BACKGROUND PAPER 6

ISSUES ARISING ON THE INTERFACE OF MPAs AND FISHERIES MANAGEMENT[1]

by
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Summary

This paper focuses on three key themes. First, it highlights the commonalities between discussions of marine protected areas and of fisheries management, with emphasis on their mutual use of spatial measures and ecosystem approaches. Second, the paper draws on the other Background Papers prepared for the Workshop, as well as a range of additional literature, to produce a substantial compilation of issues and considerations relating to the development and implementation of MPAs, within a fisheries management context. This compilation is organized according to three sequential stages in the process of consideration and development of MPAs: (1) Preliminary Steps; (2) Design; (3) Implementation and Review. This structuring seeks to make clear the variety of issues to be addressed within the different stages of the process, integrated across disciplines and across types of fisheries. The third key theme of the paper is a focus on the first of the above-noted stages – the 'preliminary steps' of decision-making, in which scoping of needs, gaps and feasibility takes place from the dual perspectives of MPAs and fisheries management. A relative paucity of information and analysis on this topic is noted, along with a consequent need for additional work on the subject. An initial effort is undertaken to explore the key decision-making elements in this 'preliminary stage'.

1. INTRODUCTION

Marine Protected Areas (MPAs) are being implemented at increasing rates around the world, particularly since the call for their development and implementation in the 2002 World Summit on Sustainable Development (Johannesburg Plan of Implementation, WSSD). MPAs are taking a wide range of shapes and forms, to meet an equally wide range of objectives. Despite this diversity, a common feature of many if not most MPAs is their impact on, and interaction with, fishery systems. Such impacts and interactions have received considerable attention in the literature on MPAs and in practical implementation. A common theme, for example, is whether the implementation of an MPA will lead to long-term increases in fish stock biomasses, and thus in fishery catch levels.

On the other hand, much less attention has been paid to the potential for synergy between MPAs and the management of fisheries. Accordingly, this paper focuses specifically on the role of MPAs as a tool of fisheries management and a means of meeting fisheries management goals. The paper seeks thereby to contribute to FAO's initiative to achieve a better understanding of the linkages between MPAs and fisheries management, within the framework of the Code of Conduct for Responsible Fisheries. Indeed, the 26th session of the FAO Committee on Fisheries (COFI) noted that "MPAs have potential benefits as a fisheries management tool..." (FAO 2005) and that there is a need for an appropriate legal framework for MPAs, a scientific basis, and effective monitoring and enforcement.

The paper has been organized into seven sections. Following this first introductory section, the second section explores the range of MPA definitions and objectives being pursued through MPAs. Section three describes how MPAs and fisheries management are linked in three ways – through the common avenue of spatial management, through the Ecosystem Approach to Fisheries, and through the policy

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context. The fourth section describes the variety of forms (models) and scales of MPAs. The fifth section first presents a structure within which to explore the linkages between MPAs and fisheries management, based on three major stages: (1) a preliminary stage of initial aspects and policy/legal frameworks, (2) the design stage, and (3) implementation, management, monitoring and assessment. This is followed by an extensive listing of the various issues and considerations arising on the topic, and a synthesis of those issues. Section six goes into detail on the 'preliminary stage' of MPA decision making, noted above, within which the objectives and approaches of both MPAs and fisheries management must be examined. Finally, section seven provides a closing discussion. Throughout the paper, the recommendations of the five background documents associated with the Workshop, as well as other relevant research, are incorporated to the extent possible.

2. DEFINITIONS AND OBJECTIVES OF MPAs

2.1 Definitions

Among scholarly studies on marine protected areas, and among the range of international, national and nongovernmental initiatives to implement MPAs, there is a considerable diversity of views of what exactly should be considered an MPA. This diversity has arisen because MPAs are used for a wide range of purposes, and take a wide range of forms (depending on how wide the net is cast of what is included as an MPA). What is common to all the definitions is an understanding that an MPA is in the 'marine' environment, it is an 'area' of ocean space, and it is 'protected' in a manner beyond that of neighbouring areas.

These fundamental features are reflected in what is perhaps the most widely accepted definition of an MPA, that produced by the IUCN:

> *"Any area of intertidal or subtidal terrain, together with its overlaying waters, 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."(IUCN 1994)*

An extension of this definition has been put forward (although not yet formally agreed upon) by the Convention on Biological Diversity, a major forum for discussion of MPAs:

> *"'Marine and Coastal Protected Area' means any confined 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 it's marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings." (CBD 2002)*

While these definitions are often quoted, there remain elements of debate, and indeed variations on what is considered to *be* an MPA, and what types of spatial measures are considered as MPAs. This has been blamed for problems involving misuse and abuse of the term[3]. Certainly, confusion can result: in referring to MPAs, some exclude anything other than 'no-take' areas in which no resource use is allowed, others exclude single-sector fishery closed areas, others exclude large-scale zoned areas, while many others take a broad and inclusive view of the term MPA. While a common understanding would make discussion easier, there is also debate over the utility of pursuing a single internationally accepted definition – since a multitude of individual jurisdictions have already adopted their own definitions.

There remains a further challenge with respect to fisheries specifically, in that most definitions have not explicitly included fisheries management considerations. This has led to additional confusion in that some refer to the idea of separate "fishery MPAs" (whether or not this simply means a fishery

[3] Such as at the Conference on Marine Biodiversity, Fisheries Management and Marine Protected Areas (Brussels, 10 November 2005)

closed area). There is no consensus over the usefulness of such a term, but rather a widespread sense that in terms of the role of MPAs in fisheries management, it would be more helpful to work with existing definitions, to focus these on the key MPA-fishery interactions.

2.2 Objectives

Each MPA is implemented to achieve some sub-set of what is in reality a wide variety of potential objectives. Indeed, there have been many listings made of the possible benefits provided by MPAs. An illustration of such a list is that of the Independent World Commission on the Oceans (1998: p.200):

- "protection of marine species at certain stages of their life cycle;
- protection of fixed, critical, habitats (e.g., coral reefs, estuaries);
- protection of cultural and archaeological sites;
- protection of local and traditional sustainable marine-based lifestyles and communities;
- provision of space to allow shifts in species distributions in response to climate and other environmental changes;
- provision of a refuge for recruits to commercial fisheries;
- provides a framework for resolving multiple stakeholder conflicts;
- provides models for integrated coastal zone management;
- provision of revenue and employment;
- provision of areas for scientific research, education, and recreation."

In addition to these, other indirect objectives could be envisioned, such as the following:

- Generating 'spin-off' benefits to the coastal economy, thereby helping to diversify the economy (e.g. through tourism and conservation work), which in turn can reduce stress on fish stocks.
- Providing a hedge against uncertainty, a form of conservation 'insurance policy' (Dugan and Davis 1993; Holland and Brazee 1996; Rowley 1994).
- Generating non-market values such as (a) non-use value (e.g. increased oxygen production from the sea), 'existence value' (the societal value derived from the existence of the MPA), and 'option value' (the value of maintaining a marine ecosystem for future use).

Among the many objectives MPAs may be designed to meet, some are directly fishery-related – for example, an MPA in the form of a closed spawning area may be put in place explicitly to improve fishery yields and sustainability by protecting spawning fish, and an MPA on a tropical coral reef may be designed to both improve reef quality and increase fish biomasses, thereby supporting the fishery. Even MPAs implemented with an emphasis on other economic sectors (e.g. tourism, recreation), on marine conservation and biodiversity goals, or on other values in the marine environment, will likely indirectly affect fisheries, even if no fishery-specific objectives are in place.

In such cases, attention may well be paid to the possible *impacts* the MPA has on fisheries, whether positive (e.g. long-term increased biomass) or negative (e.g. decreased short-term yields). While there may also be some attention paid to fisheries management needs, it has been less common for MPAs to be designed to serve fisheries management goals *per se*. This paper focuses on the idea that, whether new marine protected areas are being contemplated or existing ones adjusted, it can be useful to focus more on opportunities to consider the role of MPAs in meeting fisheries management objectives.

Whatever the mix of objectives being pursued, it will be important to assess the extent to which the potential benefits of the MPA (as listed above) are being realized, relative to the costs that will likely arise in the establishment of the MPA – including direct management costs (additional costs incurred

to manage the MPA), as well as opportunity costs (e.g. foregone catches, due to restrictions in the MPA). With respect to fisheries management, it will be important to understand the balance of costs and benefits involved with the use of MPAs, in comparison with other management tools, in order to undertake evaluations of the MPAs in meeting objectives, both fishery-related and otherwise. Equally, it is important to examine distributional considerations, since each of the benefits and costs of MPAs may impact in differing ways those affected. This involves assessing (1) who is receiving the benefits and who is incurring the costs, as well as (2) how benefits and costs are distributed spatially (including at local, regional and national levels) and over time.

3. LINKING MPAs AND FISHERIES MANAGEMENT

3.1 Spatial management

All Marine Protected Areas – and indeed all protected areas, whether marine or terrestrial – have in common the fact that, by definition, they are forms of *spatial management*. A management measure is spatial in nature if it is geographically-defined, and implemented within certain delimited sub-areas of a given jurisdiction or management area. It is important to highlight the idea of a sub-area, in the sense of drawing a clear distinction between an MPA on the one hand, and on the other hand, management measures that apply throughout the jurisdiction or management area in question (whether that be the EEZ of a nation, or an entire statistical area designated by a regional fishery organization, or the entire area of a municipal fishery in the Philippines).

Spatial management, in turn, is a well established component of fisheries management, notably in terms of fishery 'closed areas' that typically protect spawning or juvenile fish (discussed below). It is crucial to assess and understand how MPAs and other spatial management measures fit within the 'toolkit' of fisheries management – along with effort/input controls, quota/output controls, and technical measures. Conversely, it is important to see how fishery-oriented closed areas – as spatial management measures developed for fisheries management – mesh with moves toward establishing protected areas having broader objectives.

3.2 Ecosystem approach to fisheries

Since MPAs provide protection on a spatial basis to components of marine areas, it is useful to view the connection of MPAs to fisheries management in the context of the Ecosystem Approach to Fisheries (EAF). The EAF broadens the approach to fisheries management, and to utilization of fisheries, by placing the fishery within the context of the surrounding ecosystem, as well as by incorporating relevant human interactions [e.g. FAO 2003, Garcia *et al.* 2003]. As noted in the FAO Technical Guidelines for Responsible Fisheries (FAO 2003):

> "an ecosystem approach to fisheries (EAF) strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries"

From the perspective of EAF, it is important for fisheries management to take into account the impacts of fishing on the ecosystem, and conversely, the impacts of the ecosystem and of other human uses of that ecosystem, on fisheries. Martin *et al.* (2007) have noted that MPAs can play a role in this:

> "MPAs may be viewed as a complement to other fisheries management tools and integrated with sustainable management practices over the wider marine environment."

Indeed, it has been argued in many contexts that MPAs, and fisheries management for that matter, often fit within a larger context of integrated ocean and coastal management. For example:

> "To be effective on a wide scale, MPAs should be embedded within large planning frameworks such as integrated coastal management (ICM)… These frameworks are designed to balance resource management and economic development, consider ecologically-significant processes, and encourage cross-sectoral planning." (Christie and White 2007)

3.3 The policy context of MPAs and fisheries management

Although spatial management – notably in the form of closed areas – is not new as a tool of fisheries management, the particular integration of MPAs into fishery policy frameworks is evolving. The varying roles, definitions, and uses of MPAs on domestic, regional and international scales are still subject to debate. However, there do seem to be certain recurring aspects of a policy and institutional nature that need to be understood to provide a larger understanding of how MPAs connect within marine conservation and fisheries management regimes. Some of these key aspects are noted in the template of Table 1, which includes:

- the departments/agencies involved or responsible for MPAs
- whether an MPA policy is in place within the jurisdiction
- the integration of MPAs into a larger policy frameworks of ICM or IOM
- the extent of application and incorporation of EAF within fisheries policy
- the definition of an MPA in the particular jurisdiction/organization
- the spatial dimensions of the jurisdiction's principal fisheries
- whether the definition or use of MPAs includes the following fisheries management tools: (1) Closed fishery area, (2) Fishery zoning, (3) Habitat conservation for fisheries management
- whether the country/region has other spatially managed areas that might provide protection or sustainable management of fisheries, apart from those identified as MPAs.

The headings in Table 1 constitute a set of key elements relating to the interaction of MPAs and fisheries management, and accordingly, if the Table were to be completed for relevant countries, regions, sub-national jurisdictions and/or organizations, this could provide a vehicle for comparing how MPAs and fisheries management interact, across jurisdictions and/or organizations. In turn, such an assessment of the international diversity with which spatial protection is applied within varying policy situations could lead to insights into 'best practices' in the application of MPAs to fisheries management, and into 'gaps' and areas for further research. To maximize the utility of Table 1, the set of information compiled could be combined with that produced in current projects that are helping to inform MPA implementation (e.g. with respect to management effectiveness), and efforts to catalogue MPAs globally.

TABLE 1: Template for Policy Analysis of MPAs and Fisheries Management

Country/ Organization	Departments involved or responsible	MPA Policy in place?	Application and incorporation of EAF in Fisheries Policy	What wider ocean/coastal management regimes are in place (IOM ,ICM, etc)?	Definition of an MPA	What are the spatial dimensions of the jurisdiction's principal fisheries?	Does the country/region have other spatially managed areas that might provide protection or sustainable management of fisheries which are not identified as MPAs?	Are the following fisheries management tools included in the country's/organization's definition or use of MPAs?	
NON-GOVERNMENTAL AND INTERGOVERNMENTAL ORGANIZATIONS									
								Closed fishery area	
								Fishery zoning	
								Habitat conservation for fisheries mgmt	
								Closed fishery area	
								Fishery zoning	
								Habitat conservation for fisheries mgmt	
COUNTRIES									
								Closed fishery area	
								Fishery zoning	
								Habitat conservation for fisheries mgmt	
								Closed fishery area	
								Fishery zoning	
								Habitat conservation for fisheries mgmt	
								Closed fishery area	
								Fishery zoning	
								Habitat conservation for fisheries mgmt	
REGIONAL BODIES									
								Closed fishery area	
								Fishery zoning	
								Habitat conservation for fisheries mgmt	
								Closed fishery area	
								Fishery zoning	
								Habitat conservation for fisheries mgmt	

4. TYPES AND SCALES OF MPAs IN THE CONTEXT OF FISHERIES MANAGEMENT

4.1 Diverse models of MPAs

A key challenge in assessing the role of MPAs in the context of fisheries management lies in the multiplicity of forms they can take. As Martin *et al.* (2007) note:

> "MPAs are a flexible tool encompassing a range of management options, from smaller, strictly protected no-take reserves to larger, zoned multiple use areas where different activities are carefully managed."

Of the various forms MPAs can take, some key examples include:

- spatial limits on fishing areas (as well as simple fishery closures)
- 'no take' areas in which there is a complete prohibition on entry or resource extraction
- areas with ocean zoning schemes or other comprehensive controls on usage
- areas with regulation of specific designated activities, e.g. modes of fishery production
- territorial rights systems and allocation-oriented area regulation

Each of these forms of MPAs is discussed briefly below.

4.1.1 Fishery closed areas

Every fishery textbook covers the use of 'closed areas', specific parts of a fishery management jurisdiction within which fishing (whether all fishing or that for certain species or using a certain method) is prohibited, most often to protect the spawning or juvenile fish on spawning and/or nursery grounds therein. A closed area is a form of spatial management, as discussed above, contrasting with non-spatial management tools, such as limiting the size of mesh in fishing nets, that typically apply *throughout* the range of the competent authority, as opposed to a sub-area within it.

In closed areas, the closure may be temporary (seasonal) within a given year, perhaps during a spawning period, or it may be permanent. In either case, however, the restriction is most often focused on a specific activity, such as fishing for a certain species. For example, fishing for groundfish may be prohibited in a closed area known to be a cod spawning ground, but fishing within that area may be permitted for shellfish. One of many examples of a permanent but limited closure is the 'haddock box', a designated area of ocean space on the Scotian Shelf off Nova Scotia, Canada. This area was identified by fishers as being important for spawning and as a juvenile area for haddock. Fishers themselves therefore pushed for, and consistently support, a prohibition on targeting the haddock stock within the 'box'. The fishers are convinced that protecting the area is both in their own self-interest and the 'right thing to do' in conserving the haddock stock.

Fishery closed areas are typically narrowly-targeted and fishery-focused, having the advantage that their purpose is very apparent and clear-cut. Fishers, for example, can see that the goal of a fishery closure is to protect and conserve a specific stock. On the other hand, their narrow focus means that while such closed areas may provide indirect ecosystem benefits, they cannot be expected to provide comprehensive protection or management of the designated spatial area (nor of the full ecosystem, however defined). In other words, closed fishery areas are certainly spatial management measures, and may fit within many definitions of what is considered an MPA, but they are but one specific class of spatial measures.

4.1.2 No-take reserves

While a fishery closed area is specifically and usually solely designed as a fisheries management measure, 'no-take reserves' typically have broader, more ecosystem-level, goals. These types of

spatial measures are generally MPAs in which no extractive activities are permitted – they may well permit tourism and recreational activities, such as diving and boating, but are essentially meant to be parts of the ecosystem relatively unaffected by human use. The establishment of such an MPA may reflect a specific objective, such as protection of a fragile or unique habitat, while a system of several no-take areas could serve the broader pursuits of biodiversity conservation and ecosystem well-being. It has been suggested that no-take reserves can also serve as tools for public education and as a means to reflect "heritage and moral values" (Ballantine 1994: 210). To gain acceptance, no-take reserves have tended to be relatively small in size, albeit possibly within the context of a network of such areas, or within a zoned approach (see below). However, the idea of closing most of a fishery management jurisdiction through 'large space-time refuges' has been suggested as well (Walters 1998). Early examples of no-take reserves are New Zealand's Leigh Marine Reserve established in 1977 (from Cape Rodney to Okahari Point) (Ballantine 1996); France's Scandola Nature Reserve established by decree in 1975 (Mabile and Piante 2005); and the Philippine's Sumilon Reserve gazetted in 1974 (Russ and Alcala 1999).

4.1.3 Ocean zoning

Ocean zoning refers to the practice of specifying the kinds of activities allowable within each of a set of sub-areas ("zones") within an overall geographically-defined area. This produces what can be seen as a larger-scale multiple-use MPAs, usually designed from a multi-objective perspective. In a zoned marine region, there could be (for example) an interior no-take area at the 'core' of the MPA, together with selective use limitations (e.g. on fish harvesting) throughout the MPA, often with a declining level of stringency further from the core. From a fishery perspective, one could envision conservation and stock rebuilding efforts in outer zones of the MPA, being aided by larval migration from no-take areas, and potentially efforts to reduce the pressure on the fish stocks through economic diversification in neighbouring coastal communities. King (1995: 282) notes that a multi-use MPA might include zones ranging from preservation zones (no access allowed) to recreational zones (with only regulated recreational fishing allowed) to traditional fishing zones (with exclusive fishing rights held by local fishers) to scientific and experimental zones. Perhaps the best known zoned MPA is the Great Barrier Reef Marine Park (GBRMP) in Australia – roughly 350 000 square kilometres, approximately 2 500 individual reefs, and varying levels of protection relating to a range of uses (Independent World Commission on the Oceans, 1998: 199).

4.1.4 Spatial restrictions on mode of production

Increasingly, spatial management is being used in fisheries in ways more elaborate than the classic 'closed area' described above. In many jurisdictions, patchworks of area-specific restrictions have developed, in which a range of spatial restrictions are imposed on specific fishery sectors (e.g. recreational), or specific modes of production (e.g. large-scale or industrial fleets) and gear types (e.g. bottom trawling). Not only do these situations often involve a wide variety of spatial restrictions, the measures are put in place for varying purposes – notably (a) for conservation, habitat protection, etc., or (b) for allocation and/or conflict resolution.

4.1.5 Access rights in small-scale fisheries

Spatial management tools such as those that deal with access rights can play a large role in general fisheries management, but have become increasing important in the management of small-scale fisheries. Territorial use rights in fishing (TURFS) and customary marine tenure (CMT) are rights-based approaches in which rights are assigned to individuals or groups. Such systems can be representative of traditional use patterns and exist in many areas of the world (Christy 1982; Charles 2001). Examples of the widespread successful use of these systems is apparent in Chile where TURFs have been allocated in the form of Management and Exploitation Areas for Benthic Fisheries (MEABR), and are supported through legislation. Such arrangements can be a feasible option for small-scale artisanal fisheries and have enjoyed success in Chile, producing long-term benefits in terms of the economic welfare of fishers, the strengthening of monitoring and management, and

reduced costs (Defeo and Castilla 2006). TURFs can be beneficial, particularly, in areas where the central governance system is weak or distant. The assignment of rights to local fishers can provide a powerful incentive for sustainable management of fisheries. These systems represent yet another form of spatial management, which is defined by some as a type of marine protected area.

4.2 Varying scales of marine protected areas

The discussion of MPAs and their role in fisheries management must also take into account the wide range of scales of MPAs – from the local, community and sub-national levels, through to those that cross national boundaries, and indeed those that may be implemented on the high seas beyond national jurisdiction.

4.2.1 Local, community and sub-national MPAs

Most MPAs are of a scale that fits easily within the borders of a given nation. Indeed, many are of a local and/or community level – as is common in the Philippines and in well-known cases such as that of Soufriere in St. Lucia (eastern Caribbean). On the other hand, the Great Barrier Reef in Australia, and the recently declared MPAs of the Northwestern Hawaiian Islands Marine National Monument composed of 362 062 km^2 in the United States (June 2006) and the 184 700 km^2 Phoenix Island Protected Areas in Kiribati (April 2006) are examples of large MPAs that nevertheless fit within a nation's borders (White House 2006; MPA News 2006a). While the complexities of all these MPAs can be considerable, they obviously avoid the challenges of international considerations, found in the two cases discussed below.

4.2.2 Regional and transboundary MPAs

Transboundary spatial management is becoming more feasible as instruments to facilitate the development of marine protected areas across borders are developed. An instrument that currently supports planning to create MPAs across national boundaries of members is the Barcelona Convention and its Protocol concerning Specially Protected Areas and Biological Diversity (Young 2007). Regional Fisheries Management Organizations (RFMOs) are also beginning to address issues of resource sustainability through spatial measures, including the use of MPAs. RFMOs, in fact, need to apply principles of sustainability under the UN Convention on the Law of the Sea (UNCLOS) which implies that they are expected to "to establish conservation and management measures to facilitate joint assessment of stocks and ecosystems, and ensure that the biodiversity of aquatic habitats and ecosystems is conserved and endangered species are protected" (Young 2007). However, only a few RFMOS have incorporated this aspect of management informally into their 'toolbox', and many have yet to address this issue, representing a serious weakness in global and regional governance regimes (Molenaar 2005)

4.2.3 Areas beyond national jurisdiction ("the high seas")

Spatial management is now being considered in areas governed by international or regional agreements, or in areas only governed by the regime of the high seas. As interest grows in the resources of such areas, including both demersal and highly migratory and straddling stocks, as well as in corresponding resource management and research approaches, various management regimes are being considered and debated internationally. Many of the issues associated with coastal or offshore (within-EEZ) MPAs carry over directly to questions relating to the high seas. Despite the differing history of fishery management and diversity of management regimes, many of the conversations on the benefits and costs of MPAs within national jurisdiction are also applicable to the seabed, water column and ocean surface of the high seas. Though few in number and rarely designed for fishery management purposes, examples of such spatial protection measures do exist in the high seas. For example, the North East Atlantic Fisheries Commission (NEAFC) established a temporary ban on trawling and use of static gear over seamounts in its jurisdiction to protect "vulnerable deep-water habitats."(NEAFC 2004) Efforts to identify international regimes through which to establish MPAs

are ongoing, although discussions relating to spatial protection for fisheries management in this are still nascent. Indeed, there is still much debate internationally as to whether such measures are feasible and necessary in the high seas.

5. ISSUES ARISING AT THE INTERFACE OF MPAs AND FISHERIES MANAGEMENT

This section first presents a 3-stage process for assessing the links of MPAs and fisheries management, then provides a preliminary listing of issues, questions and considerations that may arise in addressing the potential for and implementation of MPAs (including high seas MPAs), with emphasis on the fisheries management context.

5.1 MPAs and fisheries management: decision-making stages

There is an abundant literature on the process of fisheries management, and a rapidly growing literature on MPA design and implementation. However, when one examines the linkage between these two – MPAs and fisheries management – there arises a need to adjust the analysis somewhat to effectively combine two related but different processes. On the one hand, in MPA implementation, one might typically begin by determining the goals of the MPA, where it should be located, suitable dimensions and internal regulations, among other details required to best meet the goals. On the other hand, in considering fisheries management, one might begin by examining the fishery goals being pursued, along with the current management realities and needs, before choosing suitable tools from the 'toolkit' of fishery management. However, when we are looking at both MPAs and fisheries management together, it is not enough to carry out these processes separately.

Instead, we must initially integrate, simultaneously within a 'preliminary stage', an understanding of fisheries management needs and MPA needs, as well as the current state of the world, in terms of the fisheries management tools already in place, and whether MPAs are already in place. Questions that arise in this preliminary stage may include: What are the fisheries management needs? Can an MPA help meet those needs? What non-fishery needs motivate MPA implementation? Is an MPA a feasible tool to meet the various fishery and non-fishery needs?

The nature of this combined examination of MPAs and fisheries management leads to a modified process, based on three sequential stages in the process of consideration and development of MPAs: (1) Preliminary; (2) Design; (3) Implementation and review.

5.1.1 Preliminary issues

This preliminary stage is intended to address the issues that might be faced before the actual decision of implementing an MPA is taken. Many questions are posed that might determine whether an MPA is indeed feasible or desirable for a specific area, and in particular, whether an MPA fits with the needs and current reality of fisheries management (or alternatively, whether it is motivated by other goals). This is an initial 'scoping' stage in which information on the nature of the marine system, and the fishery, is gathered to determine the most effective method or tool necessary to address the problems at hand. The preliminary stage may also provide an appropriate avenue for making decisions on the best possible method for addressing international obligations, implementing the precautionary approach, and adopting different avenues for management proactively to avoid future fisheries problems.

5.1.2 Design

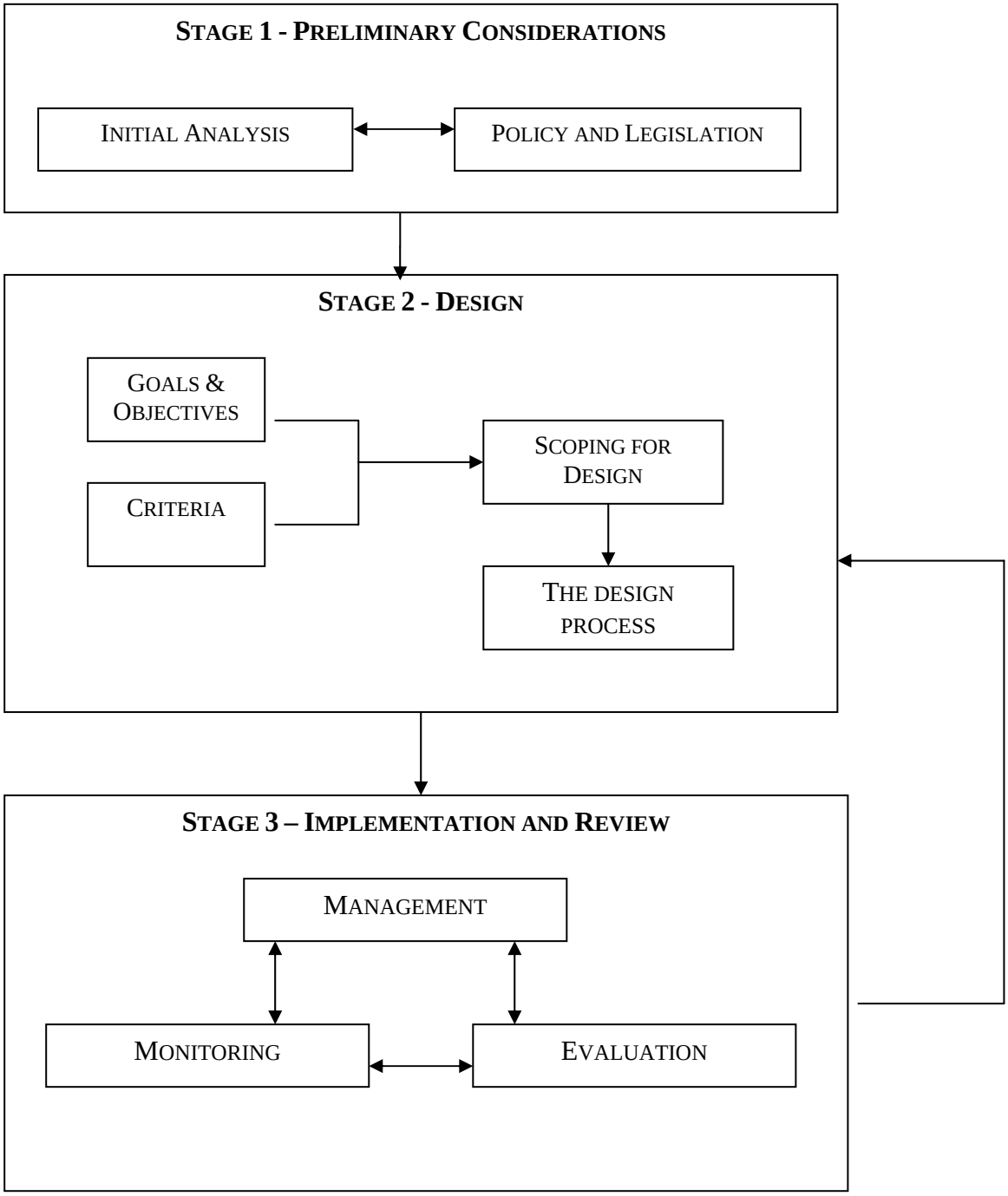
In the Design stage, the decision to implement an MPA has already been made, and the focus turns to an initial concentration on goals and objectives to be met, as well as criteria (i.e. criteria established for particular MPA regimes within a nation, region or internationally). This is followed by the scoping phase for design of the MPA, which includes suitable assessments (biological, socioeconomic, etc.) to determine feasibility in a specific area as well as appropriateness of the selected fisheries management

measures to meet the issues faced by the fishery and community. Once these questions are addressed this stage flows into the actual design process, which has been the subject of abundant MPA literature.

5.1.3 Implementation and review

The last stage in the process incorporates management, monitoring and evaluation components. All of these are key to an effective MPA, whether or not it is related to fisheries management. Furthermore, these can be seen as providing feedback into the design stage, as an essential ingredient of adaptive management.

The structure of the 3-stage process is reflected in the diagram presented below.



5.2 Issues and considerations at the interface of MPAs and fisheries management

This section of the paper presents an extensive listing of issues and considerations that arise in terms of the interactions between MPAs and fisheries management, and particularly the role of the former (MPAs) in carrying out the latter. The list is organized to follow the 3-stage structure described above, with sub-headings within each stage. Within the first stage of the process, the issues in each component are presented in two groupings: issues relating to the MPA-Fishery Interactions, and general issues. In the second and third stage (Stage II — Design, and Stage III — Implementation and Review), the issues presented within each component are organized under three groupings: (a) Stakeholders and Participation; (b) Management System; and (c) Structure, Information, Uncertainty.

It should be noted that a listing of issues, such as this, may facilitate the step-by-step assessment of MPAs in the context of fisheries management, but it cannot represent *guidelines* for the actual implementation of an MPA. The question of how to actually carry out the steps necessary to create an MPA is a separate one, which has been addressed by many others (e.g. Sobel 2004) and will not be dealt with here.

Issues and Considerations at the Interface of MPAs and Fisheries Management

[citations for the papers commissioned for the Workshop use only the last name of the author[s]]

STAGE I - PRELIMINARY CONSIDERATIONS

STAGE I, SECTION A: INITIAL ANALYSIS

I - A.1 Issues Relating to MPA-Fishery Interactions

1. What issues are being faced in fisheries management?
2. What societal objectives are being pursued with respect to (1) fisheries, and (2) marine management?
3. What international goals or commitments drive and/or constrain how the issues are addressed?
4. With respect to both the issues faced and the objectives pursued, are spatial management measures potentially feasible (e.g. from a biological/species and a governance perspective) and beneficial? Has a preliminary analysis been done of the possibilities of spatial management?
5. Within the realm of spatial management, is a marine protected area the appropriate spatial tool? (Or does the concept of "MPA" encompass all spatial management measures for the jurisdiction involved?) In the specific circumstances being addressed, is there a priority to meet biodiversity conservation goals or fisheries management goals (or alternatively, a combination of goals)? Are there variations in addressing these questions across local, national, regional, international levels?
6. If an MPA (or MPA network) is being considered as one of the fishery management tools for a specific area or species, how effective is it expected to be as a tool (either solely or in conjunction with other measures) for management of the specific species, ecosystem and/or administrative area?

7. What level of cooperation is needed to develop MPAs and MPA networks, whether internationally (e.g. within the UN system) or domestically? What is the role of UN agencies, regimes and agreements? What should be the role of domestic or regional departments or agencies?
8. If MPA networks with mixed objectives are desirable, how can MPAs with a fisheries focus be integrated? Is this desirable? How does this vary across national, regional and/or global scales?
9. What mechanisms can assist in identifying short-term and long-term legal/institutional goals for MPAs? Is there integration with long-term and short-term fisheries management goals? If not, would this integration be beneficial?

I - A.2 Generic MPA Issues

1. What is the appropriate scale for an MPA in the given circumstances? What is the knowledge base with respect to MPAs of this scale? Can available research on small-scale MPAs be 'scaled up' to larger scale situations, or vice versa? What would be the appropriate institution, group and/or mechanism to do this? What research is need on this?
2. In light of studies indicating current relatively high rates of unsuccessful implementation and/or management of MPAs, what lessons can be learnt, or what analysis should be undertaken, to proactively avoid the risk of this occurring?
3. What is the role of large-scale spatial management – notably Large Marine Ecosystems (LME) and large MPA networks - and under what circumstances is such management feasible? What analyses are needed of corresponding institutional structures? With respect to establishing large MPA networks, what approaches can lead to broad international acceptance of these, or should these be pursued only in contexts for which the institutional and financial means are available in all the nations involved?
4. *On the high seas:* Can MPAs offer an opportunity to address illegal fishing (IUU) through establishing a strong enforcement and compliance scheme? (Martin *et al*.) How can current illegal fishing on the high seas be dealt with and how can IUU fishing be reduced in order to make potential high seas MPAs effective?

STAGE I, SECTION B: POLICY AND LEGISLATION

I - B.1 Issues Relating to MPA-Fishery Interactions

1. In within-nation situations, which ministry is responsible for marine protected areas, or is this divided among ministries, or are there sub-national (provincial, state) jurisdictions responsible? Which ministry is responsible for fisheries management? Is there coordination between the different ministries?
2. *On the high seas:* What agency/department/organization/etc. would be responsible for high seas MPAs? And what would be the roles of the many potentially-involved agencies or organizations, including fisheries related organizations?
3. At a regional/multi-national level, is there multilateral regional jurisdiction for MPAs? for fisheries management? Is there a need for the creation of new regional organizations with all-inclusive mandates?
4. Would greater integration within national and international agencies/departments be beneficial, to serve fisheries management and marine conservation goals? If so, how can overall policy be made efficient and well organized?
5. Is there a need for an overall policy or plan for use of spatial restrictions for fisheries management (or for other [broader] management goals) within the EEZ?

6. Is an 'integrated management' approach (e.g. Integrated Ocean Management or Integrated Coastal Management) useful for MPAs in fisheries management contexts? How is this best linked to the Ecosystem Approach to Fisheries?
7. Does harmonization exist between MPA and other fisheries management legislation and existing legal frameworks? How can synergies between fishery legislation and environment/conservation legislation be promoted and strengthened? Have the requirements of existing fisheries legislation been incorporated into MPA management plans wherever possible? (Martin *et al*.)
8. With respect to international coordination, is there a need for an internationally accepted definition of an MPA? Is the IUCN definition sufficient for marine situations, i.e. MPAs? Is it encompassing of fisheries management areas? What categories of MPAs should be envisioned, in terms of interactions with fisheries management? Do the IUCN categories apply well enough to MPAs in general, and to interactions with fisheries management in particular?
9. *On the high seas:* In considering high seas MPAs, if this option is pursued, is there a need for a different definition that more closely reflects the high seas situation? Do the IUCN categories fit high seas MPAs? Is it relevant to categorize such MPAs, and if so, are new categories needed? How do these questions relate to the interaction of high-seas MPAs and fisheries management?

I - B.2 Generic MPA Issues

1. In cases of combined marine and terrestrial protected areas, how can management be made effective?
2. Is there a need to recognise the MPAs of varying scales, governance regimes, and locations (i.e. distance from shore) in a legal sense?
3. Are appropriate policy mechanisms in place to address the maintenance and enforcement of an MPA? If not, how can this be addressed? [*On the high seas:* What international legal framework is needed to address compliance, enforcement, and implementation on the high seas?]
4. Has integration of MPA-related governance instruments and approaches, both in and beyond national jurisdiction, taken place where necessary? [*On the high seas:* Integration of instruments could prove to be particularly important, given the necessity for cooperation among all ocean users.]
5. From a legal standpoint, has there been adequate consideration of the three-dimensionality of marine spaces (i.e. the seabed, water column, ocean surface, and even the air column above – which contrasts with the typical 2-dimensional terrestrial situation), and how MPAs fit into that?
6. On the high seas: *How is it best to deal with the reality that none of the available international instruments include all the main ocean user countries as parties?*
7. Are the laws and legislation dealing with MPAs effective? Have indicators of excellent legislation been identified? Have these been put into practice? [Ingredients may include clear and direct legal authority, relationship between mandate and the nature of provisions selected, direct connection between the proposed legal approaches and practical objectives, etc.] (Young)
8. Have existing mandates and instruments been taken into consideration?
9. Is the legislation controlling an MPA consistent with relevant international instruments?

10. *On the high seas:* Are there significant gaps regarding the management of high seas resources for RFMOS, and if so, how can these be addressed? What is the extent of RFMO jurisdiction, and to what extent can MPAs be established for different purposes within the potential RFMO jurisdiction?

11. Have the possible gaps been addressed in MPA legislation and instruments (in addition to the gap of incomplete accession) for surface activities, demersal fisheries and other biological resources, seabed biodiversity and resources? (Young) If not, what are appropriate methods through which to manage or correct the identified gaps?

STAGE II –DESIGN

STAGE II, SECTION A: GOALS AND OBJECTIVES

1. Do the goals for the scope and purpose of MPAs reflect a balance between scientific and human (social and economic) needs and realities? (Pomeroy *et al.*)
2. Are the goals and objectives well-defined and stated in a clear way?
3. Are possible conflicts and trade-offs in objectives taken into account (e.g., between biodiversity conservation and fisheries management)?
4. If fisheries management is a secondary rather than a primary goal, how is this taken into consideration? Is there communication and coordination between the different departments or agencies involved? Is there confusion between spatial areas of differing names [e.g. MPA, MMA (marine managed areas), FMA (fisheries managed areas)]? Is it necessary to choose one of these, or is a mix desired?

STAGE II, SECTION B: CRITERIA

1. What are the criteria for identifying priority areas/habitats for MPAs, and the amenability to spatial management of species and fisheries within the area in question? What is the appropriate balance of scientific, social/economic or management-related criteria? Indeed, is there sufficient understanding of the various values (e.g. the genetic, ecological and socio-economic values of marine biological diversity) to develop appropriate criteria and set an appropriate balance? Do the criteria include amenability of species within the area in question to spatial management? If so, are adequate data available to determine feasibility?
2. Is there a need for identification of biogeographic areas/distribution, e.g. possibly for ensuring representativeness of the MPA? If so, who will address this?
3. Do MPA selection criteria address and coordinate relevant legal frameworks regarding tenure, durable resource-use rights, and the rights of offsite persons (coastal landholders, marine resource users, users of general rights regarding shipping and passage, NGOs, conservationists, researchers and others)? Do the selection criteria reflect the different needs, objectives, and legal issues of marine protection? (Young)

STAGE II, SECTION C: SCOPING FOR DESIGN

II - C.1 <u>Stakeholders and Participation</u>

1. How can issues of communication be addressed in order to avoid conflict? Has communication about the purpose and intent of the MPA been clear and transparent and presented early in the process (thereby allowing any misperceptions to be addressed)?

2. Do the stakeholders and the local and national governments sense a need for and understand the process of implementing the MPA? (Christie and White)
3. Is stakeholder participation incorporated in all stages from goal-setting to evaluation? Have the best processes been determined to meaningfully engage all stakeholders? Is responsibility and authority being shared, by bringing diverse stakeholder groups, including resource users, into MPA decision-making and management processes? Have people, individually and as a group, been made to feel that they have been part of the decision-making process of the MPA, and been able to actively participate in and influence the process? Has there been attention to determining the best mechanisms to gain acceptance of the MPA? (Martin *et al.;* Pomeroy *et al.*)
4. Is appropriate information available on socioeconomic issues? Has a socioeconomic assessment been done that can be used to learn about the social, cultural, economic and institutional context and conditions of individuals, groups and communities, and identify the potential impacts of the MPA? (Pomeroy *et al.*)

II - C.2 <u>Management System</u>

1. Have cultural traditions and values – which will shape perceptions and attitudes towards MPAs – been kept in mind? (Pomeroy *et al.)*
2. Have traditional and/or local forms of management, governance, and knowledge systems, including informal or customary resource use rights, been taken into consideration? (Pomeroy *et al.)*
3. Have the means by which households adapt to reduce their risks, the incentives that drive the decisions of resource users, and the sources of vulnerability to stresses and shocks been properly investigated and understood? (Pomeroy *et al.*)
4. Since legal tools for MPA management will facilitate their development, acceptability and implementation, have these been developed or embedded within existing legal frameworks as far as possible? (Martin *e*t *al.*)
5. What other fisheries management tools, determined to be useful in the preliminary stage and relevant to the type of fishery and type of MPA, are already in place or being considered for use in combination with the MPA? Has research on the species present in the targeted area been adequate to determine the type of protected area or fisheries management tool most efficient for the species present? (Gell and Roberts 2003) Is there a role for a 'moving' or temporal protected area, if these are both feasible and necessary to provide protection of fish species? Are there highly migratory species that require special attention in terms of the potential for spatial management through MPAs or other means?
6. Is adequate information available in terms of trade offs and strengths between or among conventional management techniques and MPAs? Has a comparison been done of yields possible through implementation of MPAs and yields through a change in conventional management, or use of different management schemes, as well as the costs of management by each method? (Botsford *et al*)
7. Is the MPA and the entire fisheries management portfolio designed to be robust, i.e. to produce reasonably good results across a range of scenarios considered likely? (Botsford *et al.*)
8. Does the management process attempt to keep costs to a minimum while planning for long term sustainability of the project? What options are available for long-term or sustainable financing? If outside financing is available for short-term costs, what other opportunities exist to support the sustainability of the project?
9. Is it feasible and desirable to regulate activities outside the MPA, i.e. around the boundary or in areas close enough to affect the area (e.g. land-based pollution, point-source pollution, seabed disturbance, etc.)?

10. Has the combination of resource management with livelihood opportunities been considered? (Pomeroy *et al.*)
11. Is a monitoring plan in place? Does it encompass monitoring of the fisheries and their associated bio-physical and socio-economic context in and around the MPA? Is monitoring being done both before and after establishment of the MPA? How can the monitoring plan be most effective? (Martin *et al.)*

II - C. 3 <u>Structure, Information, Uncertainty</u>

1. How can the design and location of the MPA most effectively combine a scientific basis, stockholder's needs, economic concerns, etc.?
2. Is the importance of communication of the specifics of placement of the MPA given due consideration? Has the area been assessed and mapped so that everyone concerned knows the location and condition of resources and the potential boundaries for an MPA? (Christie and White)
3. Have the possible negative effects of increased fishing activity along the borders of the MPA been taken into account and mitigated for?
4. What are the relative benefits and costs of implementing an MPA in a wider management framework of Ecosystem Approach to Fisheries and/or Integrated Coastal and Ocean Management?
5. How should decisions be made with respect to multiple smaller MPAs versus fewer larger ones? Is the information available to decide? For MPAs focused on fisheries management or including related objectives, has the contribution of larval spillover been analyzed (Botsford *et al.*)? Have such analyses and research been incorporated into design?
6. Has the data situation been accounted for in design of the MPA, and in the decision to implement either an MPA on its own or in conjunction with other fisheries management tools? (Is the situation data-poor, data-rich, or with no evaluation?) (See Botsford *et al*.)
    a. *Data-rich situations*: Have uncertainties been identified and explored within this situation? Has performance of different MPA designs combined with other conventional management tactics been compared under different scenarios that represent the existing uncertainty? (Botsford *et al.*)
    b. *Data-poor situations*: Have "influences of management costs, practicality of implementation and enforcement and uncertainties on the decision of whether to implement reserves or conventional quota or effort management, or any combination of conventional and spatial controls been considered? Has the type of gear and its various influences on species been assessed? Are proxy reference points available, to be utilized in design decisions in data-poor situations? What assumptions are appropriate about the type and level of uncertainty associated with implementation of different regulatory schemes?" (Botsford *et al*.) In small-scale artisanal fisheries where data-poorness contributes to lack of compliance with fishing regulations, has consideration been given to the possibility that conventional fisheries assumptions may be untenable? (Botsford *et al*., In: Parma *et al.* 2003).
    c. *Situations with no evaluation*: What rules of thumb can be followed in situations with limited or no data? (see Botsford *et al.* for background)
7. Has the particular placement of the MPA (i.e. near the coastline, offshore, or high seas) been taken into consideration in terms of the affect on fishers combined with the effectiveness of management of the species in question?
8. What trade-offs are made when choosing between using larger MPAs offshore, to benefit more mobile species, versus having smaller coastal MPAs?

9. Has implementation uncertainty been considered in the decision framework? Have the merits of different regulatory techniques involving both reserves and conventional management been assessed in terms of the ability to implement harvest targets? (Botsford *et al.)*

STAGE II, SECTION D: THE DESIGN PROCESS

II - D.1 Stakeholders and Participation

1. Does the design of the MPA reflect the goals and objectives, and deal with possible conflicts between objectives?
2. Have efforts been made to minimize disruptions to lives and livelihoods through impact assessment and preparing strategies to address the disruptions? (Pomeroy *et al*.) In this regard, has the MPA been established in combination with an appropriate adjustment and compensation package for those negatively affected?
3. Is the design of the MPA adequate to avoid the 'trap' of producing minimal benefits while giving managers/fishermen a false sense of security?

II - D.2 Management System

1. Is the MPA appropriately designed (e.g. with respect to size, spacing, location, etc.) in accordance with available biological, social and economic data, and according to defined objectives, and stakeholder and/or community needs? Are there multiple uses to be accommodated within the MPA? How is zoning used?
2. How can the boundaries being considered be most effectively marked and/or known to stakeholders, are they sufficient to meet management goals, are they in accordance with the habitat assessment, and are they widely agreed upon by key stakeholder groups? (Christie and White)
3. Given that clear rules governing resource often foster compliance and simplify enforcement, has establishment of such rules been considered or implemented? (Pomeroy *et al.)*
4. Have the design and implementation taken into account the diversity of coastal people and communities, especially in relation to their livelihood strategies? (Pomeroy *et al.)*
5. How can appropriate mechanisms for maintenance and enforcement of the MPA best be incorporated into the design?
6. Are there synergistic effects of implementing an MPA together with other fisheries management tools (benefits greater than solo use of individual tools)? If so, with what other tools?
7. *On the high seas:* How can the issue of combining appropriate or effective fisheries management tools with high seas MPAs be addressed?
8. What are the relative advantages of MPA networks or larger single MPAs? How does this relate to considerations of (a) improved ecological functioning, (b) representativeness of different habitats, (c) the need to meet national/international network goals?
9. Is the utility of large-scale and centrally-planned MPAs for biodiversity conservation and/or high seas areas taken into consideration? (Christie and White) How can the particular need for adequate long-term funding and strong institutions in large-scale MPAs be fulfilled?
10. Are accountability mechanisms (e.g. elections, consultative sessions, or open meetings) incorporated into the design and implementation? (Pomeroy *et al*.)

II - D.3 Structure, Information, Uncertainty

1. Is adaptive management incorporated into the design? Has it been taken into consideration from the initial planning stages? Is it being used appropriately (i.e. is research being incorporated into action)? (Martin *et al.)* Are the environmental and social dimensions of MPA performance being tracked in order to provide the basis for adaptive management? Are the MPA rules linked to the state of social and environmental systems, so as to foster adaptive (and more socially and environmentally sustainable) management of these systems? (Pomeroy *et al.*)
2. *On the high seas:* What are the relative benefits and costs of implementing a high seas MPA within a wider management framework of an Ecosystem Approach to Fisheries and/or Integrated Coastal and Ocean Management? Is it feasible or desirable to also manage threats/issues outside of spatially managed areas on the high seas?
3. What are the effective and efficient means for monitoring and evaluation?
4. *On the high seas:* What is necessary to use or redesign zoning for high seas MPAs?

STAGE III-IMPLEMENTATION AND REVIEW

STAGE III, SECTION A: MANAGEMENT

III - A.1 Stakeholders and Participation

1. How can a mechanism for conflict management and conflict resolution best be integrated into management/design? Is training for conflict resolution available for managers and/or stakeholders? Do individuals feel that the benefits to be obtained from participation in the MPA, including better compliance with rules, will be greater than the costs of such activities? (Pomeroy *et al.)*
2. Are the impacts on community members (e.g. of economic changes in the community, loss of their traditional way of life, etc.), and the distribution of those impacts, taken into consideration? (Pomeroy *et al*.)
3. Has a functional core group that represents various stakeholder groups been identified and empowered, so as to manage the MPA at the appropriate local level? (Christie and White)
4. Are the objectives for management clear to all the stakeholders and generally agreeable to the majority of the affected stakeholder community members? (Christie and White)
5. Are formal and non-formal institutional mechanisms in place that distribute MPA management responsibilities across relevant organizations? Are incentive (and sanction) structures in place that encourage long-term buy-in? (Christie and White)
6. What is the impact of the MPA on fishers? How are negative impacts best mitigated? Has displacement occurred? Is there conflict between user groups? Have issues of equity been addressed? What are the traditional arrangements? Have they been violated? Taken into account?
7. Has the magnitude of the benefits or costs for individual fishers been examined (taking into consideration the size, objectives, location, allowed uses, and level of compliance)? (Pomeroy *et al*.)
8. What strategies can be put in place to address increased occupational risks to the fishers due to shifts in fishing grounds and travel time as a result of the MPA?

III - A.2 Management System

1. What are the funding issues? What financing options exist and/or could be developed? How do the funding options or sustainability of funding differ depending on whether an MPA is instituted with a focus on fisheries management objectives, or with a focus on other objectives, but with fisheries components? Or is there a difference?
2. What is the balance of a 'bottom-up' or 'top-down' management approach? What management schemes are effective/appropriate for what situations? What are the difficulties/issues associated with the various options? If a co-management approach is followed, what are the factors needed for success? (see Christie and White)
3. *On the high seas:* What current tools could be used to facilitate information exchange or is there a need to develop specific instruments and legislation for this purpose?
4. How are the various aspects of MPAs managed and by what different management regimes, with what interactions? [What is the level of integration and cooperation between relevant international and regional agencies (e.g. UNCLOS, ISA, CBD, FAO, IMO, CMS, IWC, and regional instruments)?]
5. Is it beneficial to integrate site level management with regional and national policies? If so, how is this best accomplished?
6. How can the mobility of threats from beyond national jurisdiction, and from within national jurisdiction, be addressed? *On the high seas*: How can these particular threats be addressed taking into consideration the issue of freedom of the seas?
7. Does a realistic long-term plan for the institutionalization, financing, and implementation of an MPA exist? (Christie and White)
8. Are the strategies within the capacity of the institution responsible for implementation and reflected in the law legally supporting the MPA? Are consistent laws in place from the local to the national levels that support MPA implementation? (Christie and White)
9. How can issues of capacity building, including long-term funding and training programs in the community best be addressed? (Martin *et al.*)

STAGE III, SECTION B: MONITORING

1. How can timely monitoring of the effectiveness of an MPA allow adaptive adjustments to improve effectiveness and thereby avoid unfulfilled expectations and loss of credibility of MPAs as a management tool?
2. Are the MPA managers seeking suitable advice and expertise for monitoring requirements? Are sufficient resources and technical capacity available for efficient monitoring? Are there resources available for a long-term monitoring programme? (Martin *et al.)*
3. Since MPA usage (e.g., excessive visitation of MPAs, and the development that can accompany tourism), can be damaging to the environment and reduce the biological, cultural and economic benefits obtained from the MPA, is monitoring and management of the MPA being done to ensure that all human impacts – fishing, as well as other activities such as tourism – are at sustainable levels? (Pomeroy *et al*.)
4. Have baseline data on the condition of the habitat and the status of management been updated and changes noted? Has this information been incorporated into a standard database for comparison in the future? Has this information been incorporated into an education program for the community and local and national governments? Have local residents been involved in monitoring and evaluation? (Christie and White)
5. *On the high seas*: How can effective monitoring techniques be developed on the high seas? or what techniques currently exist or are being developed?

6. How can monitoring data best be communicated to stakeholders? Are all stakeholders, including resource users, enlisted in data collection and analysis?
7. Is there sufficient monitoring of possible degradation of fishing grounds external to the MPA, and/or effects on fisheries outside reserves?

STAGE III, SECTION C: EVALUATION

III - C.1 Stakeholders and Participation

1. Who is sustaining losses due to the MPA, at which scales (ranging from individual to community to nation, etc.), and how can these losses be mitigated?
2. Who is benefiting from the MPA, at which scales (ranging from individual to community to nation, etc.)? In particular, are the original resource users benefiting?
3. How can the success of the allocation of resource use benefits best be measured? Has the allocation scheme ensured that the benefits are proportionate to the costs that resource users incur? (Pomeroy *et al.*)
4. Have alternative livelihoods arrangements been adequately addressed? If not, what additional options or opportunities exist? Are 'best practices' available from similar situations or settings useful?
5. How can legitimacy be enhanced? Can distribution of results assist with this issue? If so, is information regarding the social and environmental performance of the MPA being shared? (Pomeroy *et al*.)
6. "Does the education program address the needs of the community and stakeholders so that benefits and trade-offs are highlighted and that questions regarding the need for the MPA are addressed? Are appropriate education strategies used, such as peer sharing, cross-visits, materials in local language that are culture sensitive?" (Christie and White)
7. How can enforcement/compliance be made more effective? Has broad dissemination of information taken place regarding compliance rates and enforcement actions, to enhance legitimacy and foster compliance? Have graduated, context-dependent sanctions been used, to enhance compliance by raising the opportunity cost of non-compliance and enhancing perceived legitimacy of the MPA? (Pomeroy *et al*.)
8. Has appropriate attention been given to social dynamics, trade-offs, and incentives? Have real and potential trade-offs and conflicts been identified in an open and participatory manner? (Christie and White)

III - C.2 Management System

1. What are appropriate evaluation methods? How can flawed/inadequate evaluation methods be fixed, so that a proper evaluation of the MPA can be made?
2. Has the need for long-term institutional support been successfully addressed?
3. Is there an existing MPA rating and evaluation system sufficient for the MPA in question? If not, can one be developed/modified, and/or what models can be explored for best practices?
4. How can achievement of fisheries management objectives and goals be evaluated? Are programmes in place for this? Are management goals being evaluated for fisheries management on a larger scale than the MPA in question, or in cooperation with national fishery management programs?
5. Have the various benefits, uses and values of the ecosystem and species contained within the MPA been quantified adequately?

6. How can the MPA's contribution to poverty alleviation and food security be measured? (For example, what are the long-term food security impacts of restoring degraded marine areas/fishing grounds, and what are the livelihood benefits to artisanal/traditional fishers?)
7. Are the appropriate government agencies supporting the MPA together with the nearby communities and stakeholder groups in a mutually beneficial manner and in relation to the national government? (Christie and White)
8. *On the high seas*: Are enforcement/compliance concerns being successfully addressed? How can related programs be adjusted to better tackle the most pressing issues?

RESEARCH NEEDS/GAPS

This final component of the listing of issues and considerations relating to MPAs in the context of fisheries management seeks to supplement the above with a corresponding list of research 'gaps' and priority areas, in accordance with a goal of the Workshop, to identify key areas in need of further research. The majority of entries are provided by the authors of the background papers; this listing is therefore intended to provide a sample of research needs and should not be considered an exhaustive list.

1. Research on conditions for success [Best Practices (e.g. adaptive management approach)]
2. Research on biological aspects (Sale *et al*, cited in Botsford *et al*.) including: larval dispersion; juvenile and adult movement; ecosystem aspects; coastal circulation; and impact of no-take reserves.
3. Research on MPAs in comparison to conventional management [Empirical comparisons of increases in catch with reserves to increases possible through conventional management (Botsford *et al.)*]
4. Reliable scientific research and data through:
   4.1. Initial evaluation/study of potential sites, to be able to compare with later studies, for efficient monitoring (Botsford *et al*.)
   4.2. Studies of size and spacing, and level of fishing outside of reserves (Botsford *et al*.)
   4.3. *Additional high seas research on: seamounts, hydrothermal vents, cold water corals, and other sensitive underwater features*
5. Studies of the potential benefits of MPAs and the role of habitat protection and restoration in fisheries management. (Martin *et al.*) This is also needed in regard to spawning and nursery site protection.
6. Assessment of the relative merits of different governance systems for MPAs in different cultural, political and socio-economic situations. "A global analysis might reveal interesting models from which guidelines for suitable, integrated legal frameworks for MPAs and fisheries management tools could be developed in particular contexts." (Martin *et al*.) [see Christie and White for background information]
7. Indicators for measuring effectiveness of MPAs for fisheries management. (Martin *et al.*)
   7.1. A global meta-analysis of datasets around the world on priority fisheries should be conducted to determine suitable indicators (Martin *et al.*)
8. Research that addresses the current gaps in monitoring design and data analysis protocols.
9. Research and tracking of fisheries management success, and where MPAs or other fisheries management tools have been used. (Martin *et al.*)
10. Assessment of the relative merits of MPAs among the suite of tools employed in managing a fishery area should be incorporated into fisheries models. (Martin *et al.*)
11. Modelling approaches to assess the applicability of MPAs for highly mobile species. (Martin *et al*.)
12. Assessment of suitability of MPAs for different fisheries. In the many fisheries that have not yet used area-based management, the use of MPAs needs to be properly assessed. (Martin *et al.*)
13. Studies of the link between improved livelihoods of coastal communities and MPAs.
14. Analysis of costs and benefits of MPAs – to support identification and definition of the role of MPAs, and in turn identify sources of funding for MPAs. (Martin *et al.*)
15. Assessment of the processes for considering, developing and implementing MPAs in various countries, and the manner by which MPAs are promoted or facilitated by various organizations (case studies).

5.3 Synthesis of issues

MPAs clearly have significant potential benefits as a tool of fisheries management, as well as for broader ocean use planning and biodiversity conservation. However, at the same time, the limitations and appropriate use of MPAs as a fisheries management tool must be carefully considered throughout the various stages of MPA implementation and decision making. Pomeroy *et al.* (2007) reiterates the need to consider MPAs in the context of other tools:

> "In some circles, MPAs have come to be advocated as the solution for all fisheries and ecosystem management problems. In reality, MPAs are not substitutes for fishery management, but are one of several tools in the toolbox."

A variety of issues and considerations associated with MPAs (including high seas MPAs) have been noted in the listing above, which represents an initial effort at identifying key factors to consider in linking MPAs and fisheries management (and areas where further research could be beneficial). The list is extensive, however, and it will be necessary to extract the most central issues. In this section, we briefly review a few major themes around which recommendations on the links between MPAs and fisheries management seem to have been concentrated (e.g., within the background papers). Six key theme areas are reviewed, as follows:

5.3.1 Understanding and monitoring management effectiveness

There has been a recent increase in efforts to investigate the success rates of MPAs. In some countries, studies have shown high rates, up to 80-90 percent, of MPAs that are ineffectively managed or lacked elements necessary for success such as a management plan and management team (Pollnac *et al.* 2001).[1] In order to enhance the positive potential of MPAs in fisheries management and reduce the negative impacts associated with lack of effective management, it is important that successes and best practices in effective spatial management be highlighted within potential guidelines and recommendations. The successful use of MPAs as a fisheries management tool relies on numerous factors, but a key determinant of the ability of the MPA to meet its objectives is the effectiveness of its application. Numerous resources for measuring management effectiveness are available, but analysis of the relevancy of these tools within the context of the interaction of MPAs and fisheries management could prove useful.[2] Various determinants of successful and effective management arise in the Background Papers, some of which are highlighted below. There are also suggested approaches given for overall MPA rating systems, such as the 'MPA rating system for municipal/city MPAs' that is now being used in the Philippines as described by Christie and White (2007):

> "Five stages of MPA governance emerged from the Rating System: initiation, establishment, enforcement, sustained management and institutionalization of the MPA. The activities or processes that must be successfully accomplished to achieve a given level came to be seen as the essential ingredients to successfully managed MPAs."

5.3.2 Adaptive management and well-informed design

Key aspects of an effective MPA include: (i) a basis in good science, and (ii) well-designed monitoring, evaluation and adaptive management programs with long-term support. These topics are addressed within the background papers on a number of levels: suggestions for further research needed to provide a suitable scientific basis, descriptions of situations requiring varying types of design, problems to overcome in enforcement, the importance of the quality and information produced from

[1] The Reefs at Risk Project in the Caribbean (2004) found that only 6 percent of MPAs (of 285 designated MPAs that were included in the study) were rated as effectively managed, with another 13 percent found to have only partially effective management.
[2] See MPA News, May 2006 for more information

monitoring, feedback of data into continuing evaluation, and overall the key aspects of an effective adaptive management plan and programme.

5.3.3 Context-specific design (species, habitat, country/region, community)

Though further research is certainly needed to inform the design of MPAs in the context of fisheries management, across a range of different settings, there is a growing literature on appropriate design. Recommendations highlight that design should be based on the objectives or goals for the specific spatial measure: broad conservation objectives, species-specific goals, fisheries management measures (i.e. larval dispersion, etc.), poverty alleviation, a combination of many of the above, etc. The specific limitations or needs of communities/countries/regions should also be considered in terms of legislation or policies that are currently in place and the socioeconomic situation of the communities surrounding the proposed MPA.

5.3.4 The importance of stakeholder participation

This is a key to gaining acceptance of the MPA, increasing support within the community or among stakeholders, and therefore strengthening the viability of compliance and enforcement procedures. A need for the MPA must be perceived by those involved with or affected by it, and this requires the continuous participation of stakeholders. Stakeholder participation is important not just in the initial phases of setting up an MPA, but throughout the entire process of establishment, and continuously throughout the life of the MPA. Clearly, for MPAs connected with fisheries management, stakeholders involved would need to include those within the fishery itself. Many authors of the background papers have focused on this as a key to success and suggest not only consultation with fishers, communities and all other stakeholders but actual involvement in management, such as participation of stakeholders in the monitoring process.

5.3.5 Equitable distribution of benefits

In conjunction with participation of the stakeholders, there needs to be a sense of equity in the distribution of benefits among stakeholders, and all those involved with or affected by the MPA. As Christie and White (2007) have noted:

> "Experience and empirical evidence demonstrates that the generation and equitable distribution of benefits from such MPAs is essential to long-term success."

Initial analysis of pre-existing traditional arrangements, governance structures, and socioeconomic assessments can prove vital, among other measures and tools, to ensuring that a group of stakeholders is not experiencing undue costs. Alternative livelihood arrangements are often necessary to distribute benefits equitably across all stakeholder groups, and should be continually evaluated to ensure effectiveness and appropriateness of the programmes.

5.3.6 Integration of legislation and policy

A challenge ahead, but also a key feature in the establishment of effective MPAs, will be the integration of policy and legislation – on a national level within different departments and agencies (e.g., both environment departments and fisheries management agencies), regionally within the various bodies designated to manage resources, and internationally for relevant management regimes. The background papers have reinforced the importance of collaboration, cooperation, and integration in all levels of the policy and legislation process. For example, it has been noted that:

> "The creation and management of an MPA, however, sometimes uses various existing pieces of legislation, each regulating one activity or use. In such cases, it is important to consider harmonization of these overlapping regulations. "(Martin *et al*. 2007)

6. PRELIMINARY-STAGE DECISION-MAKING: MPAs IN FISHERIES MANAGEMENT

As discussed in the previous section, the process of considering MPAs in the context of fisheries management involves three major stages. The first is a preliminary 'early stage' which explores specific needs, objectives and constraints relating to fisheries management and to marine conservation, as well as the amenability of the particular fishery and/or ecosystem, including its constituent fish stocks, to spatial management measures, of which MPAs form a part. This preliminary stage can be viewed as one in which the decision whether or not to utilize MPAs has not been made, but must be made as a key outcome of that stage. Subsequently, if such a decision to implement an MPA is made, the other stages of the process proceed: as described earlier, the second stage involves scoping the design of the MPA, and the design itself, while the third stage involves aspects of implementation, management, monitoring and evaluation. These second and third stages have been addressed quite comprehensively in the literature, and the steps for dealing with them match fairly closely with those used in developing a fisheries management plan.

On the other hand, an assessment of the literature on MPAs and fisheries management indicates a relative paucity of information on, and lack of focus on, the above-noted preliminary stage of the MPA decision making process. In any given situation, this preliminary stage involves the assessment of (1) existing aspects of fisheries management and of marine conservation initiatives, (2) the current and/or potential role of spatial management (and particularly MPAs) in the context of fisheries management and marine conservation, and (3) specifically whether there is a need and feasibility for an MPA, and if so, in what manner it can fit within the fisheries management system.

To address these matters, it is helpful to identify the differing situations that may be faced. This section elaborates on these various initial conditions, classifying scenarios according to two major considerations. The first is the question of whether MPAs and/or other spatial management measures are (1) already in place (and thus potentially in need of adaptation to meet additional objectives) or (2) being contemplated (whether proposed or under consideration). The second consideration is whether the actual or contemplated spatial management has its emphasis on (a) meeting fishery management objectives, (b) meeting conservation objectives, pursuing non-fishery aspects and/or emphasizing multi-use management, or (c) implementing a broader approach of zoning or spatial planning.

The first of these considerations reflects the fundamental differences between two scenarios:

- **Situations in which spatial measures are already in place**. These measures may have been (a) fishery-focused in the first place (perhaps a closed area, for example), in which case the issue is whether they are effective in meeting fisheries management goals, or (b) originally implemented with little or no consideration of fishery effects or impacts (perhaps put in place for broad biodiversity conservation purposes, for example), in which case the issue is whether they can be adapted to better meet fisheries management goals.

- **Situations in which spatial measures are being contemplated (proposed or under consideration)**. If spatial measures are under consideration (rather than already in place), there may be potentially more flexibility in designing the measures to simultaneously meet specific fisheries management goals and other goals such as protection of endangered non-harvested species, habitat restoration, etc.

It should be noted that in some cases, both of these scenarios may be relevant. For example, an ecosystem may have one fishery within it that has spatial measures in place (e.g. a closed spawning ground for a certain species) but other fisheries without such measures. Within that ecosystem, there may be discussion underway of instituting an MPA (in addition to or incorporating the closed spawning ground) to meet the dual goals of fisheries management and of broader ecosystem protection.

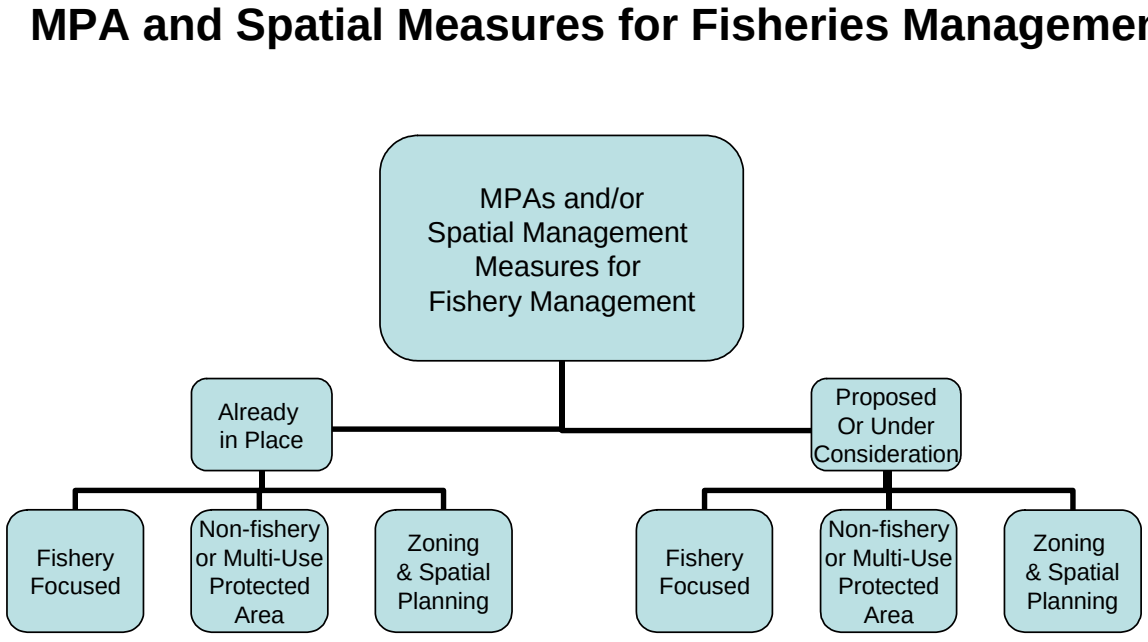
The second consideration above relates to the dominant objective or approach of the spatial management, i.e. which of three realities reflects the actual or contemplated spatial management:

(1) A protected area with emphasis placed on meeting fisheries management objectives (e.g. a closed area designed to protected juvenile fish),

(2) A protected area with emphasis on conservation objectives, on non-fishery aspects (e.g. tourism) and/or on multi-use management,

(3) A broad-based situation of zoning or spatial planning involving a variety of spatial elements within the relevant area, and potentially including both of the above types of protected area, (1) and (2).

With this in mind, the flowchart below sums up some aspects of the 'preliminary stage' decision problem faced in considering the interaction of MPAs and fisheries management, in a situation in which marine protected areas and/or other spatial management, such as zoning, are being assessed or considered.



The following provides some further aspects arising in each of the situations – i.e. (1) an MPA (or other spatial management measure) already in place, or (2) a case in which such a measure is being contemplated.

Measures already in place. If the spatial management measure is *already in place*, assessment of its current and potential role in fisheries management might be based on asking a sequential set of questions:

- Is there room for improvement in meeting fisheries management goals? If the MPA is in fact fishery focused, is there room for improvement in meeting broader ecosystem goals and other objectives possibly pursued through MPAs? If neither of these holds, there may be no real need to modify existing management measures (no further action is needed) but if improvements can be made, then…

- Is the species and/or fishery amenable to spatial management? If available data is sufficient to indicate that this is not the case, there is unlikely to be any value in continuing to pursue the adaptation of current spatial management measures to better support fisheries management. If, however, the situation could benefit from spatial management (or if there is a possibility of this being the case, with data limitations preventing a definitive conclusion either way), then…

- Is it feasible to adjust existing arrangements to improve fisheries management? If not, e.g. if the spatial management measures currently in place cannot be altered (perhaps because they are rigidly set in legislation, or they result from lengthy processes of development, etc.), then no further action can be taken. If, however, it is feasible to alter the current measures, then…

- Positive responses to each of these three questions may make it possible to modify current spatial management to better meet fisheries management objectives. Of course, it will be important to do so without negatively affecting the achievement of the objectives previously in place.

Measures under consideration. On the other hand, if spatial management measures are not yet in place, but implementation of such measures is under consideration, then it is important to clearly assess the objectives and the form of the measure (e.g. MPA) under consideration. [For the latter, reference is made to IUCN categories of protected areas, although it should be noted that the utility of these in an MPA setting is under active discussion.] Consider the three forms of spatial management measure listed above:

(1) Protected areas with emphasis on *meeting fishery management objectives* might be grouped into two categories, depending on the specific focus of the area:

- Habitat Protection Focus (e.g. IUCN Category IV)

  Protected areas under consideration may have a fishery focus, with the primary aim of protecting the habitat on which the fish species of interest to the fishery depend. Such MPAs might be linked to IUCN Category IV ("Habitat/Species Management Area: protected area managed mainly for conservation through management intervention").

- Fishery Management Focus (e.g. IUCN Category VI)

  A protected area with a fishery focus may alternatively be under consideration as a contributor, a component, of the overall fisheries management system, i.e. as a 'tool' in the 'toolkit' of fisheries management broadly. Such MPAs might be linked to IUCN Category VI ("Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems").

(2) Protected areas under consideration, if without a particular fishery focus, may instead have primary goals involving (a) conservation objectives, (b) non-fishery considerations, and/or (c) multi-use management. Such protected areas might be grouped into two categories, reflecting the two major forms of such areas:

- Conservation Focus (e.g. IUCN Category Ia, Ib, or III)

  This form of MPA is that perhaps most associated with the protected area concept, the goal being to provide conservation benefits, whether for the full ecosystem in question or emphasizing particular species (e.g., turtles or whales). Such MPAs might be categorized under IUCN Categories Ia, Ib, or III – pertaining respectively to: (Ia) Strict Nature Reserve: protected area managed mainly for science; (Ib) Wilderness Area: protected area managed

mainly for wilderness protection, or (III) Natural Monument: protected area managed mainly for conservation of specific natural features.

- Multi-Use Focus (e.g. IUCN Category II, IV, V, or VI)

  An MPA might be considered to serve a range of objectives, and to accommodate a range of marine uses, such as fisheries, aquaculture, tourism, boating, conservation of particular flora or fauna, etc. (while not reaching the form of a broad spatially-planned, zoned, multi-faceted area, described in (3) below). Such MPAs might fall under several different IUCN Categories including II, IV, V, or VI – described respectively as: (II) National Park: protected area managed mainly for ecosystem protection and recreation; (IV) Habitat/Species Management Area: protected area managed mainly for conservation through management intervention; (V) Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation; (VI) Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.

(3) Broad-based situations involving zoning or spatial planning, with a variety of spatial elements, will typically involve more than one of the IUCN categories of protected areas. Given its multi-objective nature, this form of spatial management cannot be classified in the same manner as the two forms above. Instead, from a fisheries management perspective, it is helpful to categorize them based on whether or not fisheries management is explicitly incorporated in the arrangement:

- Fishery Management Role is Explicit (includes IUCN Category IV, VI areas)

  In a broad spatial management scheme, there typically will be multiple marine uses to deal with, and multiple objectives being pursued. In some existing real-world cases within this heading, such as the Great Barrier Reef in Australia, fisheries are explicitly included in the usage arrangements, and fisheries management is thus at least partially incorporated in the overall management of the area. If this is the case for the planned area under consideration, this categorization would apply (if not, the alternative below would be appropriate). This relatively-broad form of spatial management might include either or both of IUCN Categories IV and VI – i.e. (IV) Habitat/Species Management Area: protected area managed mainly for conservation through management intervention; (VI) Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.

- Fishery Management Role Not Included in the Plan for the Protected Area

  Presumably, any sufficiently broad-based spatial management scheme, incorporating multiple marine uses and multiple objectives, should explicitly consider the relevant fisheries, in the usage arrangements and in the management system. If, however, this is not currently the case for the situation under consideration, it is important to recognize that reality, and to deal with it in some way, as the spatial planning or zoning may well end up at cross purposes with the fisheries management arrangements.

7. CONCLUSION

This paper has explored the linkages between Marine Protected Areas and fisheries management. In addressing these linkages, a unifying idea was that of spatial management – MPAs being inherently spatial in nature, and spatial management measures, such as closed areas, being well established in fisheries management. The paper drew on the Background Papers prepared for the Workshop, as well as a range of additional literature, to present a listing of issues and considerations relating to the development and implementation of MPAs, within a fisheries management context – organized according to the three sequential stages involved (preliminary, design and management/monitoring) – together with a summary of related research gaps and priorities. The paper then analysed this listing to produce a set of major recurring themes addressed widely in the literature. The analysis also

highlighted the need for additional work on the 'preliminary' decision-making stage in the process, there being an apparent paucity of information in this area. An initial effort is undertaken in the paper to explore the key decision-making elements involved in this 'early stage' of the process.

It is hoped that the examination in this paper of factors relating to the interface of Marine Protected Areas and fisheries management will help to identify key issues and further research to be addressed to provide the necessary understanding of the role of MPAs within a fisheries management context.

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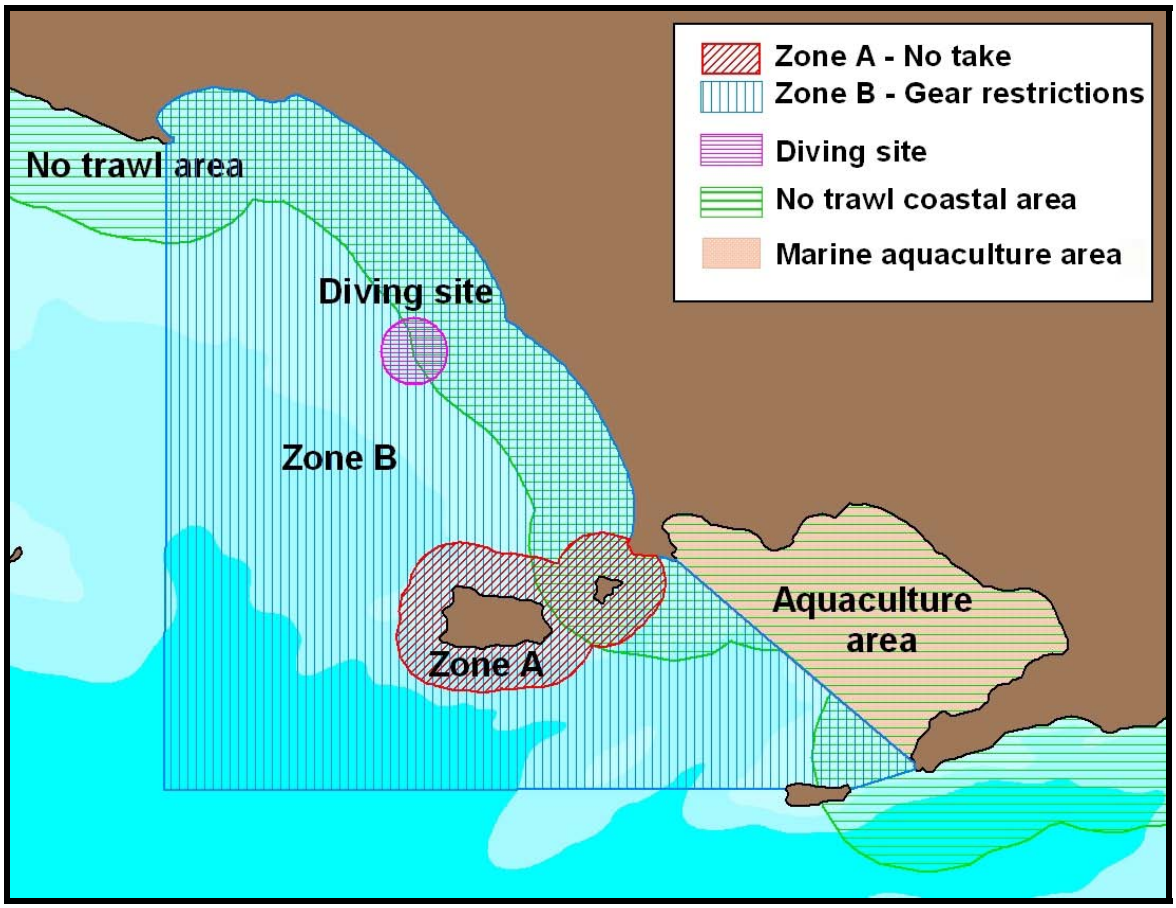
Report and documentation of the

EXPERT WORKSHOP ON MARINE PROTECTED AREAS AND FISHERIES MANAGEMENT: REVIEW OF ISSUES AND CONSIDERATIONS

Rome, 12–14 June 2006



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ABSTRACT

The Expert Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and Considerations was held in Rome from 12 to 14 June 2006. The workshop is a response to the FAO Committee on Fisheries' call for technical guidelines for marine protected areas (MPAs) to assist Members to establish representative networks of MPAs by 2012, as agreed at the World Summit on Sustainable Development. During the workshop, invited experts and FAO staff discussed characteristics of marine protected areas (MPAs) relevant to fisheries management. Their discussions were informed and stimulated by six background papers on a wide range of topics including concepts and definitions, case studies of MPAs, biological factors, economic and social considerations, governance, legal aspects, and the interface between MPAs and fisheries management. The workshop also considered a draft framework outline for technical guidelines on MPAs and fisheries management. Participants agreed upon "Key Points" on definitions, terminology and concepts; design, implementation and monitoring; and guidelines.