors (maritime traffic and trade, the tourism industry, industrial and local fishing, etc.) in which the state is strongly involved (via government departments or specialised institutions, amongst others), and where public and economic law is appealed to in a way which is different to that relating to terrestrial territories. Historical elements too lie behind the state's presence in maritime and coastal zones: control of the national maritime territory for law, public order and policing (with the involvement of departments such as the Home Affairs or Defence); state intervention in the fishing sector; the determining legal principle of state sovereignty over fish and mineral resources. One must not lose sight of these aspects when discussing the administrative and political systems of MPA management. The case of the marine and coastal protected area (MCPA) is even more particular in that it calls for the amalgamation of aspects of the law of the sea with other laws pertaining to the management of the terrestrial or coastal land. Institutions specialised in marine environments will find it difficult to manage the terrestrial space of an MCPA, and vice-versa. The difficulties experienced by island countries confronted with these issues are often given as an example in this regard.

The current rapid expansion of marine protected areas, particularly in the inter-tropical zone, is in line first of all with the historical increase in protected areas in terrestrial environments. However, the points of view of various disciplines towards MPAs have highlighted a number of issues that are due, among others, to the significance of economic stakes and claims to access resources and spaces. For example, the commercial exploitation of the living resources of the sea, which

has no equivalent in the terrestrial environment, will from now on be required to coexist with the interests of tourism or conservation. When considering the various scientific disciplines involved as a whole, the issue of governance turns out to be central, although it is advisable to know whether the disciplinary approach is still sufficient to answer it.

Towards a Multidisciplinary Approach of MPAs and of their Governance Mechanisms

What we seek to identify is neither rupture nor continuity in the scientific study of MPAs but, rather, the shift or perhaps even the transformation of MPAs as perceived from the viewpoint of each discipline, towards a new multidisciplinary entity. Moreover, the combination of their particularities has consequences for the study and conception of those MPA governance plans that are less mono-disciplinary but more experimental and receptive to disciplines other than law and economics, both usually concerned with the administration of territories and public choices. There is a tendency among public and private organisations to create MPA governance that relies on all the discipline-related information that could be collected.

From MPAs as mono-disciplinary units to MPAs as Multidisciplinary units

MPAs are complex units, and any reading of them from the strict viewpoint of certain disciplines, only tackles a portion of the sets and relations defining them. Understanding the structure of an MPA system requires knowledge from various disciplines, if the MPA is to be understood in all its diversity.

Experts interested in MPAs are few, irrespective of the country being considered. The increase in the number of MPAs in the inter-tropical zone has subsequently generated a growth in the demand for multidisciplinary studies, while the supply of expertise has not improved[7], even if some progress is perceptible[8]. Gathering a team of experts from different disciplines is a rare achievement. Too often research

7 The low scientific supply from the countries of the South can be explained by the small number of researchers specialising in ecosystems and the even smaller number of researchers specialised in coastal socio-systems. Generally, social science departments show little interest in coastal environments, and even less in marine environments. Students trained in rural or urban studies prefer to invest their skills in urban or rural studies rather than in coastal or marine research sites.

8 In East Africa, a study conducted within the Western Indian Ocean Marine Science Association aims at federating researchers working on the coasts of nine countries, so as to develop multidisciplinary degree courses that, together with oceanographers, will train 'coastal and marine' generalists and researchers in social sciences who will have a good knowledge on the coastal environment.

teams are limited to bringing an expert from the biological sciences together with an expert from the social sciences, thereby amalgamating disciplines as diverse in their issues and methods as anthropology, law, economics, history, geography, political science and sociology. This situation forces researchers belonging to a particular discipline to turn their attention to the fields of related disciplines, and even those of more thematically remote disciplines, that could make an indispensable contribution to understanding the MPA system. The mixture of skills used from several disciplines, not always well assimilated, tends to generate a multidisciplinary approach that could hardly qualify as 'a hybrid science of MPAs'.

The combination of the specific characteristics of MPAs almost ineluctably determines a multidisciplinary approach, if not a transversal one. Indeed, the geographical or economic particularities of MPAs have legal implications that should enable the manager to differentiate between marine and terrestrial protected areas; as far as their functional management system and their administration plan are concerned.

Thus, as an open maritime space, an MPA implies control and monitoring difficulties that cannot be compared to those of protected areas on land, and gives cause for conflict between management institutions and economic operators. MPAs made up of areas situated along the coastal fringe complicate coastal development policies and the legal relationships between elected people, local actors and tourism operators. Moreover, areas that can be transformed into MPAs are often subject to amplified anthropogenic pressure, as a result of economic actors exploiting the coastal resources. In this regard, the de-/centralised public administrations that control these activities and these human flows, tend to deploy the legal arsenal intended to guarantee the efficient regulation of environmental infringements and economic transactions. Traditional controls over the maritime domain, often military, have in fact never completely disappeared, and are revived in moments of conflicts of interest between economic actors; conflicts which the state intends to regulate and solve. The simple fact that the states of the South face a serious shortfall in financial and logistical resources does not change their attempt to control space, even if it often remains purely theoretical. Ultimately, MPAs inevitably become a separate category of space to be protected (Chaboud and Galletti 2007).

The Specificity of MPAs and the Consequences for Governance

Researchers and decision-makers have been forced to treat MPAs and their governance systems as rhizomes, at the junction between nature and society.

In this case, the geographic input to MPA governance is progressive. The temporal dimension takes on great importance when clarifying the human-environment interactions and related governance processes: protected areas were initially conceived on an island model that progressively transformed into a reticular model, based on ecological corridors (Carrière et al. and Bonnin, this

publication). Favouring, as it does, accessibility to biodiversity and its touristic valorisation, this evolution has implications for terrestrial protected areas (Grenier 2003). At sea, the reticular model in fact became essential to biologists due to the aquatic environment's inherent 'permeability' to larvae and juveniles. On the other hand, as regards governance, MPAs have been designed according to the terrestrial protected area model as spatial discontinuities (Gay 2003; David 2003). On land, the recent generalisation of the buffer zone concept, as introduced by UNESCO in the 1970s in its biosphere reserves, reduces the discontinuities between an area which is protected and an area which is not. On the contrary, in the case of MPAs, one notes that in the marine environment, there is an emphasis on discontinuity, since the fringes of the protected areas are subject of increased anthropogenic pressure on resources such as augmentation in fishing activity and the diversification of tourism activities (e.g. the development of snorkelling). In order to limit the emphasis of the discontinuity in the reef environment, it is generally proposed that a new marine space be created further offshore, via the implementation of fish concentration systems, so as to transfer fishing activity beyond the reef area (David 1998).

Nonetheless, when the monetary value of the exploited resources is high, it is indispensable to associate the regulation of the fishery pressure on the peripheral maritime areas with the creation of MPAs in order to avoid the overfishing of protected species. This measure must be complemented on land with the creation of activities that can generate revenues, generally considered by the local communities as a "fair reward" for their involvement in the management of the MPA.

The example of the marine park of Mohéli in the Comoros shows that, when the governance of the protected area is efficient, managers are sometimes requested to extend their intervention to the entire terrestrial region of the resident communities affected by the MPA (David et al. 2003). The spatial integration of land and sea within the same MPA is a new approach which is sometimes implemented at the *national* level, to promote the 'protected area' as a tourist product as complete as possible. On the other hand, at the *international* level, biodiversity protection is still influenced by the essential dichotomy between marine and terrestrial environments, as illustrated by the results of the so-called ecoregional approaches promoted by the WWF. The emphasis here is increasingly placed on the identification of centres of biodiversity and the spatial relations that exist between them.

In this context, taking into account the ecological connectivity of the reefs today leads to the inclusion of a *regional* dimension in the governance of MPAs. Thus, in the Indian Ocean, the creation of a regional network of MPAs is currently the subject of a programme guided by the WWF under the aegis of the Indian Ocean Commission, with financing from the French Global Environment Facility. This regional dimension is intended to reduce the discontinuities created by MPAs in relation to the surrounding environment. It also happens that in case of potential conflicts between states over coastal or marine resources (e.g. oil or fish), MPAs

are used in a regional perspective as indicators of geographical discontinuities, or even as factors for the increase of these discontinuities when MPAs serve as politically neutral buffer zones, in which case the management of the border territory is passed on to an international NGO.

Regarding the organisation of a governance system, the law takes on a privileged role due to the legal functions and dimensions of the MPA administrative system. As such we should mention the production mode of the rules applied in MPAs, the conditions for the application of these rules, the evaluation of the daily functioning of the administration, management, financing, control, sanction, negotiation and regulation of the crises.

The field of economics, which is also concerned with the study of MPAs, can collaborate with the field of law. The institutional change provoked by the creation of MPAs produces multiple and sometimes counter-intuitive effects, making it impossible to carry out simplistic or naïve analyses. Resorting to several disciplines then becomes an advantage. Thus, the economic appraisal shows that the participative model which underlies the delegation of management which is often implicit in promoting good governance, results in transaction costs that can reduce the efficiency of MPAs in pursuing their conservation and local sustainable development objectives. The 'proliferation of institutions' represents a threat to the establishment of MPAs in the South, and institutional rent seeking is sometimes counterproductive (Baghwati 1982), considering the objectives attributed to MPAs. As far as the legal field is concerned, the difficulties of the participative model could mean a return to state interventionism as far as conception and methodologies are concerned. State interventionism can reappear, either in the case of disagreement or in the stalling consensus between non-governmental actors concerned with MPAs, or in case of discord between administrative interventions and local civil practices (the way of life, consumption and exploitation of inhabitants, and historical actors on the natural environments and resources). Interventionism can also reappear when an MPA sponsor retires and the pressure it exercised on the administrative services eases, to the benefit of a more local management.

Beyond the networks of marine and/or coastal sites classically managed by the state, in the case of a participative governance (Féral 2007), some areas are co-managed with local communities and other stakeholders, while private protected areas are managed by their owners. These more territorialised plans are part of the movement in favour of bottom-up conservation. They are the outcome of the continued search for successful MPA governance, co-management being currently a trend as far as environmental governance is concerned. However, transformations in MPA governance become apparent in specific cases: sometimes co-management becomes the default solution when the state is unable to manage MPAs. In such cases the only cost to the state is to legalise its implementation; the political cost is higher in that it involves, for the state, a certain loss of sovereignty by relinquishing its centralised interventionist prerogatives. Sometimes co-management is a success ascribed to both parties.

The state's reappearance is by its very nature political. Since the 1972 Stockholm and 1992 Rio de Janeiro Summits, as well as the 2003 Durban World Parks Congress, environmental protection – and therefore the creation of MPAs – has become a major international challenge.

This development is particularly visible in some island states of the Indian Ocean or Oceania. The regime of President René in the Seychelles used it, at the end of the 1970s, to build a respectable image for the country. The political advantage gained from taking the international stage ended in significant economic costs for the country, since the creation and management of the MPAs were entirely paid for by the Seychelles government. Since then, the situation has evolved considerably. Powerful international NGOs, North American NGOs in particular, have been financing the majority of – if not all – the implementation of protected areas. The costs to the recipient state are therefore modest compared to the political benefits yielded by the operation.

Countries from Oceania with limited economic resources, such as the Federated states of Micronesia and the Marshall Islands, have embarked on this type of operation with the intention of taking advantage of both political and economic benefits. A parallel can be drawn with the Malagasy presidential commitment in 2003 in Durban, concerning the expansion of protected areas, marine in particular, which pulled together sponsors, NGOs and state institutions.

However, MPA implementation in Oceania and the Indian Ocean is still constrained by difficulties and a lack of definition. In addition, the financial and social costs of conservation, already high for terrestrial protected areas, remain a problem for future MPAs. In Madagascar, as in the poor countries of the Indian Ocean, due to the multiplication of protected areas, the state could end up without the means to carry out its prerogatives as both MPA creator and manager, leaving the many international NGOs or local associations a clear field to act. This can be explained by the decrease in the state's effective intervention capacity due to drastic cuts in public expenditure, while environmental protection is increasingly included in the conditionality of public development aid.

In reality, despite the massive withdrawal of the state when it comes to either financing the MPA operation (particularly via the creation of trust funds managed by international NGOs and in which a state is a partner, among others, see Méral et al., this publication), or negotiating with local communities, the state always remains present. Indeed it cannot be avoided as far as the administrative aspect, MPA registration and the associated legalities are concerned (i.e. integrated management of coastal areas, decentralisations, association law, resorting to agencies and the legal framework of the fishing or tourism sectors). Even in the case of Madagascar or the Comoros, where the administration is falling apart in such a way that sponsors are taking the MPA creation process into their own hands (by looking after the financing and current management of the MPA when it cannot be supported by the state), sponsors still cannot break away from the state which is indispensable in order to ratify the legal status, the zoning or the policing of the MPA. The steps taken by sponsors towards the state are permanent. Once the legal

framework is completed, sponsors often ensure its management, or promote its delegation, with an NGO or agency.

Special Governance between Authorities and Private Organisations

The MPA sector is becoming specialised due to the efforts (in terms of time, design, means and projects) made by public decision-makers and dedicated institutions. The differences between MPAs from various states are becoming less marked while their experiences are becoming increasingly similar. Their failures and oppositions too are often similar. A culture of MPA and MCPA managers could just as well be created, with the appearance of a body of civil servants or private experts specialised in this domain.

In the majority of cases, we find that an effort has been made to clarify the legal situation concerning MPAs, and that the authorities in charge of MPAs are becoming aware of the new influence of administrative and political decentralisation, as well as local authorities. Finally, we observe attempts by state administrations to better align their conservation action with the interests of territorial organisations (e.g. territorialised structures and groups of local stakeholders). These attempts are two-fold. On the one hand, the state tries to create *legal* governance for MPAs, which cannot always be autonomous in developing countries; and on the other hand, this legal governance should rely on a decentralisation process (where the decentralised authorities become environmentally competent). The state sometimes also wants to legitimise the 'de facto' practices of pre-MPA actors who hold certain powers, in which case the administrations adopt unchanged or updated rules on local access, and use the efficient self-monitoring ability of local individuals and groups on protected areas. The focus is on regulations peculiar to local actors. Such regulations remained little known for a long time and were often considered archaic. The state now wants to bring it into law in order to overcome the inefficiency of modern instruments. The renewed attention given to systems of sanctions expanded to include the protection of natural resources, by reusing existing customs and sometimes reinterpreting them, is a case in point.

Above MPA management, the central state, at the highest institutional level, can adopt two positions. On the one hand, it can co-ordinate the management and legal actors involved in a given maritime area, which will paralyse it if it cannot manage to juridically organise this institutional complexity in competition with its own. On the other hand, it can revert to the (opposite) centralised unilateral formula, aimed at determining the MPA perimeter as a space distinct from ordinary areas, a special area where the rules of common law are excluded to the benefit of more restrictive access, harvesting, displacement and development methods. Through this, the state includes the additional territory into a new grid pattern, delineating MPAs which state agents can dominate. The management of this area can be left either to a public institution (with reduced material and human resources) or to a private establishment created for that purpose. This management institution can be linked to the state or to private sponsors or NGOs, in proportion

to the quantum of private funds and/or exogenous funds invested to ensure this management function.

Conclusion

The recent increase in the number of marine protected areas does not yet include specifically dedicated autonomous public policies. On the one hand, MPA zoning which benefits from special regulatory and administrative policing, is more the concern of a programme or a simple project, than a carefully considered public policy. On the other hand, MPAs are often included in an all-encompassing national policy (e.g. environmental protection, fishing or forest management, coastal development or the integrated management of coastal areas) and are only a particular element of it. It is important to take MPAs out of the policy context that sometimes obscures their analysis more than it helps it, by keeping in mind that whereas MPAs, as conservation tools, are unequivocally part of the *conservation of natural resources*, they can prejudice any improvement in the livelihoods of the most disadvantaged individuals and social groups. And yet, they are part of sustainable development that advocates the *pursuit of poverty reduction and best distribution of wealth between beneficiaries of development* (Chaboud 2006).

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