

**INDICATORS OF EFFECTIVENESS IN COMMUNITY-BASED MARINE
PROTECTED AREAS**

by

Marivic Gosamo Pajaro

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Abstract

Despite an expansion of marine protected areas (MPAs), a big gap exists in monitoring and evaluating their effectiveness. In less developed countries such as the Philippines, community-based (CB) MPAs have flourished. This thesis focused on exploring how local communities identify indicators of MPA effectiveness and subsequently monitor and evaluate an MPA. I first examined the process of MPA policy development, and found that global targets may be unknown or meaningless to local communities because of limited localization of international and national policies. In response, I recommend the participation of legitimate multi-level representatives from a network of alliances that can effectively act to harmonize MPA policies. With the active engagement of communities in the central Philippines, I identified sets of indicators and criteria for evaluating CBMPA effectiveness and found they change over time as MPAs and local conditions evolved, *e.g.*, communities associated with younger MPAs preferred the input and output types of indicators while those associated with older MPAs preferred outcome indicators. Changes in community expectations as the MPAs evolve also influenced the criteria for evaluation. Analyses of community indicator development, monitoring and evaluation processes indicated that the strongest determinant of participation was social association among the residents. The highest participation levels were recorded for men and youth. The suite of indicators used did not detect changes in the CBMPAs over two years of tracking. However, the monitoring process resulted in a shift from passive to active participation. During monitoring, community volunteers collected socio-economic data more easily than both enforcement and ecological data in terms of cost, time, skills and social fit. Standardized monitoring and evaluation can be sustained through

legislation and institutionalization of management bodies. Also, CBMPA effectiveness indicators need to be developed iteratively to reflect the changing needs and perspectives of local stakeholders. The wider application of the methods and approaches generated from this thesis needs to be explored for other CBMPAs. Such research ensures that the effectiveness of MPA is evaluated. This is significant due to the commitment of countries to report on the progress of their MPAs by 2010, as set by the Convention on Biological Diversity.

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Co-authorship statement

All the chapters, except for chapters 1 and 8 have been written as stand-alone manuscripts to be submitted to peer-reviewed journals. Chapter 3 has been conditionally accepted by a peer-reviewed journal. I am the senior author on all chapters. I am primarily responsible for the conceptualization, implementation, data management and analysis and drafting the text for all the chapters with the guidance of Drs. Monica Mulrennan and Amanda Vincent who are co-authors of all chapters. Both co-authors contributed to the development of the ideas, methods and discussions. For chapters 3 and 7, Dr. Jacqueline Alder worked with me in completion and interpretation of the data analysis. All of my co-authors provided substantial editions, feedback and suggestions to improve the manuscript.

1. Introduction

Rationale

We are currently confronted with widespread degradation of marine environments and a crisis in global fisheries. Reports indicate that over 80% of world fish stocks are heavily exploited or depleted (FAO 2008) while 70% of the world's reefs are at risk due to human activities (Wilkinson 2004). Also, mangrove forests are vanishing at 1-2% per year (FAO 2003) while 18% of the recorded seagrass areas have disappeared in the last 20 years (Walker et al. 2006). Different conventional management tools to reverse the declining trends have been employed, including fishing restrictions, fleet and gear regulations and size limits. However, these conventional methods are not always practical due to the extensive biological knowledge and financial resources required to effectively use them and the challenges involved in enforcement (Roberts et al. 2005). An alternative management tool that has gained wide acceptance globally is the establishment of marine protected areas, where exploitation is regulated or restricted.

In recent years, an international advocacy for the establishment of no-take marine protected areas (MPAs) or marine reserves has emerged, although not entirely without controversy. In 1998, over 1600 marine scientists urged governments to protect 20% of the world's oceans by 2020 (MCBI 1998) through a network of no-take MPAs. A scientific consensus statement has acknowledged marine reserves as a central management tool that conserves both fisheries and biodiversity (Lubchenco et al. 2003). However, some scientists argue that other management options need to be considered because establishing more marine reserves might alienate fishers and entice them to shift their fishing activities to areas that are currently healthier (Hilborn et al. 2004, Kaiser 2005).

Despite their growing importance in marine policy, the performance of MPAs has not been widely monitored and assessed. The most recent global estimates of MPA success, now more than a decade old, indicate that only 31% of 1,306 MPAs surveyed had achieved their management objectives (Kelleher et al. 1995). Some regional estimates were produced around the same time stating that 10-15% of the Indo-Pacific MPAs (Alder 1996) and 35% of the Caribbean MPAs (McClanahan 1999) were faring well but no global update on MPA effectiveness is currently available. Determining MPA effectiveness is acknowledged to be challenging because it requires carefully designed long-term monitoring, evaluation and adaptive management programs (Martin et al. 2007).

Despite this gap in the monitoring and evaluation of effectiveness in MPAs, an ambitious target of establishing a global representative network of MPAs that cover 20-30% of the world by 2012 was set during the Fifth World Parks Congress sponsored by the International Union for Conservation of Nature (IUCN 2003). The design of a MPA network constitutes a well-coordinated collection of no-take areas encompassing ecological, social, economic and administrative considerations that collectively contribute to coastal management decisions and actions (IUCN-WCPA 2008). In recognition of the weakness in the assessment process, Parties to the Convention on Biological Diversity (CBD) agreed to develop and adopt by 2006, methods, standards, criteria and indicators for evaluating the effectiveness of protected area management. Furthermore Parties were urged to take account of local conditions and to implement these evaluations in at least 30% of their state's protected areas by the year 2010 (SCBD 2004). At this same gathering, country

signatories to the CBD also acknowledged the need for full engagement of indigenous and local communities in the establishment and management of protected areas (SCBD 2004). In assessing whether the global target of a network of MPAs is being met, a standard set of indicators for consistent application by countries was advocated to facilitate comparison (Chape et al. 2005). However, global analyses remain a challenge, particularly for the inclusion of MPAs managed by local communities with limited financial resources and technical skills.

This thesis focuses on developing indicators for local communities which can be applied in monitoring and evaluating the effectiveness of their MPAs. This study is part of an interdisciplinary research program of Project Seahorse, an organization committed to conservation and management of the world's ecosystems (<http://www.projectseahorse.org>). Project Seahorse recognises that human communities are a critical part of marine conservation and works with people who have first-hand knowledge of ecosystem processes. Since 1995, Project Seahorse has been active in Danajon Bank, supporting communities and catalyzing action for marine conservation. A large part of its work involves facilitating the establishment of new MPAs, implementing MPA research and testing MPA effectiveness in the Philippines and elsewhere. In the course of such ventures, Project Seahorse Foundation for Marine Conservation has emerged as an effective Philippines' non-governmental organization and now collaborates with the international Project Seahorse researchers and Philippines' organizations and individuals (from community to national levels) to produce a joined up programme of biological and social action. Our team's long history of respectful involvement with villages and municipalities

across Danajon Bank allows Project Seahorse researchers unusual access to people across the region.

The Project Seahorse research program on MPA effectiveness includes three studies conducted by PhD students, mine and two others that complement my work. Eulalio Guieb examined the cultural and institutional correlates such as tenurial rights (Guieb 2008), while Jonathan Anticamara provided an in-depth analysis of the response of fishes to MPAs (Anticamara 2009). My research is centered on community-based MPAs (CBMPAs) as this type of MPA is more commonly associated with less developed countries (LDCs) in the tropics which are considered to be major biodiversity hotspots (Myers 2000). Throughout this thesis, I refer to CBMPAs as no-take marine areas within a local community or *barangay* (the smallest political unit in the Philippines) primarily managed by local residents.

This study investigates the process (*i.e.*, the methods and approaches) and product for development of the indicators and their application and relationship to local participation. The potential and challenges of standardization and sustainability are also explored. Below I present the concepts of CBMPA and indicator development on which this thesis is founded. I include a discussion on the supporting evidence and issues underlying the benefits of MPAs as they relate to local communities. I also outline the issues relevant to the development of indicators for CBMPAs and provide a review of progress in evaluating the effectiveness of CBMPAs highlighting the gaps that this thesis will attempt to address.

Community-based management of MPAs

Management approaches for MPAs vary widely depending on the nature of establishment and the day-to-day management of the MPA. These approaches can be described as traditional, centralized, sectoral, or community-based. Prior to colonialism and the liberation of states, customary marine tenure practices were common and some have persisted (Johannes 2002, Aswani et al. 2007). During colonial times, ownership of natural resources in the settled areas was often transferred to the conqueror or Crown. Later, as nation-states emerged, centralized management of these resources became the norm and it was not uncommon for states to designate areas as parks and reservations (Johannes 2002, Christie and White 2007). In some cases, MPAs have been established and operated by private sectors, such as non-profit non-government organizations (NGOs) in Seychelles (Guénette et al. 2000) or private companies in Tanzania (Riedmiller 2003).

For many LDCs with small MPAs, community-based management has become the preferred approach. CBMPA essentially utilizes a bottom-up or grassroots-led strategy. The community-based management process commonly begins with individuals or NGOs acting as catalysts in the formation of fisherfolk organizations or local management councils that eventually become the MPA stewards (Luttinger 1997, Pomeroy 1997). The CBMPA can progress into a co-management arrangement if the community of resource users shares responsibilities with government authorities in managing the MPAs (Christie and White 2007).

The establishment of CBMPAs has grown with the emergence of decentralized governance systems, the recent push for community involvement in protected area management through international treaties, and the increased legal recognition given to a community's right to manage their natural resources (Pomeroy and Carlos 1997, Johannes 2002, Eisma et al. 2005). The CBD urges Parties to “establish, manage and monitor protected areas with the full and effective participation of, and full respect for the rights of, indigenous and local communities consistent with national law and applicable international obligations” (Decision VII/28, COP7 CBD 2004). “Local community” refers to a “socially and geographically defined group of people, not necessarily homogenous, living close to the natural resources with customary rights of use, distinctive knowledge and skills and direct dependency on natural resources as individuals or groups of individuals with a close and unique relationship to the natural resources as a community” (IUCN 2000). Resident groups are believed to have strong, vested interest in the sustainable use of natural resources as this is where their livelihood or cultural survival rests as opposed to more distant state or corporate managers (West and Brechin 1991).

A commitment to CBMPA is based on the principle that local people are capable of understanding and resolving many of their environmental problems because they possess the experience and knowledge to identify and design appropriate management strategies (Burkey 1993). Some elements that propel a community to become involved in establishing and managing MPAs include the presence of committed social and political institutions, traditional knowledge and established resource management practices as well as core values like self-reliance, self-determination and sovereignty (Fiske 1991). However, not all

communities have the ability and/or resources to carry out management responsibilities effectively. People, according to Hardin's classic essay, are rational beings who tend to maximize gains that eventually lead to a tragic ruining of an environment where there is open access to resources (Hardin 1968). Thus, attempts to integrate local people and community needs into conservation efforts have been viewed by some as a waste of time, finances and human resources that actually diminish rather than enhance the effectiveness of conservation (Rabinowitz 1999, Terborgh 1999). However, other studies have shown that community members make communal rather than individual choices as influenced by social relationships (Ostrom 1998). This perspective is at the core of CBMPA approaches which are considered especially well suited to developing countries with limited financial means and resources to manage marine resources across widely dispersed fishing grounds (Berkes 2004, Christie and White 2007).

The new conservation paradigm on ecosystem-based management has led to suggestions that nature protection should not only consider the biological context but also the social and political context so that issues of human organization are factored into conservation efforts (Brechin et al. 2002, Christie 2004). Progress in CBMPA can be influenced by community characteristics such as size, leadership support, project development initiatives, skills of external facilitators and similarities in experiences (Crawford et al. 2006). Although the ideal model is difficult to achieve, the CBMPA approach has contributed to the success of several small MPAs in different parts of the world (Luttinger 1997, Roberts and Hawkins 2000, Pollnac et al. 2001, White et al. 2002). Much could also be learned from failed MPA

initiatives, particularly from the high incidence of failure among CBMPAs in the Southeast Asian region (Crawford et al. 2006).

Community participation in design, planning and implementation is a key element in a CBMPA. Participation promotes the inclusion of interests of users and helps ensure that the MPA interventions respond to user needs thereby facilitating engagement by the community (Salm et al. 2000). However, a community can participate at different levels and to fully take charge of MPA management, local people need to move up the ladder of participation from passive and symbolic participation to one of citizen control (Arnstein 1969). This means that in the process of MPA establishment and management, participation needs to shift along a continuum from varying degrees of passive participation to increasingly active and ultimately self-reliant engagement. Initially, participants can be mere recipients of information from external agents, providing feedback and advice during consultations but dependency on external agents needs to decrease over time. Through continuous capacity building, participation can evolve into a community and external agent partnership arrangement with shared responsibilities in MPA planning and decision-making. Ultimately, the community should be able to assume more accountability for the management of the MPA until the entire process of planning and implementation requires limited outside intervention.

There are many challenges to getting the full participation of local people in resource management. Communities are dynamic, multidimensional sets of groups and factions (Brosius et al. 1998) confronted with different conflicts and struggles (Agrawal and Gibson

1999). In addition, inequities and disincentives for conservation persist at broader political, economic and institutional scales. In many instances, local residents continue to bear a large proportion of the costs of environmental conservation while marginally sharing in its benefits (Belsky 2003). Another concern raised is the opportunity cost of participation by marginal groups in the community that can add to their work burden or decrease their leisure time (Mayoux 1995). These realities can create weak commitments from the community that are easily dissolved. Some strategies employed by NGOs and the academe to address these challenges include community empowerment, organizational building, sustainable livelihood development and participatory research (Olsen and Christie 2000, Allison and Ellis 2001, Jentoft 2004, Wiber et al. 2009).

Benefits of MPAs

Many studies have documented the benefits derived from fully-protected no-take MPAs or marine reserves. These refer almost exclusively to the demonstrated biological impacts on sedentary or limited-range species found in MPAs: increased fish density, increased biomass and re-appearance of rare species inside MPAs and in waters adjacent to MPA boundaries (Mosquera et al. 2001, Gell and Roberts 2002, Halpern and Warner 2002, Russ et al. 2004, McClanahan and Graham 2005, Anticamara 2009). Other studies, however, argue that MPAs, particularly if small, offer few benefits to highly mobile or migratory species (Horwood et al. 1998, Bohnsack 2000).

Some limited attention has been given to the socio-economic benefits of MPAs, indicating increased profit from fishing (Whitmarsh et al. 2000, White et al. 2008), increased fish

yields (McClanahan and Mangi 2000, Russ et al. 2004) and a steady source of income from tourism despite decreased fish landings (McClanahan and Kaunda-arara 1995). Thus, MPAs can potentially generate employment through non-consumptive activities (*e.g.*, eco-tourism) and security in exploitation when the chances of managing populations or stocks are increased sustainably (Sumaila et al. 2000). Even then, the costs of conservation are allocated to fishers because they set aside part of their potential catch to ensure future harvests (Costanza et al. 1999).

There is skepticism about the impacts of MPAs from both biological and socio-economic perspectives. For example, the expectation that populations of commercially valuable reef fish species will increase after closure to fishing may not always happen, particularly when another species is suppressing its recovery (McClanahan and Kaunda-arara 1995).

Similarly, some economic and ecological modellers have challenged the usefulness of establishing MPAs when the MPA is incorrectly sized or unsuitably located; in such cases the MPA may perpetuate rather than reduce the risk of resource depletion (Holland 2002).

It has also been suggested that increased human pressure and continued indiscriminate fishing outside MPAs will not maximize economic rents in a fishery (Holland and Brazee 1996, Allison et al. 1998, Sumaila 2002). However, a rise in the yield could lead to increased effort, particularly in open access systems, thereby cancelling out any gains (Hannesson 2002).

Despite some reservations about MPAs as a management tool and a dearth of evidence on the realized social and economic benefits, MPAs remain popular as one of a suite of marine

management options. The number of MPAs has continued to grow from only 118 in 1970 (Kelleher and Kenchington 1992) to some 1,306 in 1994 (Kelleher 1999) and to 5,045 in 2008 (Spalding et al. 2008). One factor that has contributed to the proliferation of MPAs is the growing impetus in the development of policies at the international level which subsequently filter down to the national level as signatory countries comply with their commitments.

It is important to note that while a MPA may be officially established through a national legislative act and designated as a no-take or multiple use reserve, it may not necessarily be functional. For this reason, there is usually a large disparity in the proportion of fully functional or effective no-take MPAs within the total number of established MPAs. Once MPAs are established, determining their effectiveness and sustaining their management over time becomes a significant challenge.

Development of indicators for CBMPA effectiveness

The effectiveness of MPAs against the desired objectives has been evaluated by using indicators to measure trends and detect changes over time. Indicators allow evaluators to translate MPA effectiveness into numerical terms, thus making comparisons possible. For CBMPAs, it is practical for communities to develop indicators based upon their own circumstances and needs (Innes and Booher 2000). The indicators generated by communities are critical to detect changes or show cause and effect correlations. Moreover, data generated from community-based monitoring of indicators can be crucial for conservation and management decision-making and actions (Andrianandrasana et al.

2005, Danielsen et al. 2005b, Topp-Jørgensen et al. 2005, Townsend et al. 2005).

Although indicators may not always pinpoint the cause of problems, they can serve as starting points for discussion and exploration of potential action (Innes and Booher 2000).

The process of developing the list of effectiveness indicators is as valuable as the set of indicators itself (Farrell and Hart 1998). One study observed (Innes 1990) that the most influential, valid and reliable indicators are constructed not just through the efforts of technicians, but also through the vision and understandings of other participants in the process. The process of developing indicators brings people together from different sectors to foster new alliances and relationships with a common understanding of community problems and goals (Gahin and Paterson 2001). In yielding information about the past, indicators also guide members into a dialogue about the future, motivating them to focus on particular policy and action items that have proved important (Innes 1990). In such cases, it is not the information itself but the ideas that come out of the deliberation and production process that will have the strongest impact on action (Innes and Booher 2000).

The development and use of community-based indicators involves a particular set of considerations with regards to resource management. For example, participation by stakeholders is usually site- and issue-specific so that the indicators selected tend to vary (Fraser et al. 2006). The relevance of any particular indicator depends upon the timing and scale of its application (Sheldon and Freeman 1970, Maczko et al. 2004). This means that the indicators in use now may not be perceived as useful next year. Also, those relevant at a local scale may not be applicable to a broader regional and national scale. Experiences with

indicator development suggest it is time-consuming, expensive and challenging when done properly (*e.g.*, Niemi and McDonald 2004, Fraser et al. 2006). Therefore, it is recommended to limit the number of selected indicators to a manageable number to avoid information overload (Innes and Booher 2000). In the context of CBMPAs, the selected indicators must be considered appropriate and be observable and manageable by the community (Boyd and Charles 2006).

Indicators have been categorized to facilitate assessment of progress and formulation of relevant plans and actions toward improvement of existing conditions. Specifically, categorization allows managers to identify the focus of the evaluation, the cross-linkages among indicators and the gaps in the implementation (Boyd and Charles 2006). There is now a growing recognition (see above) that the performance of MPAs not only depends on biophysical factors such as size, shape, location, habitat complexity, size of the home range of adult fishes and migration patterns but also on social and economic factors (Christie 2004, Stern 2006, Pomeroy et al. 2004) levels of progression and themes (see next section). However, categorization of complex and multi-dimensional indicators can be challenging (Bliss et al. 2001). For example, the level of available funds can be perceived as both an input (*e.g.*, government support) and an outcome (*e.g.*, tourist income) indicator or fish catch could be categorized as an ecological or economic indicator. To ensure that indicators capture the relevant ecological, social (which includes political and cultural considerations) and economic realities of MPA effectiveness, they should be developed with input from local people (Innes and Booher 2000).

Progress in monitoring and evaluating MPA effectiveness

To facilitate the fulfillment of the MPA assessment obligation by Parties to the CBD, the IUCN took the lead in developing tools and guidelines as part of the implementation program for protected area management evaluations. This work began with the publication of a general framework (Hockings et al. 2000) that guided the development of various monitoring and evaluation methods proposed for both terrestrial reserves and MPAs. A subsequent review found that over 40 methods of protected area evaluation have been developed (Leverington et al. 2008). Fourteen of these 40 methodologies specifically focus on MPAs and two of the fourteen focus on CBMPAs (Stern 2006). Only one of these two CBMPA evaluation methods is currently being applied, by a non-government organization (*i.e.*, Coastal Conservation and Education Foundation) in the Philippines. The research presented in this thesis also draws upon the framework developed by Hockings et al. (2000) in its efforts to address the dearth of CBMPA evaluation methods suitable for community-based managers.

The general framework adopted by the IUCN identified six components of progressions towards effective management that need to be assessed: context, planning, inputs, process, output and outcome (Hockings et al. 2000). Context and planning refers to issues of design, inputs and processes relate to the adequacy of resources and approaches in relation to the management objectives, outputs pertain to the goods and services produced to realize the MPA objectives, and outcomes focus on the tangible results in relation to the MPA objectives. In my study, I consider all these six components relative to the engagement of local communities that manage MPAs of different ages or duration of protection.

The indicators of MPA effectiveness are commonly categorized into themes or evaluation fields such as ecological or biophysical, living or non-living resources, ecosystem function, socio-economics, governance or management (Alder et al. 2002, Pelletier et al. 2005, Pomeroy et al. 2004). The IUCN guidebook on evaluating effectiveness also suggests three ways of approaching the monitoring and evaluation of protected areas depending on the complexity of information that can be acquired and utilized (see Hockings et al. 2000): (1) collection of secondary information through literature search, and informed opinions of managers and/or independent evaluators which may not encompass all the aforementioned six components; (2) use of primary data in addition to the secondary information but with limited monitoring information on outputs and outcomes; and (3) use of detailed primary monitoring information and data analysis that considers all the six components identified earlier with emphasis on outputs and outcomes (Hockings et al. 2000). Approach (1) is less costly and is useful for prioritizing management concerns with policy makers as the targeted audience, while approaches (2) and (3) require more time and resources but provide more information to local stakeholders to gauge and improve the performance of MPAs in terms of reaching the targets (Hockings et al. 2000, Wells and Mangubhai 2004). In this thesis, we explore the application of approaches 2 and 3, particularly their appropriateness when developed by and then practiced by community-based managers themselves in monitoring and evaluating the effectiveness of their MPAs.

Available MPA evaluation methods (EM) range from simple to complex and from site-specific to broadly applicable. Often, a cautionary clause that the methods can vary for

different MPAs is provided by authors. Some methods use a scoring scheme or scorecard to rate MPA performance (*e.g.*, Alder et al. 2002, Staub and Hatzios 2004, White et al. 2004). Other MPA EM guidebooks recommend in-depth analysis using more detailed information derived from empirical data rather than limited to perception surveys or literature reviews (Wells and Mangubhai 2004, Pelletier et al. 2005, Pomeroy et al. 2004). My research draws on previous studies in developing the MPA EM preferred by local communities using participatory approaches.

In recent years, the participation of local people in monitoring and evaluation of protected areas has demonstrably led to management actions (Danielsen et al. 2003). Participatory monitoring is intended to build on the capacities of local people with respect to data collection for a lower cost and results that are more credible, accessible, locally relevant and therefore more useful for decision making at the local level (Danielsen et al. 2005a). There is also a push towards supplementing individual experiences and opinions with evidence-based assessment of effectiveness for more informed guidance in management decision-making and policy formulation (Sutherland et al. 2004). However, skepticism remains, particularly from scientists, about the value of local monitoring schemes and their ability to reveal trends or changes in indicators (Danielsen et al. 2005a). There are also significant concerns about the durability and reliability of local evaluation, particularly given the common use of volunteers and the often overly ambitious monitoring schemes introduced by catalyst organizations. To better understand the role of local participation in evaluating CBMPA effectiveness, my study examines the engagement of local people in indicator development and its application (*i.e.*, monitoring and evaluation).

This thesis explicitly addresses the lack of tried and tested methods and approaches that community-based managers could use for a sustained iterative cycle of monitoring and evaluation of CBMPA effectiveness. The existing frameworks and guidelines available for evaluating MPAs are based upon limited practical experience (Day et al. 2002, Stern 2006) particularly in community-based settings. For example, in field testing of one MPAEM guidebook, only one of the 18 field test sites was completely community-based (Pomeroy et al. 2005), despite the assumption that the resultant MPA evaluation framework and guidelines would be adaptable for local conditions. The community-based EM mentioned above, which is presently being applied in the Philippines by a non-government organization, has assessed over 200 MPAs based on survey interviews (CCEF 2005). This assessment can provide information to raise awareness but the lack of empirical evidence from monitoring of indicators limits its usefulness to decision-makers.

Research objectives

The goal of this research was to identify suitable methods and approaches for the development of indicators that can be applied in monitoring and evaluating the effectiveness of CBMPAs. The study was conducted in the central Philippines, which offers an unusual selection of CBMPA sites with similar geographical, ecological, cultural and political contexts. In that context, I selected ten MPA study sites of different ages or durations of protection, on the assumption that older MPAs should be closer to achieving their objectives than younger MPAs. Throughout my research, I actively engaged the community in indicator development including (i) clarification of MPA objectives, (ii)

identification of indicators and (iii) application of these indicators to the monitoring and evaluation of effectiveness.

The following objectives guided the research:

- 1) to recommend ways to draw on the whole array of global MPA experience, from local to international, in order to enhance MPA effectiveness;
- 2) to identify indicators of effectiveness and evaluation methods that are appropriate for CBMPAs of different ages (durations of protection) and then compare across such MPAs;
- 3) to examine local community participation in indicator development, monitoring and evaluation;
- 4) to detect changes in CBMPAs of different ages, using the indicators of effectiveness developed by local communities;
- 5) to determine whether the application of a set of CBMPA indicators of effectiveness matched the resources, skills and cultural characteristics of the local communities.

Thesis outline

This thesis consists of eight chapters and primarily draws upon field research on local community participation in MPA management. The Introduction (chapter 1) provides the rationale, context, objectives and structure of the thesis. Chapter 2 supplements the Introduction by providing a literature review of the brief history of MPAs and an analysis of the MPA policy-making process that influences CBMPAs. In chapter 2, mechanisms are also proposed that can localize and internationalize MPA policies, particularly in support of building a social and ecological network of MPAs. In chapter 3, I ask what indicators of

effectiveness are suitable for local communities managing MPAs of different ages. Specifically, I clarify the objectives of the CBMPA with different stakeholder groups (elders, fishers, leaders, women and youth) within and across communities and then compare their preferred indicators and objectives while considering external influences upon such choices. In chapter 4, I ask how and why local participation varied within and among communities managing MPAs. Specifically, I want to understand the level of interaction of community institutions with external groups, and participation levels among stakeholders (of both genders and among youth and elder age groups) within and across communities as they develop and apply the indicators of effectiveness. In chapter 5, I examine whether changes over time can be detected in the indicators of effectiveness as monitored by local communities in a two-year period. In the absence of baseline information before the establishment of the MPAs, empirical data is supplemented with interview data on perceived changes in the selected indicators over the last two decades. In chapter 6, I explore the extent to which the indicators applied in each local monitoring scheme are relevant in terms of cost-effectiveness, reliability transferability appropriateness or socioeconomic fit. I also identify innovations in the approaches taken by local volunteers. In chapter 7, I consider which evaluation method is preferred by local communities and investigate variations in the scoring scheme used to evaluate the progress of the key indicators of MPA effectiveness, as proposed by the stakeholders. In the final chapter (chapter 8), I summarize the findings presented in this thesis and consider the strengths and practical applications of my findings. I also discuss the limitations of this study and present some recommendations for future work.

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2. Towards an integrated marine protected areas policy: connecting the global to the local¹

¹ A version of this chapter will be submitted for publication. Pajaro, M.G., M.E. Mulrennan and A.C.J. Vincent. Towards an integrated marine protected areas policy: connecting the global to the local.

Introduction

Global deterioration of coastal and marine habitats (Valiela et al. 2001, Duarte 2002, Wilkinson 2004) and fish stocks (Pauly et al. 2005, FAO 2008) has prompted the formulation of a wide range of management and protection strategies. Key among these has been the establishment of marine protected areas (MPAs), broadly defined as “any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment” (Resolution 17.38 of the IUCN General Assembly, 1988). The number of official MPAs has increased dramatically in recent years; from only 118 in 1970 (Kelleher and Kenchington 1992), to some 1,306 in 1994 (Kelleher 1999) to 5,045 in 2008 (Spalding et al. 2008). This trend reflects the considerable support MPAs have received in recent decades from international and national agencies, national governments, the scientific community and various non-governmental and grassroots organizations involved in protection, conservation and management of natural resources (Roberts and Hawkins 2000).

As MPAs become more central to marine resource management (Lubchenco et al. 2003), concerns about the proliferation of “paper parks” have also increased. Kelleher et al. (1995) reported that only 31% of gazetted MPAs worldwide were achieving their management objectives in the mid 1990s. At the same time only 10-15% of Indo-Pacific MPAs were considered functional in terms of strategies to improve fisheries resources and livelihoods (Alder 1996), while only 18% of 558 MPAs in the Philippines were reported to be enforced in the late 1990s (Pajaro et al. 2000). No recent global estimate is available on

the total number of effective MPAs currently in existence. However, the most recent comprehensive estimate available for coral reef environments suggests that a mere 1.6% of the world's coral reefs are effectively managed (Mora et al. 2006).

Despite such trends, the current number of MPAs, covering only 0.6% of the world's oceans (Wood et al. 2008), is expected to continue growing, and especially in response to recent international commitments made by over 145 nations on global MPA targets. For example, parties to the 2002 World Summit on Sustainable Development (WSSD) adopted a plan, which included the creation of representative global networks of MPAs by 2012 (United Nations 2002). This plan was reinforced by the decision of delegates to the Fifth World Parks Congress who called for the full protection of at least 20-30% of marine habitats also by 2012 (IUCN 2003). Similarly, the Eighth Conference of the Parties to the Convention on Biological Diversity (CBD) adopted the goal of effectively conserving at least 10% of the world's ecoregions, including the marine and coastal ecosystems, by 2010 (UNEP 2006).

While the benefits of MPA establishment are well documented (Gell and Roberts 2002), a major challenge of the contemporary MPA movement is to connect the iterative development of conservation and resource management policies at international and national levels to local settings. This challenge may be characterized by difficulties related to time intervals between negotiation, decision-making and implementation, the presence of a large number of participants, often with conflicting goals and aspirations, and the complexities of harmonizing potentially conflicting policies across different sectors as well

as scales (Greenberg et al. 1977). Power imbalances between the different parties and differential access to resources, knowledge and opportunities compound these challenges. The complexity of marine ecosystems combined with the urgency of addressing conservation issues contributes an additional dimension to the above.

Opportunities currently exist to facilitate or strengthen links between existing MPA social networks operating at international, national and local levels. The emergence of three factors, in particular, is helping to bridge the gap between these levels (Narayan and Shah 2000): 1) social movements, including transnational or cross-national networks that interact at different levels; 2) social entrepreneurs dedicated to increasing the access of disempowered people to resources; and 3) technological advances in information and communication technology. The extent to which these, and other mechanisms, can contribute to the establishment of a more integrated, nested regime of MPA policies at international, national and local levels is a central concern of the present paper. Integrating MPA policies on these three levels of governance will help improve the effectiveness of MPAs as the objectives become more relevant and transparent to the local people.

We begin with an overview of the historical development of the MPA concept, highlighting its origins in local customary practices of marine management. The emergence of MPAs on the international stage is then discussed and a review of important policy developments in this field is provided. The influence of MPA policies across international, national and local levels is then explored by examining the roles and actions of organizations and agencies at different levels of governance in the development and implementation of MPA

policies. We draw our discussion from current literature and experiences, mostly from the Philippines where extensive community-based MPA (CBMPAs) initiatives exist. Our findings focus on mechanisms to enhance linkages between global and local levels and are therefore most relevant to the context of CBMPAs in less-developed countries (LDCs), the latter representing 90% of all nations that own and manage the world's coral reefs (Risk 1999).

Historical development of MPAs

While the MPA concept appears to be a relatively recent introduction to the lexicon of contemporary or science-based marine management, its origins can be traced to pre-colonial times. At the local level, prior to colonialism and the liberation of states, customary marine tenure practices were common. The application of harvest rotation, the demarcation of sacred areas of restricted access, and the creation of sanctuaries to facilitate species recovery have been widely documented among traditional or indigenous fisherfolk, particularly in Oceania and the Asia-Pacific (Nietschmann 1985, Hviding 1992, Ruddle 1993, Mantjoro 1996, Scott and Mulrennan 1999, Mulrennan and Scott 2000, Johannes 1982). The persistent undermining, during colonial times, of the socio-economic, cultural and political systems that supported these traditions combined with the imposition of European notions of the sea as a commons appeared to erase or reduce the viability of these areas (Mulrennan and Scott 2000). The resilience of many such societies translated into a remarkable ability to adapt to change and to evolve management systems that were rooted in past traditions (Ruddle 1993, Folke et al. 2005).

In areas like the central Philippines, anecdotal reports suggest that local people pursued marine conservation initiatives through their informal social networks that advanced their livelihoods and culture during contemporary times. The social networks implementing these marine conservation initiatives were primarily village-based clans who have made claims to a particular marine area (Guieb 2008). For example, elder fishers in the central Philippines remember the existence of “sona” or zoned areas (usually fronting the settlement), which were designated as “no-take areas” but which were occasionally open to fishing, such as just before the annual fiestas (pers. comm. R. Paden and L. Tacatani, leaders of grassroots organization called KANAGMALUHAN and residents of Jandayan island, Bohol, June 2002; Green et al. 2002). In a village in the northern Philippines, people are said to have never fished on a reef called Malaginoo (god-like), which is believed by villagers to be a sacred place; divers claim it has a pinnacle formation shaped like an altar adorned by a religious icon (pers. comm. W. Bendal, Mayor of Burdeus, Quezon province, March 1992). Other documented local practices, which have persisted to varying extents in the central Philippines, include marine tenurial rights in intertidal zones. The latter include sea estates (*sitio-sitio*) or fish corrals (*bunsod*), which provide certain family groups with exclusive fishing rights in the claimed area (Guieb 2008).

While the doctrine of the sea as a global commons persists, increasing recognition at the international level of the value of many traditional resource management practices and associated ecological knowledge has served to strengthen the role of indigenous groups specifically and the position of local resource-based communities more generally. Global recognition of the rights and interests of local people do not however readily translate into

provisions to accommodate such rights and interests on the ground and in the water (Scott and Mulrennan, forthcoming). Furthermore, while informal social networks may continue to be significant at the local level, many current challenges and solutions to marine conservation action require a broader strategy. Hence, the integration of indigenous or community-based perspectives is more generally a function of the individual national frameworks.

Notwithstanding these traditional underpinnings of the MPA concept, the experiment in contemporary MPA establishment owes much to the hugely popular national parks and protected areas movement, which began in the mid 1800s and centered on the protection of terrestrial wilderness in the New World (Redford and Sanderson 2000). Motivated by ideals of wilderness preservation for aesthetic, recreational and educational purposes that tended to displace users, the creation of these protected areas was inspired and promoted by and for the interests of the elite (Adams 2003). For example, the reserve status given in 1858 to a forest in Fontainebleau, France was in response to the efforts of a group of painters who wanted the area protected for aesthetic purposes (Jepson and Whittaker 2002). As early as 1906, a marine protected area was proposed for the Great Barrier Reef but was rejected by fishers (Sumaila et al. 2000). The first national park to include a marine component was established in 1925 in Glacier Bay National Monument in Alaska followed in 1935 by the Fort Jefferson National Monument on the Florida Coast where protection was extended to all underwater areas within its boundaries (Gare 1975). Both areas excluded or actively discouraged the continued presence of local people who resided within or adjacent to park boundaries and were dependent upon and/or had strong attachments to

the area (Stevens 1997). During colonial times, ownership of natural resources in these settled areas was transferred to the Crown. Later, as nation-states emerged, centralized management of these resources became the norm.

Emergence of MPAs on the international stage

Following World War II, a new era of international governance was established and science became the major determinant of policy decisions (Sloan 2002). Commensurate with such thinking, a global scope and scale was widely embraced in relation to conservation initiatives, including protected area establishment. The founding of the International Union for the Conservation of Nature and Natural Resources (IUCN) in 1948 was key in this respect and led to the creation of the Commission on National Parks (CNP) in 1956. The IUCN then organized the first World Congress on National Parks (WCNP) in 1962, which has continued to convene every ten years since. With respect to marine protection, the first WCNP highlighted the absolute necessity to set aside unmolested areas “of special significance” in the sea with all life protected (WCNP-1962 Recommendation no. 15), while the second WCNP (1972), urged governments to declare “appropriate marine areas” as national parks and reserves (WCNP-1972 Recommendation no. 4).

These conferences also contributed to decisions made at the 1971 Convention on Wetlands of International Importance, with 159 Contracting Parties agreeing to designate and manage 1,847 listed sites worldwide, of which about 45% include marine components (Ramsar Convention 2008). The subsequent World Heritage Convention held in 1972, signed by about 180 nation states, also committed to uphold agreements which inscribe outstanding

sites of cultural, natural and universal value to the World Heritage List where 31 sites include marine components (UNEP-WCMC 2001). To further engage governments in marine park establishment, the IUCN organized an international conference on marine parks and reserves in Tokyo in 1975. It was not, however, until the 1980s when the WCPA created a marine theme that the term ‘marine protected area’ gained prominence in international discourse.

MPA endorsement at the global level followed on the heels of a major transformation in the definition and role of the IUCN in 1982. At this time, the IUCN formally adopted the concept of ‘protected areas’ and renamed the CNP as the International Commission on National Parks and Protected Areas (CNPPA). The name change coincided with the third WCNP (also in 1982), which had as its stated theme ‘the role of protected areas in sustaining society’. Several presentations at the Congress used the terms ‘terrestrial and marine protected areas’ (see McNeely and Miller 1982) in preference to ‘parks and reserves’. By 1992 when the fourth WCNP was held, under the new title of World Congress on National Parks and Protected Areas (WCNPPA), the term ‘marine protected area’ was widely accepted and in popular use. Since then the protection of the marine environment for the purpose of nature preservation has been expanded to include non-preservationist goals emphasizing sustainable use in conservation and management. To support this direction, the IUCN developed categories of protected areas that include multiple use zones for livelihood and conservation purposes. This categorization, for adoption by policymakers, indicated the potential for full engagement of local communities in MPA management.

The developments following the 1982 IUCN changes in their role influenced subsequent international agreements and conventions of relevance to MPAs. For example, the “Jakarta Mandate on Marine and Coastal Biological Diversity” is one of the most potent agreements on MPAs to be recently adopted (UNEP 1995). The mandate recognizes MPAs as an essential tool and approach in marine conservation and commits to the establishment and maintenance of comprehensive, effectively managed, ecologically representative global network of MPAs through a national framework (CBD COP2, Decision II/10). Institutional support to guide international, regional and national activities in the establishment of this network and monitor their effectiveness was also confirmed by this agreement.

The adoption and implementation of these MPA international agreements has been facilitated by a transnational social network of MPA advocates. The formation of transnational advocacy networks (TANs) emerged during the activism of the 1960s when groups shared a common cause, new ideas and research to support lobbies for policy changes (Keck and Sikkink 1999). TANs allow various non-state actors to have greater influence in policy development by contributing to the identification of a problem, providing advice during the treaty-making process as well as monitoring implementation and compliance to treaties. The IUCN is unique in that it has become a cross-cutting TAN, engaging both state and non-state actors, at a variety of levels. Through the IUCN’s World Commission on Protected Areas, government representatives and over 800 international- and national-based IUCN member NGOs promote and influence MPA policy advocacy. Other examples of TANs promoting the value of MPAs include the Global Coral Reef

Monitoring Network and the International Coral Reef Action Network. The latter was established through a historic grant by the United Nations Foundation (<http://www.icran.org/icran-icri.html>). TANs have a tendency to be dominated by international NGOs with established ties to the UN system and thus tend to have better access to resources for networking and lobbying when compared to national or local MPA organizations.

Despite the prominence now given to MPAs, the contemporary elaboration of the MPA concept owes more to the seaward extension of concepts, policies, and practices associated with the terrestrial-based national parks and protected areas movement than a resurgence of traditional or customary models and practices of marine protection. Linkages to past practices, customary tenure arrangements and traditional knowledge systems are all too often forgotten. A recent shift in perspective from the exclusion of humans from nature to one that accommodates humans within nature (Pretty and Smith 2004) is facilitating the establishment of community-based MPAs, created and managed by local communities and indigenous groups (Guénette et al. 2000). However, a significant number of MPAs continue to be initiated at the whim of distant non-local parties (i.e. scientists, central government agency representatives and selected international or national non-government organizations or NGOs) to fulfill objectives and goals that may be at odds with local agendas. The harassment of fishers operating in MPAs valued for tourism has been reported from LDCs in Africa and Asia (Dungog 1998, WRM 2004, Gustave 2005). Similarly, citing experiences from their constituents, the International Collective in Support of Fishworkers (ICSF) and the World Forum of Fisher Peoples have recently discouraged

further global initiatives on MPA expansion in LDCs because of claims that such action has displaced, excluded and alienated fishing communities, and violated their basic rights to life and livelihood (ICSF 2006). Meanwhile, conservationists concerned about current exploitation and extinction rates of fish species continue to promote the need for resource conservation and habitat protection (Naughton-Treves et al. 2005). Thus, linking global aspirations and initiatives for MPAs to the grounded realities of MPA implementation at the local scale is a project of increasing urgency and importance.

MPA policy development and key players

MPA policy development undergoes an iterative process of formulation, negotiation, adoption, implementation, monitoring and evaluation involving players from international, national and local levels in different aspects of the process. International policies tend to set the framework for the creation of national legislation and regulation. These international policies can be formal legal instruments, such as those entrenched in treaties and agreements that are binding to signatory parties. They can also be informal, non-binding policies that arise from international congresses or conferences. Provisions in the national constitution of individual states then determine how and which institutions can be involved in the decision-making and implementation (Winter 1996) of MPA policies. For example, recent international calls to decentralize management of natural resources have resulted in some national legislations supporting greater participation from local institutions in national level decision-making. In this way, the allocation of management responsibilities at lower levels of governance is accompanied by enabling policies formulated at the higher levels (Cash and Moser 2000). This supports the interdependence of the different policy

levels and the importance of integration and synergy across these nested levels of governance.

The achievement of this integration maybe complicated by cross-cutting issues involving nested geographical, jurisdictional and institutional scales. The delineation of boundaries, downstream impacts, and conflicts of interest are just some of the many over-lapping issues relevant to MPAs. As such, MPA policy development needs to be linked to other coastal and marine protection policies. Developing integrated policies that are inclusive of different interests and in synchrony with other existing policies across various levels and scales is a challenging task. Yet, the growing trend of globalized interdependent economies, output of technologies and information, and environmental degradation compels nation-states to develop policies that can take account of multiple level and nested scale considerations.

The role and responsibility of key players at international, national and local levels in advancing a more integrated MPA policy is examined below. Particular attention is paid to the emergence of social networks at each level and their role in fostering cooperation, building constituency, information exchange, influencing MPA policies and supporting governments in implementing MPA initiatives.

International level

At the international level, specialized intergovernmental organizations (IGOs) such as the United Nations Environment Program (UNEP) and UN-designated expert panels (e.g. Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas), NGOs and donor

agencies contribute to the formulation of international MPA policies and to ensuring the fulfillment of obligations undertaken by contracting nations (Frank et al. 1999). The presence and increasing power of these various organizations reflects the priority being given at the international level to the search for solutions and responses to global environmental problems. However, a lack of coordination and integration of strategies inhibits progress through the promotion of rivalry between donor and recipient agencies, causing duplication of work programmes as well as inefficient deployment of resources (GESAMP 2001). The outcome in relation to MPA international policy implementation can be the undermining of common goals and agendas as individual projects become subject to the bias and priorities of the particular agency responsible for their formulation, e.g. biodiversity conservation or fisheries management. Indeed, policy advocacy for MPAs as a fisheries management tool has in recent years sparked heated debate among conservationists and fisheries scientists (Willis et al. 2003, Kaiser 2005). Another, unfortunate outcome of poorly coordinated efforts is that MPAs get relegated to one among several items on a list of management strategies, with the result that provisions specific to marine protection appear diluted and ambiguous (Aqorau 2003). Recent reviews of MPA policy development suggest that progress is being made to promote the linking of MPAs with integrated coastal and ocean management (Cicin-Sain and Belfiore 2005, World Bank 2006).

The recent shift at the international level from decision-making structures exclusively comprised of government representatives and technical experts, to an accommodation of non-government organizations (NGOs) has encouraged the creation and participation of

environmental NGOs, with mixed results (Charnovitz 1996) The First WCNP conference organized by the IUCN in 1962 had only 145 delegates from 63 countries (Adams 1962) compared to the Fifth WPC in 2003 when 3,000 participants from 154 countries represented resource managers, scientists, civil servants and leaders of large and small non-governmental organizations, international bodies and grassroots groups (IUCN 2003). The latter also had individual NGOs presenting general and specific issues of relevance to community conservation and development. These changes in the number, origin, and perspective of delegates reflected a fundamental ideological shift from the conventional science and technology focus of previous world congresses to the inclusion of broader social and economic perspectives in protected area policies.

International government and non-state actors or TANS have made significant contributions to MPA policy implementation. For example, an assessment of sources of financial support for biodiversity conservation in Latin America and the Caribbean regions between 1990-1997 found that 65 international funders invested US\$3.26 billion, 70% of which supported protected area projects (Castro and Locker 2000). Among the top funders were multilateral and bilateral agencies and NGOs, such as the World Bank, the German Technical Corporation, the U.S. Agency for International Development (USAID) and the World Wildlife Fund (Castro and Locker 2000). Because MPA establishment and management requires substantial financial resources (Balmford et al. 2004) the engagement of more such funders can be anticipated as nation-states attempt to meet international targets to extend MPA coverage. Such support could also address the currently minimal participation of LDCs in international policy making. For example, the 2003 WCPA list of

participants showed that delegations from grassroots organizations (GROs) directly representing the interests of local communities in LDCs comprised only 2% of total participants compared to about 10% representation from various agencies from within the United States alone (IUCN 2003). In reality, organizations with limited financial resources, such as many small national-based NGOs and community-based GROs, are excluded from international fora because they can barely support management of their CBMPAs; much less find the means to attend expensive international gatherings.

While increased support and participation from external agencies is a welcome development particularly for LDCs with limited financial resources, concerns have been raised about the extent to which national environmental policies, including those related to MPAs, are informed by top-down international agendas rather than grounded in the local context (Frank et al. 2007). The provision of funds also has the potential to create polarization among the external agencies themselves as they compete for authority and resources (Cerny 1997, Rodriguez et al. 2007). For example, the effectiveness of a protected area project in Madagascar was compromised by poorly coordinated and overlapping institutional support being provided from international, national and local levels (Gezon 1997). The project engaged USAID and the national government as funders, two international NGOs as managers and a national NGO as coordinator. As a result, the project implementers were overly restricted by the chains of command, taking directives from donors, their employers and the coordinator who had to respect individual institutional policies. This situation also highlights concerns arising from donor-led projects related to the compatibility of the funder's objectives with the local agenda (Rodriguez et

al. 2007). Another issue is the sustainability of the project given that funding provided by international donors typically lasts for only five years at best (Sanjayan et al. 1997).

One strategy employed to address the above mentioned concerns is to internationalize actions through the development of networks. For example, an international NGO launched the Locally-Managed Marine Area (LMMA) network in 2000 as an organization where practitioners of marine conservation projects worldwide learn from each other's knowledge, skills, resources and experiences (LMMA Network 2004). Its broad membership ranges from individuals to communities, land-owning groups, traditional leaders, government representatives, conservation organization staff, elected decision-makers, university scientists, researchers and donors promoting the LMMA strategy. Other networks such as the Birdlife International and Wildlife Trust Alliance collaborate with local organizations and help raise funds to realize agendas set by their local partners (Rodriguez et al. 2007). These examples of TANs demonstrate that international NGOs, even with a limited presence in the local project sites, can be influential and effective players in supporting local MPA projects.

National level

As noted earlier, MPA policy development at the national level is increasingly influenced by international policies. An examination of the compiled list of statutory acts by the Food and Agriculture Organization (FAO) indicated that growth in international MPA policies corresponded with the enactment of about 967 MPA-related national legislations between 1970 to 2007 (Figure 2.1), 60% of which were in LDCs. The timing illustrates the influence

international policies have on national legislative developments. For example, 213 of the 967 MPA-related legislative acts were enacted between 1982-1995 following the establishment of the WCPA-Marine Program, while 651 were enacted in the wake of the adoption of the Jakarta Mandate between 1996 to 2007 (data obtained from <http://www.faolex.fao.org/>).

National MPA policies can be influenced by either international agreements or local actions to favor the implementation of CBMPAs. In Brazil, marine extractive reserves (MERs) were established to accommodate the traditional user rights of indigenous groups (Diegues 1999). There is limited information on the extent to which contemporary MPA policy and practice at the local level influences national MPA policies. Some widely cited examples include the significant role of two historic CBMPAs, Apo and Sumilon Islands, in shaping the national co-management (shared management between community and government) regime for MPAs in the Philippines (Alcala and Russ 2006). Similarly the success of local level management in Bunaken National Park, Indonesia, resulted in a shift toward decentralized co-management policies in the national protected area system (Erdman et al. 2004). In Samoa, local rules on MPAs are recognized nationally if deemed compatible with the Fisheries Act (World Bank 2006).

MPA policies together with relevant concepts, terms and definitions have all too often been translated directly from international policy instruments into national legislative acts and policies using western intellectual frameworks and language (usually English). This contributes to local perception, particularly in LDCs, of their limited relevance to local

conditions. For example, in the Philippines a series of Presidential Proclamations (PP) created 101 MPAs in a span of 3 years, between 1978 to 1981: 58 Tourist Zones and Marine Reserves (PP1801 in 1978), 16 Wilderness Areas and 27 Mangrove Swamp Forest Reserves (PP 2151 and PP 2152, respectively, in 1981). In 1992, the legislation of the National Integrated Protected Areas System (NIPAS) Act required that the 101 designated MPAs be assessed for suitability and acceptability using biological and ethnographic studies and community consultations. By 2003, only 9 of the 101 MPAs were proclaimed as NIPAS sites (DENR 2003). This limitation was likely due to the huge financial and human resources required to undertake the assessment, the general lack of support from the community and lengthy process of proclamation by Congress, all of which were tied to the mismatch between the Act and local realities.

The top-down approach whereby MPA policies are formulated and imposed by national governments upon the local is a source of tension for many communities. For example, a village chief reacted with skepticism upon hearing from a DENR staff member conducting a survey that their site has been declared a protected mangrove swamp forest reserve. Another problem is the tendency for national governments in many LDCs to focus on the tourism potential of MPAs to support weak national economies (Gustave 2004, Mwaipopo 2008). In some cases, tourism can contribute significantly to the community and the nation's economy (e.g. Erdman et al. 2004, Diedrich 2007). In other cases, such as those reported from Africa and Asia (Dungog 1998, Rajagopalan 2008), fishers have been disenfranchised from their traditional fishing grounds, which became valuable for tourism after being declared MPAs by the national government. Such cases stem from the

exclusion or limited involvement of LDCs during the drafting of international agreements (Boer et al. 1998) as well as the failure on the part of policy makers to modify or amend agreements to suit the local context.

Implementation of the numerous MPA-related policies developed at the national level are usually designated to different institutions depending on the legal instrument. In the Philippines, three national legislative acts related to MPAs are implemented by three different national line agencies: (1) the Local Government Code (Republic Act or RA 7160, 1991) implemented by the Department of Interior and Local Government (DILG); (2) the National Integrated Protected Areas System (NIPAS) law (RA 7586, 1992) implemented by the DENR; and (3) the Philippine Fisheries Code (RA 8550, 1998) implemented by the Bureau of Fisheries and Aquatic Resources (BFAR). The Local Government Code authorizes municipal local government units (LGUs) to manage their territorial waters (up to 15 km from shoreline) including MPA establishment and collection of user fees.

Therefore, municipal ordinances provide the legal framework for community-initiated MPAs. On the other hand, the NIPAS Act serves as the legal framework for parks and protected areas declared by the national Congress. Hence, for CBMPAs proclaimed under the NIPAS Act, the multi-sectoral Protected Area Management Board (PAMB), chaired by the DENR Regional Executive Director, has jurisdiction over the MPA. Beyond this, because the Fisheries Code (Section 80) mandates every municipality to designate at least 15% of their total coastal areas as fish sanctuaries or no-take MPAs, BFAR coordinates with municipal LGUs and the Fisheries and Aquatic Resource Management Councils in the preparation of MPA ordinances.

The operation of the three separate national legislative acts and the presence of three distinct implementing agencies pose significant challenges to MPA management in the Philippines. Jurisdictional overlaps among the different institutions confound MPA management and create redundancies. For example, the DA-BFAR, being responsible for overall management of fisheries in the Philippines, decides on the issue of boundaries for commercial fishing beyond municipal waters. However, DENR has jurisdiction over natural resources and environment and its line agency, the National Mapping and Resource Information Agency (NAMRIA), is tasked to map boundaries including land and the coastal waters which the Local Government Unit (LGU) must respect. The overlapping roles of these institutions gave rise to a major conflict in recent years when DA-BFAR assessed that commercial waters begin 15 km from the major island of any coastal municipality (mainland principle) in the Philippines, while DENR argued that they begin from the most seaward island (archipelagic principle) of the municipality (Batongbacal 2003). This disparity has serious implications not only for island communities managing MPAs but also for small-scale fishers displaced by the establishment of no-take MPAs who are forced to compete with commercial fishers in their already diminished and depleted fishing grounds.

The NIPAS Act is the over-arching national policy for protected areas in the Philippines; all CBMPAs declared through municipal ordinances can be nationalized as provided under the NIPAS Act. Once a MPA site is enacted by the Congress, the national government is required to provide financial and technical assistance to the MPA and ensure its

management effectiveness. Unfortunately, the application of the NIPAS Act to MPAs is fraught with problems because of the terrestrial bias of the Act and the lack of implementing guidelines specific to marine sites with established management regimes. Thus, when the San Salvador island marine sanctuary became a NIPAS site in 1993, embedded within the broader Masinloc and Oyon Bay Protected Seascape, it disrupted the existing system for patrolling and collecting fines for San Salvador. However, the Protected Area Management Board (PAMB) with an array of representatives from the government, academe, NGOs and fisherfolk organizations from two municipalities became the lead management body and eventually installed a new system appropriate to the more extended PA. In another case, Apo island community groups expressed concerns when tourism revenues were remitted to the national treasury (White and Courtney 2004). In both cases, the PAMB became the critical avenue for resolving the issues (pers. comm. M. Pascobello and F. Tiburcio 2003, national council leaders of the MPA grassroots alliance called PAMANA, May 2004; Alcala and Russ 2006)

Non-state actors such as national conservation NGOs and academic institutions have been active in MPA implementation at the local level through capacity building, as well as technical and financial support (Harvey and Hilton 2006). In the Philippines, to further strengthen these roles, the University of the Philippines-Marine Science Institute facilitated the creation of the Marine Protected Area Support Network. Its broad membership is dominated by professionals from the academe and NGOs although grassroots organizations have been encouraged to join. It is a loose network with no binding agreements as the activities focus more on sharing information and experiences on implementation rather than

policy issues. The Vietnam MPA Conservation Network is another national network made up of Vietnamese and foreign individuals and organization where members share information and support marine conservation activities in Vietnam (Trinh 2007).

Globally, little information is available on national alliances of grassroots organizations (GROs) that actively and strategically promote MPAs. The best known existing grassroots alliances that are involved with MPA concerns tend to be issue-based rather than ecosystem-based, (e.g. focused on monitoring issues that affect their sector's livelihoods and rights). Thus, these alliances tend to deal with a wide array of concerns and initiatives, and MPAs may be only one of many issues being addressed, as in the case of the national fisherfolk federation in the Caribbean (Breton et al. 2006), Peru, Mexico and elsewhere (see www.icsf.net). One rare example of a national alliance found in the Philippines that is at least partly ecosystem-based is the *Pambansang Alyansa ng Maliliit na Mangingisda na Nangangalaga ng Karagatan at Santwaryo sa Pilipinas* (PAMANA). It includes 122 CBMPAs, which are structured according to "bay-wide" chapters and represented by their managers. In addition to being directly involved in the day to day management of MPAs, the alliance engages in participatory monitoring activities and environmental awareness campaigns. Its policy advocacy agenda promotes common issues such as insurance benefits for volunteer fish wardens, marine tenure and livelihoods (Lavides and Tiburcio 2002).

Local level

Neither international frameworks for MPA promotion nor statutory acts that legally establish MPAs at the national level provide any guarantee of enforcement and

maintenance at the local level. High level international and national policies usually have broad provisions that can be challenging to integrate directly into local management plans (Sainsbury et al. 2000). For this reason, legislating MPAs at the local level (usually defined at the municipal or district level) may be appropriate, particularly if the primary issues and problems are not national in scope (Luna 1997). This is being facilitated by decentralization trends among some national governments whereby functions for marine resource management, among others, are being devolved to the local governments.

Decentralization has been identified as a key contributor to MPA sustainability, particularly in LDC settings (Siry 2006). In recent years there has been an increasing trend to establish and legislate CBMPAs at the municipal or district levels (White et al. 2002, Siry 2006). Notwithstanding many positive assessments of this development (Alcala and Russ 2006, Guénette et al. 2000) concerns have been raised about the uncoordinated actions and questionable priorities of local governments (e.g. the temptation to increase revenues at the expense of marine conservation goals; Siry 2006). While revenue raising and improved livelihoods are essential to community support for CBMPAs, issues such as community access and control over local resources as well as building local management capacity need to be considered. In short, the process of devolving centralized resource management powers to local governments must include provisions that prepare and subsequently support local communities in the enhanced role they play in devolved resource management arrangements (Poteete 2004, Francis et al. 2002).

Although many functional CBMPAs would not have arisen or survived without support from external agents, the success of CBMPAs is intimately tied to local participation (Christie and White 2007, Lundquist and Granek 2005, Mascia 2003, Wells and White 1995). The involvement of community stakeholders in all phases of MPA development is critical (Pomeroy and Douvere 2008). Failure to engage communities, particularly in the early stages of establishing legislated MPAs, can lead to a breakdown in management (Guénette et al. 2000). Continued community participation for MPAs has been linked to perceived positive benefits from the MPA, positive interactions with managers (McClanahan et al. 2005) and the presence of a committed and trusted core group leading a strong institutionalized management body (Brody 1998, Hofman and Kaiser 2005). Another contributing factor to success is sustained support from the academe, NGOs and government agencies (Chou et al. 2002). Conversely, a lack of stability and unreliable support from governments or external agents has led to the collapse of monitoring and enforcement systems (Lundquist and Granek 2005). This collapse can also occur due to conflicts within the community brought about by inequitable sharing of benefits, unbalanced power relationships, and unfair political alliances (Oracion et al. 2005, Majanen 2007).

Cross-cutting issues such as tenurial rights in open access and conflict over the delineation of fishing boundaries have important implications for MPA establishment given that open access is among the principal drivers of resource degradation in common marine areas (World Bank 2006). In the Philippines, where the municipality rather than the village has jurisdiction over inshore waters, local MPA initiatives can be undermined because violators

apprehended for poaching in a village-legislated MPA can theoretically sue the village council if a self-enforced MPA has not yet acquired municipal legislative backing. At the same time, the municipality may be unable to define their territorial waters in the absence of clear national policy directives on delineation. Another tenurial issue expressed by village-based MPA managers concerns the vulnerability of MPAs to the political whims of elected leaders, particularly at the municipal level. The consequences of having leaders disregard existing MPA management regimes to accommodate political favors have been documented. For example, coral cover and fish biomass declined in Sumilon Island, Philippines when the mayor allowed fishing in the reserve after 5 years of protection (Alcala & Russ 2006). Bridges need to be built so that the most pressing concerns at the local level, such as tenurial rights, can be addressed with support from national and international MPA policymakers.

Connecting the global to the local

The scope and magnitude of current and future threats to the oceans extend from the global to the local, with the national level serving as a potential interlocutor between the two. International MPA agreements cannot be implemented domestically unless ratified by national policymakers while local policies are heavily dependent upon national policy frameworks. Likewise, the centre for the support and actions that flow from social movements, particularly with respect to environmental concerns, is most often located at the national level (Rohrschneider and Dalton 2002).

In recent years, non-government institutions have had an increasing presence in discourses concerning environmental policy making, including protected area management, both internationally and domestically (Alcorn et al. 2003; Gordenker and Weiss 1995). The emergence of international non-state actors or TANs has made a significant contribution to regional and international integration of MPA policies through the facilitation of dialogue, exchange of information and the provision of financial and other support to national and local levels (Keck and Sikkink 1999). The evolution of such MPA social networks has the potential to improve the coordination and synchronization of policies through multilevel participation of institutions with the goal of more effective management of MPAs. To fulfill this potential, it has been suggested that institutions should be highly structured, be able to penetrate across international, national and local levels of governance and be stable enough to persist over time (Schofer and Hironaka 2005). In general, with the exception of the GROs, the record and achievements of the various existing MPA social networks (e.g. IUCN, LMMA, ICRAN, Philippines MPA Support Network, Viet Nam MPA Conservation Network) is promising and reflects the existence of the aforementioned attributes.

Recent changes in the way international policies are developed bode well for the integration and increased effectiveness of MPA policies. The participation of NGOs in international policy-making has enhanced the legitimacy of governmental decisions by improving the quality of decision-making through the provision of information, ideas and perspectives otherwise unavailable and by making relevant information more accessible to the public (Stairs and Taylor 1992). Given the existence of functional MPA social networks, these recent changes offer opportunities for multiple level institutions to work

together to influence policy outcomes. Casey (2004) identified four factors that determine ability to influence policy outcomes: the political and socio-economic environment, the nature of the policies involved, characteristics of the non-state actors, and the presence of networks of political actors. Using these factors, we conducted an assessment of the opportunities and constraints available across multiple levels of governance for institutions to participate and influence MPA policy (see Table 2.1). Our findings suggest that while significant challenges exist, the MPA social movement that emerged at the international level has promoted a growth in advocacy actions by organized institutions at national and local levels. As a result, political actors and social entrepreneurs, including private individuals and business corporations, have demonstrated greater support for marine conservation efforts. Technological advances in communication have also allowed even remote island communities to participate to greater or lesser extents in nationwide MPA advocacy actions. These conditions provide unprecedented opportunities for the development of integrated MPA policy agendas.

Opportunities to influence the integration of MPA policies

The present political and socio-economic environment at the global, national and local levels is supportive of community-based approaches and the accommodation of non-state participation. The resulting decentralized political structures, where they occur, have given local communities a much greater role in the implementation of some MPA policies, such as those related to user fees. Despite some skepticism (Redford 1992, Terborgh 1999, Oates 1999), community-based approaches to conservation, including MPA establishment and management, have become widely embraced and increasingly integrated within

broader policy contexts. For example, co-management arrangements and integrated coastal management has been successfully implemented in several LDCs (Pollnac and Pomeroy 2005, White et al. 2005, Wilson et al. 2003). These policy shifts are the outcome of several influences, including the accommodation of inputs from non-state actors in the formulation and negotiation of international policy. Since the Earth Summit declaration in 1992 (Chapter 23, Agenda 21), non-state actors or major groups, including NGOs and GROs, have participated in identifying problems, designing and applying solutions, monitoring results, and accessing information on a wide range of sustainable development issues and activities. These major groups now have UN consultative or observer status at international conferences where new conventions are adopted (UN-ECOSOC 2004).

Policy-making at the international level presents valuable opportunities for national discussion and exchange. In particular, policy negotiations can provide fertile ground for the initiation and elaboration of globalizing discourses on environmental conservation. Such discussions may subsequently gain broader support and ultimately hold greater significance than the passage of the policy or law itself (Hurrell and Kingsbury 1992). The negotiation stage can also provide nation-states with important transitional periods of adaptation and innovation while awaiting formal ratification of the agreements by a predetermined minimum number of member states. For example, with the United Nations Law of the Sea (UNCLOS), which provides the unifying framework for the conservation and management of marine resources, although it was formally adopted in 1982, it took twelve more years before it entered into force (Kimball 2001). However, this period of intense debate and negotiation gave many nation-states the much needed time to formulate

and amend domestic policies and legislation so that they were more closely tailored to the needs and interests of the state while also being compatible with the international policy framework. In this way, the ratification process can provide an opportunity for NGOs and GROs to contribute to national level negotiations and allow local interests to be put forward to shape the national interpretation of general framework agreements.

The characteristics of non-state actors at international, national and local levels reflect some degree of interdependence between the institutions. For example, the considerable ability of international NGOs to mobilize resources and tap expertise and relevant technology can benefit national-based NGOs with whom the international NGOs collaborate. In turn, national-based NGOs are credited with assisting GROs and developing local capacities to manage MPAs. Even social entrepreneurs have become engaged in developing local capacities. For example, in 2004, Smart Communications Incorporated donated cellular phones to over 100 CBMPA leaders to support their monitoring and surveillance efforts (Samdhana 2004). This has helped increase the flow in communication providing regular feedbacks or frequent exchange of relevant information among the GROs, local government institutions and NGOs

The networks of MPA actors at the international level, such as the IGOs and TANs, can provide valuable support for internationalizing local participation. For example, the opposition of the local people of Bolinao to the proposed development of a cement plant, where the University of the Philippines' marine science laboratory is located, was brought to the attention of scientists attending the Eighth International Coral Reef Symposium. A

consensus of support emerged resulting in a signed petition by hundreds of international delegates in support of the Bolinao people, which has been attributed to influencing the government's subsequent decision to shelve the development (pers. comm. E.D. Gomez, former University of the Philippines-Marine Science Institute Director, May 2003)

For community-based MPA managers to participate more effectively in international and national policy development, they will need to form links with international/national government bodies and transnational/national NGOs. However, these links can be more enduring if representation takes the form of national or regional collectives because of their enhanced ability to mobilize resources and a wider network. In the Philippines, the GRO national alliance (PAMANA) has promoted their advocacy agenda on marine tenure, delineation of boundaries, institutionalization of wardens and establishment of judicial courts for marine environment-related cases at the national level by linking with national NGOs, broadcast media groups, and politicians (Samdhana 2004).

Mechanisms to influence MPA policy integration

The opportunities for non-state actors to influence the development of integrated MPA policy have parallel constraints (Table 2.1). These include the legitimacy of participants, confusing and conflicting policies, power imbalances, competition for resources, overlapping functions, as well as limited access to information, funds and technology. However, the complexity and urgency of issues can be reduced if an organized multilevel network of actors can work together. In particular, strategies to organize national MPA alliances of GROs in other LDCs and then build a transnational MPA alliance of these

GROs should be developed further. Based on past experiences with the establishment of national and transnational alliances of local organizations, this can be facilitated with the support of national and international NGOs with expertise in network building.

The emergence in recent decades of a transnational network of indigenous peoples (IPs) illustrates the potential and power of such alliances. The initial catalyst for this IPs network dates back to 1972 when the UN began sponsoring international conferences. With funding and logistical support from European NGOs, indigenous representatives from LDCs were able to attend international conferences on indigenous rights (Sanders 1989). The resulting social movement encouraged IPs to organize and communicate their experiences, needs and aspirations through their own representatives to national and international levels (Niezen 2000). The success of the IPs social movement demonstrates how local people can get connected with international groups as legitimate representatives. Interestingly, the IPs network now represents a significant source of support and expertise for advocacy development on a range of marine and coastal issues, including MPAs.

The sustained success of MPA social networks depends in large measure upon the implementation of accountability and transparency mechanisms to ensure systematic and effective collaboration. While NGOs have effective mechanisms for upward accountability to donors (Ebrahim 2003), their tendency to represent the voices of local communities in national and international forums without accountability or proper feedback is problematic (Lundy 1999). To address, this we propose as a first step the organization of a functional network of GROs that can subsequently be recognized by TANs and IGOs. The GRO

network, once functional, must as a next step develop a robust communication system among themselves and with the TANs to support timely feedback, e.g. through internet and text messaging or cellular phones. This system will assist in ensuring that the GROs are regularly invited to important events and have access to funds to support their direct participation in policy development and implementation. GROs, like NGOs, will need to develop their own feedback mechanisms, such as disclosure statements, meetings, reports and evaluations. Meanwhile, NGOs need to scale their well-designed mechanisms for upward accountability downward to clients such as the GROs (Ebrahim 2003).

Establishing effective communication links can allow GROs to collaborate more closely with the TAN or social entrepreneurs in designing programs appropriate to the local context. A related role for GROs is in the translation of MPA policies imported from afar to the realities of the local context where they will be implemented. This includes the specific translation of the foreign and unfamiliar concepts, language and definitions embodied in international policy instruments as well as the more generalized translation and matching of MPA policy frameworks imported into national legislative acts and policies to local histories, contexts and challenges.

We have identified the presence of opportunities for local participation in MPA policy development that can be scaled up. At the same time, we recognize the challenges involved for international players to support these opportunities. Notwithstanding this, sustainability is possible only if the local agenda is linked to national and international levels of governance (Buckingham-Hatfield and Percy 1999). The harmonization of policy agendas

at multiple levels is thus critical, particularly to foster local relevance and acceptance in LDCs. GROs can contribute to this harmonization if they can realize empowerment through the presentation of a united, politically engaged perspective at the transnational level and if resources can be provided to facilitate their efforts in doing so.

Conclusion

MPA establishment and management is a massive experiment in human environment relations. As with any experiment, it is necessary to carefully monitor progress in both the achievement of objectives and improvements in the condition of human communities and the natural environment. Reporting based upon meaningful engagement of local people about their experiences, both positive and negative, with MPA development and management will contribute to better policy formulation and implementation. To this effect, initiatives such as that proposed by the IUCN which seeks to adopt assessment systems for management effectiveness in 10% of protected areas by 2010 are particularly promising (www.iucn.org/wpc2003). At the same time, the creation of a coalition of GROs interacting through a coordinated network with more established TANs would help ensure that the targeted global network of MPAs recommended by scientists is inline with local realities.

The integration and localization of MPA policies is an ambitious project that would be facilitated by the presence of structured multi-level and nested MPA networks of GROs, NGOs, academe and donor institutions engaged in MPA policy development and practice. As illustrated in Figure 2.2, MPA policy development involves various levels of governance, from the village to the nation and the world. Integration and localization

requires specific roles from different levels of the TANS and the alliances of GROs. These networks, through their links with government institutions, have the potential for expanded engagement in the formulation, negotiation, implementation, monitoring and evaluation of MPAs. However, a gap that needs to be addressed is the creation of a transnational alliance of GROs composed of legitimate GRO representatives from different nations (Figure 2.2). To ensure that they function collaboratively and effectively across all levels, we recommend the implementation of mechanisms for formalizing partnerships, information feedback, conflict resolution and reporting accountability. The creation of a functional network of multi-level, nested MPA organizations would be a good supplement, if not a better alternative, to current practices, which focus on technical training and implementation of short-term projects. Further, this approach provides a local context for scaling up of both action and results.

The current favorable opportunities and trends in MPAs have not only brought about the proliferation of MPAs (including paper MPAs) but also the emergence of many new social organizations embracing MPAs. To avoid a “paper MPA social network” we recommend that the TANS, the national NGOs and GRO alliances complement and support each other so that they can meet the following criteria (after Yanacapulos 2005): 1) be strategically structured to influence critical institutions such as international funding institutions or governments; 2) demonstrate legitimacy (e.g. through memorandum of agreements, constitution and by laws) since they are given a mandate by members to adopt and voice their positions; and 3) be permanently linked to those they serve, focusing on broader goals rather than single-issues with high levels of commitment between member organizations and invest in developing a standard long-term operational plan among partners.

The MPA concept finds its origins in the traditional and customary practices of local people. While the concept has evolved at international and national levels informed by the science-based MPA objectives of experts, the success of MPAs continues to depend on local realities and relevance. For this reason, the discourse on MPAs cannot be dominated by natural scientists and conservationists focused exclusively on addressing dramatic declines in marine biodiversity (Christie et al. 2003). Evidence indicating that the recovery rates and resilience of a single MPA is greatly enhanced by its proximity to other MPAs (McClanahan et al. 2002, Halpern 2003, Gell and Roberts 2002) prompts us to consider networks of CBMPAs covering a range of different political jurisdictions. As well, the ecological, socio-cultural and economic conditions of the CBMPAs demand that vertical and nested cross-cutting scales of authority and stakeholders work together.

We expect that the setting aside of more marine areas under protected status will be a continuing trend in the effort to comply with international targets. While this is good news, too much emphasis on such initiatives can divert political will and essential resources away from the need to address limitations and gaps and identify opportunities within existing arrangements. The expansion of MPA social networks would build upon and strengthen existing alliances and capacities and contribute to the important goal of connecting the global to the local.

Table

Table 2.1. Factors (after Casey 2004) that determine the ability of international, national and local institutions to participate and influence the MPA policy development and implementation process.

Factors considered	International	National	Local
1. Political and socio-economic environment ¹			
Opportunities	<ul style="list-style-type: none"> • International non-state actors have become engaged in policy-making; the UN has granted consultative status to qualified non-government organizations (NGOs); • International donors commit funds for MPA initiatives based on international agreements; 	<ul style="list-style-type: none"> • Many nations have enacted legislations establishing MPAs in compliance with international agreements; • The academe and national alliances of NGOs and grassroots organizations have participated in decision-making with governments through management bodies concerned with MPAs, e.g. Protected Area Management Board and National Fisheries and Aquatic Resource Management Council; • The government have actively sought and provided funds(through bilateral aid or loans) to implement community-based (CB) MPA projects; 	<ul style="list-style-type: none"> • Decentralization gave local government units (LGUs) authority to manage coastal waters, e.g. in Indonesia, Philippines; • Many LGUs have passed laws designating MPAs within their jurisdictions; • Integrated and co-management arrangements for MPAs between community-based organizations and governments have emerged; • Self-sustaining financial schemes, such as user's fees have been implemented in some areas; • Infrastructure to reach remote island communities have been installed.

¹ Refers to socio-economic development, emerging political structures and actions, strength of political parties

Factors considered	International	National	Local
Constraints	<ul style="list-style-type: none"> • Several inter-governmental bodies promoting the creation and effective management of MPAs have overlapping functions; • The vast coverage and competition for financial resources remain insufficient for global MPA development work; • Unequal access of different nations to advances in communication technology. 	<ul style="list-style-type: none"> • Several national government agencies implementing MPA initiatives have overlapping functions; • National budgets do not prioritize funding MPA management efforts; most funding are obtained through loans, bilateral aid, foreign donors; • Cost of communication amenities still prohibitive in many nations. 	<ul style="list-style-type: none"> • Conflicts over the delineation of boundaries; • Change in leadership can be unstable for MPA policy advocacy; • Inadequate financial & technical support for MPA management from LGUs and mostly dependent on external donors • Lack of financial and technical capabilities to communicate through phones, internet.
2. Nature of policies intending to be influenced¹			
Opportunities	<ul style="list-style-type: none"> • Various international policy instruments relevant to MPAs have included socio-economic as well as ecological considerations; • International MPA policies set within the context of broader policies 	<ul style="list-style-type: none"> • National MPA policies usually formulated in line with international policy frameworks. 	<ul style="list-style-type: none"> • MPAs policies formulated and implemented at the local level can be based on customary practices and legislated at the village, district or municipal/ provincial level; • Local MPA policies are more area specific.
Constraints	<ul style="list-style-type: none"> • Uniform but may be irrelevant categorization for protected areas between terrestrial and marine ecosystems recognized by international government, NGOs; • Compliance in international policies by national governments is voluntary. 	<ul style="list-style-type: none"> • Some national MPA policies developed according to international guidelines may be culturally irrelevant when implemented; • National legal framework for protected areas biased on terrestrial protected areas concept. 	<ul style="list-style-type: none"> • Lack of unifying or consolidated policy to address several common issues among adjacent waters of neighboring villages, (e.g. illegal fishing, pollution, and tenurial rights).

¹ Refers to technicality, public profile, complexity

Factors considered	International	National	Local
3. Characteristics of the non-state actors ¹			
Opportunities	<ul style="list-style-type: none"> • International NGOs are well-connected to different international funding sources and scientific expertise compared to inter-governmental bodies; • Many private donors have increasingly committed to fund conservation projects such as MPAs in less developed countries (LDCs); • Non-state actors have favored the use of advanced communication technology (e.g. phone brigade, internet campaigns, website education) to advance MPA advocacy and influence policymakers • Some international funders have committed to directly fund GROs; 	<ul style="list-style-type: none"> • National-based NGOs have acted links between international NGOs and grassroots organizations (GROs); • NGOs have engaged in development work in coastal communities have engaged in MPA policy advocacy; • Some business corporations have provided financial and technical support for MPAs • NGOs have shown ability to mobilize non-state actors to advance MPA agenda. 	<p>Many GROs have taken the lead in CBMPA management while working closely with elected village council member;</p> <ul style="list-style-type: none"> • Most GROs have been formally organized with assistance from external agents, providing the necessary trainings; • GROs have been represented municipal fisheries management council or protected area management board; • GRO membership have volunteered personal time and skills for MPA management.
Constraints	<ul style="list-style-type: none"> • International non-state actors may possess limited knowledge and comprehension of local, community issues. 	<ul style="list-style-type: none"> • NGOs implementing several MPA projects may utilize uniform schemes for different localities which can be inappropriate; • Lacks legitimacy and accountability schemes when representing NGOs; • National NGOs often rely on foreign funding for MPA projects; • Inadequate feedback mechanism to facilitate both top-down and bottom-up information. 	<ul style="list-style-type: none"> • GROs and village council tend to depend on external organizations for logistical support in MPA management; • Limited exposure to social entrepreneurial opportunities; • Limited communication technology and experience.

¹Refers to ideology and culture, organizational capacities and resource mobilization, membership

Factors considered	International	National	Local
4. Network of other political actors ¹			
Opportunities	<ul style="list-style-type: none"> • Emergence of transnational advocacy networks (TAN), generally with NGOs and international funders as members supporting GROs and CBMPAs; • Existence of a unique TAN (i.e. the IUCN), engaging both intergovernmental organizations, academe and NGOs to promote MPA policy advocacy; • Existence of a network of academic experts promoting the MPA agenda; • A network of several influential NGOs have merged resources to facilitate compliance of international MPA agreements; • International networks have made effective use of print, broadcast media and the internet for networking and lobbying across the globe. 	<ul style="list-style-type: none"> • Emergence of several national MPA social networks with membership from the academe, NGOs, and government line agencies; • Existence of a national alliance of CBMPA managers officially representing their local GROs; • Partnerships, collaborations among different NGO or GRO networks, coalitions and alliances or with government agency through memorandum of agreements; • National networks have made effective use of print, broadcast media and cellular phones for networking and lobbying across the country. 	<ul style="list-style-type: none"> • Some GROs have collaborated at the municipal and provincial level to advance common MPA cause, e.g. patrol common waters, lobby together for support on MPA concerns; • Dissemination of information among the local network combines traditional and modern technology (e.g. through word of mouth, mail, meetings or text messaging on cellular phones); • Opportunities to exchange knowledge and experiences between communities within the same municipality, across the country and internationally, facilitated by network of NGOs.
Constraints	<ul style="list-style-type: none"> • Presence of a parallel international fishworkers network advocating to cease the establishment of more MPAs claiming MPAs displace fishers. 	<ul style="list-style-type: none"> • Partnership or collaborations can be on an ad hoc or project basis, therefore lacking sustainability • Inefficient exchange of information between networks. 	<ul style="list-style-type: none"> • Limited access to network of other political actors due to lack of resources and less effort from national, international NGOs to reach them.

¹Refers to the alliances, interlocking of actors.

Figures

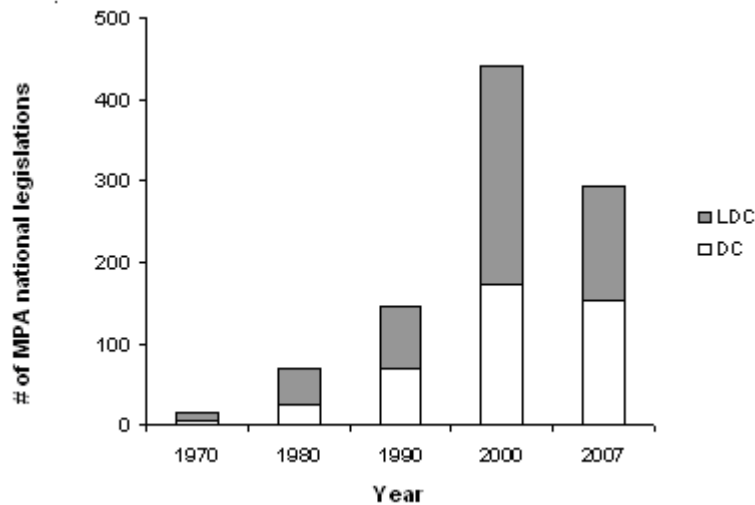


Figure 2.1. Number of MPA-related national legislations in developed countries (DC) and less developed countries (LDC) (source of data: <http://www.faolex.fao.org/>)

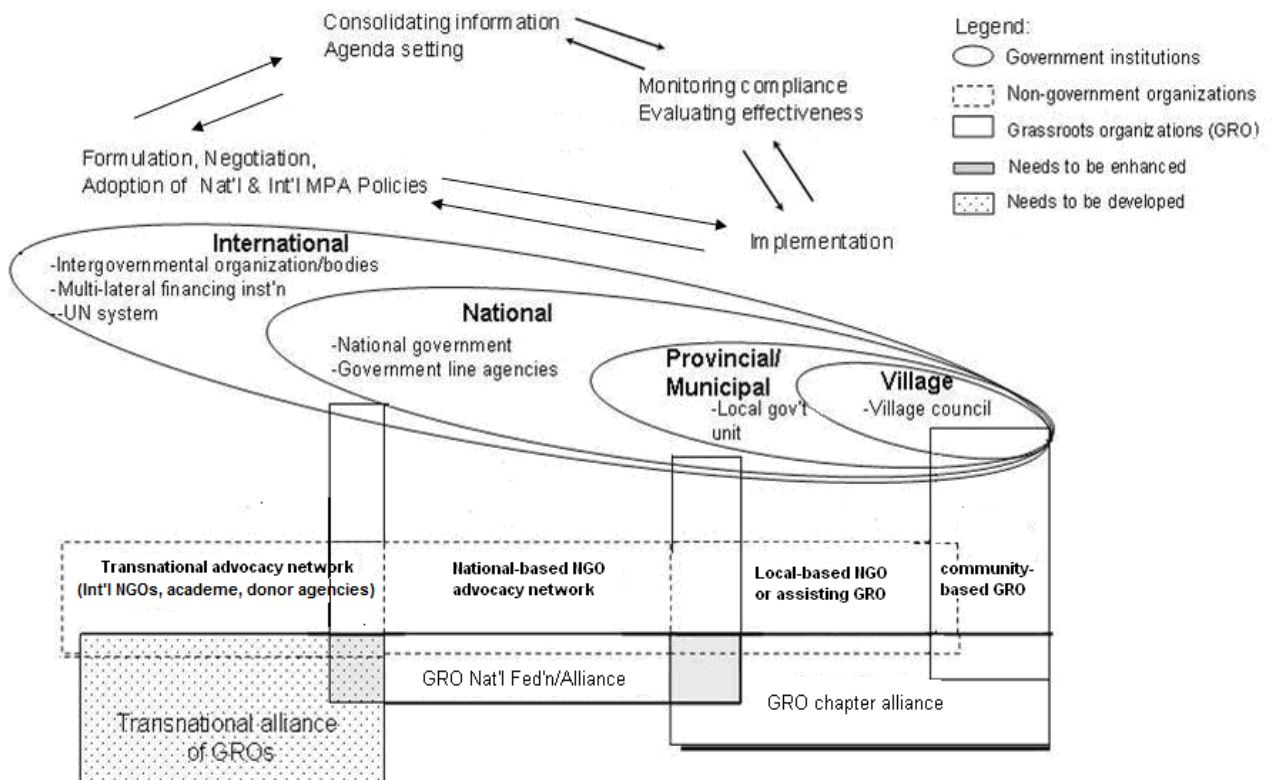


Figure 2.2. Nested scale and cross-cutting levels of engagement by various actors in MPA policy development.

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3. Developing indicators of MPA effectiveness: a comparison within and across stakeholder groups and communities¹

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Introduction

Closure of critical habitat through the establishment of marine protected areas (MPAs) is increasingly being used as a management response to the global decline of marine resources. The most recent global estimate of 5,045 MPAs represents less than 1% of the surface of the world's oceans (Spalding et al. 2008). However, this figure is expected to rise dramatically in light of global movements advocating MPAs. During the World Summit on Sustainable Development in 2002, signatory Parties committed to establish national networks of MPAs by 2012 (United Nations 2002). A group of international marine scientists have called for an increase in the number and effectiveness of MPAs to cover 20% of the world's oceans by the year 2020 (MCBI 1998) while participants of the Fifth World Parks Congress recommended the designation of 20-30% of marine habitats as fully protected MPAs by 2012 (IUCN 2003).

There are major concerns about the effectiveness of MPAs, however, with only 10-35% of existing MPAs achieving their objectives, where these have been declared (Kelleher et al. 1995, Alder 1996, Tun et al. 2004). In response, Parties to the Convention on Biological Diversity agreed to adopt and implement frameworks for monitoring, evaluating and reporting on MPAs by 2010 (CBD 2004). Monitoring and evaluation is viewed as an iterative cycle that allows resource managers to determine their progress towards achieving their objectives (Salafsky and Margoluis 2003). Part of this cycle is the development of measures or indicators of progress that show how well a management strategy is working relative to its objectives. Indicators that provide accessible information to community stakeholders are considered valuable for decision-making and

an important motivator to assist communities achieve their objectives. Indicators are also recognized for their role in simplifying and harmonizing reporting to improve communication at different levels of governance (Garcia et al. 2000), particularly during policy formulation and evaluation of MPA effectiveness.

Several studies indicate that stakeholder perceptions of MPA effectiveness differ according to their needs and interests (Suman et al. 1999, Christie 2004, Dahl-Tacconi 2005, Oracion et al. 2005, Himes 2007). Despite this, methods to evaluate MPA effectiveness are usually based on *a priori* developed set of indicators for use by conservation practitioners and MPA managers, i.e. recognized individuals or groups directly responsible for the day to day on site management who can either be residents or outsiders (Alder 2002, Staub and Hatziolos 2004, Wells and Mangubhai 2004, White et al. 2004, Pelletier et al. 2005, Pomeroy et al. 2004). The present study incorporates this approach by examining how *a priori* indicators of MPA effectiveness differ from the indicators identified by local stakeholder groups within and across ten different communities in the Central Philippines. We believe that an improved understanding of how indicators vary within and across different communities can provide better guidance on appropriate monitoring and evaluation schemes for different community-managed MPAs.

The establishment and management of a group of MPAs require social as well as ecological inputs (Christie and White 2007). There may be a general expectation that community-run MPAs share common objectives. However, because MPAs are not established simultaneously and objectives change over time, differences can emerge

between them, sometimes leading to confusion, conflict and false expectations (Christie and White 2007). In this paper, we examine how stakeholder groups and communities that establish MPAs at different times vary in their MPA objectives and indicators. More specifically, our study aims to: 1) examine the objectives and indicators for MPA effectiveness as identified by stakeholder groups from different communities with different timelines in MPA establishment; 2) compare the differences between locally identified MPA objectives and indicators vis a vis *a priori* or standardized MPA objectives and indicator responses; and 3) determine the factors responsible for variations in MPA objectives and indicator response. The stakeholder groups we refer to here are the local resource users who may have different needs and aspirations from external stakeholder groups. The critical role that these local resource users can play in MPA effectiveness makes them the intended beneficiaries of a project (Grimble and Wellard 1997). Community is defined as the sum of the local stakeholder groups residing in a village or *barangay* (smallest political unit in the Philippines) that historically exercised authority and rights over its coastal resources (Pomeroy and Carlos 1997).

Development of MPA indicators

Following Hocking et al.'s (2000) framework for the assessment of the management effectiveness of protected areas, several methods for indicator development have been proposed to guide MPA managers. The framework is based upon six elements for effective management: context, planning, inputs, process, outputs and outcomes. MPA indicators, which were identified through literature reviews and consultation among 'experts', are based upon widely accepted management objectives, including protection

and rehabilitation of marine resources, maintenance of biodiversity, promotion of tourism and fisheries enhancement (Boersma and Parrish 1999, Pelletier et al. 2005, Pomeroy et al. 2004). Other stated objectives include protecting the coastal area, promoting sustainable development, protecting cultural heritage, promoting research and providing educational opportunities (Jones 1994, NRC 2001).

Many of the methods proposed for assessing MPA effectiveness focus on output and outcomes. Outcome indicators are categorized into domains or evaluation fields such as ecology, economics and social sciences (Pelletier et al. 2005), governance, biophysical and socio-economics (Pomeroy et al. 2004) or living and nonliving resources, economic, social, ecosystem function and management (Alder et al. 2002). Other MPA performance evaluation methods focus more on context, planning, inputs and processes using a score card or a rating system to be completed by MPA management staff and stakeholders (Staub and Hatziolos 2003, White et al. 2004).

Incorporation of MPAs in the broader coastal management framework is being advanced by an international group of experts (Cicin-Sain and Belfiore 2005). (Olsen 2003) designed an ICM evaluation framework that also applies to MPAs as an integral contributor to the conservation outcomes of an ICM program. The framework consists of four orders of outcomes: (1) focusing on enabling conditions that set the stage for implementation; (2) dealing with changes in human behavior towards improved environment; (3) making tangible improvements in coastal ecosystem qualities; and (4) finding an acceptable balance between improved environmental and societal conditions.

Assessing the progress towards achievement of this array of objectives may be contingent on other objectives being achieved first. For example, the maintenance of fish populations in the reserve (outcome objective) first requires that fishing mortality be reduced or removed via coastal protection (enabling objectives) through establishment and enforcement of fishing restrictions.

External, or independent, approaches may have limitations when it comes to assessing the effectiveness of community-based MPAs. Although MPA experts provide significant inputs for MPA indicators, it has been argued that protected area management will function effectively only if it respects the perspectives of, and is driven by, local or community stakeholders (Kelleher 1999, Berkes 2004). Previous studies have also demonstrated that community involvement is critical to the achievement of management objectives (Wells and White 1995, Roberts and Hawkins 2000, White et al. 2000, Elliott et al. 2001). Despite this, local or community stakeholders - particularly in LDCs - have rarely been centrally involved in identifying indicators in marine resource management; nor has the local context been adequately incorporated in the research design (Dahl-Tacconi 2005). For example, a survey conducted among coastal management practitioners on tropical Integrated Coastal Management (ICM) noted that only 24% of respondents considered local communities to be major stakeholders in the management process (Westmacott 2002). The present study attempts to address this imbalance by engaging local stakeholders across different community-managed MPAs in the process of developing indicators of MPA effectiveness.

Methods

Study sites

The study was carried out in ten *barangay* communities, all of them situated in the central Philippines (Figure 3.1, Table 3.1). All sites lie within the waters of the Bohol Strait and the Danajon Bank, with nine in the western part of Bohol province and the tenth located in the province of Negros Oriental. Because Bohol alone has over 100 no-take MPAs with different levels of enforcement and management (Green et al. 2002), the province offers an unusual array of MPA sites with similar geographical, ecological, cultural and political contexts. Our study sites were selected to provide a set of MPAs that had been established for 0 to 21 years as of 2002, when this study began. The site designated as age 0, Alumar, had been a no-take MPA from 1995 to 2000 but was abandoned until 2003 when the new leadership took actions to re-establish the MPA. For this analysis, 2003 was considered as the year of effective enforcement.

All ten MPAs are managed by the local community through the village (*barangay*) council or a grassroots organization or both, although their initial establishment and management was facilitated or catalysed by external institutions (Table 3.1). In three MPA study sites, communities began enforcing their no-take regulations through *barangay* resolutions even before enactment of the official Philippine government protocol of MPA legislation at the municipal level (Republic Act 7160 or the Philippine Local Government Code).

Individual face-to-face interviews were administered in the local dialect (Cebuano) by either the local research assistant or the lead author during March to May 2003 in ten sites. The interviewers took notes for each interview which lasted 20 to 30 minutes, beginning with unconstrained questions (open-ended) followed by constrained questions (closed-ended) as described below.

Respondents

We sought to interview 10 respondents in each of five key stakeholder groups actively engaged in MPA management at the 10 community-based MPA study sites. The identified key stakeholder groups were defined as: elders (60 years old and above), women (26 to 59 years old), fishers (26 to 59 years old with fishing as primary source of income), leaders (26 years old and above, currently an official of a *barangay* or village council or organization) and youth (18 to 25 years old). Although community leaders also fell into other stakeholder groups, s/he was assessed only as a leader. The 10 community groups (Figure 3.1) were also categorized according to the years since their MPAs were enforced, distinguished as either an old MPA (≥ 5 years) or a young MPA (< 5 years).

A community census list provided by health workers was used to select potential respondents randomly. We initially approached 500 potential respondents (50 from each of the 10 study sites) and given available time, approached 21 more when the previous potential respondent was unavailable. In the end, we achieved a 95% response rate where a total of 495 people agreed to be interviewed: 96 elders, 102 fishermen, 96 leaders, 103

women (in this case, the women were all non-fishers) and 98 youths (Table 3.2). In some cases, we interviewed more than the targeted 50 respondents per community when: 1) potential respondents that were previously unavailable approached us to be interviewed (n=4), 2) respondents volunteered to substitute for the absent respondent in the same household (n=2) or the respondent's stakeholder group was reclassified (n=6) as a result of outdated information from the census list (e.g. youth respondent's ages were older and therefore reclassified as woman or fisher stakeholder group).

Survey interviews

Several preparatory activities such as courtesy calls and community orientation meetings were held to ensure maximum participation. We also obtained relevant information on the MPA study sites from community leaders, municipal executives, representatives of grassroots organizations and alliances, government and non-government institutions and agencies to set the context. The survey instrument was piloted in a village adjacent to one study site to test for interview technique, appropriateness of the language and clarity of phrasing.

Interviews were conducted in two stages using a semi-structured approach: unconstrained interviews provided the respondents with the chance to offer any views or opinions while constrained interviews asked respondents to choose among pre-determined options. In the first stage (unconstrained), we asked respondents to respond to two questions: (1) what are the objectives of your particular MPA and (2) what indicators would tell you that your MPA is effective? The responses were coded manually by using the respondents' actual

phrases to identify themes that became the set of nominal variables (Bernard 2000). The interview notes elicited a total of 19 themes for MPA objectives and 29 for MPA indicators of effectiveness. The presence or absence of these identified themes was then recorded for each respondent. In the second stage, we used the constrained condition to interview respondents and compare the variation in responses from community stakeholder groups. The constrained interview asked each respondent to select his/her five most important indicators from among 20 show cards, each listing a possible MPA indicator. The respondent was isolated from onlookers whenever possible. When this was not possible, the onlookers were instructed not to communicate with the respondent. A total of 20 indicators were used for the show cards, guided by a list of 53 indicators available in the literature at the time of the study (Alder et al. 2002). A shortlist of 20 indicators was compiled based on their relevance to the local context, with the help of two local fisher-leaders who had received training and had practical experience in community organizing within the study sites. The final set of 20 show cards was pre-tested with 5 community members (2 fishers, leader, woman, and youth), and then presented with refinements (primarily to suit the local culture, particularly with respect to language and cultural context). The shortlist, in preference to utilizing the complete list of 53 available MPA indicators, was intended to facilitate survey participation based on findings that suggested a set of 10 to 20 indicators as a reasonable compromise between time and accuracy (Lindholm and Nordeide 2000). Response rates are usually maximized when the task is simplified so that mental effort and chances of embarrassment are reduced (Schmidt et al. 2000).

Analysis

We used descriptive statistics to characterize the frequency distributions of the MPA objectives and indicators identified by the respondents. To compare variations in responses for MPA objectives and indicators within and across stakeholder groups and communities, the generalized linear model (GLM) using the binomial distribution with a logit link was employed with the SPLUS software (Insightful 2001). The interaction effect of stakeholder groups and the MPA community was also evaluated. We then determined the factors causing the variations by performing a cluster analysis of the responses using the Bray-Curtis index of similarity on untransformed data and the group average linkage mode to discern any distinct associations between stakeholder groups or between communities. Finally, the similarity percentages (SIMPER) routine was applied to determine the responses that contributed most to the similarities or differences in MPA objectives and indicators (unconstrained) identified by respondents. SIMPER analysis was not applied to responses that had >80% similarity or to constrained indicators since GLM results were not significant for either stakeholder or community comparison. The cluster and SIMPER analyses were performed using the PRIMER (Plymouth Routines in Multivariate Ecological Research) software (Clarke and Warwick 2001).

In our study, the MPAs were grouped as young or old according to the duration of protection: the former had been established no more than five years before the study began (2002) while the latter had been established more than five years prior to 2002. We used this somewhat arbitrary threshold because community organizing interventions

in the Philippines estimate that that it takes up to five years to develop a self-sufficient MPA organization (Carlos and Pomeroy 1996).

Results

Respondents identified multiple MPA objectives and indicators; these were predominantly ecological but also included socio-economic considerations and governance issues. Overall, the responses across the stakeholder groups and communities showed significant differences, with more variation between the community responses than the responses across stakeholder groups. Not surprisingly, the unconstrained responses showed significant variation while the constrained responses did not. Differences in MPA ages accounted for the greatest variation in the responses.

Identification of MPA objectives and indicators

a. Objectives: unconstrained responses

Respondents (n=495) identified multiple objectives for their individual MPAs. A total of 19 possible objectives were identified, with an average of 3.4 (s.d. \pm 1.4) objectives per respondent (Figure 3.2). The most frequently identified responses focused on ecological objectives for MPAs: restore fish populations, provide a breeding place for marine life, and protect and restore habitats. The respondents also nominated objectives related to governance and socio-economic concerns: deter illegal fishing, enhance fishery yields, provide heritage for the future generations, promote community well-being, sustain livelihoods, sustain enforcement, generate income and enhance coastal areas (Figure 3.2). Some objectives identified by respondents also reflected proximal and ultimate

objectives. For example, the proximal targets of gaining recognition (win awards), supporting productive fishing nearby and ensuring laws are enforced are closely tied to the ultimate objectives of promoting community well-being, sustaining livelihoods and sustaining enforcement, all of which were mentioned by respondents.

b. Indicators: unconstrained and constrained responses

Respondents identified a total of 29 indicators during the unconstrained interviews. Each offered an average of 2.4 (s.d. ± 1.2) indicators. The more frequently mentioned indicators were ecological, governance and socio-economic indicators: increased fish abundance, regular guarding within MPAs, increased fish catch, regular patrols outside MPAs, improved habitat health, absence of habitat disturbance, increased number of visitors, increased villager support and increased income (Figure 3.3a). Only three indicators (i.e. increased fish abundance, regular guarding within MPAs and increased fish catch) were mentioned by more than 25% of the respondents. In contrast, the constrained interviews resulted in ten indicators out of the 20 available being selected by more than 25% of the respondents (Figure 3.3b). These ten indicators were concerned with ecological considerations, socio-economic conditions and support for MPAs. The constrained indicator responses were also more evenly selected by different respondents than the unconstrained responses (Figure 3.3b).

Variations in responses within and across stakeholder groups and communities

The GLM results suggest that in general the responses for objectives (Table 3.3a) and indicators (Tables 3.3b and 3.3c) were significantly different. In unconstrained conditions

(Tables 3.3a and 3.3b), the responses varied significantly depending on the stakeholder group or community to which they belong ($p < .05$). Such variation was not observed in the constrained responses ($p > .05$) (Table 3.3c). The responses categorized into communities accounted for more of these variations, as shown by the higher deviance ($D=44.48$ for objectives and $D=33.089$ for indicators) compared to stakeholder group responses ($D=19.73$ for objectives and $D=16.30$ for indicators). This same pattern of deviance in community responses is observed for the interaction effect indicating the dependence of one variable (objective or indicator response) upon another (stakeholder group or community). The higher deviance observed for community ($D=421.24$ for objectives and $D=568.65$ for indicators) showed the responses were more dependent on this variable compared to the stakeholder group ($D=140.28$ for objectives and $D=163.73$ for indicators). This similar interaction pattern was observed even in constrained conditions ($D=341.82$ for community and only $D=128.32$ for stakeholder group), although their deviances were much lower compared to the unconstrained responses

The cluster analysis performed for the unconstrained indicator responses showed the tendency of respondents within a community to group together more than those within the stakeholder group to which they belong (Figures 3.4). This suggests a higher chance of agreement in responses within communities than within stakeholder groups. Further analysis of the similarities in responses across stakeholder groups showed them to be also consistently high, at $>80\%$ (Figures 3.5a, 3.5b, 3.5c).

The high agreement in responses within communities is not reflected across communities, particularly for the unconstrained interviews. For example, the cluster analysis for MPA objective responses showed one community (Balicasag) separating at 70%, while the rest of the communities separated into two groupings at 73% (Figure 3.6a). The unconstrained indicator responses also revealed even more distinct group separation at <50% similarity (Figure 3.6b). The responses appeared to generally separate according to the age of the MPAs, with the older MPAs (>6 yrs) tending to group together. However, two older MPA communities (Lapinig=13yrs and Handumon=8yrs) departed from the old MPA age group (>5 yrs) cluster and instead joined the younger MPAs. This clustering according to MPA age was not as apparent under constrained conditions where responses across all communities (except Jandayan Norte) was high at >80% similarity (Figure 3.6c).

Factors causing similarities and differences

The SIMPER test results revealed the main similarities and dissimilarities among MPA age groups. For responses regarding MPA objectives (Table 3.4), there was agreement with respect to both old and young MPAs on the following: restore fish populations, provide breeding places and protect habitats. As well, the respondents from the older MPAs (except Balicasag) wanted to focus on habitat restoration and enhancing fishery yields. However, respondents of young MPAs showed more concern with habitat protection and deterrence of illegal fishing. In the case of indicators, the old and young MPAs were differentiated (Table 3.5 and Figure 3.7) by the indicators that concerned enforcement; respondents of younger MPAs saw enforcement as a greater issue than those with older MPAs; this reflects a greater problem with illegal fishing among young

MPAs. Respondents of older MPAs tended to identify increased fish catch and fish abundance as their indicators of MPA effectiveness. Other indicators identified by these respondents which were omitted by respondents of younger MPAs include increase in number of visitors, increase in income and volume of fish set aside for food (Figure 3.7). At the same time, more respondents from younger MPAs than older MPAs identified awareness of rules and regulations and presence of grassroots organization and MPA facilities as indicators of effectiveness.

Discussion

The broad range of MPA objectives and indicators identified by local people from our study sites was comparable to those developed by experts and available in the literature. These included a preference for a subset of ecological objectives similar to those found in the literature (e.g. Jones 1994, Boersma and Parrish 1999, Pomeroy et al. 2004, White et al. 2004), including restoring and sustaining fish populations, providing breeding places and protecting and restoring habitats. One key objective proposed by several community respondents was the deterrence of illegal fishing. Interestingly, this has not been specifically identified in the current literature although it is akin to recorded objectives of insurance against possible failures of conventional regulatory system (NRC 2001) or maintenance of effective legal structures and strategies for management (Pomeroy et al. 2004). The respondents' preference for ecological objectives may also reflect the influence of MPA education and public awareness activities provided by catalyst organizations working with communities during the initial stages of MPA establishment (Howe 2001, White et al. 2002).

The multiple objectives identified by respondents suggest that MPAs are often viewed by local communities as an effective means of tackling social, economic and ecological challenges (e.g. deter illegal fishing, enhance fish yields, promote community well-being, sustain livelihoods, etc). Also the multiple responses were not just focused on management objectives within MPAs, but covered broader coastal-wide concerns such as pervasive illegal fishing, food insecurity and poverty. The responses appear to be set in hierarchical level of means (inputs, e.g. protect habitat, deter illegal fishing) and ends (outputs, e.g. restore habitat, restore fish population) which then converge on the ultimate objective of securing the heritage of future generations. Identifying broad MPA objectives may also mean that community respondents recognize that MPAs can play a central role in integrated coastal management (NCEAS 2001). For example, some respondents suggested that the presence of MPA facilities (e.g. guardhouse, patrol boats and searchlights) and volunteer MPA wardens has decreased illegal fishing activities even outside the MPA boundaries (n=3). Also, the MPA wardens have usually extended the scope of their patrol outside the MPAs (n=8) reflecting a broader mandate than just MPA management. This shows that MPAs can be a significant first step in establishing the broader goal of integrated coastal management.

Indicators that are useful to external agents may not be as relevant to direct users of the resources. For example, the MPA objective of promoting scientific knowledge (Jones 1994) was never mentioned by community respondents, suggesting they did not consider this to be relevant to them or there was a lack of awareness on the importance of research.

This also suggests the need to strengthen collaboration and coordination between outsiders and local people to ensure more effective and sustained partnerships (Pollock and Whitelaw 2005).

In the case of indicators, all those identified by respondents during unconstrained interviews fell within the broader set documented in the literature. However, community members offered insights to the local importance of the selected indicator as well as some interesting refinements. Of particular note was the respondents' distinction between enforcement of regulations inside (through guards) and outside (through patrols) the no-take MPAs. The literature usually defines enforcement with respect to MPA coverage (e.g. Pomeroy et al. 2004) whereas in our study local respondents distinguished between enforcement within and outside the no-take MPA zones. During the pre-test surveys for the constrained indicators, enforcement was initially treated in a general way but respondents always sought clarification on whether it meant inside or outside the MPAs. In addition, the two local-fisher leaders who assisted in the selection of the 20 indicator show cards suggested that we distinguish the two forms of enforcement, in response to the findings of the pre-test and initial consultation process. Not surprisingly, the responses from the unconstrained interviews reflected this distinction between the two types of enforcement indicators.

Eliciting responses using both unconstrained and constrained approaches involved costs and benefits. Unconstrained responses were of value in revealing local perspectives on the purpose and progress of MPAs that are often established with the assistance of

outsiders. While the influence of external agents has no doubt had an impact on the unconstrained responses, these responses provide useful insights to the most pressing MPA management needs as perceived by respondents, and those that must be addressed by the community. The process also provided a mechanism for ensuring that the priorities of local community members were considered, rather than lost in the suite of outsiders' targets (Datta and Virgo 1998). The extent to which this can occur is demonstrated by the lack of variation and the even frequency distribution we documented among the constrained responses. The corollary to this, however, is that prompting choices can broaden community understanding of the possible roles of MPAs, particularly where literacy levels are low and access to adequate information is limited (Krishna 2004). For example, pollution or water quality indicators were rarely suggested within the unconstrained responses but were selected under a constrained approach. In our study, the combined use of the unconstrained and constrained approaches may have maximized the communication between researchers and the community stakeholders although we acknowledge that all of our MPA study sites have experienced considerable intervention from catalyst organizations and outside experts such that even unconstrained views reflect external influences.

It was observed that the responses across communities were more variable than those within communities. The marked similarity in the responses across stakeholder groups within a community suggests that despite local differences in marine resource use, common interests and concerns are shared with respect to their particular MPA. This suggests the importance of developing indicators according to the local context (Boyd

and Charles 2006) and cautions against the application of generalized MPA effectiveness indicator blueprints for use across all MPAs

As mentioned earlier, the unconstrained responses resulted in a trend where communities from younger MPAs (usually < 5 yrs) selected more indicators related to inputs and outputs (e.g. village buy-in, enforcement) than the tangible outcome indicators (e.g. fish abundance, catch) that were more favored by communities from older MPAs (> 5 yrs). In our study, the difference in the selection pattern of indicators by MPA age may be attributable to rising expectations over time based on perceived and/or measured benefits from MPA management. This trend with MPA age suggests that objectives and indicators may change over time according to the progression of the MPAs and their management. In a dynamic ecosystem, real or perceived changes in the impact of management or the condition of the resource can happen (Carruthers and Tinning 2003).

Our findings suggest the responses received reflect local and current issues that were meaningful to the communities. This substantiates the argument that current issues make meaningful local indicators (Dahl-Tacconi 2005). Using Olsen's (2003) framework on Order of Outcomes, the indicators selected can be viewed in part as a reflection of MPA progress and age which is also linked to the understanding, experiences and expectations of respondents. Therefore, early MPAs (≤ 5 years old) which are at the first order, generally focused on input and output indicators (means of achieving objectives) such as awareness of rules and regulations, support from external agents, buy-in from villagers and enforcement. For the older MPAs, (above 5 years), their focus is on tangible

improvements in the environment or on outcome indicators (whether the ends have been achieved) such as increased fish catches and habitat health which reflects Olsen's second and third order outcomes. The old MPAs (>15 years old) focused on alternative income generation such as tourism which illustrates the compromise between improved environmental conditions and societal conditions described in Olsen's fourth Order outcome. Nonetheless, enforcement remained a concern for some old MPAs, especially where weak political will offset the advantages of a long-term sustained enforcement program. This is probably why Handumon (age=8 yrs) grouped closer to younger MPAs (Jandayan Norte and Alumar) within the same municipality, which suffered from a deficiency of attentive police and political support. In the Philippines, illegal fishing can thrive under such circumstances because coastal waters within 15 km offshore are under the stewardship of municipal governments (Courtney et al. 2002).

Implications for management

Improving the effectiveness of MPA management through monitoring and evaluating indicators requires consensus building and collaborative work among various community-based and external stakeholders. While the development of a standardized set of a priori indicators would appear to facilitate this, our findings suggest that a blue-print approach is flawed because the process that supports it excludes or limits community engagement and the product, as reflected in the selected indicators, may provide a poor measure of local community needs and aspirations with respect to their MPA. This situation poses a major challenge for the monitoring and evaluation of MPAs, particularly

large ecological MPA networks and the organizational alliances that have emerged in association with them at regional, national and international levels (CBD 2005).

Based on our findings, certain locally-specific indicators may offer little potential for scaling up but provide appropriate reflections and evaluations of the local context. At the same time, our findings indicate that MPA age is a critical factor allowing certain MPA indicators to be synchronized at a certain time across several communities such that a set of common indicators can be identified for young MPAs and another for old MPAs. The implementation of indicator development approaches that build consensus and promote collaborative work can perhaps address the challenge of identifying sets of common and comparable indicators across MPA sites and networks. For example, regular on-site interviews and focus group discussions can be undertaken and the results communicated to the organizational alliance. The alliance can then identify which indicators are held in common by member MPAs and recommend these for standard application. Feedback to the member MPAs concerning the evaluation of common indicators could be used to inform local managers and resource users of their relative progress and also provide valuable information to support policy advocacy and financial support. Guidelines to support simplified and harmonized reporting among the member MPAs should be developed.

MPA indicator development should be viewed as part of a broader integrated coastal management approach given the range of ecological and socio-economic aspirations and expectations identified by stakeholders. In this sense, effective MPA management is an

evolving process rather than a product or final achievement. To support this, MPA indicator development needs to be an iterative process which supports revisions and formulation of adaptive management based on continued assessments by stakeholders both within and across communities. The indicator development approach described above which engages local organizations and regional alliances may help realize or adjust expectations of stakeholders that seem to go beyond MPAs.

The present study provides guidance on timely and relevant interventions particularly by external agents and government authorities. With respect to the allocation of limited resources for MPA management, young MPAs require resources for training, equipment and facilities to monitor input indicators such as enforcement and support for MPAs rather than output indicators. Allocating resources for communities to monitor output indicators through conduct of ecological or fish catch surveys may be more appropriate for older MPAs.

Our study has wider application to community-based MPA management and the following recommendations should be considered in developing indicators of effectiveness:

- 1) There is no established suite of indicators that is relevant or appropriate to all community-based MPAs at all times. In developing indicators, a key consideration is that the suite will depend on the age of the MPAs.
- 2) In developing indicators, facilitation by outside experts may be necessary. Consensus between community and outsider perspectives can be reached but

since objectives and indicators change over time the development of indicators requires a long-term sustained partnership between outside experts and local communities.

- 3) Following #1, management priorities should be attuned to the age of the MPA. For example, at the onset of establishment, enforcement of MPA rules and regulations should be a top priority action for on-the-water management while initiatives focusing on livelihoods to augment incomes or gear efficiency to increase fish catch can be implemented in the later stages of MPA development.
- 4) The hierarchical nesting of MPA objectives and indicators needs to be elicited among community stakeholders through consensus building. This way the chronological connection between the proximate and the ultimate objectives and indicators can be appreciated and acknowledged. This will facilitate more timely, appropriate and contextual interventions.

Tables

Table 3.1. Profile of MPA study sites.

MPA site	Municipality	Year legislated	Year enforced	Size (ha.)	Age (years as of 2002)	Village Land Area (ha)	Village Population	External agent¹
Alumar ²	Getafe	1995	2003	2	0	137	635	GLA
Jandayan Norte	Getafe	2002	2002	10	0.5	49	895	NGO
Asinan	Buenavista	2000	2001	55	2	12	757	NGO
Batasan	Tubigon	1999	1999	21	4	6	1074	NGO
Magtongtong	Calape	1996	1996	7	7	56	805	GLA
Handumon	Getafe	1998	1995	33	8	40	838	NGO
Lomboy	Calape	1995	1995	9	8	10	482	NGO
Lapinig	Carlos P. Garcia	1986	1990	160	13	49	1050	GLA
Balicasag	Panglao	1986	1985	17	17	22	557	UNI
Apo	Dauin	1985	1982	11.2	21	72	700	UNI

¹GLA = government line agency; NGO = non-governmental organization; UNI = university

² enforced for five years from 1995 to 1999 when it was reopened to fishing

Table 3.2. Respondent sample size per stakeholder group and MPA community.

Site	Elder		Fisher		Leader		Women		Youth		TOTAL	
	P ¹	A ²	P	A	P	A	P	A	P	A	P	A
Alumar	10	7	11	10	11	8	12	12	11	10	55	47
Apo island	11	11	10	8	10	10	11	11	10	10	52	50
Asinan	11	12	11	10	10	9	11	11	11	9	54	51
Balicasag	11	10	10	10	10	10	10	10	10	10	51	50
Batasan	10	10	11	11	11	10	10	10	10	10	52	51
Handumon	10	10	11	11	10	9	11	11	10	9	52	50
Jandayan Norte	10	7	10	11	11	10	10	8	11	10	52	46
Lapinig	10	10	11	10	11	10	10	10	10	10	52	50
Lomboy	10	10	10	10	10	10	10	10	10	10	50	50
Magtongtong	10	9	11	11	10	10	10	10	10	10	51	50
TOTAL	103	96	106	102	104	96	105	103	103	98	521	495

¹Potential respondents

²Actual respondents

Table 3.3a. Analysis of deviance for binomial generalized linear model of MPA objectives responses.

	df	Deviance	Residual df	Residual deviance	$p(\chi^2)$
Null			9404	8852.034	
Objective	18	2271.633	9385	6580.100	0.0000000
Community	9	44.482	9377	6535.618	0.0000005
Stakeholder group (SG)	4	19.734	9373	6515.884	0.0005635
Objective x Community	162	421.241	9211	5950.051	0.0000000
Objective x SG	72	140.278	9139	5809.772	0.0000026

Table 3.3b. Analysis of deviance for binomial generalized linear model of MPA unconstrained (UC) indicator responses.

	df	Deviance	Residual df	Residual deviance	$p(\chi^2)$
Null			14267	8280.702	
UC-Indicator	28	2289.337	14238	5987.734	0.0000000
Community	9	33.089	14230	5954.645	0.0000594
Stakeholder group (SG)	4	16.298	14226	5938.347	0.0026446
UC-Indicator x Community	252	568.647	13974	5024.738	0.0000000
UC-Indicator x SG	136	163.725	13862	4861.013	0.0002000

Table 3.3c. Analysis of deviance for binomial generalized linear model of MPA constrained (C) indicator responses.

	df	Deviance	Residual df	Residual deviance	$p(\chi^2)$
Null			9779	10842.78	
C-Indicator	19	449.2152	9759	10393.25	0.0000000
Community	9	2.3213	9751	10390.93	0.9695433
Stakeholder group (SG)	4	0.6116	9747	10390.31	0.9617689
C-Indicator x Community	181	341.8244	9576	10004.70	0.0000000
C-Indicator x SG	76	128.3244	9500	9876.38	0.0001660

Table 3.4. Similarities and dissimilarities of MPA objectives in unconstrained interviews within communities from old (Groups A&B) and young MPAs (Group C) based on SIMPER analysis.

MPA Indicators	% contribution of objective responses					
	similarity within Group A ¹	similarity within Group B ²	similarity within Group C ³	dissimilarity between Group A&B	dissimilarity between Group A&C	dissimilarity between Group B&C
Fish population restored	35.51	38.07	45.99	12.57	9.50	13.19
Provide breeding place	21.18	36.48	13.63	12.86	11.99	13.59
Habitat restored	12.34	<5	6.43	10.87	10.89	8.29
Enhance fishery yields	12.12	<5	<5	11.15	10.13	6.53
Habitat protected	8.46	10.29	14.14	10.99	11.13	12.29
Deter illegal fishing	<5	<5	10.73	<5	9.47	9.81
Security for next generation	<5	5.35	<5	8.40	7.06	8.01

¹ Group A = Apo (21 yrs), Lomboy (8 yrs), Magtongtong (7 yrs)

² Group B = Balicasag (17 yrs),

³ Group C = Lapinig (13 yrs), Handumon (8 yrs), Batasan (4 yrs), Asinan (2yrs), Jandayan Norte (0.5 yrs), Alumar (0)

Table 3.5. Similarities and dissimilarities of MPA indicators in unconstrained interviews within communities from old (Group A) and young MPAs (Group B) based on SIMPER analysis.

MPA Indicators	% contribution of indicators		
	similarity within Group A ¹	similarity within Group B ²	dissimilarity between Groups A&B
Fish abundance	67.33	29.85	16.30
Fish catch	17.83	<5	12.29
Habitat health	6.51	<5	8.54
Regular guarding inside MPA	<5	45.11	15.37
Regular patrols outside MPA	<5	15.56	9.52

¹ Group A = Apo (21 yrs), Balicasag (17 yrs), Lapinig (13 yrs), Lomboy (8 yrs), Magtongtong (7 yrs)

² Group B = Handumon (8 yrs), Batasan (4 yrs), Asinan (2yrs), Jandayan Norte (0.5 yrs), Alumar (0)

Figures

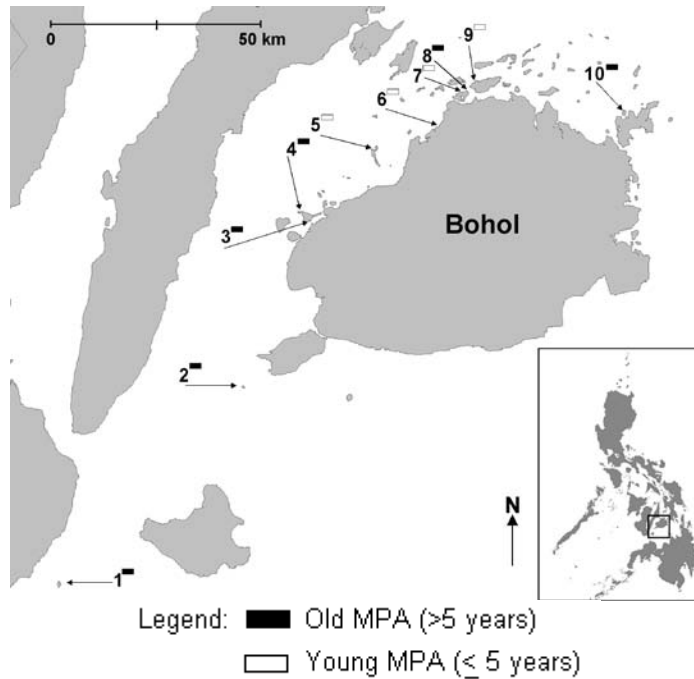


Figure 3.1. Location map of study sites (1=Apo, 2 =Balicasag, 3=Lomboy, 4=Magtongtong, 5=Batasan, 6=Asinan, 7=Jandayan Norte, 8 =Handumon, 9=Alumar, 10=Lapinig).

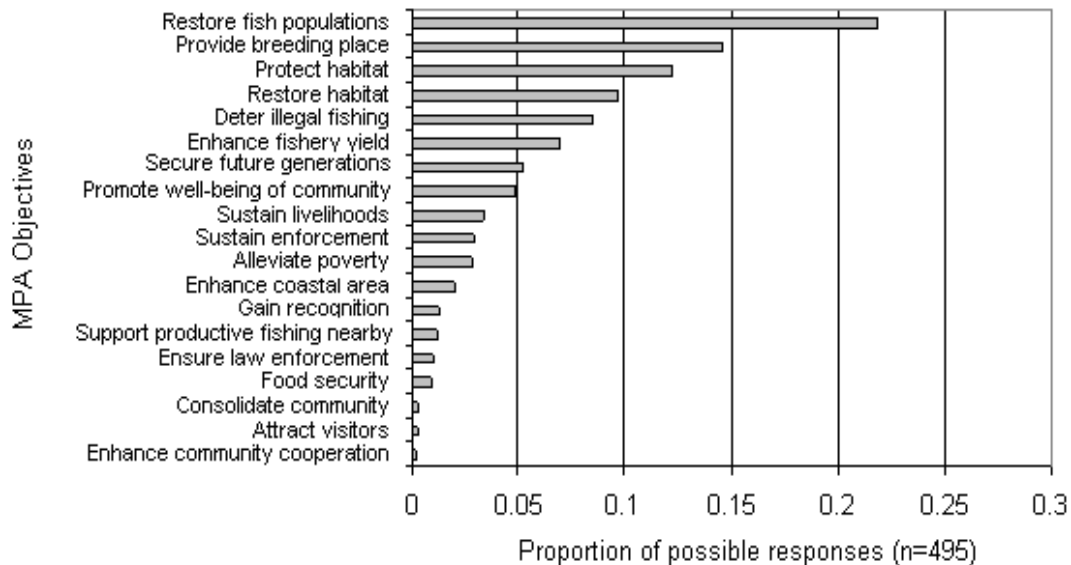


Figure 3.2. Frequency histogram of unconstrained MPA objectives responses.

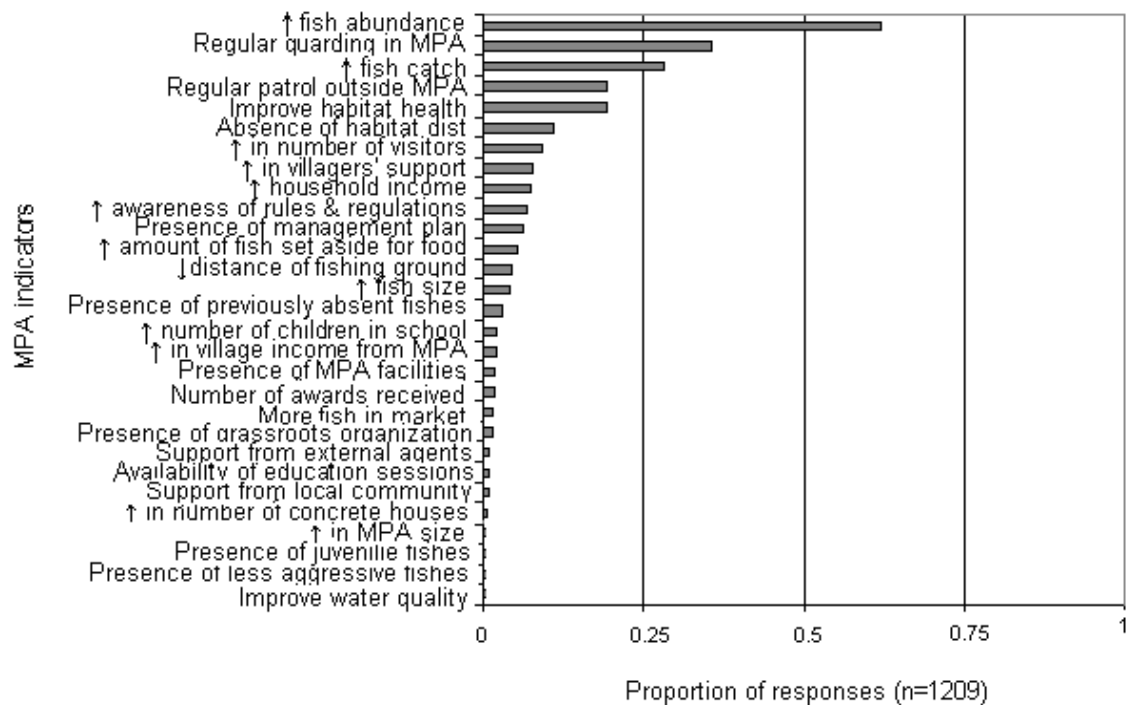


Figure 3.3a. Frequency histogram of unconstrained MPA indicator responses.

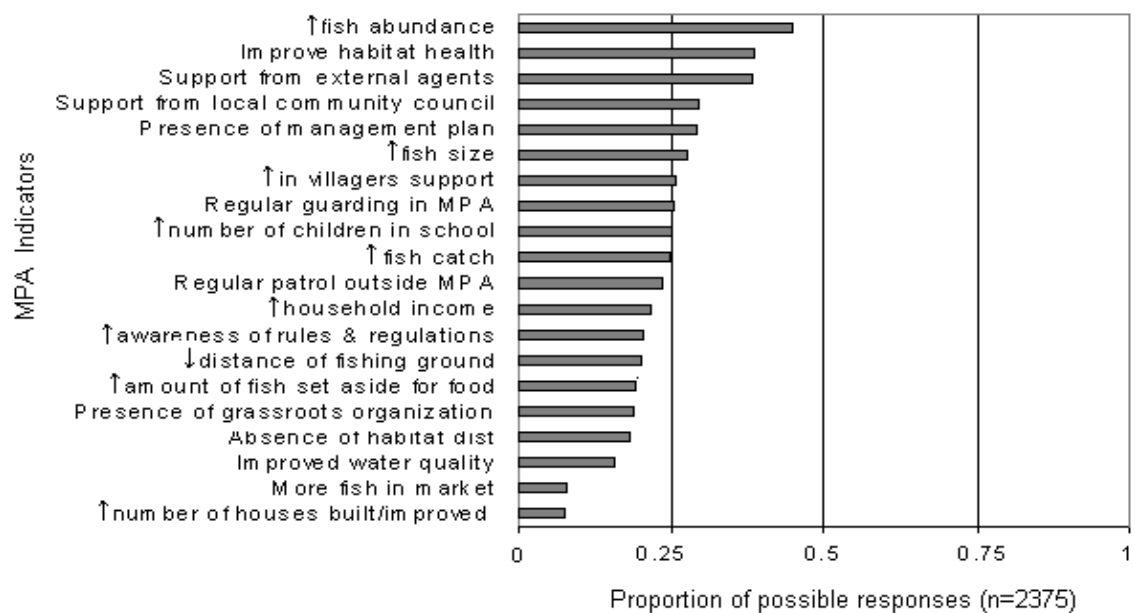


Figure 3.3b. Frequency histogram of constrained MPA indicator responses.

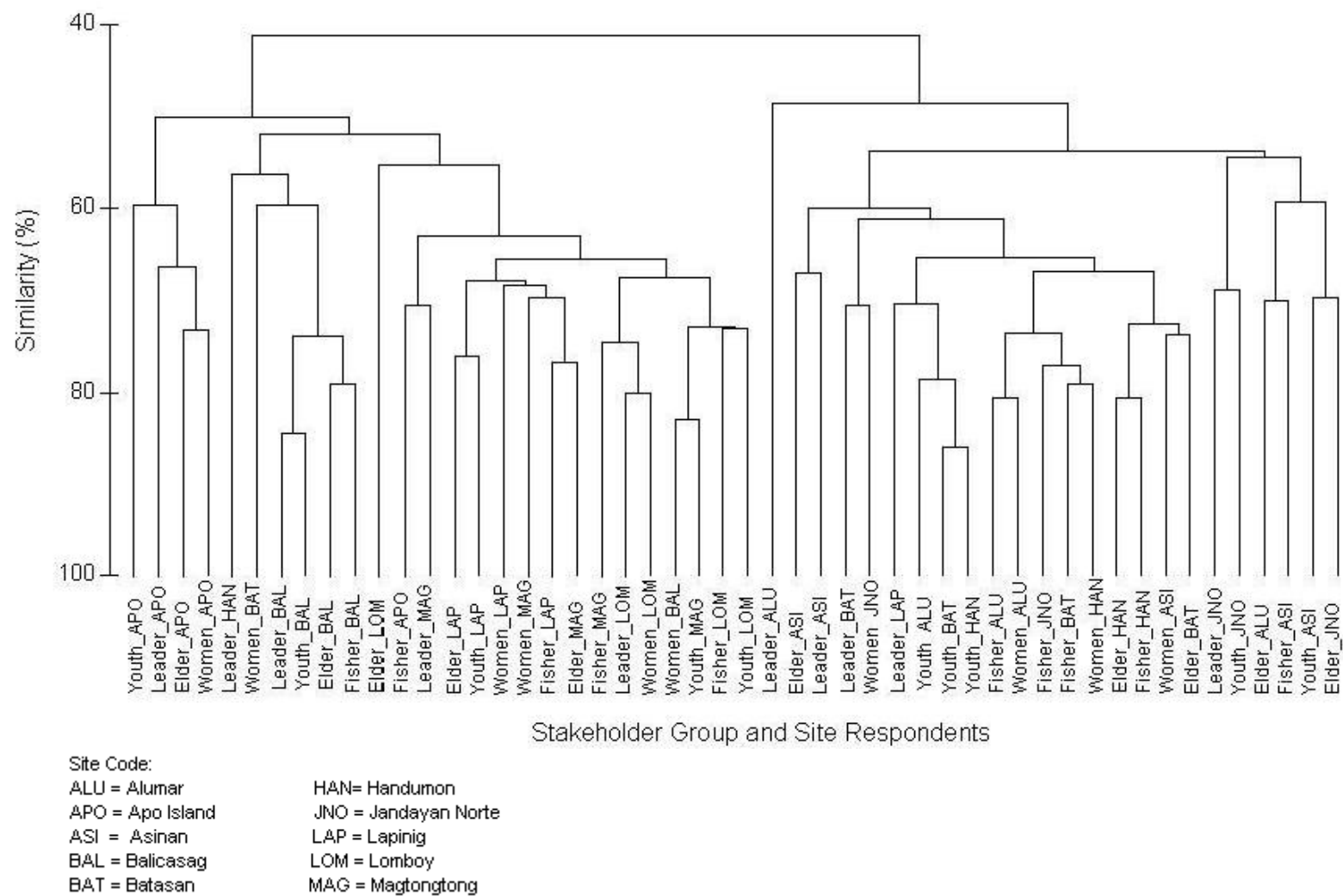


Figure 3.4. Cluster analysis for unconstrained MPA indicator responses within and across stakeholder groups and sites.

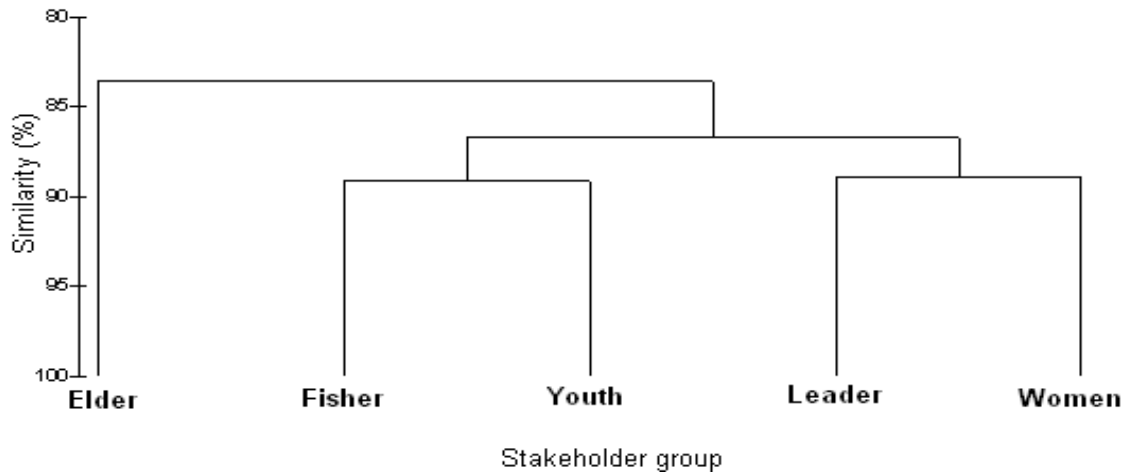


Figure 3.5a. Cluster analysis for unconstrained MPA objectives responses across stakeholder groups.

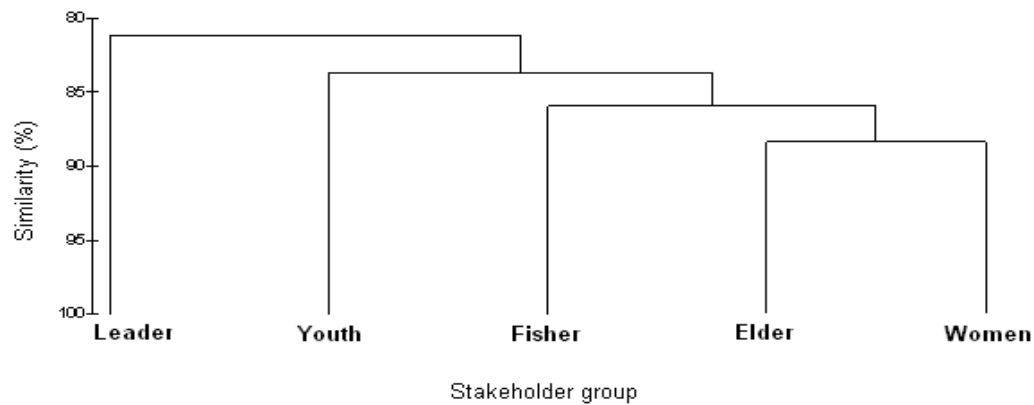


Figure 3.5b. Cluster analysis for unconstrained MPA indicator responses across stakeholder groups.

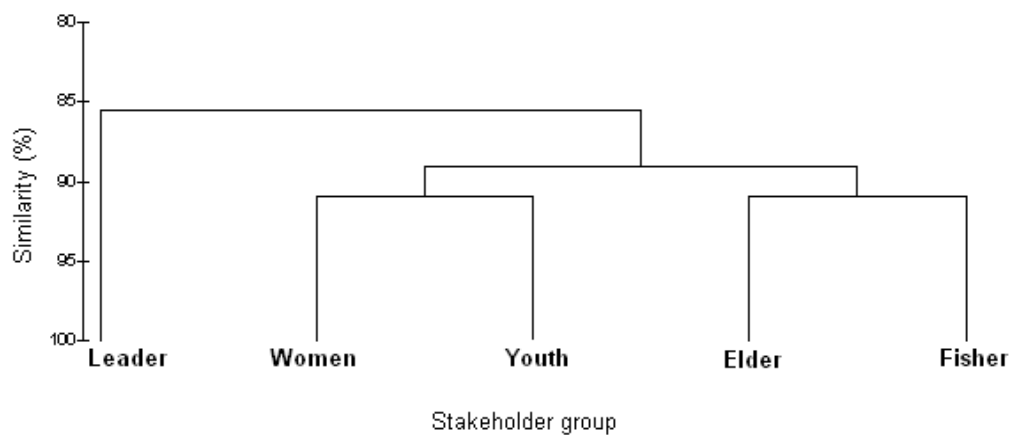


Figure 3.5c. Cluster analysis for constrained MPA indicator responses across stakeholder groups.

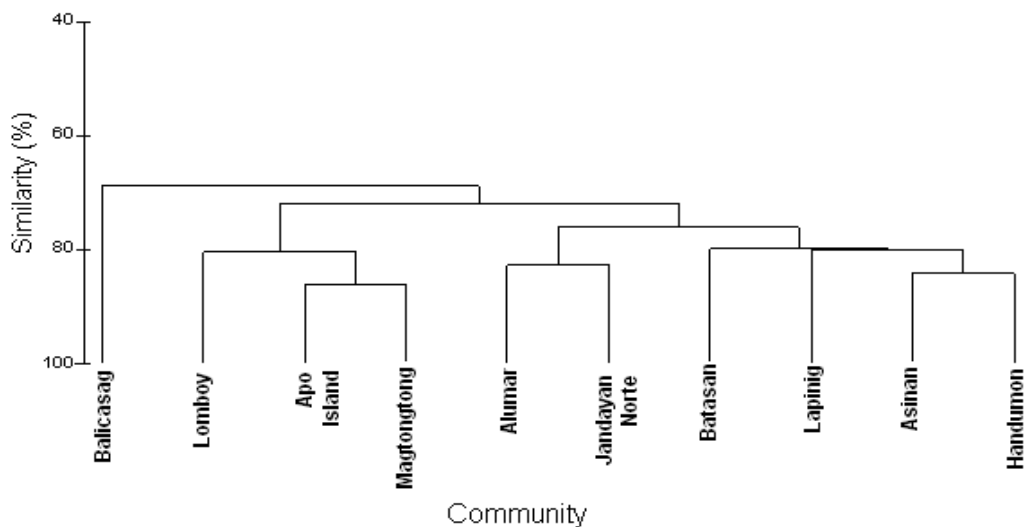


Figure 3.6a. Cluster analysis for unconstrained MPA objective responses across communities.

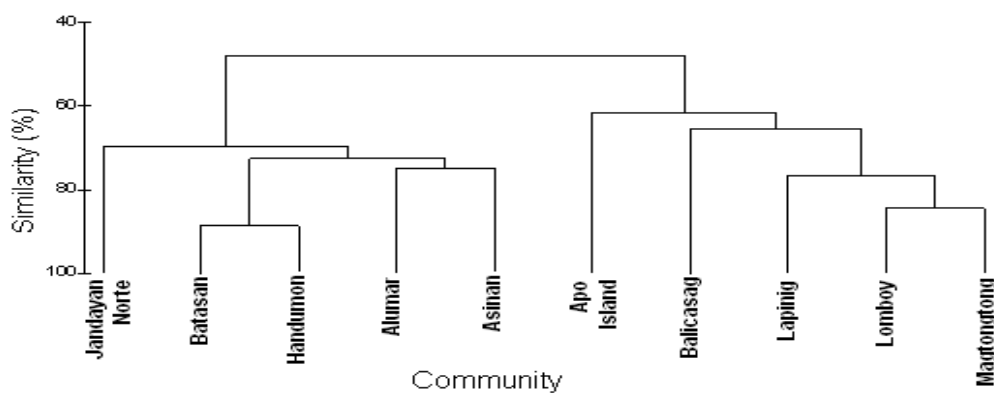


Figure 3.6b. Cluster analysis for unconstrained MPA indicator responses across communities.



Figure 3.6c. Cluster analysis for constrained MPA indicator responses across communities.

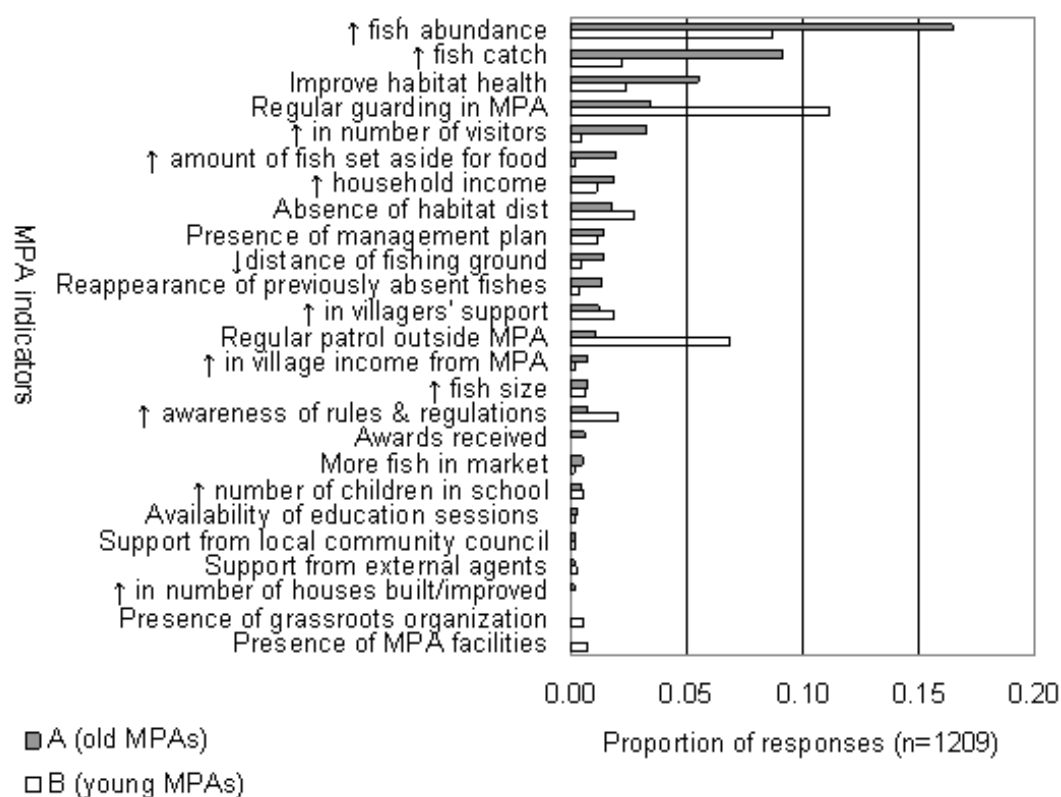


Figure 3.7. MPA indicators proposed by communities managing older MPAs vs. younger MPAs during unconstrained interviews.

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4. Engaging communities towards sustained indicator development, monitoring and evaluation of MPAs in the central Philippines¹

¹ A version of this chapter will be submitted for publication. Pajaro, M.G., M.E. Mulrennan and A.C.J. Vincent. Engaging communities towards sustained indicator development, monitoring and evaluation of MPAs in the central Philippines.

Introduction

The contribution of community participation to the success of long-term conservation and development projects, such as establishment of protected areas, is now widely acknowledged (Furze et al. 1996, Sumaila 2000, Francis et al. 2002, Johannes 2002).

Prior to the 1970s, centralized and top-down approaches to protected area management tended to exclude local communities from areas and resources under protection (Pimbert and Pretty 1997). In the 1990s, several international fora (*e.g.*, Earth Summit, Fourth World Congress on National Parks and Protected Areas and the Conference of the Contracting Parties to the Convention on Wetlands) raised global awareness of the need for greater community participation to be able to achieve conservation objectives (United Nations 1992, IUCN 1993, Ramsar Convention Bureau 1999). Since then, numerous studies from both terrestrial and marine protected areas (MPA) have demonstrated that the effective engagement of local communities in management decision-making as well as in management activities such as monitoring and evaluation can (i) increase compliance and reduce user conflicts (Pretty and Ward 2001, Mascia 2003), (ii) encourage extraction of resources at sustainable levels (Orlove and Brush 1996, Kapoor 2001, Kelly 2001) and (iii) provide a supplement or substitute for external expert services (Chambers 1997, Johannes 1998). Despite these potential benefits, assessments of the effectiveness of protected areas continue to rely almost exclusively on external ‘expert’ agencies rather than inputs from local stakeholders (Hockings et al. 2006). Such approaches can impede local participation and support, reducing the effectiveness of monitoring and management evaluation processes and even of the protected area itself.

Monitoring and evaluation (M&E) needs to become a core component of conservation management to ensure the objectives are met (Sheil 2001) and provide information for decision making (Danielsen et al. 2005a). For protected area management, the need for M&E was recognized globally during the Seventh Conference of the Parties to the Convention on Biodiversity (CBD 2004). In this conference, the Parties committed to implement the goal of evaluating the management effectiveness of at least 30% of protected areas by 2010 (Decision VII/28, Recommendation 4.2.2). Some major setbacks to realizing this target and sustaining M&E, particularly in less developed countries, include the lack of financial and human resources and the difficulty in collecting standardized data (Danielsen et al. 2000, Kleiman et al. 2000, Sheil 2001). More recently, these setbacks have been addressed by engaging communities in M&E for protected area management. For example, partnerships among community-based groups, scientists and conservation agencies have been forged to implement M&E schemes (Danielsen et al. 2005a, Vermeulen and Sheil 2007). Studies suggest that compared to professional monitoring, locally-based M&E approaches are cheaper with greater potential for sustainability, if institutionalized (Danielsen et al. 2005a), and capable of providing better insights to realities on the ground, which is important for management decisions (Stem et al. 2005). However, there is still skepticism as to the value of local-based M&E approaches, particularly among professionals and scientists who prefer to base resource management decisions on more empirical forms of information (Danielsen et al. 2005b).

Community engagement is not a synonym for effective management of natural resources. After all, communities are not homogenous social units (Agrawal and Gibson 1999) but

are represented by groups and individuals that may have multiple competing and conflicting interests depending on their social, cultural, economic and political inclinations. Existing factions and inequalities, economic hardships, and varying desires and capacities to become stewards create challenges to local participation in resource management (Clapp 1998, Bradshaw 2003). For example, these differences can influence the nature and level of local participation so that it varies considerably from passive to active and from simply listening, voicing opinions, and volunteering time and services to taking part in decision-making processes (Oakley 1991, Ericson 2006). This can in turn result to variations in M&E needs that require different approaches among communities (Stem et al. 2005).

Community participation in activities such as M&E can be influenced by a number of variables according to the characteristics of both the community and the individual. For communities, the critical variables appear to be socio-cultural (*e.g.*, social associations or networks, norms and traditions, population density), physical (*e.g.*, clustering of houses), economic (*e.g.*, incomes, livelihoods) and geographical (*e.g.*, jurisdictional location) (Wandersman et al. 1987, Ryan et al. 2005). Other studies categorize these variables in terms of human and social capital, and include political preferences and attitudes as possible determinants of participation (Bekkers 2005). At the level of the individual community member, socio-economic variables such as age, gender, education, occupation, incomes, ethnicity and leadership skills and personality attributes that include interpersonal skills, and a desire to control a situation appear to be important

(Wandersman et al. 1987). As a result, we can expect variation in who participates in their community, at what stages of management (including M&E), and how.

The literature on the application of community participation approaches to M&E in fisheries management and marine protection is surprisingly scarce (Campbell and Salagrama 2001). Although guidelines promote community participation in MPA assessments (White et al. 2004, Pomeroy et al. 2004), most MPA research on community participation focuses only on the establishment, enforcement and maintenance of MPAs (Elliott et al. 2001, White et al. 2002, Mascia 2003, Helvey 2004). A few papers document directly engaging the local people in M&E, but the reports emphasized the ecological results rather than the participation process (Aswani and Weiant 2004, Uychiaoco et al. 2005). There is better documentation available on the community participation process in relation to development of indicators in agricultural (Natcher and Hickey 2002, Reed and Dougill 2002), forest (Nazarea et al. 1998) and freshwater ecosystems (*e.g.*, Fraser Basin Council 2001, Zanetell and Knuth 2004).

There is a dearth of studies documenting participation as it evolves over time and how participation varies from one community to another. In particular, the process of community consensus on MPA management goals has not been examined relative to the selection of indicators through to local application of the indicators in M&E. Limited attention has been given also to improving our understanding of patterns of participation associated with resource management among local stakeholders. The few studies available have focused on participation of individual members belonging to a grassroots

organization involved in management of land-based resources (Beard 2005, Sanginga et al. 2006). However, natural resources require communal and ecological management and therefore need to consider various resource stakeholders from both within and outside the community (Berkes 2004).

The current study, to our knowledge, is the first to investigate patterns of participation among community stakeholders involved in participatory indicator development, monitoring and evaluation (PIDME) of community-based no-take MPAs. We describe and analyse the engagement of participants with respect to three specific questions: (1) how does the participation process in PIDME begin and proceed for communities with established MPAs?; (2) Does local participation vary *across* different communities and if so how?; and (3) Does local participation vary *within* communities and if so how? The findings aim to contribute to an improved understanding of the variables that influence local participation levels in indicator development, monitoring and evaluation. This will guide practitioners in the establishment and development of appropriate long-term PIDME programs for the sustained management of MPAs.

METHODS

Study area

The study was conducted in the Central Philippines, which has an established record of collective action initiatives linked to marine resource management. Bohol province, the focus area of this study, has over 100 no-take MPAs, albeit of different levels of functionality (Green et al. 2002). Eight community-managed no-take MPAs, located in

five municipalities in western Bohol, were selected for the study (Figure 4.1). These MPAs ranged from 0 to 13 years old in terms of duration of protection when our study began in 2002.

Each of the eight villages or *barangays* (smallest political unit) is defined as a single community for the purpose of this study. The communities vary in terms of population, educational attainment and economic status (Table 4.1). For the MPAs, the prime responsibilities of all the communities were enforcement (patrols and apprehension of violators) and maintenance of facilities. The lead persons within the community usually include members of the barangay council and/or the grassroots organization to which they report. At least six of the eight communities had previous experiences with M&E, but these experiences have not been sustained. For example, some had been briefly involved in conducting fish visual census surveys (n=6 of 8 sites) and benthic cover estimates of the MPAs (n=2 sites) and/or collecting fish catch data (n=2 sites) prior to this study. In all eight communities, MPA enforcement and M&E had been implemented with intervention from external agents such as academic institutions, government line agencies or non-government organizations. In the current work, we attempted to facilitate a local approach to PIDME, documenting the participation process that we hoped could produce sustained M&E in community-based MPAs.

Different opportunities of participation

The research design included the implementation of participatory PIDME process (Abbot et al. 1998) in the eight communities managing their MPAs. Three contexts were

differentiated (Figure 4.2): (1) as external to the communities where institutions and associated individuals provided various forms of ‘expert’ support to the community at the outset and during the PIDME process; (2) across variable communities, where neighboring grassroots organizations and village MPA management councils developed functional linkages during the PIDME process; and (3) within communities, where village institutions (village council and grassroots organizations) and loose cohorts of village-based individuals (elders, fishers, leaders, women and youth) engaged in the PIDME process. The nature of the participation was documented for each context for four of the five phases of PIDME (Figure 4.3): (1) preparatory phase; (2) setting or revisiting MPA objectives and developing indicators; (3) monitoring; and (4) evaluating MPA effectiveness. The fifth phase (MPA planning) was sometimes carried out by participants in our absence during the village council or organizational meetings so we do not report on the planning phase in this study.

Information was gathered through interviews, focus group discussions (FGD) and participant observation. The field research was conducted by the senior author, a Filipina who speaks the local dialect (Cebuano) fluently. She had already lived and worked in the region for 10 years with a non-governmental organization, before embarking on this research, and had many personal and professional ties in the region. She was assisted by a Filipino local research assistant who came from one of the villages participating in this research. The local research assistant was a fisher, had received previous training in research methods, and had about two years of experience in community organizing.

1) External to the community

We documented participation of external agents supporting the community management of the MPA, either directly or indirectly, at various phases of the PIDME process. Before entering the study sites in the first quarter of 2003 to conduct PIDME, we created a contact list of external institutions that had been involved in each MPA from the time it was established until 2002. The list was generated from historical and recent information concerning MPA establishment and management, available in the published literature and unpublished reports and from key informants knowledgeable about the particular MPAs. The contact list usually included the municipal local government units (MLGUs) and non-government organizations (NGOs) or government line agencies (GLA) - such as the Department of Environment and Natural Resources (DENR) - who helped establish a particular community's MPA. We met with the officers of the institutions found in the contact lists when they were accessible to inform them of the current research being undertaken and seek their endorsement. We considered the recent activities of other external agents in relation to the current and future monitoring and evaluation efforts within the community. In this study, we did not discuss the external agents' roles in the process prior to the establishment of the MPAs. As well, we did not identify and analyse differences among individuals external to the community context.

2) Across communities

To be able to compare participation across communities, we obtained the community profile for each of the eight study sites with the assistance of community officers. The *barangay* health workers (BHWs) supplied data on the community's demographics (total

population, education levels, and household incomes). Other information such as the MPA's age, spatial area and lead MPA management institutions and individuals was provided by the *barangay* captain or secretary. We also inferred community norms and practices through participant observation; for example observing cultural activities through direct participation in the community's annual festivities, and living with host families for at least a week every two months in each community between March 2003 and April 2005.

We compared community engagement by participation level across communities in several PIDME activities. Participation level for each study site was determined by quantifying community engagement during three FGDs on 1) orientation (preparatory phase) 2) development of indicator and monitoring schemes, 3) application of the monitoring scheme and 4) designing an evaluation scheme. In addition, we evaluated random one-on-one interviews conducted for indicator development. Between the primary author and the local research assistant, the participation levels were quantified using a scoring scheme of 1 (lowest) to 5 (highest) for each study site based on records of attendance by community members in various PIDME activities (Appendix 1.1). We then averaged the participation level scores in all five PIDME activities for every site to gauge their participation levels and plotted this against the attendance (in %) as a measure of community engagement. Attendance was defined as the total number of people participating in an event proportional to the total estimated adult population (18 years and above) for each community.

Quantitative data were supplemented by qualitative information derived from participant observation and interviews (Bernard 2002). We considered our notes on personal observations throughout the duration of PIDME activities including FGDs and volunteers' collection of monitoring data. Among the observations noted were the interactions among participants, their degree of engagement in the FGD sessions and interviews. Other qualitative data utilized were notes on routine activities and traditional community events (*e.g.*, livelihood activities such as fishing and trading, feast day celebrations, funerals, etc) derived from informal, semi-structured interviews and follow-up conversations with a wide cross-section of villagers to further inform and clarify possible patterns in community participation. The qualitative information guided the scoring and interpretation of our results (see Appendices 1.1, 1.2 and 1.3).

We investigated how and why participation varied across communities by evaluating four variables that could influence participation levels in MPA M&E. These variables included MPA age, community demographics, social association and leadership personality variables. MPA age was based from the year of effective enforcement up to 2002. One site (Alumar) was designated as age 0 as it had been a no-take MPA from 1995 to 2000 but was abandoned until 2003 when the new leadership took actions to re-establish the MPA. Community demographics include average educational attainment and average income levels which were obtained from the BHWs' census records. Social association and a leader's personality have been considered critical (Wandersman et al. 1987, Ryan et al. 2005). They are also relatively accessible variables which was an important consideration given the limited time spent in each community. Information

related to social association and leadership personality was provided by key informants from outside the community and validated by casual interviews from within the community and personal observations of both the researcher of this study and the local assistant. The strength of the relationship between participation and community demographic variables, such as average educational attainment and average income level, was tested using Pearson's correlation analysis (Mantzopoulous 1995). We analyzed similarities in the scores obtained for participation levels, social association and leadership personalities from the eight communities. The social association attributes considered were those relating to opportunities for social contact, sense of community, presence of institutional support and extent of community support for MPA management (Appendix 1.2). For the leadership variable, we considered the personality of the acknowledged leader in MPA management from each of the eight communities (Mosse 1994). Leaders of each community were scored based on consistency in their presence and level of engagement during FGD meetings, dedication to public service and commitment to MPA management (Appendix 1.3). We performed hierarchical clustering analysis using the Plymouth Routines in Multivariate Ecological Research software (PRIMER) where similar samples were grouped and the groups themselves form clusters at lower levels of similarity (Clarke and Warwick 2001).

We developed functional linkages among grassroots organization and village MPA management councils during the PIDME process by conducting joint focus group discussion sessions (FGDs) when suggested by the participants. Joint PIDME-related activities were initiated for those communities situated on the same island and within the

same municipality. Three focus group discussions (FGDs) were held for Jandayan Island with participants from both Handumon and Jandayan Norte; and two FGDs for Pangangan Island included participants from Lomboy and Magtongtong. A feedback session of the monitoring results was also jointly conducted with Alumar, Handumon and Jandayan Norte in the Getafe municipal hall.

3) Within communities

We gathered information on the roles and activities of various groups and individuals within a community for the PIDME process. During the preparatory phase, we made initial contact with the village leaders and members of recognized institutions in the community who subsequently became our key informants given their major roles in MPA management. These institutions were usually the village or *barangay* council (BC) and the grassroots or people's organization (GRO). Community consent and support for the research was gained by the lead author through separate meetings with the BC and GRO. Their assistance was then sought in organizing orientation sessions to inform the community and facilitate broader participation. The local leaders provided advice on whom to invite as participants, how to invite them, and where to hold the group sessions. We then contacted and invited the BHWs, fish wardens, elders (60 years old and above), fishers and their wives (between 26 to 59 years old) and the youth (18 to 25 years old).

We then further identified the various PIDME process elements by implementing this within communities in three phases, *i.e.* indicator development, monitoring and evaluation. The indicator development phase began with surveys of community members

through semi-formal interviews and FGDs in 2003. Access to the BHW's census records allowed us to randomly select 50 participants in each community for interview. We also conducted FGDs with 12 to 30 participants in each group. The FGD participants invited were primarily members of the village council, GRO and other organized groups such as the youth sector and BHW, based upon the recommendation of key leaders we consulted prior to the FGDs. Each FGD was divided into 4 to 6 small breakout groups to identify the goals and indicators of MPA effectiveness. One member in each of these breakout groups was assigned by the group members to document the contributions of participants and one reporter was identified to present the contributions to the plenary. A feedback of the interview results was also shared during the FGD which was considered in achieving a consensus on the goals and indicators. The most frequent responses in both the interviews and FGDs were selected and subsequently approved by the group. Following the establishment of a community consensus on MPA goals and indicators during the plenary, a second breakout group session was held to formulate an appropriate monitoring scheme for these goals and indicators.

The monitoring and evaluation phases were implemented after the monitoring scheme recommended during the FGD was refined and approved by the participants. In this same FGD, community volunteers who would conduct the monitoring activity were identified. Before and during actual data collection, the first author and the local assistant provided technical and logistical support to community volunteers. Orientations were given to clarify tasks, assess skills and provide training. Data sheets were designed following consultations with the volunteers and writing materials (pens, notebooks, log sheets) were

provided as needed. A focal person was then identified for every community, with the endorsement of the GRO and village council leader. The main responsibility of this individual was to organize and compile all the monitoring data collected each month by different volunteers. Since this was a commitment that required at least 4 hours each week, the focal persons were offered minimal financial incentives. Community volunteers began collecting monitoring data during the last quarter of 2003 and continued to the first quarter of 2005. Another FGD session was later conducted to establish a scoring system on which to evaluate the performance of each community's MPA.

Variation in participation by gender and age within communities was also investigated. We considered their attendance and engagement during the preparatory, indicator development, monitoring and evaluation phases. Additional relevant information on their activities within the community was obtained through the village census surveys and interviews.

Results

The community-based PIDME process proceeded in five phases, with the first four each associated with a set of key activities that we tracked in all three contexts (Figure 4.3). The PIDME began with the facilitation of the activities by the researchers for this study who aimed to engage the local people in the process. We found the extra-community participants (external agents) to be primarily involved in facilitation and documentation while the inter-community (across community) activity largely amounted to information exchange. As expected, the intra-community or local participants (within community) in

each study site were heavily involved in the implementation of the PIDME activities and assumed varied roles such as survey respondents, FGD discussants, data collectors and evaluators, and feedback agents.

Participation across and within communities varied with a range of parameters. The average education level of the community appears to be directly correlated with participation. Also, across communities, the variation in participation appeared to depend more on social association (Appendix 1.2) than the leaders' personality attributes (Appendix 1.3) for each community. The important social association characteristics include proximity of neighbors, presence of a GRO and the extent of community support for MPA management. Within communities, community engagement in PIDME varied according to the gender and age of the participants. More males participated in PIDME compared to women and the elders tended to be more consistent in their engagement than the youth.

1. External to communities

Participation in the PIDME phases by people and groups outside the community was mostly indirect, primarily providing logistic, personnel, technical and financial support. For our study sites, the external institutions and individuals that played supporting roles in the PIDME process included the MLGUs, GLAs, and the non-state actors such as national conservation NGOs and the academe. The encouragement, technical support (*e.g.*, training on fish visual census survey methods and organization building) and financial support (*e.g.*, supplying gear, facilities and amenities - snorkelling gear,

guardhouse, marker buoys, patrol boat, fuel, honorarium for guards) were provided to the communities at least a year before we began this research in 2002 or on an ongoing basis to assist in monitoring. The external agent's facilities such as boats and computers and their staff also helped enhance PIDME-related activities with the community.

We found that the development path for local communities is in part a consideration of the current and historic role of external agents. Hence, another important role of the external agents in the preparatory phase was providing documentation and orientation on community approaches they used. The external institutions provided valuable background information and lessons learned for each MPA, including details of who are potential participants, and when and how to approach them based on their previous experiences. The preparatory phase also involved project orientations and consultations with different external institutions and individuals historically or recently associated with a particular MPA (Figure 4.3). These interactions helped build upon collaborative relationships that external agents had already established with communities and helped obtain the trust of community participants. The previous capacity building trainings on participatory monitoring and the established track record and familiarity of these external agents with the local context (*e.g.*, customary practices, livelihood patterns, power relations) facilitated the preparedness of both the researchers of this study and the community to undertake the PIDME process.

In the subsequent indicator development, monitoring and evaluation phases, the involvement of the external agents at the study sites was limited to facilitation of the

PIDME process, providing logistical support, as well as encouragement and recommendations. For example, the NGOs and LGUs allowed access to computers or sent representatives to attend FGDs. The most direct and active participation demonstrated by the MLGUs (n=3 of 5 municipalities) was observed when community representatives held feedback sessions at the local executive's offices (*i.e.*, in the municipal hall) during the monitoring phase. The municipal executives and councilors interacted with village representatives and responded to problems presented. In some instances the mayors committed boat engines and local military support and gave recommendations on how to access funds at the end of the feedback session. These supporting roles provided by the external institutions contributed to a smooth progression of PIDME from indicator development to the monitoring phase within a year in the eight sites.

The level and type of support extended by a variety of external institutions differed across sites from 2003 to 2005. The MLGUs of Buenavista (for Asinan) and Calape (for Lomboy and Magtongtong) provided substantial support in the form of gear and facilities through a loan facility from the World Bank. A NGO (Project Seahorse) also facilitated the acquisition of a patrol boat and guardhouses for Handumon and Jandayan Norte. In Lapinig, the MLGU funded the MPA guard's honorarium. Alumar and Batasan informants claimed that they were not presently receiving support for their MPA from any external institution although a LGA and NGO were identified to have previously provided a guard house, patrol boat and buoys that had since become nonfunctional in Alumar.

2. Across communities

The PIDME process progressed through the different phases in all communities even as participation levels and attendance varied between communities. Some study sites recorded increasing participation, *i.e.*, Asinan, Batasan and Lomboy (Figure 4.4) as more participants collected data on fish catch and regularity of enforcement and thus, became engaged in the monitoring phase. One site (Alumar) that had low participation levels (with only the BC primarily involved in PIDME) scored a higher proportional attendance (30%) at least partly because of the low proportion of adults in the population when compared to the other sites. Our results suggested that higher educational levels in the community statistically contributed to higher participation ($r=0.72$, $p=0.045$) while other variables such as average household income ($r=0.55$, $p=0.158$) and MPA age ($r=-0.12$, $p=0.78$) were not statistically significant. However, this result should be treated with caution due to the small sample size of our study sites ($n=8$).

Results of the cluster analysis showed that participation levels (PL) were more closely connected with social association (SA) variables than with leadership personality (LP) (Figure 4.5). Two hierarchical groups with 60% similarity showed one group having PL (PL2 and PL4) distinctly clustered with SA variables (SA1, SA3 and SA4) whereas the second group showed less distinct patterns of PL, SA and LP linkages. This result indicated that sites with a higher intensity of engagement (PL2) and more consistent involvement (PL4) tended to occur in a neighborhood with houses more proximal to each

other (SA1), and in the presence of an active GRO (SA3) and high levels of community support for MPA management (SA4).

Activities undertaken across communities during the various PIDME phases maximized the existing linkages of inter-community groups usually composed of GROs and the village council from adjacent communities. Through the Jandayan Island Coastal Development Council (JICDC), Handumon and Jandayan Norte conducted all their FGD sessions jointly during the orientation, development of indicators and monitoring scheme and evaluation phases. When the group decided to feedback the monitoring results to the Getafe municipal officers, the other study site (Alumar, from a different island) was invited to take part. In another instance, Lomboy and Magtongtong, situated on Pangangan Island, also held a FGD session to exchange information on monitoring results. For the evaluation phase, Lomboy and Magtongtong participants decided to include participants from a neighboring village from the same island (Cahayag) in connection with the Protected Area Management Board (PAMB) of Pangangan Island's decision to extend the Lomboy MPA to Cahayag. The Pangangan island PAMB was organized and led by the Department of Environment and Natural Resources (DENR) whose mandate includes a lead role in management of protected areas.

3. Within communities

Participation levels in PIDME among community members in our study sites appeared to be influenced by different process elements in the different phases (Figure 4.3). Our experience indicated relationship and trust building process elements associated with the

preparatory phase was the most important stimulus for PIDME to proceed. Our survey results suggested that participation and community acceptance were determined according to the residents' first impressions of the researchers of this study. In situations where the researchers indicated they had met with and had the support of both external and internal institutions and persons associated with their MPAs, community members generally showed willingness to participate in the activities. For example, during interviews, even before the researchers could inform respondents of the courtesy visits made to institutions, some asked if we had met with the LGU, NGO, BC or grassroots leaders (n=5 of 408), while others suggested we meet with individuals representing the external institution (n=3 of 408). Some respondents, during the indicator development interviews, also identified names of certain persons associated with their MPA and asked if the researchers knew them (n=8 of 408).

The intra-community PIDME process needed to be adaptive in its scheduling of the various activities to accommodate the livelihood and customary activities to be practiced. During FGDs, we observed that participants arrived and departed at different times depending on their fishing or trading schedules. Some buyers came later after trading fish (n=6 of 20 FGD participants) while some fishers needed to leave early to fish on a distant fishing ground (n=14 of 30 FGD participants). In other cases, schedules of important traditional and social events such as *fiestas* and funerals took precedence over PIDME activities. In some instances (n=7 of about 40 activities), the participants scheduled PIDME activities to coincide with social, political and cultural events to maximize the

attendance of expected participants. For example, in Alumar, the participants agreed to schedule FGDs during the regular BC meetings.

Generally, community stakeholders demonstrated readiness to participate in at least one activity of the PIDME process. During the one-on-one interviews conducted for the indicator development phase in the eight study sites, 395 of 408 randomly selected people (average of 49.4 ± 1.8 individuals per site out of the targeted 50 individuals) willingly shared their opinions on MPA goals and indicators of effectiveness. Lack of knowledge (n=5) and time constraints (n=8) were the reasons mentioned by those who declined to participate in the interviews. In group activities, such as the FGDs, attendance appeared to be dominated by institutional representatives linked to organizations such as the BC and GRO. Between 70 to 100% of the FGD participants were affiliated with either the BC (including village health workers and *barangay tanods* or village police) or GRO. Consistently in all FGDs, between 50 to 100% were composed of leaders elected by the village (for BC) or the GRO members (for GRO leaders). Many of the leader participants attending the FGDs represented both BC and GRO (n=24 of 102).

Gender and age also affected participation levels within communities. Participation by men was slightly higher than women in terms of average number of people in attendance, but fluctuated during the different PIDME phases (Figure 4.6). Compared to the indicator development phase, an increase in male participation was observed during the subsequent monitoring phase when many fishers and fish wardens volunteered to contribute catch data, and conduct MPA surveillance and fish visual census surveys. In the succeeding

evaluation phase, participation levels for men reverted to the same level as the indicator development phase. The participation level of women held steady for all phases of the PIDME. We also noted a gender division in the roles and responsibilities of participants during PIDME. Consistent with our compiled contact list, we observed that women were often relied upon for record keeping. For example, the all-women team of BHWs provided the census records that facilitated the random selection of the FGD participants and the barangay council secretaries were mostly women (n=6 of 8). Similarly, in the monitoring phase, fishers (all men) were identified to collect fish catch data but some (n=6 of 40) reported they relied upon their wives to fill up the daily log sheets. This appeared to be a convenient arrangement since the wives usually sorted and sold the fishers' catch. All fish buyers who volunteered to share information on the fishers' daily sales were women (n=8). We also observed that when the larger FGD groups were subdivided into smaller group discussions (SGDs) with an average of 4 people (n=53 SGDs; s.d.±1) per group, women either took or were given responsibility as documenters 60% of the time and served as rapporteurs 44% of the time.

With respect to age, there were more youth than elder participants in both the FGDs and monitoring activities (ratio of 4:1). However, the elders were more consistent in their participation, as measured by their attendance at the different phases. Almost all of the elders participated throughout the PIDME process (n= 4 of 6) while less than one-third of the youth (7 of 26 total youth participants) sustained their participation through all phases.

Results indicate that participation in PIDME (except for the interviews in the indicator development phase) was influenced by the individual's institutional affiliation, occupation and level of responsibility within the community. During the FGDs in the monitoring phase, participants identified institutions or groups rather than individuals to collect monitoring data *e.g.*, a fish warden for frequency of enforcement and apprehensions, the GRO fishers and buyers for fish catch and incomes, BHW, treasurer or secretary of the BC for household education levels and incomes. The elected or appointed BC and GRO leaders demonstrated their commitment to participate in all phases of the PIDME, particularly the FGDs. However, this commitment was sometimes dependent upon them getting re-elected or re-appointed. This was the case in relation to BC leaders (n=6 of 8) from four different communities and GRO leaders (n=2 of 2) in two communities. Those former BC leaders (n=2 of 8) who failed to get re-elected but remained committed to participate were elected officers of the GRO.

Discussion

Our study demonstrates that the PIDME process can begin and proceed in predictable ways but that variation among communities influences how participation in PIDME proceeds. The PIDME process can be initiated with facilitation from external agents who should first consider building a relationship and trust with the community. Trust alleviates concerns about motives and benefits and therefore enhances collaboration particularly for participants who are not familiar to each other (Kwak et al. 2004). Proceeding with the effective implementation of PIDME then depends on the participation of community volunteers performing various roles as representatives of the

institutions they identify with (*e.g.*, BC, BHW, GRO). Variations in participation levels across communities depended more on the average educational attainments and social association characteristics of a community than on income and leadership attributes. Within communities, gender and age of participants were the most important considerations that influenced the volunteers' level of participation in the PIDME process.

The external agents' role, even if indirect, nevertheless appears crucial in the progression of PIDME. The historical approaches and initiatives of external agents who had an active presence in a community during the early stages of MPA establishment can be a stepping stone for PIDME progression. For example, if the external agent has catalyzed the formation of a core group or GRO for MPA management, PIDME can be undertaken by this group instead of forming a new group for this purpose. During PIDME implementation, the community participants need to be encouraged to seek the external agent's support throughout the process. Particularly for the MLGUs, providing them with feedback of the monitoring and evaluation results can elicit timely and relevant support as demonstrated by the experiences of some communities. A beneficial response from external agents can motivate the community to continue PIDME implementation. The feedback exercise to gain the support of external agents also develops the confidence of community members to document and communicate their results in an effective way.

We can expect variation in participation levels across communities who may be working together to advance MPA management. Our results suggest higher education and better

social association across communities contribute to a higher participation level is consistent with other studies (Guagano and Markee 1995, Kwak et al. 2004, Tang 2008). One study showed education as the most significant contributor to participation when regional differences in terms of age, sex, income and education among groups participating on environmental concerns in northeastern United States was considered (Guagano and Markee 1995). Arguably, communities with a more highly educated population may have greater enthusiasm to participate in coastal management activities because they tend to have better perceptions of the need for coastal protection (Tang 2008). However, many remote coastal communities have limited access to formal education. In such cases seeking non-formal education inputs focused on marine conservation for the community, usually delivered by external agents, may be a practical alternative. Approaches to non-formal education can include activities that potentially enhance social association such as games, film shows and discussion sessions. Social associations facilitate engagement in community projects through more frequent contacts among neighbors which allow friends to recruit each other for causes they believe in (Uslaner 2003). In addition, the experiences and public spaces the community members have shared become the foundations upon which collective actions can be built (Kwak et al. 2004).

The PIDME process presented opportunities for the existing island-wide network of community management bodies to become functional by working together. The two inter-community groups, JICDC and Pangangan island PAMB consolidated their abilities to jointly implement PIDME through the use of the same indicators, monitoring scheme

and evaluation strategy as agreed during the FGDs. Their openness to accommodate other groups so as to strengthen MPA management suggests a potential for PIDME to be extended through inter-community group connections to a broader provincial and even regional level. However, these types of advancement will require facilitation by an external agent and consideration of community participation process (Figure 4.3) described earlier. Formation or strengthening of existing provincial or higher level alliances of GRO advancing MPA management need to be ensured so as to reach these broader political and ecological goals. This has implications for achieving the target of creating representative networks of effective MPAs by 2012 (United Nations 2002).

The sustained engagement of individuals within a community was associated with their affiliation to an institution. Participants engaged differently in accordance with their institutions' policies and decisions. For example, the consistent participation of the BC officers, BHWs, and *barangay tanods* was largely because of their mandated roles. This indicates that the presence of certain institutions or formal organizations rather than individuals may be a more critical consideration in the progression of PIDME.

Institutional representation may also minimize the impact of individuals whose participation is based on a sense of duty to their position as elected or designated officer. Hence, the institution can ensure continuity of PIDME by appointing a new representative to fulfill an outgoing officer's functions with proper protocols for turning over of responsibilities. Working with local institutional organizations rather than as individuals in the community is more productive for resource management because they promote stability of expectations and consistency in actions (Agrawal and Gibson 1999).

In our study, gender and age influenced participation, even though broader stakeholder participation improves opportunities for long-term socially acceptable solutions to coastal environmental problems (Klinger 2004). The apparent domination of men and the minimal participation of women in participatory approaches are quite common (Cornwall 2003). For example in Cameroon, men commonly hold strategic executive positions in the village development associations while women are relegated to supporting roles (Fonchingong and Ngwa 2006). Another study observed higher participation by men but only at the beginning of the participatory process while women became the dominant and more persistent participants later on (Sanginga et al. 2006). In our study, the women participants did not dominate in any phase but demonstrated consistent participation up to the later phases of PIDME. Apart from the probable lack of recognition for women's capacities, the timing and nature of the PIDME activities may have affected the participation of more women. The timing of the FGDs may have coincided with women performing household chores. The monitoring schemes also called for the designation of volunteer participants, usually males, who conducted patrol and surveillance of the sea at night and have knowledge of fish catch and effort. This points to the need for a more conscious effort on promoting gender-balanced approaches particularly for external facilitators.

An understanding of community gender profiles may be a significant consideration for external facilitators at the beginning of the PIDME process to allow adjustments for more gender-balanced participation. The gender profiles can provide guidance on providing

equal and better opportunities for women to participate. PIDME facilitators can then plan ahead and develop appropriate strategies to accommodate women. For example, give them access to time and options for skills development (Fonchingong and Ngwa 2006). Hence, if the reason for non-attendance is mothers need to look after their children, perhaps one or two caregivers can be assigned to look after the children so more mothers can participate. Also, women's skills, such as data collection, should be recognized as important to PIDME progression. In fact, several fishermen relied on their wives to record their daily catches (see Chapter 6). Other strategic approaches to PIDME that might allow for continued participation from non-dominant or marginalized community members can include institutionalizing an explicit mandate for external facilitators, BCs and GROs to seek equal gender representation and to monitor its success.

In terms of age, the youth (18 to 25 years) were found to be more enthusiastic and willing to contribute time to participate in MPA monitoring (particularly data collection) than older adults. This is contrary to the findings of others where voluntary participation was higher in older adults because of their longer integration within the community (Burr et al. 2002). However, the participation of young people was not sustained, perhaps because of their greater mobility and their need to seek job opportunities outside the community. In 2002, about 34% ($\pm 13\%$, $n=989$) of the youth from all eight sites sought employment in the cities (unpub. *barangay* census records 2002). In LDCs, migration to urban areas is a common livelihood strategy for young and single people (Kothari 2003). PIDME facilitators have to develop different strategies to engage specific age sectors, including youth that may tend to 'come and go' from the community. Providing local skills

development opportunities particularly for livelihoods may encourage community retention and sustained youth involvement in PIDME, but this is difficult. Rural-urban migration is a global phenomenon and with higher wages and quicker returns in the cities, the youth are enticed to leave their homes (de Haan 1999). This reality has to be considered so that the youth's short-term engagement can be maximized and not be disruptive to the PIDME process. An approach that considers mechanisms to implement the PIDME roles and responsibilities of the youth as an organized group instead of as individuals representing the youth may be necessary. For example, the youth participants can report on responsibilities such as on the data collected during the monitoring period as an organization.

Improving the effectiveness of community-managed MPAs can be achieved through a sustained PIDME process which in turn needs the continued engagement of local communities. Each local community must eventually work together with other communities to better manage their common marine resources. Our study has contributed knowledge on an approach to implement the PIDME process. This study also led to a better understanding of the patterns of participation across and within communities which indicate the need to focus on strategies such as institution-based implementation, non-formal education and equal gender representation for long-term engagement and greater participation among community constituents. In general, we found that at this time, communities need locally specific inputs from external agents to advance in their abilities to participate in PIDME. As well, a broader geographical and ecological extension of community-managed MPAs will undoubtedly require an iterative

process engaging external agents and neighboring communities, based upon local applicability, relationship and trust.

Tables

Table 4.1. Description of MPA study sites and community profiles.

MPA village location	Code	Municipality	Village Population	Education level ¹	% HH with incomes >PhP5000 ²	Village Land Area (ha)	Age of MPA from enforcement	Lead institution in management ³	External agent ⁴
Lapinig	LAP	Carlos P.Garcia	1050	7.1	21	49	13	MLGU	GLA
Alumar	ALU	Getafe	635	5.1	10	137	0	BC	GLA
Handumon	HAN	Getafe	838	6.1	33	40	8	BC/PO	NGO
Jandayan Norte	JNO	Getafe	895	6.7	55	49	0.5	BC	NGO
Asinan	ASI	Buenavista	757	8.2	36	12	2	PO	NGO
Batasan	BAT	Tubigon	1074	7.9	41	6	4	BC	NGO
Lomboy	LOM	Calape	482	9.8	69	10	8	BC	NGO
Magtongtong	MAG	Calape	805	8.3	54	56	7	PO	GLA

¹ Primary or elementary level education = 1 to 6; Secondary or high school level education = 7 to 10; Tertiary or college level education = >10

² Subsistence level for a family of 6 as reported by the Philippine government for 2002 = approximately PhP5000 or US\$100/mo

³ Local-based institution: BC=barangay council; PO=people's organization; MLGU=municipal local government unit

⁴ Partner institutions: GLA = government line agency; NGO = non-governmental organization

Figures

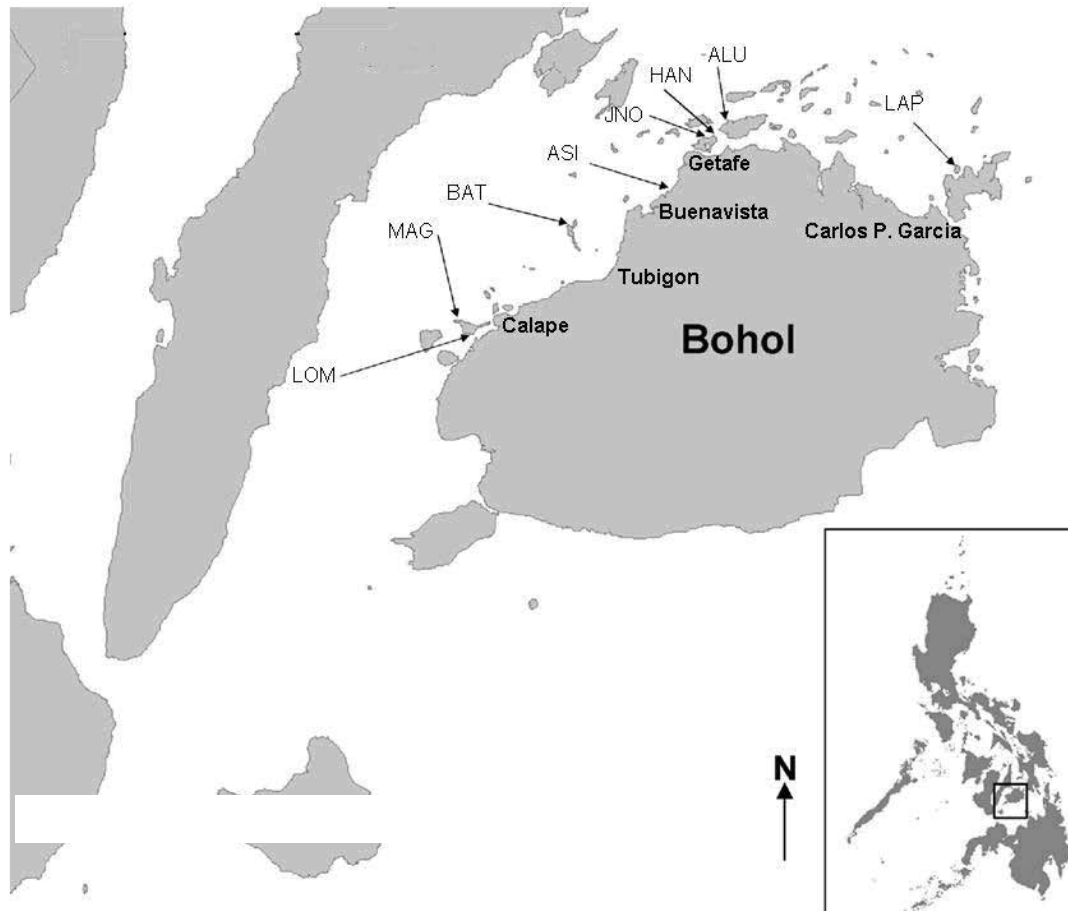


Figure 4.1. Location of eight study sites in five municipalities in western Bohol, central Philippines.

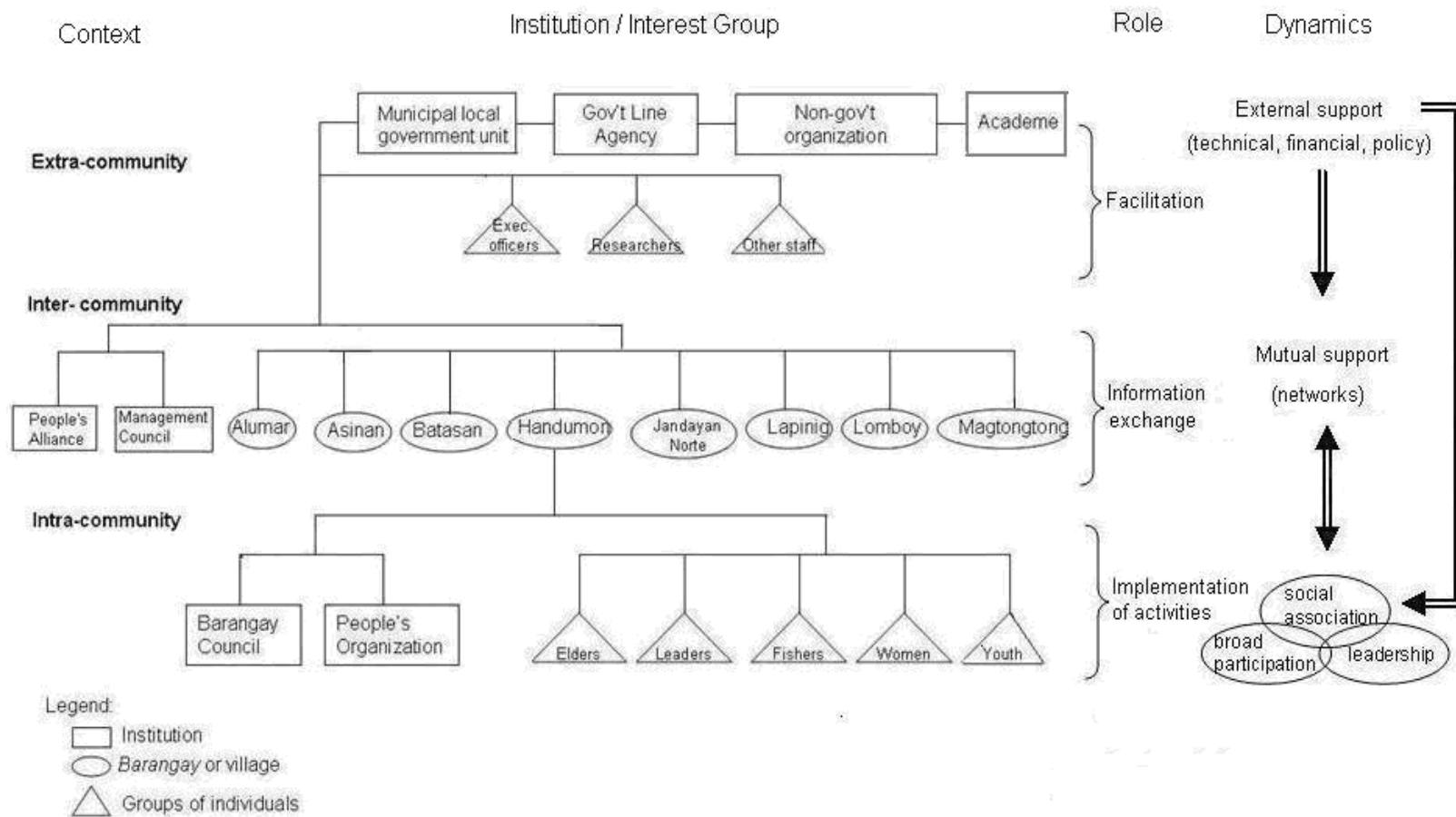


Figure 4.2. Community constituents and external group participants in participatory indicator development, monitoring and evaluation of MPAs.

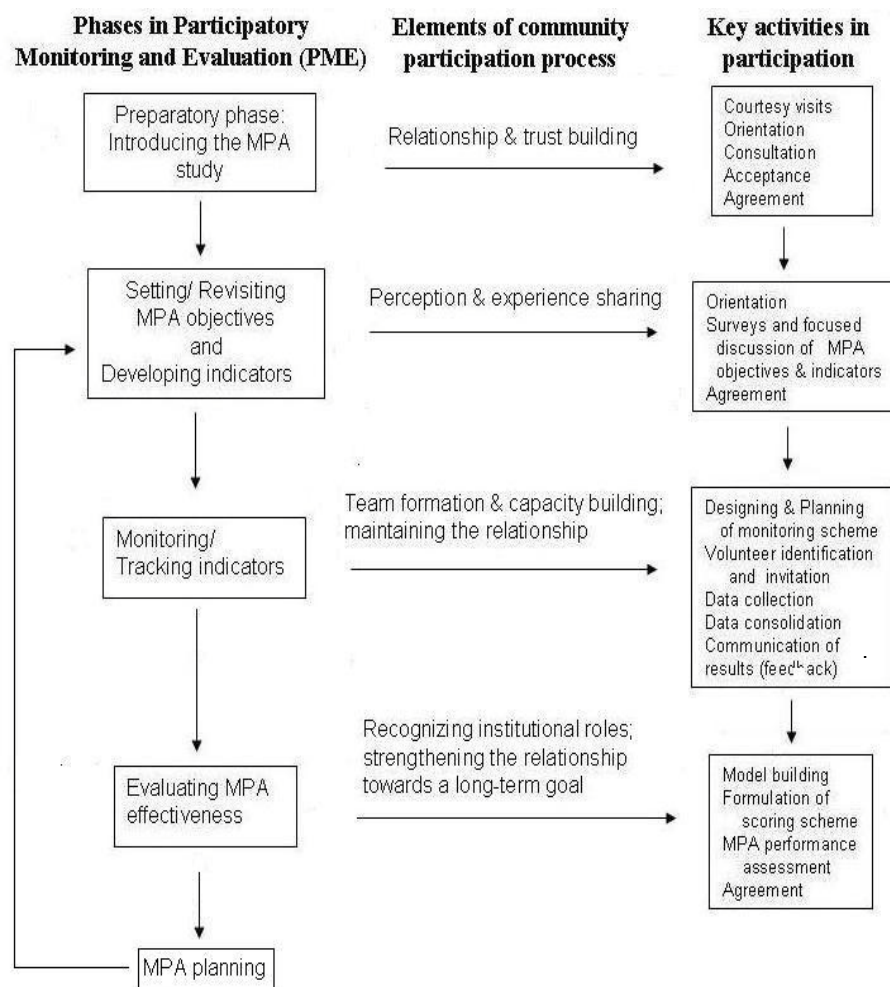


Figure 4.3. Participatory activities at different phases of indicator development, monitoring and evaluation of community-managed MPAs.

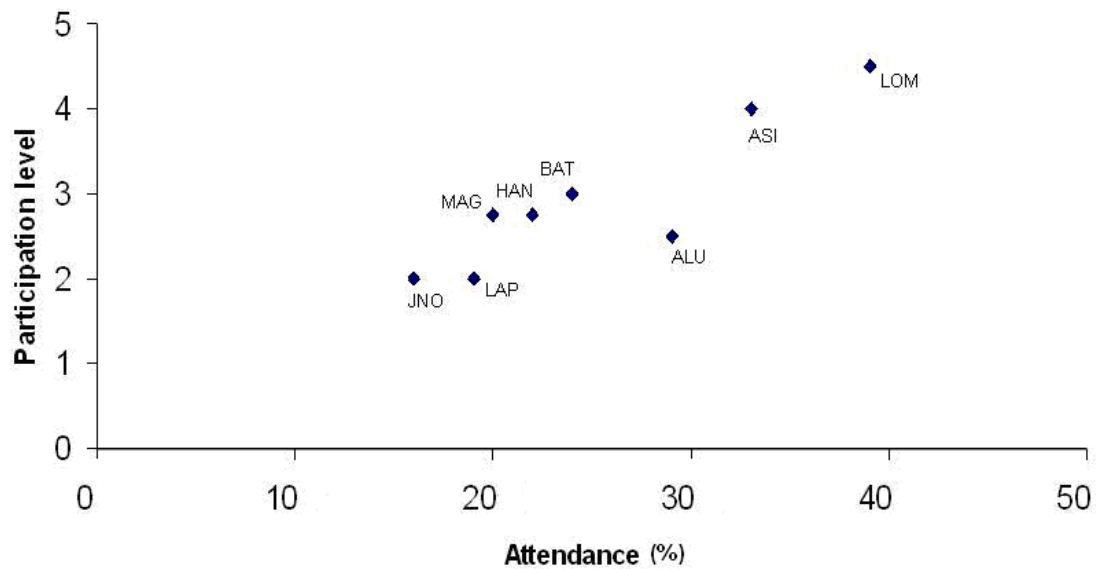


Figure 4.4. Community participation level and attendance across eight study sites.

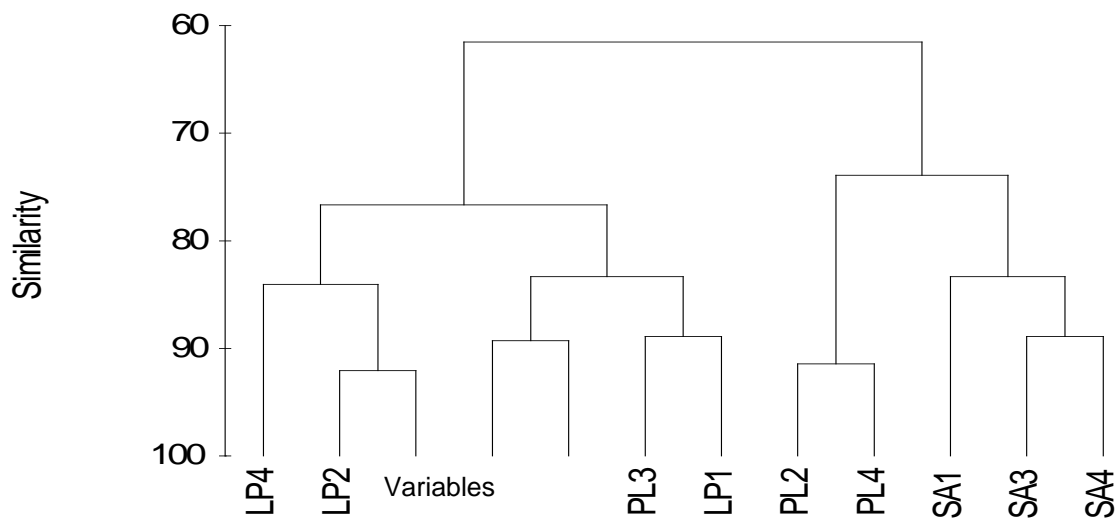


Figure 4.5. Hierarchical cluster analysis of participation levels (PL), social association (SA) and leadership personality (LP) among community participants (see Appendices 1.1, 1.2 and 1.3 for description of the variables).

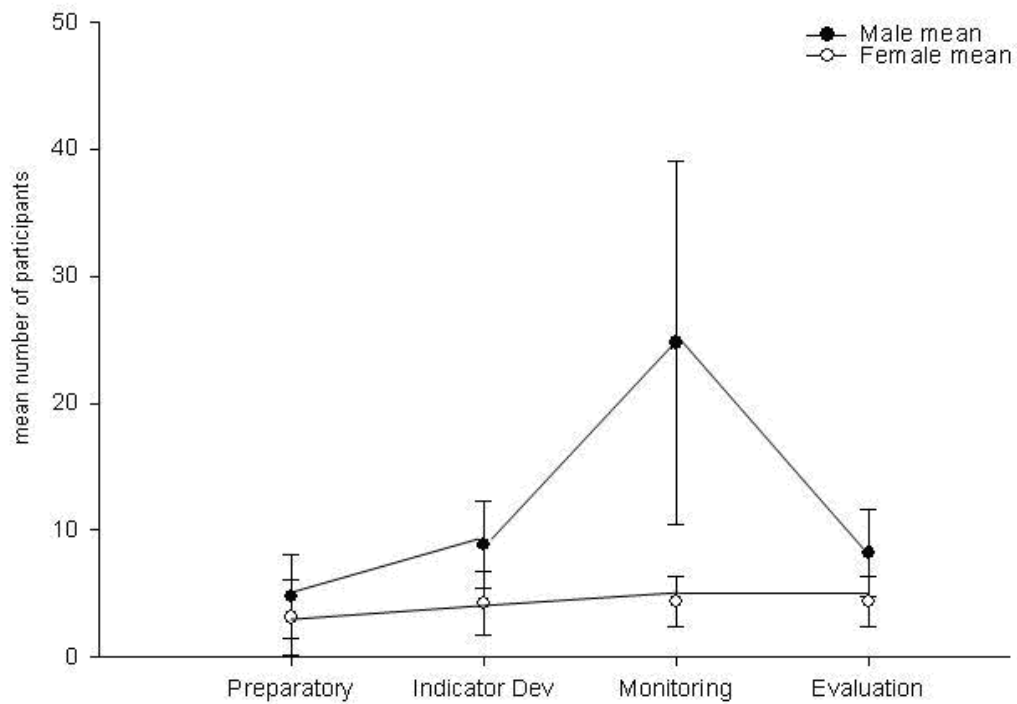


Figure 4.6. Trends in participation by gender among community constituents at different phases of participatory indicator development, monitoring and evaluation.

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5. Tracking evolving community-based MPAs: changes in the indicators of effectiveness over time¹

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Introduction

While marine protected areas (MPAs) continue to be established globally at a rate of about 40 new ones each year (Mora et al. 2006), little comprehensive information is available to evaluate the effectiveness of established MPAs (Spalding et al. 2008).

Recently, monitoring and evaluating the effectiveness of protected areas has emerged as a global priority in biodiversity conservation. Signatory countries to the Convention on Biological Diversity have committed to report on the effectiveness of their protected areas by the year 2010 (CBD 2004). In support of this, guidelines to track the progress of MPAs have proliferated (Staub and Hatzios 2004, Wells and Mangubhai 2004, Pomeroy et al. 2004). Only a limited number of these, however, have application to community-based MPAs (CBMPAs) found in developing countries (Stern 2006).

A framework developed by the World Commission on Protected Areas recommends the reporting of effectiveness evaluations according to six management elements: context, planning, input, process, output and outcome (Hockings 2000, Wells and Mangubhai 2004). Despite this, most monitoring methodologies focus only on collecting output and outcome data (Hockings 2003). Surveys conducted among local stakeholders of MPAs show that priorities for evaluation not only include effectiveness indicators on outputs or outcomes but also those that take account of context, inputs and process (Dahl-Tacconi 2005; Chapter 3).

The monitoring and evaluation systems currently being applied can be categorized into three levels according to the purpose and scope of data collected and the required

resources: the first level of assessment uses distant but readily available secondary material from the literature or informed opinions of managers and independent evaluators; the second level uses more proximate primary and secondary information from community members; and the third level uses more detailed primary data collected locally (Hockings 2000, Wells and Mangubhai 2004). While first level assessments provide information that can help prioritize concerns, these are generally insufficient to determine the effectiveness of MPAs (Staub and Hatziolos 2004). The greater ease and speed and lower cost of the first level probably explain why only one of the fourteen MPA evaluation systems identified and reviewed during this study reportedly used in-depth data collection at the community level (Stern 2006).

Several studies have considered the usefulness of local people's perceptions to gauge the effectiveness of protected areas (second level monitoring and evaluation). One study indicated that a perceived crisis of diminishing fish populations was an important predictor of CBMPA success (Pollnac 2001). Another study showed that the perceived benefits from both conservation and extractive activities produced a favourable attitude towards sustained protected area management (Allendorf et al. 2006). Monitoring local people's perceptions of MPA effectiveness has been found to encourage stakeholder involvement (McClanahan et al. 2006) and also to be cost-effective and particularly useful in the absence of 'before and after' long-term quantitative data (Webb et al. 2004).

Another method to track the performance of MPAs is the use of repeated and detailed on-site data collection techniques (third level monitoring and evaluation) that will detect

trends about the attainment of MPA objectives. Most studies conducted on long-term monitoring of MPAs focus on outcome indicators and show varying trends over time. For example, one study (Halpern and Warner 2002) demonstrated that fish biomass and diversity inside reserves or no-take MPAs can recover after three years of protection while other studies indicated that full recovery requires at least 15 years or even several decades (Gell and Roberts 2002, Russ and Alcala 2004, McClanahan and Graham 2005). From a socio-economic perspective, fish yields for artisanal fishers have reportedly increased from 46% to 90% within five years of protection or effective management of the MPA (Roberts 2001) but other studies suggest that two decades may be required to detect a 40% increase (Alcala et al. 2005). Some studies caution that declines in total catch per area may be experienced for up to 10 years after closure of a fishing area before the expected increase in yield is experienced (McClanahan and Mangi 2000).

MPAs demonstrating measurable results that meet the expectations of local stakeholders are more likely to be supported and have strong local engagement in their management (Kelleher 1999). However, MPAs can depart from expectations and from other apparently comparable and similarly managed or enforced MPAs to the extent that a 15-year old MPA may still be recovering or have yet to meet its objectives while a 3-year old MPA can already demonstrate full recovery. If recovery time within a MPA takes longer than expected, it will usually take even longer for the consequent fish populations to spill out of the MPA to benefit fishers. These circumstances can be critical for communities whose residents are highly dependent on the sea for food and income. We should, clearly, track evolving MPAs to assist in determining if MPAs are meeting their objectives. The

process of tracking can help maintain community engagement while the findings provide direction on management adjustments needed to ensure that progress towards recovery is being made.

Here, we focus on tracking the effectiveness of MPAs based on the expectations of local stakeholders as reflected in input, output and outcome indicators. More specifically we wish to determine if positive trends in MPA effectiveness can be detected over a short-term monitoring period and whether any perceived long-term changes in the CBMPA study sites reflected progress in meeting the established management objectives. The perceptions of local stakeholders regarding changes occurring in their MPAs for the past 25 years were recorded. We also tracked input, output and outcome indicators of MPA effectiveness by collecting empirical data over a two year period for eight indicators selected by the community.

Methods

Study sites & context

Selected indicators of effectiveness were tracked in nine CBMPAs situated in Bohol province, central Philippines; these were located in six municipalities and had been established in different years (Figure 5.1, Table 5.1). Bohol is an island province with 1,109 villages or barangays (smallest political unit), of which 304 are found along the coastal mainland and 63 are islands (Green et al. 2002). Over 100 MPAs have been established in Bohol although only about 20% of these are probably functional (Green et

al. 2002). All our nine study sites were no-take MPAs and all, except Asinan, are located on islands.

Six of our nine study sites (except Lomboy, Magtongtong and Balicasag) are located along Danajon Bank, an unusual double barrier reef system that is associated with about 40 small, often inhabited islands (Christie et al. 2006). In 1997, it was estimated that about 50% of the coastal population along the Danajon Bank in Bohol was directly or indirectly engaged in fishing and only 5% owned agricultural lands (Calumpong et al. 1997). The low monthly average income of US\$120 drives fishers to use more efficient but destructive gear (Armada et al. 2009). Danajon has a complex reef system characterized by high marine biodiversity but low live coral cover and fish densities; such degradation and depletion has been attributed primarily to destructive fishing methods (*e.g.*, dynamite, cyanide and trawling) and to siltation derived from land and mangrove conversions to fishponds, agriculture and human settlements (Green et al. 2002, Christie et al. 2006).

The eight indicators tracked in this study were developed with the participation of community residents who subsequently facilitated in the formulation of monitoring schemes and their application (see Chapters 2 and 3). These eight community-developed indicators were a close match with those recommended in the literature (*e.g.*, Pomeroy et al. 2004). They covered input, output and outcome indicators (Table 5.2). Input indicators refer to the resources contributed in relation to MPA management, output indicators concern the goods and services provided to realize the MPA objectives, and outcome

indicators assess the results of MPA program implementation in relation to the objectives (Hockings 2000).

Perception survey

To obtain local community perceptions of the indicators, we set out to interview 10 respondents in each of the eight MPA study sites. Because of logistic and time limitations, we only managed to interview five respondents for Balicasag and none for Apo Island. The respondents were selected among participants involved in the actual monitoring activities, on the basis of their knowledge of the establishment and past management of the MPA. Respondents were surveyed about their perceptions of the status of the indicators over 25 years by scoring them from one (lowest score, farthest from desired goal) to ten (highest score representing the score when the desired goal had been achieved). The mean scores for all respondents per MPA site were obtained for six of the eight indicators. We did not include the analysis for scores in the other two indicators (number of violations and income from fishing) because of ambiguity in the scoring. For the former, we realised that a high score in the number of violations (10) could have arisen from either good or poor enforcement. For the latter, the consumer price index (*i.e.* the actual price of goods and services bought by consumers at a certain time) was a distorting factor for the perceptions data. For example, respondents had difficulty scoring their current income compared to the past because although their income a decade ago was lower they were able to buy more goods.

Tracking the indicators

The lead author and a local fisher turned research assistant facilitated and consolidated the regular collection of data for eight of the nine study sites (not Balicasag, which is discussed later) according to the various monitoring schemes developed earlier (Table 5.2). Data from six of the eight indicators were provided by community volunteers who filled out log sheets while data for the other two indicators (fish abundance and live coral cover) were obtained by the researchers in underwater surveys. The local research assistant was trained in facilitation of community meetings and underwater survey methods by a local non-government organization (NGO). We then involved community volunteers to (a) collect data and (b) to collate and check data, both of whom were given orientation sessions to promote regular, accurate and reliable record keeping (see Chapter 3). The latter were selected on the recommendations of the village leaders. In the case of Balicasag, we drew on data from an ongoing programme of monitoring guided by another NGO. The data covered only a limited number of our indicators but any new monitoring would have confused the community. As it was, the Balicasag community leader and the NGO agreed to share available monitoring data on three indicators that allowed comparison across sites: financial support from the government, fish catch and income from fishing.

1. Community volunteer log sheets

Based on the inputs recorded during focus group discussions (FGDs), we proposed and presented common log sheets for six of the eight indicators (except for fish abundance and live coral cover) across all eight communities (see Table 5.2). We obtained feedback

from the volunteers involved in the data collection and collation, and made revisions to the log sheets accordingly. The data collators for every village then met every week with each data collector, and transmitted their information to the researchers for encoding and analysis. Data collectors recorded their observations daily, weekly or monthly, as appropriate.

2. Underwater surveys

Monitoring two of the indicators (*i.e.*, fish abundance and length and coral cover) required skills in swimming, writing underwater and identification of fish and live corals. These particular indicators were identified during a community workshop as important and initially volunteers agreed to monitor them every six months. However, over the course of the two years, only two of the eight communities managed to collect data on fish abundance for four surveys and only one community collected data on coral cover. In place of these fragmented community data on fish abundance and length and live coral cover, we used information that had been systematically gathered by the researchers, originally intended only to corroborate the data collected by local volunteers (see Chapters 4 and 6 for related discussions on this issue on sustaining the participation of volunteers in monitoring). A comparison of the fish abundance data obtained by community volunteers with that obtained by the researchers is provided elsewhere (see Chapter 6).

For the fish abundance and length data, we replicated five 50m transects randomly inside and five outside the no-take MPAs. We snorkelled each transect for 20 minutes and

recorded fishes measuring ≥ 13 cm that were within 2.5m each side of the transect line at 1m to 5m depths of water (English et al. 1997). All surveys were conducted once during the dry season (March- August) and once during the wet season (September-February) in 2003 and 2004. Weather and time constraints prevented the collection of data for two sites in 2003 and reduced the number of replicate transects during some surveys from five transects to two (n=1 site) or three (n=1 site) or four (n=5 sites).

For the live coral cover, a separate 20m belt transect was laid randomly along the reef slope in five replicates inside and outside the no-take MPAs, close to where the fish abundance transects were laid. The live coral cover was recorded underwater using SCUBA and estimated by obtaining the percentage from the benthic lifeform recorded that intercepted the 20-meter transect line (after English et al. 1997). The surveys were conducted annually for 2003 and 2004.

Analysis

Results for the empirical data on input and output indicators collected by the local volunteers were summarized and presented graphically by the author using descriptive analysis to visualize the trends across the MPA sites within the two year period of monitoring. We conducted a more in-depth analysis of the kg fish caught and daily income from fishing because we had the largest sample size for these indicators. These data were classified according to the gear used for fishing. We tested to see what factors predicted fish catch and income using general linear models (GLM) in the R statistics package (<http://www.r-project.org>). All fish catch and income variables were log

transformed prior to analysis to improve the normality of the residuals. The initial model included year, gear type and site and all interaction terms. We sequentially removed insignificant terms to identify the most parsimonious model using the backward stepwise method. Changes in deviations between each model reduction were tested with ANOVA F test for models.

We performed a Pearson correlation analysis to gain a better understanding of the relationship between changes in fish catch and income from fishing occurring among gears and sites while the MPAs were being protected during the study period. In particular, we examined the strength of the relationship between the log transformed average daily fish catch and the monthly sampling time from fishing grounds adjacent to the MPA study sites. The monthly sampling time was expressed as protection-time or the month-values during the study period from March 2003 to June 2005 for all sites except Balicasag; the available data from Balicasag was for the period March 2002. The period March 2002 was given a month value of 1 and the period June 2005 the month value of 40. Likewise, the income (i.e. log transformed average daily gross sales from fishing per month) was tested for correlation with the protection time using the same month-values within the abovementioned study period. Here, we arbitrarily considered only the group averages with a sample size of at least 10 in the analysis. Statistical significance of the correlations between fish catch and time or income over time was evaluated based on the Bonferroni probability matrix which was considered significant with a probability value of ≤ 0.05 . The p values were computed with Bonferroni correction using the SYSTAT software, version 11(2004). To control for any increase in Type I error associated with

multiple testing, the false discovery rate procedure was used to generate the adjusted p values (Benjamini and Hochberg 1995).

We examined whether site and year had a significant effect on fish abundance and length and live coral cover during the two-year monitoring period using a GLM. GLM was carried out on SYSTAT 11 with site and year as the independent variables.

Results

Perception survey

Our results indicate that local stakeholders perceived both positive and negative changes in input, output and outcome indicators in their MPA sites. Government funding (input indicator 1) was generally perceived to be low or inadequate, with no consistent improvement when compared with the 1980s (Fig. 2). In some cases, funding was viewed as adequate following the establishment of the MPA (*e.g.*, Asinan, Magtongtong, Lapinig, Balicasag), but this was not sustained. The other input and output indicators that were perceived to be making progress towards meeting the MPA objectives included villager support (input indicator 2) and frequency of guarding (output indicator 1), respectively. Respondents tended to perceive that declines in these two indicators went together. In the case of Balicasag, the latter probably drove the relationship; because the whole island is a naval reserve, the MPA benefits from the presence of a full time government military detachment.

Any perceived decline in villager support and enforcement appeared to coincide with a perceived decline in the ecological indicators, such as in the case of Alumar where their MPA was subject to poaching in the year 1999. For the fish catch (outcome indicator 1), most responses (but not those from Asinan, Lomboy and Balicasag) indicated no improvement in fish catch since the 1980s or since the establishment of their MPAs but people in one-third of the barangays with MPAs felt it had improved (Fig. 2). In general, for outcome indicators (outcome indicators 3 and 4), only the ecological indicators - fish abundance and length and live coral cover - showed positive changes (Figure 5.2).

Tracking the indicators

Input indicators

1. Government funding

Based on village reports, financial support from the government tended to be higher in communities (Asinan, Lomboy and Magtongtong) where the municipal local government had access to the soft loan program of the World Bank's project on Community-Based Resource Management, active from 2001 to 2005 (Figure 5.3). The highest financial assistance was given to Asinan (almost US\$8,000 over two years), primarily for livelihood development, which the barangay explained was directly linked to the MPA establishment. In Lomboy and Magtongtong, financial support was used mostly for acquisition of facilities (patrol boats, guard house and marker buoys). The other MPA sites with regular financial support (Jandayan Norte, Batasan, Handumon and Lapinig), although at lower amounts, used their support mainly to cover the honoraria for the MPA guards and for fuel or batteries used during the patrols. However, not reflected here is the

amount Jandayan Norte and Handumon additionally received (about US\$3,000) each in 2004 for the construction and acquisition of facilities to enforce the MPA laws through a foreign-funded NGO.

Financial support for the MPA management appeared to be unpredictable and highly dependent on available foreign funding. The seven MPA study sites were established with initial assistance from foreign-funded NGOs and one through a national government agency. Based on interviews, it took about a year to more than two years before the local government began contributing funds to help enforce their MPAs, depending on the political will of the current elected leaders (n=3). The same respondents who came from older MPAs (Batasan, Handumon and Lapinig) also mentioned they did not have access to the soft loan program but managed to obtain minimal annual funds (about US\$200 to \$800, primarily for enforcement) from their local governments.

2. Village support

The highest participation recorded came from the sites where funding from the government was also high (Figure 5.4). High participation was associated with the implementation of many MPA activities (*e.g.*, scheduled patrols, construction of guardhouses, and installation of buoys) which required funding. The study sites with the lowest participation (*i.e.*, Alumar and Lapinig) were those that did not have a functional grassroots organization. In these sites, participation depended on the presence of the elected and appointed village officials and the paid MPA guards. In the case of Jandayan

Norte, however, total participation was higher than in Alumar and Lapinig despite the absence of a grassroots organization.

Output indicators

1. Frequency of guarding

Based on the community volunteer log sheets, seven of the eight MPA study sites appeared to be fully or frequently guarded within the two-year tracking period (Figure 5.5). Alumar, the only site where enforcement was irregular, had only recently returned to guarding the study MPA (and another on the island) after a period when protection lapsed and fishing was permitted (1999-2003). For the well enforced sites (Asinan, Lomboy and Handumon), the level of guarding within a month was primarily constrained - unguarded about 6 nights/month - by inclement weather, which was more pronounced during the northeast monsoon season (November to February).

Each study site, with the exception of Alumar, had established a system to guard its no-take MPA frequently. Some sites, such as Jandayan Norte, Batasan, Asinan and Handumon, were guarded by wardens with monthly honoraria provided by the village while Lapinig and Magtongtong's honoraria were taken from the municipal budget. Lomboy and Asinan had a considerable number of volunteer wardens, primarily taking turns through the village councilors, volunteers representing a *purok* (zone) for Lomboy, and members of the grassroots organization for Asinan.

2. Number of violations

Although all barangays appeared to enforce their MPAs, Handumon and Jandayan Norte recorded the highest number of violations (Figure 5.6), particularly during the first year of the study. The MPAs are located in adjacent villages but Handumon had been established seven years before Jandayan Norte (see Table 5.1). Except for Lapinig, fewer violations were reported for the second year of the study. The records also showed that most violations were by hook and line fishers (39% of 31 violations in Handumon and 90% of 28 violations in Jandayan Norte) or spear fishers who used paddled boats (26% of 31 violations in Handumon).

The log sheets submitted by the volunteers showed that only 12% of the violations (n=277 in total) resulted in penalties (Figure 5.7). On most occasions, those who violated were simply warned orally (66%) or pardoned and made to sign a promissory note not to reoffend (8%). Sometimes, the violators managed to escape (14%). The lower number of violations recorded for the second year of monitoring for four sites (Jandayan Norte, Batasan, Magtongtong and Handumon) did not appear to be tied to stricter enforcement of these MPAs, which remained relatively unchanged for the two year monitoring period. The high number of violations in Jandayan Norte, Handumon and Batasan might partly be explained by the fact that three to five boats fishing illegally (that arrived in groups from other communities) were sometimes apprehended simultaneously. The greater number of guards in other MPAs (*e.g.*, Asinan and Lomboy) discouraged mass arrivals of illegal fishers.

Outcome indicators

1. Fish catch

The model suggested that, in general, gear type had a greater effect on fish catch near the MPA than its age or duration of protection (Table 5.3). The interaction effect of site and gear demonstrated that any significant differences observed among gears was probably dependent on site once we statistically controlled for time. The Pearson correlation matrix (which represents the strength of the relationship between fish catch/day and the protection time or month-year the fishes were caught during the study period according to site and gear) generally showed either negative relationships or weak positive relationship, suggesting there was no significant increase in catch over the duration of the study period for all gear types and site. The negative relationship was significant for fishers using nets in Asinan, Batasan and Handumon and for spearfishers in Batasan (Table 5.4). The catch from a fish corral set at the edge of Lomboy's MPA may have shown a positive relationship with protection time but this was not significant.

2. Income from fishing

The model indicates that overall, there was only a weak effect of time on the change in income from fishing around the MPAs (Table 5.5). However, any significant differences observed at a particular time could be attributed more to the effect of the gear type than to the MPA sites, with their different durations of protection (Table 5.5). Any effect of time on income was specific to a gear at a given site. We noted that different fishing gear usually targeted different fishes that may be found on different fishing grounds. For

example, spear fishers targeted demersal species while net fishers targeted pelagic fishes. These different species of fish sold to the market also fetched different prices.

The Pearson correlation analysis showed that income was generally negatively correlated with protection time, suggesting that incomes marginally declined through the study period (Table 5.6). There was a significant positive correlation only for the fish corral in Lomboy, while the net and spear fishers of Batasan experienced a significant loss of fishing income during the two year protection time within the study period.

3. Fish abundance and length

More fish were observed in protected waters than outside the MPAs, in all study sites except Alumar and Lomboy ($F_{7,261}=2.63$, $p=0.01$) (Figure 5.8). It was noted above that guarding the MPA in Alumar at the time of the study was not as frequent as the other sites (Figure 5.5). In the case of Lomboy, the sighting of schools of pelagic *anduhaw* or Indian mackerels (*Rastrelliger* sp.) in 2003, which were not observed inside the MPA, accounted for the higher fish count outside the MPA. No significant difference in fish abundance over time was found at any of the sites between 2003 and 2004 ($F_{7,261}=1.20$, $p=0.30$). The older MPAs or those sites with longer durations of protection did not necessarily have higher fish abundance. However, no fish larger than 25 cms were found outside the MPA and larger fish, except for Lapinig, were observed more frequently in sites that had longer protection (Figure 5.9). Lapinig was reported to have increasing incidents of poaching violations with very few fishers being penalized (see Figure 5.7).

4. Live coral cover

The live coral cover inside MPAs was higher in all the study sites except Batasan although the percentage live coral cover did not differ significantly between 2003 and 2004 ($F_{1,133}=0.125$, $p=0.72$) (Figure 5.10). With respect to Batasan, the villagers apparently decided to prioritize establishing the MPA where fishers would not be economically displaced and where it was near enough to the village to be effectively enforced rather than on the basis of having a good coral cover. There was a high variability of the coral cover across sites ($F_{7,133}=14.082$, $p<0.001$) which suggests the inherent differences among the MPAs and preclude detecting any trend associated with the age of MPA sites.

Discussion

The community driven monitoring in this study was largely valuable in the process of its execution rather than in the specific data it gathered about MPA effectiveness, although we did obtain new insights on MPA implementation and management. For example, the findings from our perception survey indicated that even minimal funding from local governments can motivate a community to enforce MPA rules. Our study also demonstrated that perceived increases in village support can be a useful measure of MPA effectiveness. Similar research on local perceptions of MPA success revealed that effective enforcement correlated positively with community support which in turn was strongly correlated with a perception of increased fish abundance (Christie et al. 2009). To sustain enforcement, efforts have to be institutionalized, as in most of our study sites, either through the municipal government, *barangay* council or a grassroots organization.

In Asinan and Lomboy, grassroots leaders and elected village leaders made personal and institutional commitments to enforcement without monetary incentives. The sustainability of such approaches remains to be seen, as these commitments may hold only as long the term of the leadership lasts. However, if these commitments were legislated through the municipal local government, as in other MPAs, sustained enforcement would be more likely to occur.

Complementing perception surveys with empirical data based on tracking of the indicators can help convince policy-makers of the need to legislate. However, our study indicates that tracking well-enforced MPAs over a period as short term as two years is insufficient to contribute to the detection of trends in indicators of MPA effectiveness. Based on our results, this limitation in the detection of trends may be attributed to three factors as described below: poor choice of indicator, the influence of local conditions and the impact of external factors. We must, of course, also consider the possibility that our indicators simply did not change markedly during our study period, but that seems unlikely for such a large suite of variables.

First, the indicators that were identified by the local communities and selected as proxies or measures of effectiveness may not have been ideal for use during the two-year time frame of this research project. While the majority of these indicators are either obvious choices for inclusion and/or are widely recognized as useful in the literature (White et al. 2004, Pomeroy et al. 2004), the sensitivity of their response time may be longer than two years. On this basis it would be premature to assess the appropriateness of the indicators

selected to the tracking of changes over the longer term. Despite this, we observed greater sensitivity in some indicators than in others over the short term. For example, for the ecological indicator, fish length appeared to be a more sensitive indicator of changes during protection than fish abundance or live coral cover. We would, therefore, recommend developing a fish biomass estimate when tracking trends in MPA effectiveness.

Second, certain local conditions may exert a greater influence on the indicators of MPA effectiveness than the age or duration of MPA protection and serve to dampen, reverse or reinforce the influence of time on the indicators. This was evident from our finding that older MPAs, despite many similarities in management effectiveness, did not necessarily have more fish, better coral cover, larger catches or higher incomes among fishers than younger MPAs. Another study in the same region also found that location might explain fish abundance better than age; offshore MPAs had higher fish abundance than inshore MPAs despite their shorter duration of protection (Anticamara 2009). These findings suggest that local conditions can exert a major influence on the indicators, sometimes resulting in results that appear inconsistent and even contrary to expectations, particularly when comparisons are being made across sites. On this basis, broad generalizations about the response of MPAs over time should proceed with caution and not be taken out of local context. The inference that a site should be compared with itself argues for the validity and value of community members determining and tracking locally appropriate indicators of effectiveness (see Chapter 3).

Third, external factors beyond the local jurisdictional scale can influence the trends exhibited by the MPA indicators over time. For example, market dynamics can have a major impact; incomes from fishing are influenced by market forces which in turn influence fishers' decisions about what resources to extract (Guieb 2008). The commercial value of the species caught also varies depending on the fisher's proximity to fish-landing or trading centres. Fishers usually obtain better prices when selling to buyers who have cheaper and faster access to (i) major cities such as Cebu and Tagbilaran as in the case of Batasan and (ii) export processing facilities (for blue crab) in Lapinig (pers. comm. S. Mejares, fish buyer from Batasan island, Bohol, July 2003, Guieb 2008). As a result, incomes can be higher in some sites even when the same products are extracted. Similarly, a low supply of a particular fish during a certain season can create a high demand leading to higher prices for that product, and thus skew income. Fluctuating demand for certain marine products (*e.g.*, abalone, blue crabs, cuttlefish and sea cucumbers) in the global market can also cause a shift in the fishers' targets, *i.e.* from finfish to invertebrates (pers. obs.). The response of MPA indicators to the complexity of these external factors can be challenging to discern, particularly over the short-term tracking interval applied in our study.

Despite the above limitations with respect to the use of indicators in the short term, the information or product generated from monitoring input, output and outcome indicators helps refine our understanding of both the socio-economic and ecological complexity of MPAs. In this sense the indicators provided a useful framework for local community inputs to an assessment of the MPAs and their management. For example, in monitoring

government funding, it was revealed that while the soft loan program of the World Bank brought in substantial financial support in the short term, some target municipalities had virtually no budget for MPAs thereafter while the local government repays the loan (pers. comm. M. Añabieza, municipal councilor, Buenavista, Bohol, April 2009.). As a second example, in monitoring village support, our results indicated that incentives and disincentives for community members need to be provided to sustain participation in MPA management. High participation in collective actions may reflect the commitment of participants to fulfill their duties and obligations as elected officials or as members of grassroots organizations. At the same time, by attending, participants may gain access to economic incentives or avoid sanctions such as fines for absences from meetings and other scheduled activities. As a third example, monitoring regularity of guarding and the number of violations revealed that most violations never resulted in penalties and that the highest number of violations recorded in a day involved offenders that came in groups. This information can be used to inform guidelines for prioritizing budget requests for MPAs and highlight the need to conduct MPA surveillance in groups.

Our data show that indicators related to fish catch and income might not meet expectations. First, it was hard to predict how one MPA would behave from another. For example, in the case of hook and line fishing, an Apo Island longitudinal study reported a 40% increase in mean daily catch to 2.4 kg after 20 years of protection (Maypa et al. 2002). On the other hand, we observed that hook and line fishers in Balicasag (with 23 years of protection, approximately the same as Apo) had a mean daily catch of 6.2 kg while fishers using the same gear around the Batasan MPA (with 4 years of protection,

much less than Apo) already caught a mean of 4.6 kg daily. Second, trends for both fishing and income indicators were generally weakly negative (slight declines in catch and incomes) rather than positive. This has implications for the current management regime where trade-offs between long term protection and immediate exploitation for economic gain need to be considered (Sumaila 2000). It means that communities need to be warned about this possible decline in the resource base under an MPA, and prepare plans for coping. It also means that other management strategies such as rotational harvesting, gear restriction or exclusive fishing rights for the residents might be useful supplements or enhancement to MPA management.

While the indicators did not show significant trends over time, our findings confirm the value of the process of indicator monitoring as a mechanism for engaging community members. Monitoring provided a pretext and opportunity for bringing community volunteers together as well as giving them a broader perspective on MPAs as a multidimensional management strategy. The indicators provided an objective tool for a systematic and sustained dialogue between members about the effectiveness of their MPAs. This in turn contributes to an improved general understanding of the different systems (socio-cultural, economic, ecological) influencing MPA effectiveness and how they relate to each other. The interactions and discussions that ensued while monitoring the indicators also raised awareness, promoted critical analysis of current management approaches, and ultimately led to advances in the development of effective policy or other interventions. For example, the absence of an increase in fish catch and fisher income over time prompted a proposal to consider exclusive fishing privileges for hook

and line fishers residing in the community responsible for managing the MPA. The indicator development and application process also offer opportunities for consultation and collaboration among local data providers, as well as with neighboring MPAs and external institutions (see Chapter 4). Despite these contributions, a balance has to be achieved between the process and the indicator itself; too much emphasis on process can undermine and downplay the potential value of indicators and objectives (Cariño 1999).

The utility of community long-term perceptions and the limitations of the short-term monitoring lead us to argue that longer-term monitoring might, with modification, play an important role in coastal communities' efforts to manage their CBMPAs. The indicators monitored must still be responsive to local fishers' perceptions of MPA effectiveness if long term community engagement is to be achieved and maintained (see Chapter 3 and 4). There are, however, very few examples of rigorous monitoring through community-led volunteer efforts, and any long-term systematic evaluation will also require that communities receive support through technical advice, legislative acts, economic incentives and institutionalized mechanisms (see Chapter 6). Community-based ventures in marine management are highly valuable – indeed, often vital – but they do not preclude the need for strong top down support, especially with respect to monitoring, if the MPAs are to meet their potential. That said, this study found external funding mechanisms in support of community-based MPAs to be sufficiently unpredictable that enduring responsibility will always finally reside with local people (Lewis 1996). It is in that context that attempts to develop appropriate community-based monitoring are so valuable.

Tables

Table 5.1. Profile of CBMPA study sites.

MPA site	Municipality	Year legislated (municipal level)	Year enforced	Size (ha.)	Village Population¹	Status of GRO managing the MPA²
Alumar ³	Getafe	1995	2003	2	635	Inactive
Jandayan Norte	Getafe	2002	2002	10	895	None
Asinan	Buenavista	2000	2001	55	757	Active
Batasan	Tubigon	1999	1999	21	1074	Active
Magtongtong	Calape	1996	1996	7.3	805	Active
Handumon	Getafe	1998	1995	33	838	Active
Lomboy	Calape	1995	1995	8.7	482	Active
Lapinig	Carlos P. Garcia	1986	1990	160	1050	Inactive
Balicasag	Panglao	1986	1985	17	557	Active

¹Number of residents in the village located about a few hundred meters to about 3 kms from the MPA.

²GRO or grassroots organization is considered active when at least one meeting annually is held, and when respondents in at least 3 interviews mentioned that the GRO was then engaged in MPA management.

³ Enforced for five years from 1995 to 1999 when it was reopened to fishing.

Table 5.2. Indicators monitored or tracked and the scheme used to collect data between July 2003 to June 2005.

Indicator		Monitoring scheme
Input	1. Government funding	A volunteer village officer recorded, in a monthly log sheet, the amount (PhPesos) of financial support and any other donated facilities or material goods obtained from the local government.
	2. Village support	A volunteer village officer recorded, in a monthly log sheet, the number of residents engaged in MPA volunteer activities such as warning violators or reporting any violations observed. Data were supplemented with information obtained from the secretary of the grassroots organization (GRO) on the number of attendees during the GRO's regular meetings when MPA management concerns were discussed.
Output	1. Frequency of guarding	A designated volunteer fish warden recorded, in a nightly log sheet, the presence or absence of volunteer guards watching over the MPAs.
	2. Number of violations	The aforementioned designated volunteer fish warden also recorded nightly the number of violations observed while on duty, indicating whether the violators escaped or were warned, pardoned or penalized. These records were supplemented by data summarized each month by a volunteer officer. This officer also recorded any information from residents reporting violations.
Outcome	1. Kilogram of fish caught	Volunteer fishers recorded the total fish in kilograms caught daily during their own fishing trips in fishing grounds usually located few hundred meters to 5 km away from the MPA for fishers using hook and line, spear and fish corrals; and up to 15 km away from the MPA for fishers using nets.
	2. Income from fishing	Volunteer fishers recorded the total daily sales (gross) in PhPesos from each fishing trip recorded above (i.e. kilogram of fish caught).
	3. Fish abundance and length	Researchers conducted underwater fish visual census surveys inside the MPA zone in shallow waters twice every year (wet and dry seasons). Data were collected in inches for the ease of fishers, who think in imperial measurements, and then converted in centimeters for this paper.
	4. Live coral cover	Researchers conducted benthic (live coral) cover survey once each year in 2003 and 2004.

Table 5.3. The factors affecting fish catch (kg/day) as estimated by a backward stepwise generalized linear model.

Factor	df	F	P
Site	6	0.45	0.85
Time	1	1.59	0.21
Gear	2	9.00	<0.001
Site x Gear	11	2.29	0.01

$r^2 = 0.622$

Overall model:

	SS	df	mean SS	F ratio	p
Model	10.33	35	0.23	7.86	<0.001
Error	6.30	167	0.04		

Table 5.4. Results from the Pearson correlation analysis between daily fish catch (average kg/day) by dominant gear within sites and protection-time (i.e. monthly sampling within the study period)

Site	Gear ¹	n ²	Pearson r ³	p	p adj ⁴
Alumar	Spear	12	-0.50	0.100	0.16
Asinan	Net	17	-0.75	0.001	0.01
Batasan	Hook and Line	12	0.15	0.650	0.78
Batasan	Net	11	-0.71	0.020	0.05
Batasan	Spear	14	-0.63	0.020	0.05
Magtongtong	Hook and Line	23	0.23	0.290	0.43
Handumon	Net	15	-0.70	0.004	0.02
Lomboy	Fish corral	17	0.49	0.050	0.11
Lomboy	Net	16	0.06	0.810	0.88
Lapinig	Net	15	-0.46	0.080	0.16
Balicasag	Hook and Line	18	0.12	0.640	0.78
Balicasag	Spear	18	-0.04	0.880	0.88

¹ The gear used in this analysis was the most dominant during the study, with the highest reported incidence of use within each site.

² n= sample size of log sheet reflecting the number of outings

³ Calculated by obtaining the strength of the relation between the log-transformed average daily fish catch per month and the time caught (i.e., month and year) within the study period (March 2003 to June 2005 for all sites except Balicasag where the period covered is March 2002 to May 2003).

⁴ Significant at $p \leq 0.05$

Table 5.5. The factors affecting income from fishing (PhPesos/day) as estimated by a backward stepwise generalized linear model.

Factor	df	F	p
Site	4	1.84	0.24
Time	1	3.86	0.05
Gear	2	11.45	<0.001
Site x Gear	10	5.83	<0.001

$r^2 = 0.415$

Overall model:

	SS	Df	Mean SS	F ratio	p
Model	5.85	17	0.34	7.19	<0.001
Error	8.24	172	0.05		

Table 5.6. Results from the Pearson correlation analysis between daily income from fishing (average PhPesos/day) by dominant gear within sites and protection-time (i.e. monthly sampling within the study period)

MPA site	Gear ¹	n ²	Pearson r ³	P	p adj ⁴
Alumar	Hook and Line	13	0.15	0.630	0.64
Asinan	Net	18	-0.26	0.300	0.46
Batasan	Hook and Line	12	-0.189	0.560	0.64
Batasan	Net	11	-0.66	0.030	0.04
Batasan	Spear	17	-0.57	0.020	0.04
Magtongtong	Hook and Line	23	0.22	0.320	0.46
Handumon	Net	15	-0.54	0.040	0.09
Lomboy	Net	18	0.12	0.640	0.64
Lomboy	Fish corral	17	0.69	0.002	0.02
Lapinig	Net	16	-0.32	0.240	0.46

¹ The gear used in this analysis was the most dominant during the study with the highest reported incidence of use within each site.

² n= sample size of log sheet reflecting the number of outings

³ Calculated by obtaining the strength of the relation between log-transformed average daily income from fishing per month and the time caught (i.e., month and year) within the study period (March 2003 to June 2005 for all sites except Balicasag where the period covered is March 2002 to May 2003).

⁴ Significant at $p \leq 0.05$

Figures

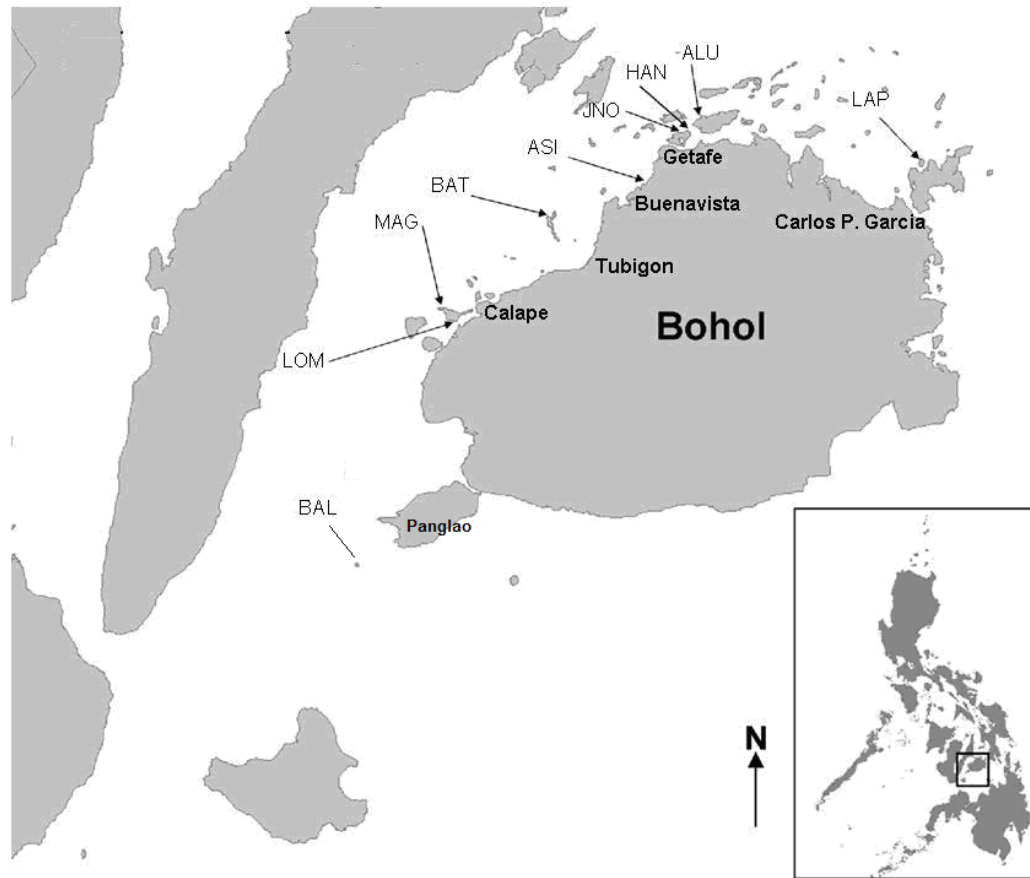
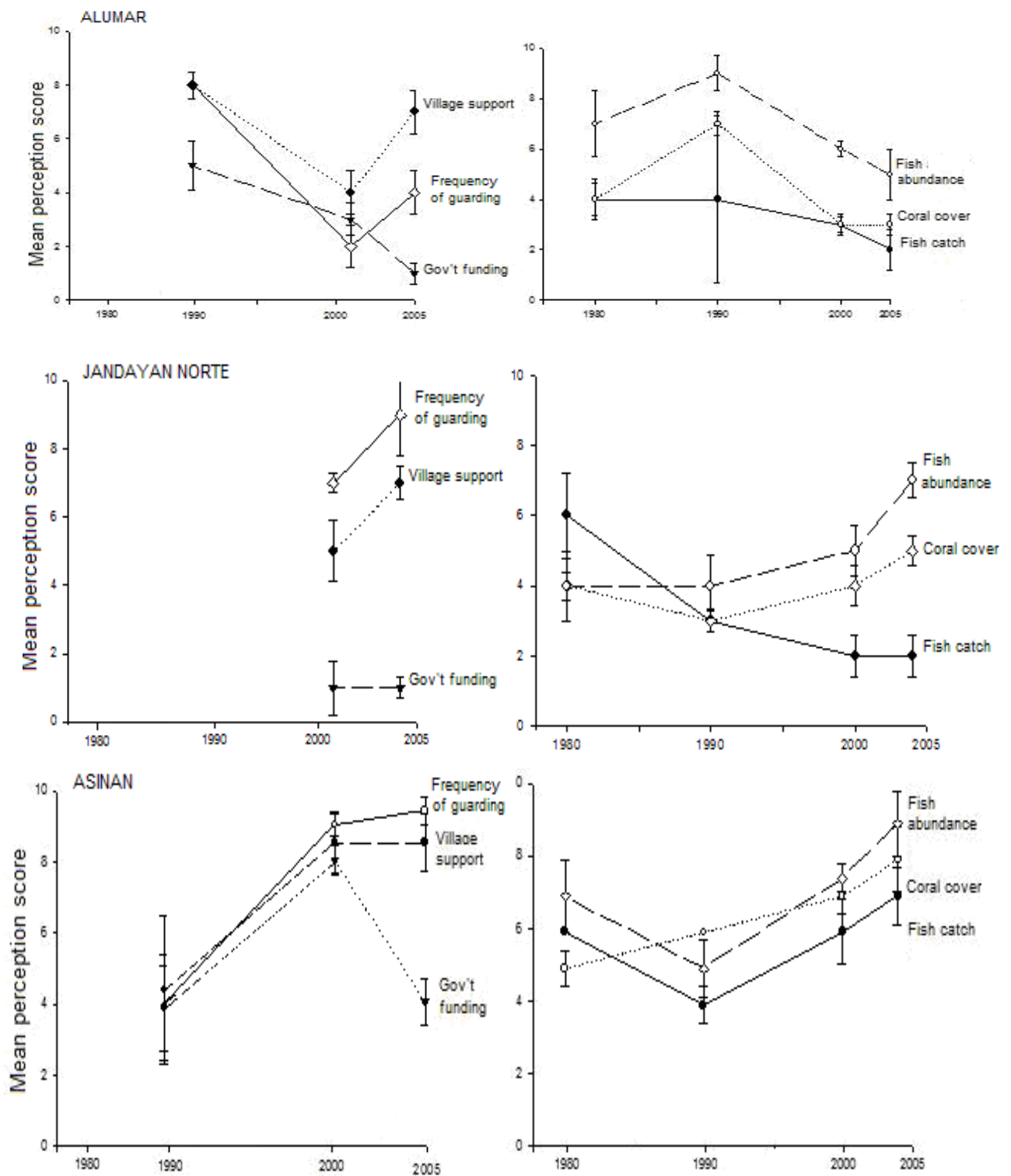
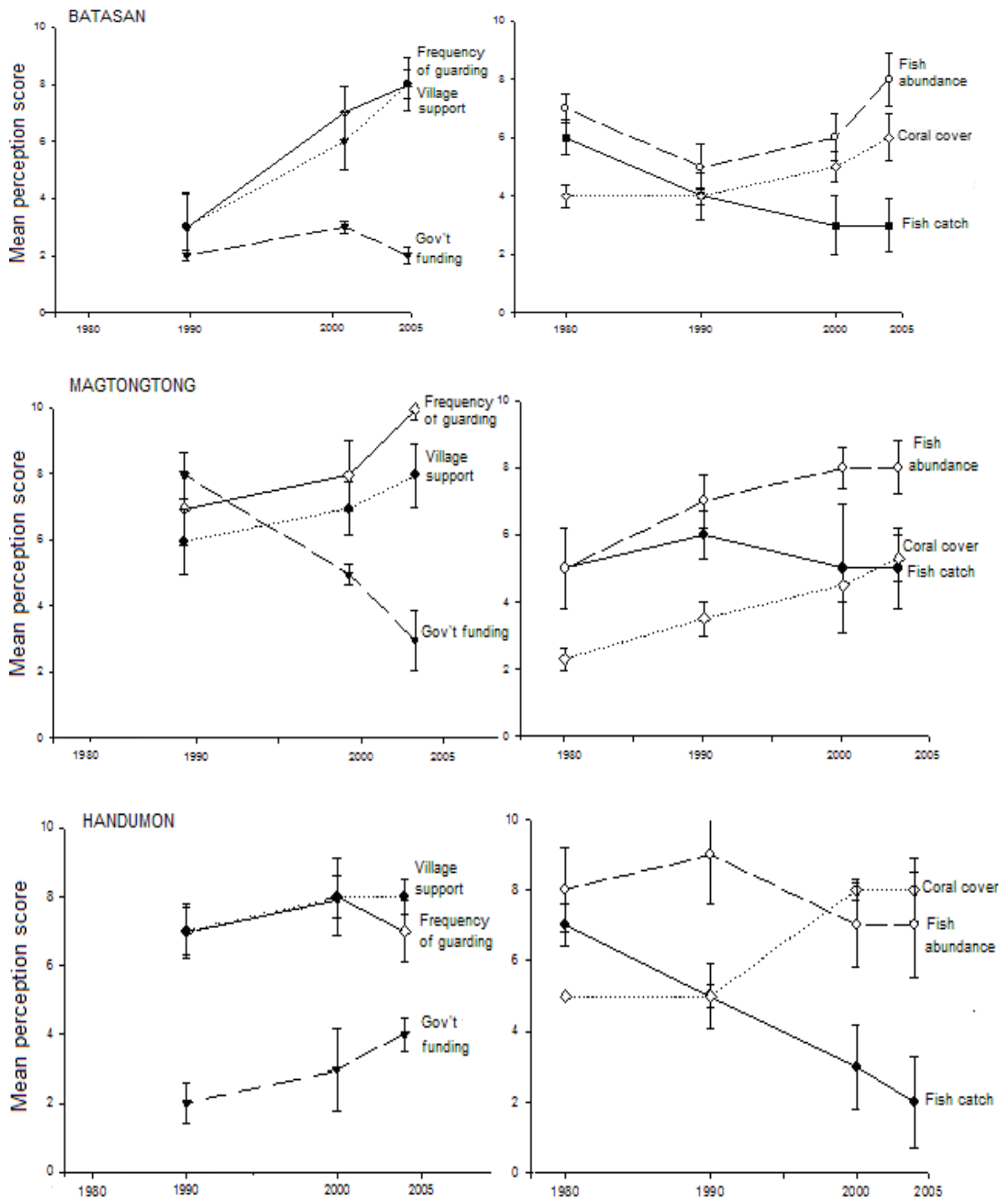


Figure 5.1. Location of eight MPA study sites in six municipalities in western Bohol, central Philippines, listed from northeast to southwest: LAP (Lapinig), ALU (Alumar), HAN (Handumon), JNO (Jandayan Norte), ASI (Asinan), BAT (Batasan), MAG (Magtongtong), LOM (Lomboy) and BAL (Balicasag).

5.2.1



5.2.2



5.2.3

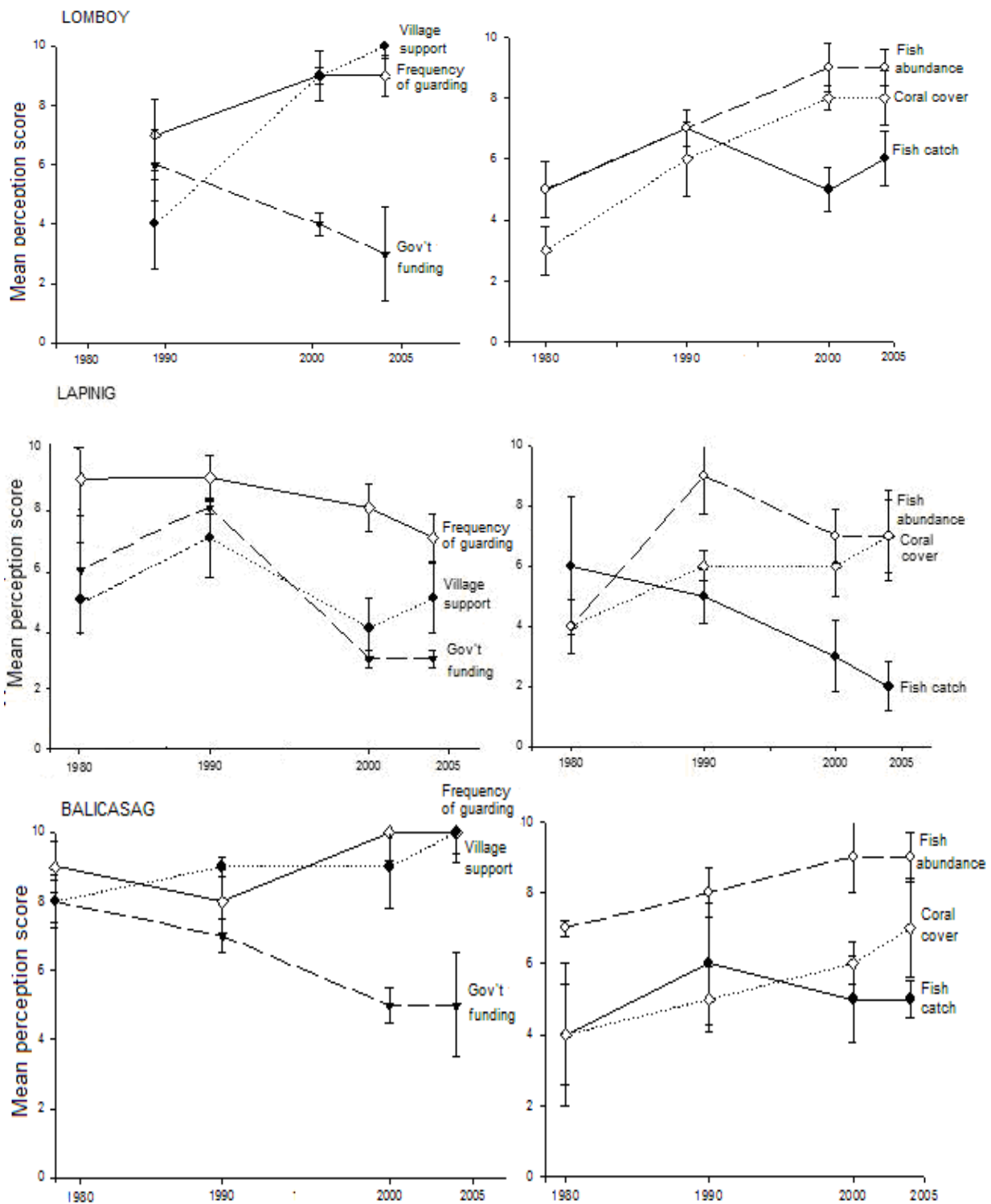


Figure 5.2. Mean score of responses (\pm SE) based on perception survey results in nine study sites for input and output indicators (shown on the left side) and outcome indicators (right side) of MPA effectiveness

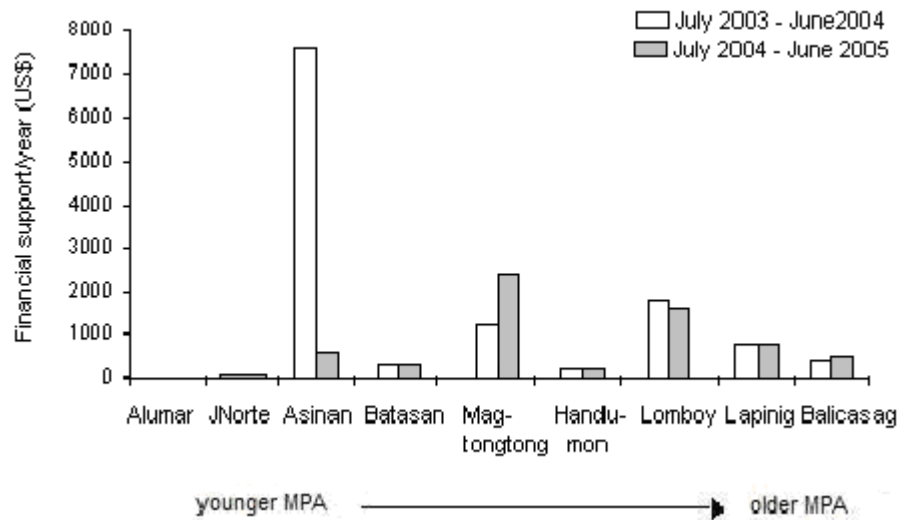


Figure 5.3. Total financial support received by the MPA study sites from the municipal local government.

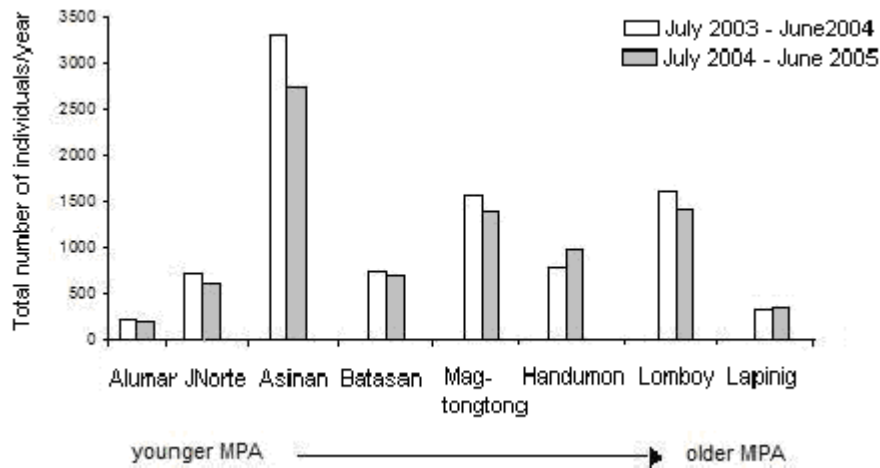


Figure 5.4. Total number of individuals participating in all annual MPA activities in the study sites, based on volunteer log sheets and on minutes of the regular monthly meetings of the grassroots organization.

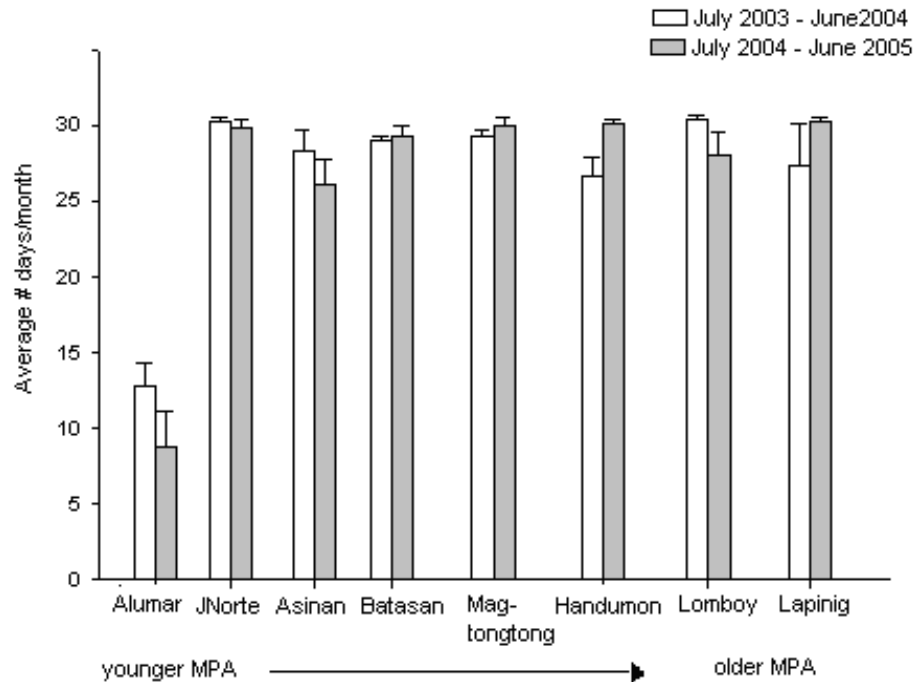


Figure 5.5. Mean number of days per month (\pm SE) the no-take MPAs were guarded, based on volunteer log sheets. The MPAs were recorded as guarded when one or more volunteer guards were posted at the MPA guardhouse or any other station from where the MPA could be observed.

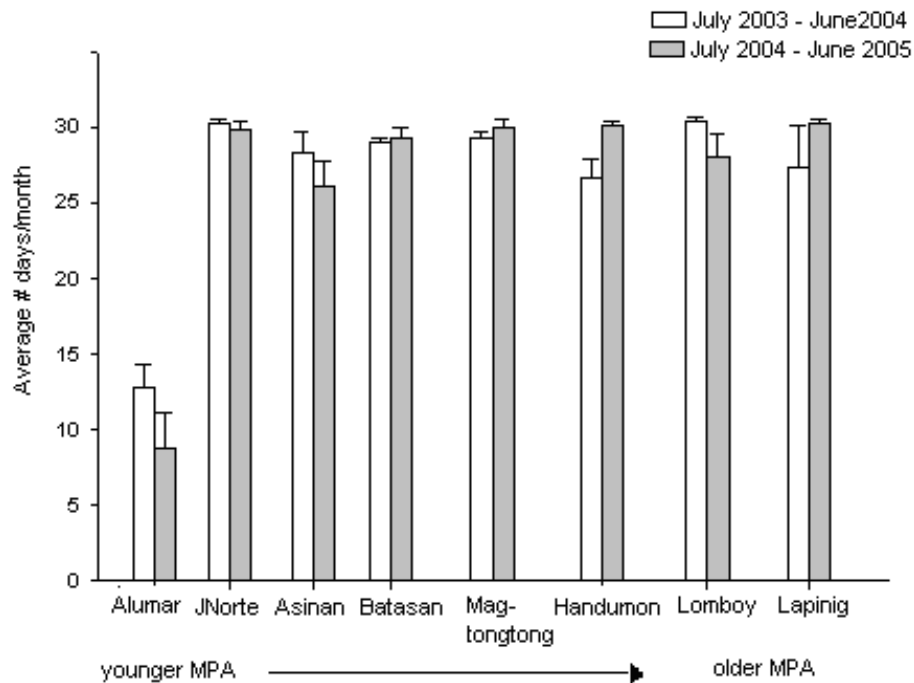


Figure 5.6. Total number of recorded violations inside the no-take MPAs per year, based on the volunteer log sheets.

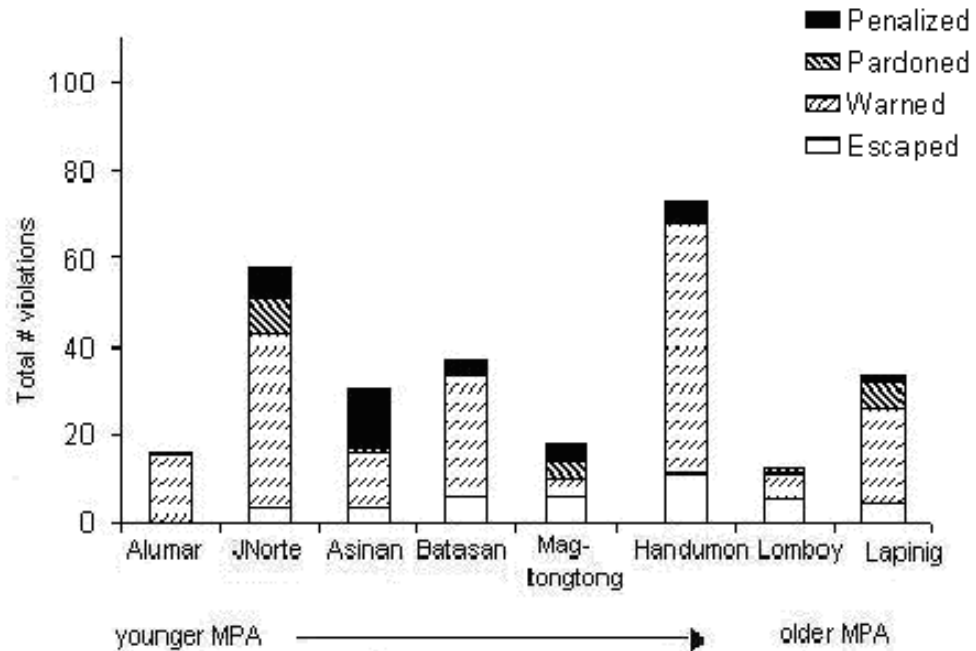


Figure 5.7. Total number of recorded violations inside the no-take MPAs and corresponding actions taken by villagers, based on volunteer log sheets.

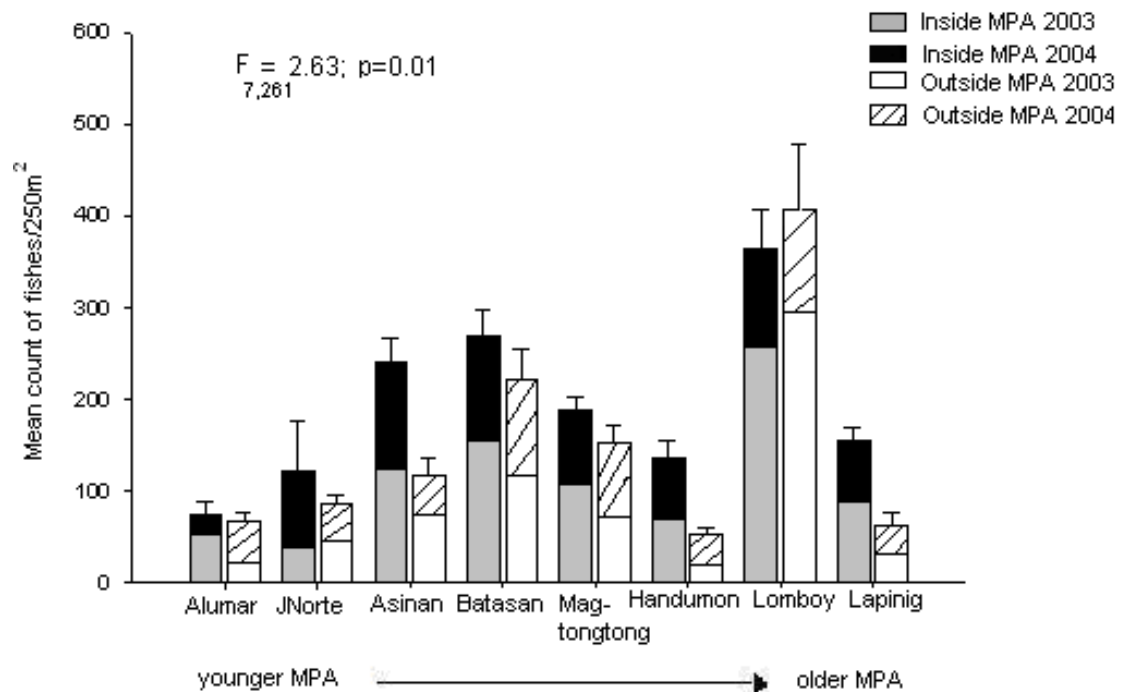


Figure 5.8. Mean count of fishes (\pm SE) inside and outside MPAs in 2003 and 2004.

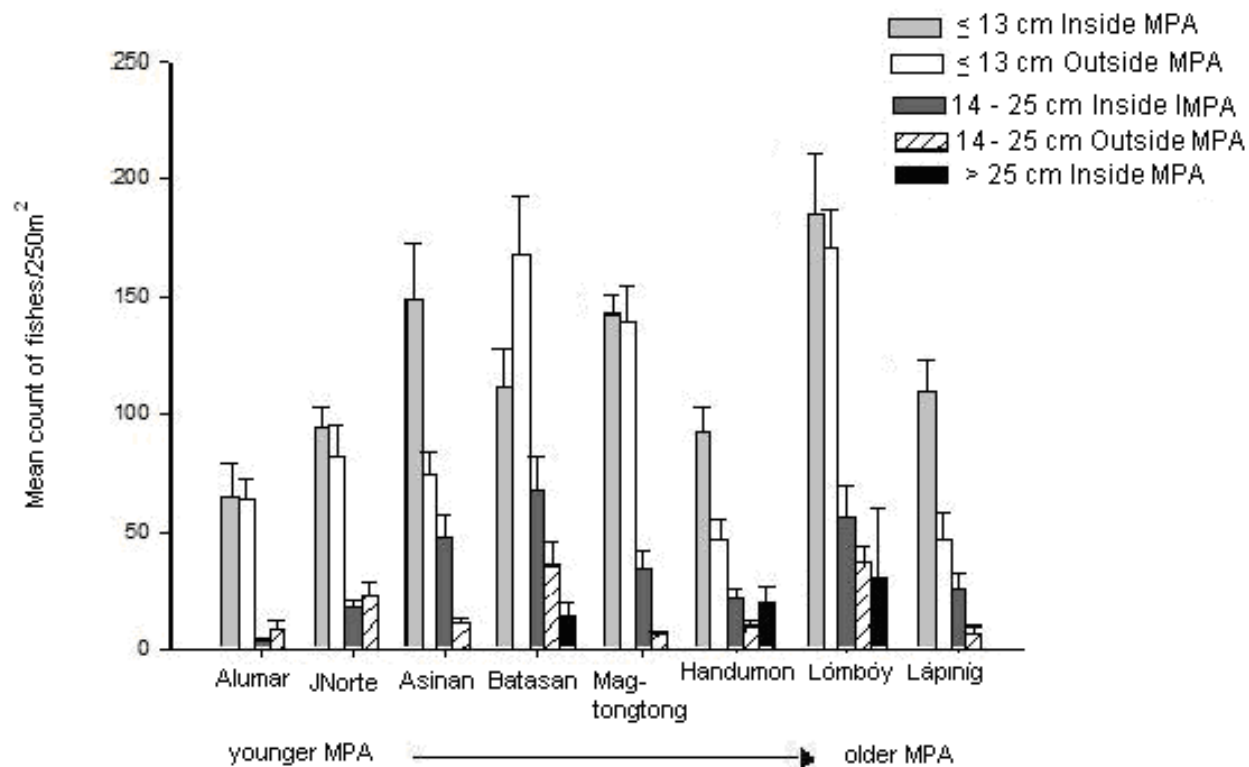


Figure 5.9. Mean count of fishes (\pm SE) inside and outside MPAs showing length categories.

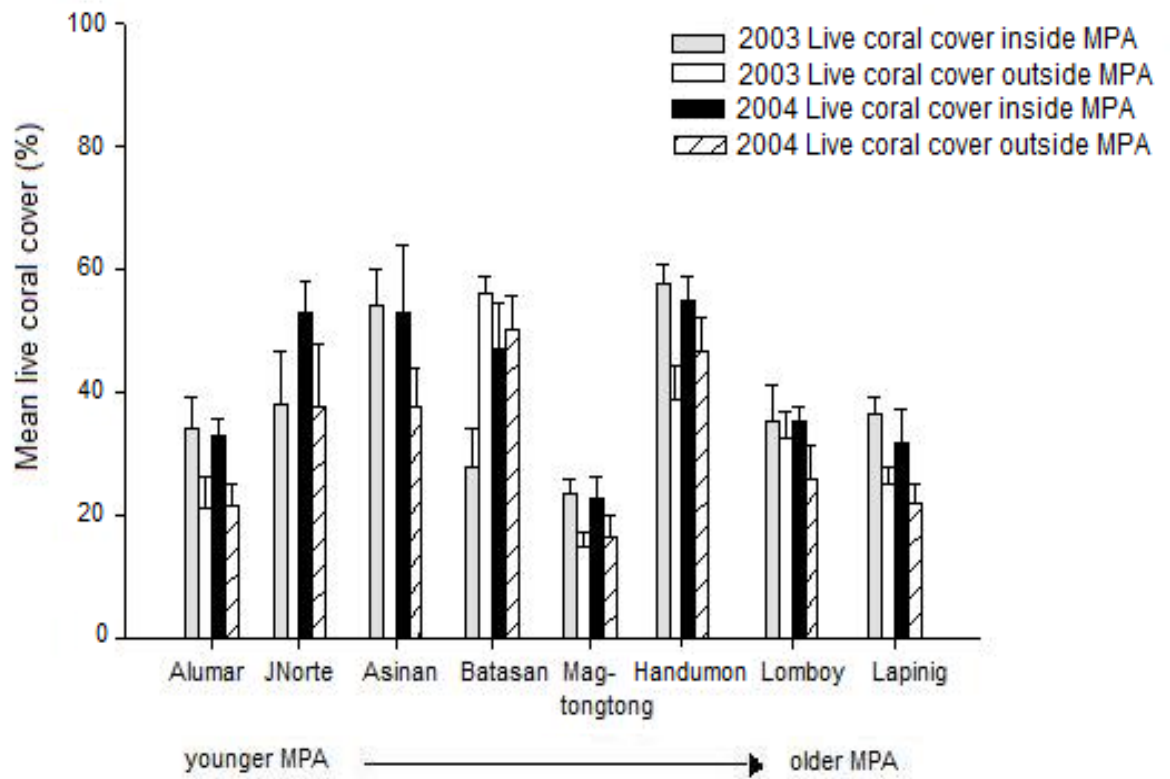


Figure 5.10. Mean percentage benthic live coral cover (\pm SE) in different MPA sites in 2003 and 2004.

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6. Applying community-based monitoring schemes for marine protected areas: implications for standardisation and sustainability¹

¹ A version of this chapter will be submitted for publication. Pajaro, M.G., M.E. Mulrennan and A.C.J. Vincent. Applying community-based monitoring schemes for marine protected areas: implications for standardisation and sustainability.

Introduction

Monitoring conservation interventions such as marine protected areas (MPA) is necessary to measure the response of ecological systems and hence the effectiveness of the action (Bosch et al. 1996). In the context of resource management, monitoring has become an obligation for the more than 190 national signatories to the Convention on Biological Diversity (Article 7.b) who committed to achieve quantifiable targets in reducing biodiversity loss by 2010. Academic institutions, as well as government and non-government agencies are expected to help fulfill this obligation by establishing protocols and standards for monitoring. But communities and user groups, despite constraints of limited financial and human resources, also have a role to play (Jamieson and Levings 2001).

Effective monitoring requires periodic and repetitive observations of appropriate parameters based on established standards. Standardization allows data to be gathered, described and stored in comparable and reliable terms and subsequently transferred from the local to public sphere (Zimmerman 2002). Through standards, different stakeholders can create shared meanings and understandings of phenomenon that facilitate communication, coordination, negotiation and conflict resolution (Fomin and Keil 2000). Standardization also supports feedback processes and in so doing promotes long-term sustainability within and among institutions (Fomin and Keil 2000) particularly when managing interventions that affect each other.

Current approaches to monitoring are limited in breadth and applicability. In natural resource management, the conventional approach to systematic monitoring is to

quantitatively record changes, such as changes in species abundance. More recently, social and economic parameters have been added to supplement ecological information and make planning and policy making more relevant to the broader management context (Bunce et al. 2000). This approach, also applied to MPAs, has tended to follow standards established by members of the scientific community, requiring advanced or professional expertise and long-term funding commitments. Often, the application of standardized methods requires special training and equipment so that the costs involved in staff employment, as well as the purchase and maintenance of field equipment and data analysis tools, can be exceedingly high (Joas 2001, Danielsen et al. 2005b). This presents a significant limitation to conventional long-term monitoring particularly for least developed countries (LDCs) located in the tropics. LDCs are characterized by overwhelming financial and technical constraints while also serving as sites for many of the world's biodiversity hotspots.

Participatory monitoring or community-based monitoring (CBM) is claimed to complement professional monitoring for less cost, while its focus on local management issues makes it more meaningful to local resource users (Danielsen et al. 2005a). CBM is recognized, at least potentially, as one of the best strategies to sustain long-term monitoring of natural resources (Abbot et al. 1998, Bunce et al. 2000, Pollock and Whitelaw 2005). Some simple cost-effective monitoring systems have been developed involving minimal inputs (*e.g.*, little formal education, very basic equipment and limited financial resources) to strengthen existing local systems for monitoring and managing natural resources (Danielsen et al. 2000, Guijt and Woodhill 2002).

The challenge of sustaining local engagement in monitoring needs to be addressed. Involving stakeholders in monitoring might, arguably, generate more support from the community, particularly if results show progress towards the achievement of management objectives. However, monitoring results may not provide immediate evidence of progress or success; indeed it can take years before tangible evidence of the positive impacts of management interventions are available (Watson and Novelty 2004). In some cases, perhaps for reasons of poor enforcement, the day-to-day functioning of the MPA may be so compromised that no significant positive impacts are realized. These situations inevitably affect a stakeholder's motivation to sustain participation and maintain standards in the implementation of monitoring schemes.

We propose the institutionalization of community-based MPA monitoring as an effective strategy to sustain local engagement in monitoring. This includes enacting policies that promote social mobilization in support of conservation governance (Steinberg 2005). For example, government legislation is needed to systematize participatory monitoring and channel funds to local communities to support the implementation of mandatory monitoring. The development of appropriate policies for sustained community-based monitoring requires a good understanding of the factors that influence ongoing participation. One study suggests that the motivation, skills and knowledge of participants (Cuthill 2000) are among the critical factors of sustained engagement. In contrast, collecting information of no apparent immediate relevance to communities can result in a loss of interest and participation over time (Abbot et al. 1998). However, motivation can

also result from policies that provide economic and non-economic incentives (Lambin 2005).

Our study examines the match between local community capacities and the sustained application of an effective monitoring scheme. Common sense suggests that local buy-in to monitoring activities rather than mere compliance, should mean that the community will be more committed and systematic in applying the scheme in a sustained long-term manner (Yarnell and Gayton 2003). Community support for monitoring can be obtained if the activity is compatible with local interests and priorities, key leaders are engaged, appropriate incentives are provided, and there is a local perception that useful and beneficial information is being gathered (Hartanto et al. 2002, Topp-Jørgensen et al. 2005). Conversely, failure to design monitoring systems that match the needs and capacities of communities can have serious consequences for CBM standardization and sustainability. Inappropriate monitoring schemes might, for example, result in data fragmentation (Pollock and Whitelaw 2005) and variability in recording data which would limit comparative analysis (Rijsoort and Jinfeng 2005).

Our study focuses on fully protected no-take MPAs, globally recognized as a primary remedial strategy to address rapid deterioration of marine resources (Lubchenco et al. 2003). MPAs have been shown to increase the density, biomass, average size and diversity of species inside no-take zones (Halpern and Warner 2002). In some (albeit limited) instances, they have also been found to enhance fisheries outside MPA boundaries through spill-over effects (McClanahan and Mangi 2000, Russ et al. 2004) or

to increase incomes (Gjertsen 2005). Because MPAs are increasingly community-driven (Guénette et al. 2000), it is essential to engage local people using a variety of approaches in sustained long-term monitoring efforts and for monitoring to address the ecological as well as socio-economic impact of MPAs. This initial investigation focuses on eight communities in the central Philippines where we developed a strategic approach to the facilitation of CBM. The central Philippines is a particularly good site for monitoring studies because a significant number (estimated to be over 100) of community-based MPAs has been established in the region over the past 20 years (Green et al. 2002).

Methods

Study sites & context

As described in detail elsewhere (see Chapters 3 and 4), we facilitated the development of indicators of the management effectiveness of no-take MPAs in eight communities in Bohol, central Philippines (Figure 6.1). Each of these communities manages its own MPA within a village or *barangay*, the smallest Philippine political unit. The institutions within a community - such as the village or *barangay* council (BC) and/or the grassroots organization (GRO) - take the lead in managing its MPA. The *barangay* council is the governing arm of the *barangay* composed ten members including eight elected officials (*i.e.* the captain, six councilors and a youth representative), an appointed secretary and a treasurer. The 1987 Constitution of the Philippines defines the GRO or people's organization as a *bona fide* association of residents with demonstrated capacity to promote the public interest and with identifiable leadership, membership and structure (Sec.15, Article XII).

The indicators were developed through interviews and focus group discussion (FGD) between March and May 2003 in the communities of Alumar, Asinan, Batasan, Handumon, Jandayan Norte, Lapinig, Lomboy and Magtongtong (Pajaro et al. in revision). The FGD also allowed the formulation of the monitoring schemes, where participants from the eight communities identified and monitored 8 to 10 indicators. After identifying these indicators, local volunteers responsible for monitoring each indicator were identified (see Chapter 4).

The most common indicators selected for monitoring across the eight study sites (Table 6.1) were: (1) total kg of fish caught, (2) income from fishing, (3) total kg of fish set aside for food (4) fish abundance inside the MPA zone, (5) fish size inside the MPA zone, (6) regularity of guarding inside the no-take MPA zone, (7) support of local government, i.e. amount of financial support and number of facilities provided, and (8) villagers' support, i.e. number of participants in MPA-related activities. Two additional indicators: (1) number of MPA management plans and activities implemented and (2) regularity of patrolling outside the MPA zone, were monitored in only 7 and 6 of the study sites, respectively. Other indicators that were identified but not commonly selected for monitoring by the majority of the communities included increase in coral cover, number of boats fishing at the edge of the MPA zone, distance of fishing ground, number of visitors and number of children completing education. These indicators were not considered in this study because time constraints prevented us from interviewing the volunteers who monitored these indicators.

The senior author, with the help of a local research assistant, examined the results of the proposed monitoring schemes for each indicator from each study site, noting the similarities and differences. After consulting individually with the local volunteers, we recommended a common log sheet for each indicator that would be completed regularly by the volunteers. The log sheets were presented to the identified volunteers from the eight communities for feedback, revised accordingly and finalized after a trial survey. Some indicators were recorded simultaneously on a log sheet, *e.g.*, (1) total volume of fish caught, income from fishing and volume of fish set aside for food were recorded in one log sheet and (2) fish abundance and the corresponding fish size were recorded together during the underwater surveys.

Local monitoring coordinators in each community were later recruited based on the BC and the GRO leaders' recommendations. The major tasks of these coordinators included meeting with each local volunteer on a weekly basis to ensure that log sheets were being completed properly and collating all the completed forms. They also reported any concerns related to the data collection to the village leader and researchers. The coordinators were also in charge of filing the monitoring log sheets, forwarding these data to the researchers and helping to summarize and present information for feedback to the community.

Evaluation of the indicators: local relevance

We evaluated the indicators being applied in each local monitoring scheme according to the following criteria (Margoluis et al. 1998): cost (time and money needed); reliability (errors that may exist in data collected while using the agreed method); transferability (more than one person can use the method); and appropriateness or socioeconomic fit (cultural suitability, *e.g.* does not disrupt livelihood or interpersonal relationships). The assessment was made using semi-structured interviews conducted between May and June 2004. We had hoped to interview all the volunteers in each community involved in monitoring any indicator but time constraints and availability of the respondents limited our tally. In the end, a total of 62 respondents (haphazardly selected) were interviewed (Table 6.2). Twelve of these 62 respondents were responsible for completing two different log sheets and were asked to evaluate separately the second indicator they volunteered to monitor. The respondents scored the indicator's cost, reliability, transferability, and socioeconomic fit according to their perceptions on a scale of 1 to 5, with 5 as the highest. In two cases, two or three indicators were evaluated as one variable because the same respondent applied the indicators using the same monitoring scheme and log sheets (see Table 6.1). In one case, these indicators included: kg fish caught, income from fishing and kg fish set aside for food monitored by the same volunteer fisher. In the second case, the indicators included fish abundance and fish size monitored by the same local volunteer at the same time.

A multidimensional scaling (MDS) plot was used to compare how each of the ten indicators scored across the eight communities. An ideal indicator, *i.e.* obtaining the best

score of 5 for all questions relating to cost, reliability, transferability and socio-economic fit was also created to determine how each indicator's scores compares with the ideal indicator.

Standardizing CBM data: comparing data collected by local and trained surveyors

To further evaluate the match between community capacity and the monitoring scheme being applied, we compared the data collected for the indicator 'fish abundance inside the no-take MPA zone' between local volunteer surveyors (LVS) and a trained surveyor (TS). The LVS were the community resident counterparts in monitoring fish abundance. They either volunteered themselves or were recommended by the leaders based on their swimming skills, ability to recognize and record fish underwater and past experience in conducting underwater fish surveys. The TS was the senior author's local research assistant who has over twenty years of experience as a full time spear fisher and collector of live ornamental fishes. The TS had participated in previous fish visual census surveys facilitated by a non-government organization (NGO) in 1999 and has conducted the fish surveys in all the study sites with the senior author since 2003 and therefore has more experience doing underwater surveys than the LVS.

Most of the LVS (n=15 of 19) had previous experience conducting underwater fish visual census through surveys facilitated by government or non-government institutions who implemented participatory monitoring programs between 1999 and 2002. Before the first transect survey with LVS, the researcher and the TS spent about one to two hours with the LVS to determine their skills and familiarity with the survey methods. Most of the

LVS (70%) were fishers and only two were uncomfortable wearing snorkelling gear and needed extra time to practice their swimming skills. Both TS and LVS agreed to use inches as the LVS appeared more familiar with this measurement than the metric measurement of length in cms.

With respect to the ten selected indicators (see Table 6.1), collecting data for changes in fish abundance and fish size using underwater fish visual survey appeared to require the most specialized set of skills. Skills required during the surveys were swimming, fish identification and length estimation, writing and recording. The fish size and length data were recorded while the surveyor maintained constant speed underwater. The monitoring scheme we implemented utilized fish visual census surveys adapted from widely used methods (English et al. 1997, Samoilys and Carlos 2000) on specific 50m transects (2 to 5 replicate transects per site per survey) conducted during the dry (between March to August) and wet (between September to February) seasons in six MPA sites (Asinan, Batasan, Handumon, Jandayan Norte, Lomboy and Magtongtong). Both the TS and LVS collected data separately on the same day or over two consecutive days depending upon the availability of the volunteers. The LVS set a target of surveying 5 replicate transects for their MPA but this was not always met due to weather constraints and due to some LVS not being available during certain monitoring periods. The LVS usually conducted the transect surveys ahead of the trained surveyor (TS). This was our usual protocol, intended to demonstrate respect for and commitment to the involvement of the host community by facilitating their inputs prior to collecting our own data. However, to

maximize time, the TS surveyed ahead of the LVS in some instances when the LVS (n=22 of 78 transect surveys) did not make an appearance at the agreed time.

The underwater monitoring protocol had the observer record the fish families (in common Visayan language), the corresponding counts and category lengths of all fishes found within 2.5 meters on each side of a 50-meter transect laid randomly (except for Asinan MPA where permanent transects had already been set up) in the MPAs. The survey for each 50-meter transect is completed within 20 minutes. During the first orientation session the researchers discussed with the LVS the advantage of recording only selected important fish families. However, many volunteers (n=7 of 19) preferred to record all fishes they can see and while some agreed to focus recording only selected species (n=4 from Jandayan Norte and Magtongtong), they recorded all that they saw anyway. For this study, we did not consider comparing the fish lengths because we did not consider this data to be reliable; for example, the length recorded for certain species was too long to be accurate. The same problem was encountered with volunteers conducting fish counts in Tasmania (Barrett et al. 2002). This problem is explored in the discussion section and some practical solutions to the size estimation method are proposed.

We compared the fish abundance data between TS and LVS for 2003 and 2004 (except for Jandayan Norte which covered only 2003). Two sites (Lomboy and Magtongtong) each completed four sets of surveys (two dry and two wet seasons) for 2003 and 2004 while Asinan, Batasan and Handumon completed three sets of surveys also for 2003 and

2004. The LVS from the two other study sites, Lapinig and Alumar, participated in only one orientation survey in 2003, doing only one transect, and were therefore not included in our analysis. For testing statistical significance of differences, we implemented the Mann-Whitney U test which detects differences between two populations (Conover 1980), *i.e.* between the TS and the LVS over time. Given the small sample size available, the non-parametric method was used.

Results

Evaluation of the indicators: local relevance

1. Cost

The MDS analysis indicated that the indicators of (i) income from fishing, (ii) volume of fish caught and (iii) fish set aside for food were the most cost effective to monitor, with proximity to the ideal score (Figure 6.2). The two most distant indicators from the ideal score were regular patrols and fish monitoring. The daily costs for patrols on a regular basis, for example required up to 3 liters of fuel (about PhP75 or US\$1.5) and snacks (culturally required) for two to ten volunteers patrolling 12 hours daily or nightly (PhP50 to 150 or US\$1 to 3) for a total of PhP125 to PhP225 or US\$2.50 to 3.50. Fish visual census surveys could take up to 1 liter of gasoline (PhP25 or US\$0.50) and at least 3 to 5 hours of a volunteer's time every 6 months. The indicator on regular guarding inside no-take MPAs was also perceived as time consuming, requiring a guard to be on watch at least 10 hours each night. In some sites volunteer guards on duty had daily (Lomboy) or weekly shifts (Asinan and Magtongtong) and in other sites an appointed guard might receive monthly honoraria between US\$10 to US\$40 (Batasan, Handumon and Jandayan

Norte). These three indicators also require substantial initial investments for equipment and facilities, *e.g.*, mask and snorkel for monitoring fish abundance and fish size, guardhouse for regular guarding and boats for regular patrol.

The other indicators being monitored were not as costly nor laborious (Figure 6.2) since only pens were needed to complete the log sheets (taking only 5 to 10 minutes daily or one hour monthly). For some indicators (*e.g.*, local government support, villagers' support, and implementation of MPA plans), the volunteer might need to spend an hour to locate and refer to data from other record keepers in the village.

2. Reliability

Our results show that the local volunteers perceive the data collected for MPA plans and activities implemented as closest to the ideal reliable indicator while fish abundance and fish size - with the greatest likelihood of errors - was the most distant from the ideal situation (Figure 6.3). For the former indicator, respondents mentioned there were none or few to record every month, such that the activities were easy to recall every month (n=3 respondents). In the case of the latter, lack of reliability apparently arose from inadequate equipment (n=2), limitation in swimming skills (n=3) and natural constraints that are beyond their control (*e.g.*, poor water visibility (n=5) or strong current (n=2)). For the other seven indicators, some volunteers admitted that reliability might have been affected by their failure to consistently log the required information daily. For example, some fishers contributing data on fish catch, volume of fish set aside for food, and incomes mentioned that they filled up the log sheets only on the day the appointed local

monitoring coordinator came to gather the monitoring data (n=3). Indeed, some monitoring coordinators (n=3 of 8) observed this both among fisher volunteers and also among volunteers assigned to regularly collect data on support from local government and villagers.

Despite vagaries in documentation, some volunteers showed astuteness in either accessing an existing system or developing a novel system to keep a consistent record of their data. For example, in two communities (Asinan and Lomboy), where guarding was designated according to teams on a rotational basis, a recording system had already been institutionalized through the BC or the GRO's initiative. A daily or nightly logbook was provided for guards on duty to log their scheduled presence at the guardhouse, including the time they started and ended their duties and the activities that took place. These records were usually inspected by the GRO president or the village chief who would call the attention of teams if they were unable to perform their duties as initially agreed. For the fish catch and income data provided by the volunteer fish buyers, a record keeping system already existed where they documented (either in a notebook or on some loose paper such as the cigarette cartons) the fish traded for the day with the corresponding transaction per fish supplier, amount paid to them and the volume sold. These fish buyers' records were given to the local monitoring coordinator to be transferred onto the log sheets. In the case of one fisher, we noted that he recorded the volume of his catch beside the date on a poster calendar before transferring this to the log sheet or sometimes just showed this to the local monitoring coordinator to be copied.

3. Transferability

Little apparent transferability was observed for indicators, according to the MDS analysis (Figure 6.4). Volunteers expressed a range of different impressions that limit or facilitate the ease of finding substitute people to perform and replicate the task of collecting information. Generally, these impressions were associated with relationships and personal commitment rather than skills. One limiting concern was that volunteers sometimes needed access to records which might only be readily available through the village chief or secretary. Other concerns were that some indicators (*e.g.*, regular guarding inside no-take MPAs, regular patrol outside no-take MPAs and fish abundance and size) required intense time commitments (*i.e.* from 2 hours to as much as 12 hours daily or nightly) which they believe very few will find acceptable. For some indicators (volume of fish catch, income from fishing and volume of fish set aside for food), volunteers generally felt that their immediate family members (wife, children) can substitute for them and would be capable of monitoring these indicators if necessary. In fact, some fishers (n=4) mentioned that their wives or daughters had filled their daily log sheets for them.

Respondents referred to logistic constraints as factors affecting transferability. Some local volunteers mentioned they had ready access to snorkelling gear acquired by the GRO or *barangay* council that enabled them to conduct fish visual census surveys. However, in other sites (n=3), the volunteers used their own personal equipment (mask, snorkel, fins and watches) – often also important for their livelihoods – and were hence unable or unwilling to lend the gear to a substitute volunteer. Permission to operate patrol boats was also dependent on authorisation by the BC or GRO. With respect to regular

guarding, respondents believed that substitutes would not readily accept the responsibility, particularly when the designated guard was known to receive an honorarium for such work.

4. Socio-economic fit

Indicators related to regular or routine enforcement (guarding inside MPAs and patrolling outside MPAs) were perceived as the most challenging in terms of the social and economic circumstances of the communities (Figure 6.5). Among the challenges cited by volunteers was potential conflict with local violators as well as with those from neighbouring communities. Two respondents mentioned experiences where interpersonal relationships had been compromised when a neighbour or a relative was apprehended. The long hours involved in regular enforcement were also perceived to interfere with schedules linked to livelihood, family commitments and village gatherings.

Volunteers who were officers of either the village council or the GROs had particular concerns with regard to socio-economic fit. Officers were expected to perform their official and traditional functions such as attending emergency meetings set by the municipal or provincial office. These functions usually took precedence over regular schedules for monitoring. Respondents also noted that they could be called to attend other unscheduled community events (*e.g.*, funerals) that interfered with their MPA monitoring tasks.

Comparing data collected by local and trained surveyors

Results of the Mann Whitney U test analysis suggest that lack of experience may lead to significant variations ($p < 0.05$) between the fish abundance estimates made by the trained surveyor (TS) and local volunteer surveyors (LVS). This was observed in four (Batasan, Handumon, Jandayan Norte and Magtongtong) of the six sites during the initial survey in 2003 (Table 6.3). Of these four sites, one site (Handumon) had a history of underwater fish monitoring and showed a lower significant difference (TS versus LTS) compared to the other sites. In one of the six sites (Lomboy) where the LVS had the previous experience of regularly conducting underwater fish surveys (from 1998 to 2003), no significant differences were observed. Similarly in another site (Asinan), where the LVS regularly conducted underwater fish surveys since 2002, we found no significant differences with the TS estimates until the last survey in 2004, when there was a change in the LVS conducting the survey.

The LVS generally estimated lower fish abundance than the TS in all sites except for Handumon for all years and seasons and in Lomboy for the first two seasons (Figure 6.6). In Handumon, the volunteers were all spearfishers, and tended to record even the invertebrates (cuttlefish, crabs) which they harvested and traded commercially. In Lomboy, during the first two seasons there were two fishers surveying one transect, one recording the right and the other the left. This was not the case during the last two surveys when the volunteers became fewer. Despite the differences in the total count estimates between the LVS and TS, the season to season trends appeared comparable (Figure 6.6). Increasing fish abundance across season was observed by both LVS and TS

for Asinan, Batasan and Magtongtong. Similarly, both observer groups noted decreasing estimates in Handumon and Jandayan Norte and a fluctuating trend in the Lomboy MPA. Visibility may have played a factor in the estimates particularly for Handumon and Jandayan Norte where fish abundance estimates tended to be increasing over time in these sites (Anticamara 2009). We also noted that at least two LVS had estimated their observations for larger sized fish (> 12 inches or 30 cm) in kilograms despite a previous agreement to conduct the measurements in inches.

Discussion

This study has demonstrated that the match between the application of the monitoring schemes for community-based MPAs (CBMPAs) and the community's skills and resources can potentially influence standardization and sustainability. Our findings suggest that indicators related to economic and social parameters (*e.g.*, fish catch, fish income, food set aside for fishing and implementation of MPA plans) are more appropriately matched to community capacity than indicators associated with ecology and enforcement (*e.g.*, fish abundance, fish size, regular guarding and patrols). Even if appropriate equipment and facilities could be provided, the sustained monitoring of ecological indicators demanded unavailable time and skills, while tracking enforcement indicators created financial and social challenges. The latter was particularly challenging because kinship values made it difficult to apprehend close relatives. For other indicators, however, kinship ties could help volunteers to access important records (*e.g.*, villager's and government's support and implementation of MPA plans). In addition, family members were often tapped to help complete log sheets related to monitoring activities.

Despite the abovementioned challenges associated with monitoring the ecological indicators, standardization of CBM data for MPAs may still be achievable. We found that although the LVS differed in their observations when compared with the TS on an individual survey basis, the two sets of monitoring obtained comparable trends over time. This is similar to a previous documented experience of community monitoring where the high variance in data between LVS and TS was attributed to the surveyor's level of skills and high turnover rate (Uychiaoco et al. 2005). Volunteers have different levels of skills in swimming, fish identification and ability to write with speed while underwater. It appears that keeping the same person to do the survey on a long-term basis may be a useful investment for tracking changes over time. Should a high turnover rate be impossible to overcome, the systematic evaluation of fish abundance may require particular attention through documentation of changes in the abilities of local volunteers to monitor this indicator. We also noted that no women participated in the underwater fish monitoring even though their skills in documentation have been recognized (see Chapter 4).

Standardization may be viewed as a social negotiation and sense-making process (Fomin and Keil 2000). This means that monitoring schemes can be designed for comparability among communities. However, it may take some years before newly introduced schemes become accepted and established within the community's culture. This can be complicated by community volunteers possibly abandoning the monitoring scheme when they obtain results that show inconsistent or negative trends over short time periods as

demonstrated by experience (see Chapter 5). To catalyze this process of standardization, other supplemental community-based approaches such as conducting consultation and feedback sessions within communities and across stakeholders from neighboring communities can be applied. In our study, different communities initially identified common indicators and agreed on similar, if not the same monitoring schemes. We found that different communities on the same island were able to come to agreement on the monitoring scheme through joint FGD sessions on indicator development and through feedback sessions on the monitoring results. The feedback sessions can provide the venue for clarifying any negative trends and reflecting on the probable causes so that appropriate actions can be undertaken.

Monitoring schemes already established and accepted within a particular community can be reinforced if they are working well or perhaps slightly adjusted to improve them in preference to requiring that they rigidly comply with a standardized scheme. In this study, after consideration of all inputs from the communities during the FGDs, the researchers helped volunteers from different communities come to consensus on standardized data collection by recommending the use of the same recording sheets or log sheets. This did not mean eliminating schemes that the volunteers were more familiar and comfortable with, such as using their own notebooks (for volunteers doing patrols) or the usual cigarette cartons (for fish buyer volunteers). Rather, the standard log sheets clarified the additional information that may have to be included (for example, any violations observed, apprehensions made or reasons for non apprehension for those doing the patrols and for fish buyers, the gear used by the fisher). The available information was

then transferred to the standard log sheets which made their data more accessible, *i.e.* easier to encode and compare with other sites.

Having a standard database made it easier to summarize and present the results from each *barangay* and more importantly, it facilitated a synthesis of results from different *barangays* which was beneficial to municipal or provincial government officials and programs. With a standard database, the results can be consolidated and used for policy advocacy or to obtain support from the government or other funding institutions. For example, simultaneous presentations from the community volunteers of three villages sites (Alumar, Handumon and Jandayan Norte) within the same municipality, succeeded in convincing the municipal executive officers of the value of well-enforced MPAs (Handumon and Jandayan Norte) compared to an unenforced MPA (Alumar) which resulted in low fish abundance. Alumar's request for a patrol boat was subsequently recognized by the mayor.

In support of local sustainability in the monitoring of CBMPAs, schemes that are context-specific, iterative and adaptive may be necessary (Pollock and Whitelaw 2005). In our study, the CBMPA monitoring schemes applied by the community was refined locally, which can indicate the participants' desire to conduct monitoring in the long-term. Refinements were made during the FGD sessions conducted among volunteers to encourage feedback and adaptation based on local experiences in monitoring and as part of the process of standardizing the monitoring schemes. Among the refinements made for example by some volunteers in Jandayan Norte and Handumon were setting schedules to

coincide with the half moon phase. The volunteers noted that visibility was better at these times because of the single small high and low tides. This is consistent with observations made by researchers conducting similar underwater surveys in Hong Kong (Parry 1999). Volunteers also replaced size estimates of length (inches) in larger fish with biomass (kg), as they are more familiar to fisher volunteers. These monitoring adaptations appear realistic, were ecologically relevant, integrated community expertise and emphasised the advantage of an ongoing exchange between local volunteers and external researchers. Such refinements, however, need to be documented and lessons shared with other communities as they may also be useful to them. Ideally, regular discussion sessions between different communities applying the same monitoring scheme should be conducted. This should allow volunteers to become more motivated in pursuing standardisation and sustain their monitoring towards a common goal and action particularly if they belong to the same local government unit. In our study, the motivation to standardise and sustain monitoring became apparent when some communities decided to present their results to the municipal local government (MLG) as part of an initiative to obtain more support for their CBMPA.

Maintaining the interest and commitment of volunteers through time remains a major challenge in participatory monitoring (Barrett et al. 2002, Uychiaoco et al. 2005).

Limitations within the capacity of a particular community can lead to barriers that need to be considered in the standardization and sustaining of monitoring by LVS as demonstrated by our study. These include 1) inconsistency in data collection as volunteers are replaced, 2) data fragmentation due to absence of alternate volunteers, 3)

lack of economic incentives and social issues, 4) inaccuracies in data collection (*e.g.*, length estimates) and 5) improper data management including analysis and archiving. These barriers may best be overcome through institutionalization of the community-based MPA monitoring system.

Institutionalization can be achieved through legislations enacted by the local government council where the *barangays* would be required to monitor their MPAs and report the results. The MPA monitoring statute should provide for the financial and technical resource needs of MPA monitoring that would be implemented by community-based institutions. These institutions (*barangay* council and the GRO) must in turn include MPA monitoring as part of their regular activity in their annual program plans. This may help address kinship-related problems with MPA enforcement monitoring as local people begin to accept the duties and responsibilities of enforcers. This institutionalization of MPA monitoring has partly happened in five of the eight study sites where the municipal or *barangay* council legislated laws that sustained MPA enforcement by allocating a monthly budget as financial incentives to volunteer guards and for fuel to watch over their MPAs nightly. These policy-driven incentives may have motivated the volunteers to systematically monitor and record information on the number of nights the MPA was guarded, as well as the violations and apprehensions obtained during their duties

Existing international agreements and national legislations offer opportunities for local policymakers to expand the current MPA enforcement policy incentives to encompass other parameters such as ecological and socio-economic considerations. A primary goal

should be to include monitoring in the annual proposed budgets of the community and access the funding regularly. The budget can be appropriated from the internal revenue allotment (IRA) of the local government to the *barangays* which under the law provides for no less than 20% of the annual IRA for development projects (Section 287, Republic Act 7160). Policymakers have then to lobby that MPA management be made a priority development project of the local government.

Conclusion and recommendations

Parties to the Convention on Biological Diversity are now obligated to develop and adopt appropriate methods, standards, criteria and indicators for evaluating MPAs; these must be suitable to local conditions for application to each Party's protected areas by 2010 (CBD CoP7 Goals 4.1.1 and 4.2.2). Our study demonstrates that, with some exceptions, the indicators monitored were generally suited to local conditions in terms of cost, reliability, transferability and socio-economic fit. In the application of monitoring schemes, the socio-economic and enforcement indicators were appropriately matched to the capacities and skills of local volunteers. The monitoring of ecological indicators proved to be most challenging. Kinship ties, high turnover rates and a lack of incentives among volunteers were identified as the key limitations to standardized and sustained monitoring.

While local volunteers demonstrated their motivation and ability to monitor the effectiveness of their MPAs over the two-year period of our study, their sustained participation cannot be guaranteed over the long term. This study suggests that

institutionalization of MPA monitoring at the local level through legislative acts that favor grassroots organizations can bridge the gap in localizing a global commitment to monitoring among community-based MPAs. In this regard, the formulation and implementation of policies that support and enhance the capacity of local communities to monitor their MPAs using standardized schemes over the long-term needs to be advocated.

Some recommendations that arise from our study regarding the standardization and sustaining of MPA monitoring include:

- 1) Foster partnerships within the community and among neighbouring communities and with external institutions to advance MPA monitoring policies, to promote the exchange of experience and knowledge, and to build local skills. Partnerships can facilitate communities belonging to the same jurisdiction to adopt a common long-term monitoring scheme as they collectively seek support for their MPAs.
- 2) Identify roles for a variety of sectors within the community with recognized skills useful to monitoring. Women, for example, have recognized documentation skills and may also help to address the high turnover rates of volunteers, currently dominated by males.
- 3) Seek guidance from technical experts to work with communities whose facilitation during the initial stages of design, data collection, analysis and interpretation of the results is crucial. One niche for external facilitators from non-government organizations to develop may be a skills upgrading program for GROs that enhances the skill level of their members who can become trainers, data managers (including archiving) and

effective communicators of results. The program should also include popular approaches to translate the monitoring results into meaningful information that can generate support and be accessible for appropriate planning and policymaking decisions.

4) Explore the progressive and strategic scaling up of the MPA monitoring efforts from village to island-wide to municipal-wide and up to larger ecological units that will build upon the abilities, experience and resources of members of different MPAs through institutional network mechanisms. This would have the advantage of also creating and expanding ecological and social networks of MPAs but will require external expert facilitation.

Tables

Table 6.1. Monitoring scheme of communities for selected indicators of MPA management effectiveness.

Indicator	Code	Monitoring scheme	Sites
Kilogram of fish caught	FCatbuyer FCatIncFood ¹	Volunteer fishers and buyers fill in log sheets reflecting total fish in kilograms caught daily per fisher per fishing trip per gear	All 8 sites
Income from fishing	FCatIncFood	Volunteer fishers fill in log sheets showing the total sales (gross) in pesos after a fishing trip	All 8 sites
Kilogram of fish caught that was set aside for food	FCatIncFood	Volunteer fishers fill in log sheets showing the total fish in kilograms set aside for food (not sold) after a fishing trip	All 8 sites
Fish abundance inside the no-take MPA zone	FABSz ²	Volunteers conduct underwater fish visual census surveys inside the MPA zone in shallow waters at least twice every year whenever possible.	All 8 sites
Fish size inside the no-take MPA zone	FABSz	Volunteers measure the individual lengths of the fishes during the underwater fish visual census surveys inside the MPA zone	All 8 sites
Regularity of guarding inside the no-take MPA zone	RGua	Volunteer fish warden fill in daily or nightly log sheets showing guarding duties inside no-take MPA zone. The fish wardens also note down any other observations, apprehensions made while on duty.	All 8 sites
Local government's support, i.e. financial and facilities	GSup	Volunteer village officers fill in a monthly log sheet showing how much financial support and any other donated facilities or material goods from the government have been received for a particular month	All 8 sites
Villagers' support, i.e. participation in MPA-related activities	VSup	Volunteer village officers fill in a monthly log sheet noting down the number of villagers participating in any MPA-related activity held during a particular month.	All 8 sites
Number of MPA management plans/activities implemented.	MPlan	Volunteer village officers fill in a quarterly log sheet noting down the plans (usually short-term) made for the quarter and how many of those plans were implemented.	7 sites
Regularity of patrolling outside the no-take MPA zone	RPat	Volunteer fish wardens fill in daily or nightly log sheets showing patrolling duties outside MPA zone. The fish wardens also note down any other observations, apprehensions made while on duty.	6 sites

¹Fishers provided data on kg fish caught, income and kg fish set aside for food simultaneously, therefore they were analysed and the codes combined as one.

²Fish abundance and fish size were monitored simultaneously, therefore the code is the same and they are analysed as one.

Table 6.2. Number of respondents who are involved in monitoring MPA indicators identified by community participants.

Indicators	Total number of volunteers involved	Number of respondents	Number of respondents evaluating two indicators separately
Volume of fish caught and set aside for fishing, income from fishing	125	23	2
Volume of fish sold to buyers	12	4	0
Fish abundance and fish sizes inside MPA zone	19	8	
Regularity of guarding inside the no-take MPA zone;	45	9	1
Regularity of patrolling outside the no-take MPA zone	38	6	1
Local government's support	8	5	2
Villagers' support	8	4	3
Number of MPA management plans/ activities implemented.	7	3	2
Total	262	62	12

Table 6.3. Mann Whitney U test results between trained observer and local volunteers for fish abundance estimates identified per transect during fish visual censuses conducted in 2003 to 2004 in different MPA sites.

SITE	Fish Visual Census Surveys							
	2003 dry		2003 wet		2004 dry		2004 wet	
	U test	p	U test	p	U test	p	U test	p
Asinan	150	NS ¹	459	NS	—	—	2615	0.000*
Batasan	— ²	—	2316	0.000*	761.0	NS	1478	NS
Handumon	1526	0.024*	2512	NS	3529.0	NS	—	—
Jandayan Norte	2720	0.000*	1246	NS	—	—	—	—
Lomboy	1132	NS	3758	NS	1091.0	NS	427	NS
Magtongtong	1271	0.000*	2410	0.000*	1.5	NS	1176	NS

*p=<0.05

¹ NS = not significant

² —=No data

Figures

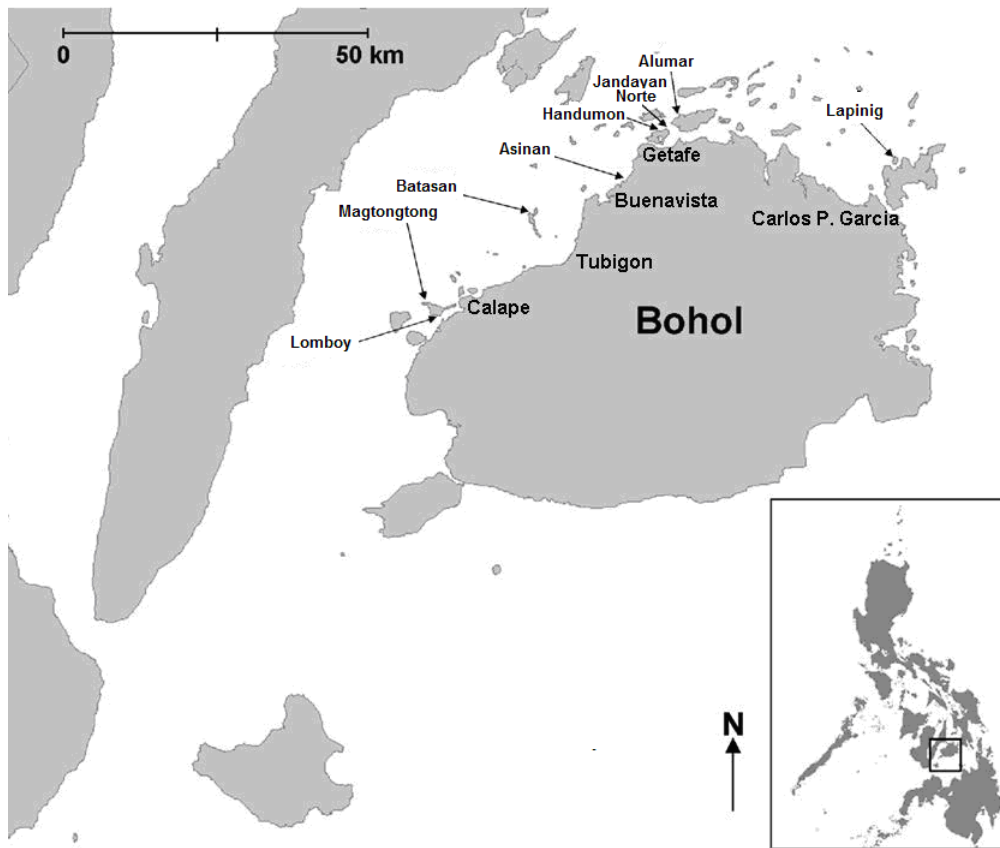


Figure 6.1. Location of the eight study sites in five municipalities in western Bohol, central Philippines.

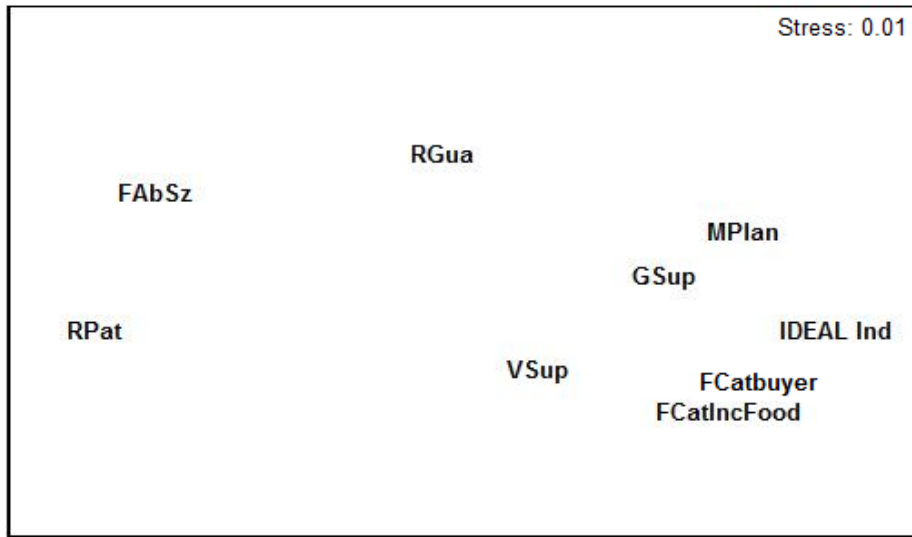


Figure 6.2. Multidimensional scaling plot of cost related to the MPA indicators as perceived by community volunteers: volume of fish caught by fishers, income from fishers and volume of fish set aside for food (FCatIncFood); volume of fish caught and bought by buyers from fishers (FCatbuyer), fish abundance and size inside the no-take MPA zone (FAbSz), regularity of guarding inside MPA (RGua), regularity of patrol outside MPA (RPat), local government support (GSup), villager's support (VSup), and number of MPA management plans implemented (MPlan).

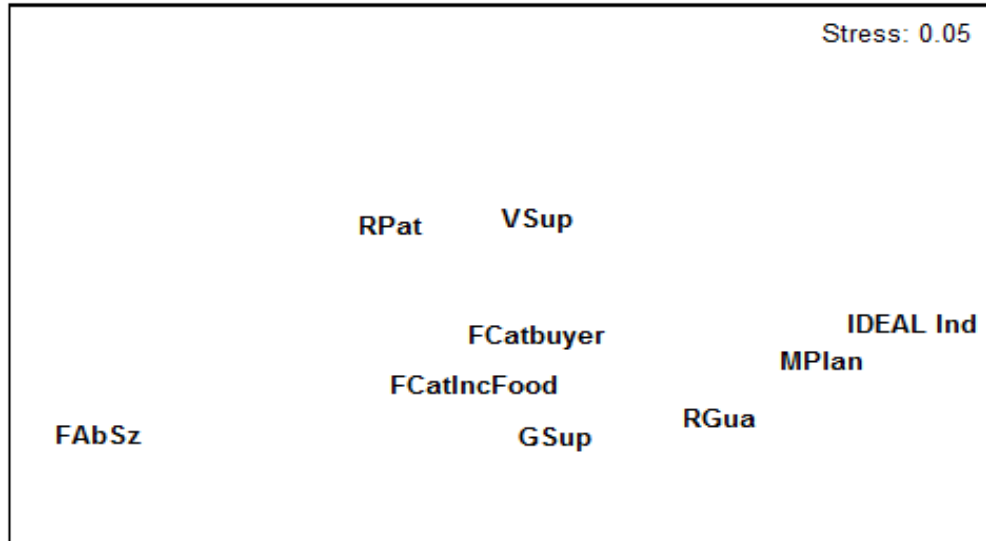


Figure 6.3. Multidimensional scaling plot of the reliability of the MPA indicators as perceived by community volunteers: volume of fish caught by fishers, income from fishers and volume of fish set aside for food (FCatIncFood), volume of fish caught and bought by buyers from fishers (FCatbuyer), fish abundance and size inside the no-take MPA zone (FAbSz), regularity of guarding inside MPA (RGua), regularity of patrol outside MPA (RPat), local government support (GSup), villager's support (VSup), and number of MPA management plans implemented (MPlan).

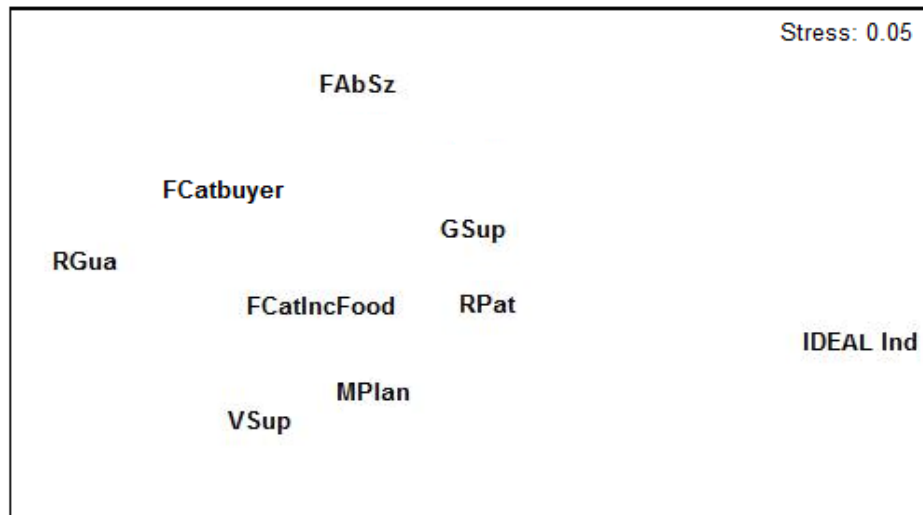


Figure 6.4. Multidimensional scaling plot of transferability of the MPA indicators as perceived by community volunteers: volume of fish caught by fishers, income from fishers and volume of fish set aside for food (FCatIncFood), volume of fish caught and bought by buyers from fishers (FCatbuyer), fish abundance and size inside the no-take MPA zone (FABsz), regularity of guarding inside MPA (RGua), regularity of patrol outside MPA (RPat), local government support (GSup), villager's support (VSup), and number of MPA management plans implemented (MPlan).

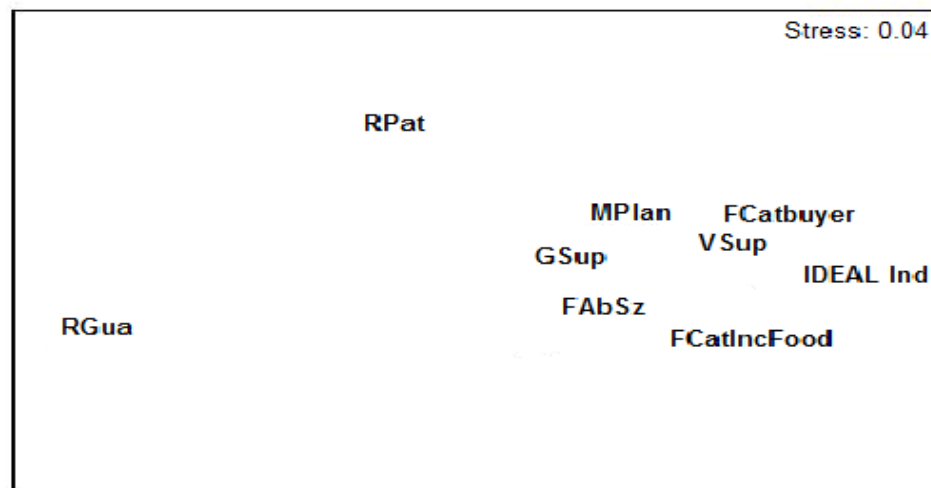


Figure 6.5. Multidimensional scaling plot of the socio-economic fit of MPA indicators as perceived by community volunteers: volume of fish caught by fishers, income from fishers and volume of fish set aside for food (FCatIncFood), volume of fish caught and bought by buyers from fishers (FCatbuyer), fish abundance and size inside the no-take MPA zone (FABsz), regularity of guarding inside MPA (RGua), regularity of patrol outside MPA (RPat), local government support (GSup), villager's support (VSup), and number of MPA management plans implemented (MPlan).

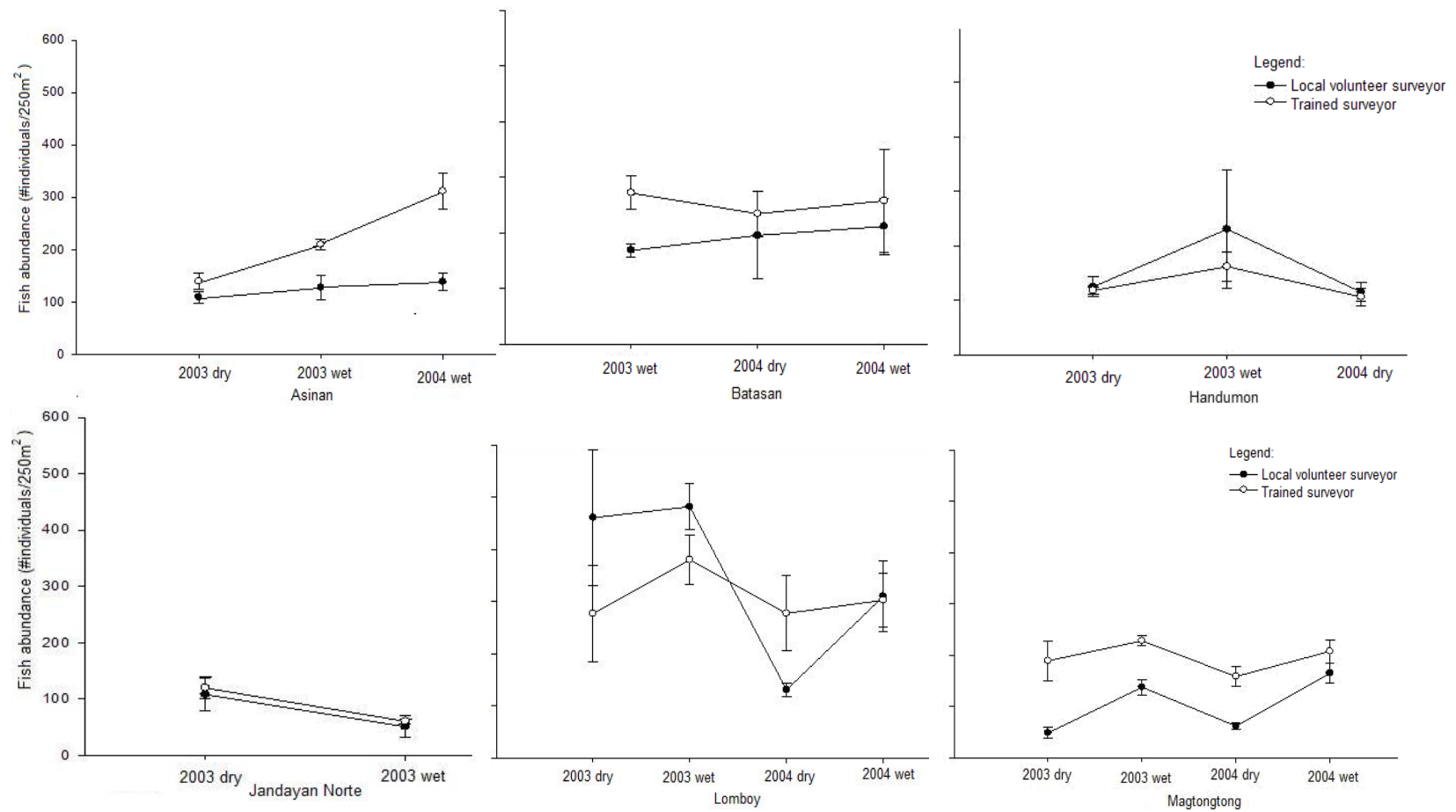


Figure 6.6. Comparison of fish abundance estimates collected by local volunteers and trained surveyors from different no-take MPA sites.

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7. Effectiveness of community-based MPAs: developing an evaluation method¹

¹ A version of this chapter will be submitted for publication. Pajaro, M.G., M.E. Mulrennan and A.C.J. Vincent. Tracking evolving community-based MPAs: changes in the indicators of effectiveness over time.

Introduction

Despite calls for the establishment of more MPAs worldwide, the effectiveness of most of the 5,045 catalogued MPAs remains unclear (Spalding et al. 2008) and there are increasing demands for transparency and accountability to justify any further commitments (Hockings 2003, Ferraro and Pattanayak 2006). In response, at the seventh Conference of the Parties to the Convention of Biological Diversity held in 2004, 188 countries undertook a commitment to conduct evaluations of their protected areas by 2010 (CBD 2004).

A previous push for systematic evaluation of protected areas, made at the Fourth World Parks Congress (IUCN 1993), resulted in the development of new methodologies, although they were largely limited to terrestrial protected areas (Hockings 2000, Leverington et al. 2008). This includes the evaluation framework put forward by the World Conservation Union (IUCN) based upon six different aspects of management: context, planning, inputs, processes, outputs and outcomes. Other evaluation frameworks put emphasis on outcomes rather than inputs to measure the impact of management action (Hockings 2003).

Comparatively few studies evaluate the effectiveness of MPAs (Day et al. 2002) and hardly any focus on community-based MPAs. Community-based MPAs warrant particular attention because of the trend in governments to decentralize responsibilities, authority and resources from the national to local levels of administration (Cheema and Rondinelli 2007). In addition, community-based management of MPAs predominates

among less developed countries such as the Philippines (Christie and White 2007). A recent review of fourteen MPA evaluation methods (MPAEMs) included only two studies on community-based MPAs although six more studies considered local stakeholders as primary sources of information (Stern 2006). Only one of these eight MPAEM method cases provided guidance on directly engaging stakeholders in primary data collection on indicators (Pomeroy et al. 2004). In many cases, MPA evaluation proceeded with stakeholders or experts engaged in individual interviews or group discussions using survey questionnaires administered by a researcher or external staff (Pollnac 2001, Alder et al. 2002, Staub and Hatzios 2004, Wells and Mangubhai 2004, White et al. 2004, Pomeroy et al. 2004). These questionnaires served as scorecards when participants completed report cards based on the chronology and progression of the MPA, *i.e.* initiated, established, enforced, sustained and institutionalized (Staub and Hatzios 2004, White et al. 2004). An alternative scoring strategy is the kite model approach which evaluates MPAs based on indicator attributes categorized into six evaluation fields (Alder et al. 2002).

Evaluation methods for protected areas, particularly community-managed MPAs, have been designed and developed *ex situ*, largely without inputs from local stakeholders (Wells and Mangubhai 2004). Yet understanding and incorporating stakeholder preferences is known to be critical to the outcomes and overall performance of MPAs (Himes 2007). For less developed countries lacking in resources, sustained engagement of external experts is a challenge. Stakeholder participation in MPA management and evaluation is a more promising alternative. Despite this, most of the available evaluation

guidebooks assume and require the involvement of paid full time MPA managers and site staff and may not be appropriate for use by local community members.

The present study attempts to address current weakness by developing a MPAEM that not only reflects the inputs of community stakeholders but can also be self-administered locally. As such our study builds on the premise that stakeholder involvement in MPAEM development can potentially lead to strong and sustained support from communities. This is likely to be particularly important in countries where national governments lack the capacity to enforce, finance or generally manage MPAs and other coastal conservation programs (Olsen and Christie 2000, Sumaila 2000). Understanding local variation in evaluation also allows detailed analysis of trends while still permitting the possibility of scaling up to larger areas; both will help support ecosystem based approaches and the development of MPA networks.

Our study aims to contribute to indicator development and broader ecosystem management by (1) identifying the preferred MPAEM system for each of eight local communities in the central Philippines, (2) assessing the variations in the preferred MPAEM across the eight community-based MPAs, and (3) identifying possible factors contributing to similarities or differences in the MPAEM of the different communities. We also compare local expectations of MPA effectiveness with national and international systems and studies. While MPAEM includes the process of development of the method itself with the stakeholders (see Chapter 4), we here focus on the measurement aspect of the MPAEM.

Methods

The study sites

We facilitated the development of MPAEMs to establish the effectiveness of no-take MPAs in eight communities in Bohol, central Philippines. The municipal coastal water of Bohol province currently has in excess of 100 no-take MPAs (Green et al. 2002). Each study site belonged to the smallest political unit (*i.e. barangay*). The sites varied in terms of their MPA size and age (Table 7.1). The establishment of the MPAs in all sites was catalyzed by external agents, *i.e.* academic institutions, government agencies or non-government organizations, with the people's organization and/or the village council subsequently moving to the forefront of local MPA management.

Developing the MPA evaluation method (MPAEM)

Before developing the MPAEM, we conducted a series of activities that engaged local community stakeholders to develop and monitor indicators. Participants at each study site revisited the goals of their MPA, identified the indicators of MPA effectiveness and formulated monitoring schemes through semi-structured interviews and focus group discussion (see Chapter 4 for details). Community volunteers, tasked to monitor the identified indicators according to protocol, were then mobilized. At a later date, another focus group discussion was then held to develop the MPAEM desired by the community.

The focus group discussions resulted in the development of a system for evaluating the community-managed MPAs as desired by the participants. This system included formulating (i) a framework for evaluating the MPAs and (ii) the corresponding scoring

scheme to evaluate performances. The scoring scheme was supplemented by inputs from respondents in subsequent interviews. The interviews were considered necessary because some individuals tended to dominate the discussions and we wanted to consider the inputs of respondents in more depth.

Participants engaged in the first focus group discussion (during the indicator development) were invited back for the MPAEM development, along with community volunteers who monitored the indicators without participating in the first group discussion. A total of six focus group discussions were conducted in eight communities with 15 to 30 participants from each community; to maximize time and resources, neighbouring study sites on the same island held joint meetings to develop their MPAEM (*e.g.*, Handumon and Jandayan Norte located in Jandayan Island, and Lomboy and Magtongtong located in Pangangan Island). Each focus group discussion lasted from four to six hours.

During the MPAEM meetings, we facilitated a discussion on the rationale for evaluating MPA management effectiveness and presented three examples of available methods from the literature (Alder et al. 2002, White et al. 2004, Staub and Hatziolos 2004). The first method presented was the report card approach where the MPA is rated based on accumulated points for five different levels of progression, *i.e.* MPA initiation, establishment, enforcement, sustained management and institutionalization (White et al. 2004). Each of the five level of progression has specific criteria or set of activities that must be satisfied to gain points. The second method uses a scorecard (Staub and

Hatzios 2004) to evaluate six elements - context, planning, inputs, process, outputs and outcomes. Each element has corresponding guide questions where the response provided for each question is ranked between 0 to 3 depending on the MPA's level of performance. The third method uses a visual kite model approach for MPAs (Alder 2002) adapted from the Rapfish approach which uses a multidisciplinary technique to assess the sustainability of fisheries (Pitcher et al. 1998). The technique evaluates sustainability by scoring a number of attributes on a scale of zero to 100% categorized within five evaluation fields, *i.e.* ecological, economic, social, technological and ethical (Pitcher and Preikshot 2001). The MPA kite model modified the Rapfish approach by using a different set of attributes within six evaluation fields, *i.e.* living and non-living resources, economic, social, ecosystem function and management.

All participants selected the visual MPAEM kite model (after Alder et al. 2002) as their preferred approach. After this agreement, participants were broken into small group discussions (3 to 5 participants in each group) to agree on the categorization of the indicators (listed in Table 7.2) into evaluation fields or themes. This list of indicators was derived from earlier interviews and focus group discussions (see Chapter 3). Each group's suggestion for categorization of the indicators (which we here also consider as the attributes) into evaluation fields was presented to all participants. After getting a consensus on the themes and corresponding indicators to be evaluated, the participants discussed the options for scoring scales that included (i) 10% to 100%, (ii) 1 to 5 (iii) 1 to 10 and (iv) A to D. The participants decided to use the scale of 1 (lowest) to 5 (highest) to rate the performance of their MPAs.

A second small group discussion was held for each MPA to define the indicator or provide the criteria for evaluation. This activity allowed six of the 29 indicators to be dropped from the list because no clear definitions were given by the participants. In all, after the refinements, 22 indicators with a corresponding total of 30 indicator criteria were available for this study (Table 7.2). This list was used for the individual interviews following the focus group discussions as described below.

Developing the scoring scheme for indicators

We conducted semi-structured interviews among randomly selected participants from the previous focus group discussion sessions and those engaged in monitoring activities. From June to August 2005, we interviewed 7 participants from each of Alumar, Batasan and Magtongtong; 6 each from Handumon and Lapinig, 5 from Lomboy and 4 each from Asinan and Jandayan Norte. The individual interviews took approximately 2 to 3 hours to complete and we categorized the responses according to the stakeholder group (fisher, leader, women, youth) and the age of the MPAs to which they belong. The 46 respondents were asked to state values that they felt represented the lowest score (poorest result with respect to MPA objectives) and the highest score (best result) for each of the 30 indicator criteria. The values proposed representing the lowest score of 1 can be considered to reflect the situation of the MPAs before or at the time it was established. In contrast, the suggested values for the score of 5 reflect the community's perceptions about when a particular MPA can be considered a success or reached the desired objectives.

Statistical analysis

We examined the variability in the responses of respondents using one-way ANOVA. For significant results from the ANOVA, we used a Tukey test to determine differences in indicators among communities. Principal component analysis (PCA) was then applied to reduce the number of indicators into orthogonal variables that account for the majority of variation in the values of the lowest or highest scores from different communities (Manly 1994). To meet the requirement of equal samples size for the responses and no missing values for the ANOVA and the PCA analysis, we considered only 42 of 46 respondents for the 30 indicator criteria analyzed: the remaining four respondents offered no responses for more than 15 of the 30 indicator criteria. The responses included 83 missing values which we substituted after obtaining the mean values for an indicator for a particular community.

Results

Developing the MPA evaluation method (MPAEM)

The six focus group discussions conducted resulted in the construction of four different kite models (Figure 7.1) which were framed by four to six themes that visually determined how well the MPAs are performing. The four themes common to participants from all eight communities were those related to the status of marine resources inside MPAs, support for MPAs, enforcement, and socio-economic status of the community (Table 7.2). Two themes (enforcement and socio-economic status) appeared broad enough that participants from six of the eight communities opted to split them. Lomboy,

Magtongtong and Alumar believed MPAs could be evaluated more accurately if surveillance (patrols, guarding) was distinguished from imposition of regulations. The socio-economic theme was split by Asinan, Batasan and Lapinig according to family (*e.g.*, household income, fish catch) or village level (*e.g.*, average educational attainment, income from MPAs) while Alumar split this theme according to social and economic concerns.

Developing the scoring scheme for indicators

Our results show the values corresponding to the lowest and highest rating score (Table 7.3) significantly differed among respondents for about a third of the 30 identified indicators (Table 7.4). The ANOVA test indicated the respondents were generally in agreement with the values proposed for the lowest and highest rating scores for effectiveness of MPAs. Responses analysed between communities showed only 9 of the 30 indicators considered appeared to differ significantly ($p < 0.05$) (Table 7.4). These indicators include internal financial support for MPAs, weight of fish caught for sale and for food, income from fishing near MPA boundaries and MPA visitors.

The Tukey test results indicate fewer indicators significantly differed when the responses were grouped according to communities (Table 7.5). Only six of the nine indicators that were earlier identified as significantly different maintained a significant difference among the eight communities. Three of these six indicators were related to fishing (volume of fish caught, fish set aside for food, fishers fishing near MPAs) and the other three were concerned with education.

The PCA results suggested a slight trend in grouping of responses based on age of MPAs but only for the values representing the lowest score (Figure 7.2). Responses from the older MPAs (7 years old and above) grouped together as did those from younger MPAs (4 years old and below). No grouping of responses according to MPA age was evident for the values representing the highest rating scores. Similarly, no distinct grouping was observed for the different stakeholder groups (*i.e.* fisher, leader, women and youth).

Discussion

This study developed an *in situ* evaluation method through the participation of local stakeholders in community-managed MPAs. In accommodating a wide range of indicators selected by participants, the MPAEM may help managers to formulate or amend management plans and strategies. Local input notwithstanding, it will also be useful to draw on limited expert input (i) to help establish local measurements for monitoring and evaluation of MPAs and (ii) to consolidate results across locations and standards, including to connect local activity to national and international standards. The most effective monitoring may lie in connecting local, national and international approaches.

It is clear that communities preferred a visual synthesis of the performance of their MPAs even though it was derived from a more complex evaluation framework than available alternatives such as scorecards (Chambers 1994, Zanetell and Knuth 2002). It is also notable that MPAEM developed during the focus group discussions included a mix of

context, input, output, process and outcomes, suggesting that participants regarded all indicators as outcomes. The kite model reflected this perspective by incorporating expected outcomes resulting directly from MPA management (*e.g.*, volume of fish caught and number of MPA visitors) as well as those not directly attributable to MPA management (*e.g.*, number of livelihood sources and education). Other evaluation methods, such as report card systems (White et al. 2004, Staub and Hatziolos 2004), separated these elements into a stepwise progression of MPAs but were apparently not clear to community participants in this study. That said, the kite model has its drawbacks. The method may be too complex for communities to self administer, and communities have neither the resources nor the capacity to implement this MPAEM without the continued guidance and involvement of external agents.

The inputs of the participants reflected local concerns and circumstances and influenced the outcome of the kite models formulated by each group. However, unlike many of the study sites, Alumar split the theme for enforcement into two (penalty implementation and surveillance) possibly reflecting a desire to regain the strict enforcement of their MPA following persistent illegal fishing or poaching since 2000. Lomboy and Magtongtong also split enforcement but possibly because 80% of the participants were male (with 90% of them active in enforcement). Gender may also have influenced MPAEM development in some other sites (Lapinig, Asinan and Batasan) where a female biased sex ratio among participants (approximately 3:2) might explain why the socio-economics theme instead of the enforcement theme was split (*i.e.* family and village socio-economic status).

The target values proposed by the respondents as indicators of MPA effectiveness highlight the importance of continued monitoring, feedback of results and adaptive planning. For example, the expectation of having as many as 18 fishers a day fishing in waters adjacent to the MPAs or catering to as many as 500 visitors a year for some MPAs, particularly when not spread over different months may not be sustainable for a particular MPA. Perceptions do influence behaviour and can therefore affect the overall performance of MPAs (Burke 2001, Himes 2007). Therefore, MPAEM must take into consideration ecological processes and other limitations as part of the feedback loop with individual MPA communities. For example, stakeholders who perceive their MPAs as robust enough to meet expectations such as 10/kg/day/fisher increases in catch may not be realistic about local ecological processes. Also, expectations on the number of visitors per year also need to be influenced by those that have a broader perspective on market and demand dynamics. Providing information on the limitations of a particular MPA and its management implications will likely need the engagement of external experts who use predictive modelling tools.

Some indicators appeared to be influenced heavily by the local context and showed more variability when compared to others. These included those concerned with outcomes related to fishing and education. Because the bio-physical setting differed for every study site, the number of hours fishing might be expected to vary widely across communities, according to the fishing gear used and the location of the fishing grounds. The number of fishers fishing adjacent to the MPAs will also vary widely depending on the MPA design (*i.e.* size, location) and the surrounding habitat. For example, some sites have larger

intertidal flats adjacent to MPAs (*e.g.*, Batasan, Magtongtong, Handumon, Jandayan Norte, and Alumar) available for fishing compared to other communities (*e.g.*, Lapinig, Lomboy, Asinan). The demographic and social characteristics of communities will also have influenced the values assigned by respondents in the rating scores. For example, members of a community may value education differently according to whether there is nearby access to a school or college. Similarly, sites that have some experience with and infrastructure for catering to tourists will reflect very different aspirations in their indicator values when compared to sites with limited experience or tourism potential. Hence, the local context and circumstances of each MPA site needs to be considered when evaluating MPA effectiveness.

The slight trend in the grouping of MPA responses according to age but only with respect to the lowest score suggests that the shifting baseline phenomenon (Pauly 1995) may be applicable to MPA effectiveness evaluation in a reverse manner. It appears that respondents were more heavily influenced by recent experiences and circumstances with their MPAs than those in place at the time of MPA establishment when it came to assigning values for the lowest rating scores that then became the basis for evaluating subsequent changes. This shift in higher baseline values for older MPAs could potentially lead to frustrations when improvements are not evident because of higher baseline values. Alternatively, this shift in goal posts could provide a motivation for the maintenance or enhancement of support and commitment to the MPA.

The results of our study can be made generally useful in communities if key considerations are respected. First, an appropriate MPAEM - with a performance rating scheme - must be developed as part of the MPA establishment process and must be attuned to the perceptions, needs, experiences and capacities of the local community. If the MPAEM is established later in MPA development, it is vital to incorporate historical information on changes since the MPA was implemented. Any translation of local monitoring and evaluation to a larger spatial scale should be handled cautiously, given variation across communities, and should comprise a well-coordinated feedback loop. It is probably more important to standardise the approach to monitoring and evaluation than the actual targets per se, which may vary locally.

Communities can benefit from institutional support, both internal and external. In some MPAEMs, the links between context, input, output, process and outcome indicators may not be immediately obvious from at least a local perspective. Where a stable community institution exists (such as village council or grassroots organization), it can take the lead in implementing and coordinating the MPAEM. There is, however, a useful role for external agents in generating and supporting local monitoring and evaluation, at least until local capacity is fully established, perhaps in partnership with local government. Local governments have a large role to play in providing technical and financial support for MPA management and incentives for MPA effectiveness; these latter could help promote audits of individual MPA performance. As well, expert facilitation may be needed to (i) assess MPAEM in an objective fashion, (ii) deepen community discussion

on the MPA results and (iii) extend community thinking to broader ecological and socioeconomic goals and changes.

The expectations reflected in the values assigned by community participants in this study are consistent with those of international and national perspectives. For example, those specified in the millennium development goals (MDGs) of the United Nations (UN 2000) which are usually translated into national goals by signatory countries such as the Philippines reasonably matched with the community responses. For two of the three indicators that allowed comparison (primary education and financial support to run MPAs) the standards set in our study were lower (Table 7.6). For the third, minimum household income indicator, our respondents set the benchmark at \$1.89 per day while the MDG is \$1/day.

The similarity of local and broader aspirations offers some potential for community activity to support national responsibilities and international accords but it is equally true that many indicators are specific to community concerns. Indicators that reflect the very particular conditions and aspirations of individual MPA sites remain essential to meaningful monitoring and evaluation effort even if they are less useful for scaling up initiatives. It might be best for MPAEM to incorporate both a standardized set of indicators and the more locally relevant ones. It is the latter monitoring and evaluation methods that will become the basis for the relevant action plan.

Tables

Table 7.1. Description of study sites.

MPA location (village)	Municipality	Size of MPA (ha)	Year legislated (municipal level)	Year enforced	Lead institution in management¹
Alumar	Getafe	2.0	1995	2003	BC
Jandayan Norte	Getafe	10.0	2002	2002	BC
Asinan	Buenavista	55.0	2000	2001	PO
Batasan	Tubigon	21.0	1999	1999	BC
Magtongtong	Calape	7.3	1996	1996	PO
Handumon	Getafe	50.0	1998	1995	BC/PO
Lomboy	Calape	8.7	1995	1995	BC
Lapinig	Carlos P. Garcia	160	1986	1990	MLGU

¹Local-based institution: BC=barangay council; PO=people's organization;
MLGU=municipal local government unit

Table 7.2. Indicator list grouped according to themes with corresponding proposed definitions or indicator criteria from community participants.

Theme	Indicator	Indicator definition/criteria
A. Status of marine resources inside MPA	1. Improve habitat health	(1) % change in live coral cover
	2. Increase fish abundance	(2) % change in fish abundance
	3. Increase fish size	(3) Average length (inches) of commercially important fishes
	4. Presence of previously absent fishes	(4) Number of variety in fish families
	5. Presence of juvenile fishes ¹	
	6. Presence of tame or less ¹ aggressive fishes	
B. Support for MPA	7. Availability of education sessions	(5) No. of external technical support (e.g. trainings, surveys) annually
	8. Support from external agents	(6) Amount of external financial support (PhPesos) annually
	9. Increase in villager's support	(7) % households who support the establishment of the MPA annually
		(8) % households volunteering in MPA-related activities annually
	10. Support from village council	(9) Financial support from the village council (PhPesos) annually
		(10) No. of MPA-related legislative acts passed annually
	11. Presence of management plan	(11) No. of MPA-related activities planned and implemented annually
	12. Presence of grassroots organization	(12) % PO members volunteering annually for MPA activities
C. Enforcement of MPA and fishing regulations	13. Increase in MPA size ¹	
	14. Regular guarding in MPA	(13) No. of days/night inside and outside no-take MPA is guarded/patrolled per month
	15. Regular patrol outside MPAs	
	16. Presence of MPA facilities	(14) Number of functional facilities available while guarding inside no-take MPA or patrolling outside MPA per month
	17. Increase awareness of rules and regulations	(15) Number of violators inside/outside MPA annually
	18. Absence of habitat disturbance	(16) % violators penalized inside/outside MPAs annually
C.1 Surveillance in and out of MPA boundary		
C.2. Enforcement of penalties		

Theme	Indicator	Indicator definition/criteria
D. Socio-economic status of barangay	19. Increase fish catch	(17) Volume of fish caught (kg) and sold to buyers daily
	20. More fish in the market	
	21. Increase volume of fish set aside for food	(18) Kilogram of fish set aside for food from catch daily
	22. Increase in household income	(19) Total net income from fishing daily
		(20) Total number of livelihoods as sources of income per month
		(21) Total gross household monthly income from different sources
	23. Increase in number of concrete houses ¹	
	24. Increase in number of children in school	(22) % villagers completing elementary education annually
		(23) % villagers finishing secondary education annually
		(24) % villagers finishing college education annually
	25. Decrease distance of fishing ground	(25) Number of fishers from village fishing near MPA daily
		(26) Fuel expenses for fishing (PhPesos) per fishing trip/day
		(27) No. of fishing hours (including travel time) per fishing trip/day
	26. Increase in village income from MPA	(28) Annual collection from visitors' fees (PhPesos)
		(29) Annual collection from fines (PhPesos)
	27. Increase in number of visitors	(30) Annual number of visitors
	28. Increase in number of awards received ¹	
	29. Improve water quality ¹	

¹No clear criteria were provided for the indicator and were therefore dropped from the list during the one-on-one interviews subsequently conducted.

Table 7.3. Mean of values proposed by respondents corresponding to the lowest (1) and highest (5) rating scores for previously defined indicators.

Theme	Indicator criteria	Lowest score (1)		Highest score (5)	
		n	Mean (SE)	n	Mean (SE)
A. Status of marine resources inside MPA	% change in live coral cover	44	20.80 (± 1.96)	44	83.64 (± 1.52)
	% change in fish abundance	41	19.63 (± 1.70)	42	81.79 (± 1.90)
	Average length (inches) of commercially important fishes	42	3.33 (± 0.17)	43	11.70 (± 0.63)
	Number of variety in fishes	40	5.65 (0.37)	42	17.91 (± 2.02)
B. Support for MPA	No. of external technical support (e.g. trainings, surveys) annually	40	1.18 (± 0.12)	41	5.68 (± 0.411)
	Amount of external financial support (PhPesos) annually	41	13,439.51 ($\pm 2,386.29$)	43	58,025.12 ($\pm 7,583.56$)
	% households who support the establishment of the MPA annually	44	18.86 (± 1.37)	44	90.34 (± 1.99)
	% households volunteering in MPA-related activities annually	41	16.95 (± 1.47)	41	70.49 (± 3.85)
	Financial support from the village council (PhPesos) annually	40	1,997.50 (± 360.92)	39	10,922.05 ($\pm 2,205.40$)
	No. of MPA-related legislative acts passed annually	40	0.90 (± 0.08)	40	4.35 (± 0.33)
	No. of MPA-related activities planned and implemented annually	38	1.58 (± 0.18)	38	9.37 (± 1.49)
	% PO members volunteering annually for MPA activities	36	19.31 (± 1.51)	36	91.81 (± 2.74)
C. Enforcement of MPA and fishing regulations	No. of days/night inside and outside no-take MPA is guarded/patrolled per month	39	6.21 (± 0.54)	39	23.85 (± 1.197)
	Number of functional facilities available while guarding inside no-take MPA or patrolling outside MPA per month	34	1.38 (± 0.11)	35	5.971 (± 0.25)
	Number of violators inside/outside MPA annually	34	80.29 (± 30.64)	32	7.97 (± 2.04)
	% violators penalized inside/outside MPAs annually	35	16.89 (± 2.01)	32	79.24 (± 2.59)

Theme	Indicator criteria	Lowest score (1)		Highest score (5)	
		n	Mean (SE)	n	Mean (SE)
D. Socio-economic status of village	Volume of fish caught (kg) and sold to buyers daily	45	1.28 (± 0.14)	45	8.67 (± 0.714)
	Kilogram of fish set aside for food from catch daily	44	0.57 (± 0.07)	44	2.34 (± 0.142)
	Total net income from fishing daily	43	73.73 (± 5.41)	44	463.64 (± 29.90)
	Total number of livelihoods as sources of income per month	44	1.11 (± 0.05)	44	4.82 (± 0.206)
	Total gross household monthly income from different sources	44	3127.27 (± 285.71)	44	12,159.09 (± 792.868)
	% villagers completing elementary education annually	31	22.58 (± 1.78)	32	85.31 (± 2.34)
	% villagers finishing secondary education annually	33	20.91 (± 1.08)	35	85.00 (± 2.38)
	% villagers finishing college education annually	32	12.56 (± 1.84)	33	60.46 (± 3.58)
	Number of fishers from village fishing near MPA daily	42	3.93 (± 0.33)	42	17.98 (± 1.44)
	No. of fishing hours (including travel time) per fishing trip/day	41	6.74 (± 0.46)	42	2.75 (± 1.33)
	Fuel expenses for fishing (PhPesos) per fishing trip/day	43	113.23 (± 5.37)	44	44.52 (± 2.53)
	Annual collection from visitors' fees (PhPesos)	35	2,959.72 ($\pm 1,026.11$)	36	16,083.33 ($\pm 2,973.26$)
	Annual collection from fines (PhPesos)	35	980 (± 97.60)	36	8,722.22 ($\pm 1,854.15$)
	Annual number of visitors	36	100.25 (± 23.57)	37	431.51 (± 60.58)

Table 7.4. ANOVA test results for values corresponding to the lowest and highest rating scores proposed by community respondents.

Theme	Indicator criteria	F and p values			
		Low score (1)		High score (5)	
		F	p ¹	F	p ¹
A. Status of marine resources inside MPA	% change in live coral cover	0.526	0.809	1.135	0.364
	% change in fish abundance	0.695	0.676	0.587	0.761
	Average length (inches) of commercially important fishes	2.175	0.062	0.76	0.624
	Number of variety in fishes	1.842	0.116	0.503	0.825
B. Support for MPA	No. of external technical support (e.g. trainings, surveys) annually	0.533	0.803	0.817	0.579
	Amount of external financial support (PhPesos) annually	2.008	0.083	2.178	0.061
	% households who support the establishment of the MPA annually	2.042	0.076	1.612	0.163
	% households volunteering in MPA-related activities annually	0.931	0.495	1.279	0.290
	Financial support from the village council (PhPesos) annually	2.866	0.020	1.669	0.154
	No. of MPA-related legislative acts passed annually	0.909	0.512	1.542	0.189
	No. of MPA-related activities planned and implemented annually	0.430	0.876	0.304	0.946
	% PO members volunteering annually for MPA activities	1.522	0.201	1.046	0.423
C. Enforcement of MPA and fishing regulations	No. of days/night inside and outside no-take MPA is guarded/patrolled per month	1.004	0.448	1.433	0.228
	Number of functional facilities available while guarding inside no-take MPA or patrolling outside MPA per month	0.444	0.865	0.413	0.886
	Number of violators inside/outside MPA annually	0.594	0.754	1.257	0.313
	% violators penalized inside/outside MPAs annually	1.131	0.376	0.893	0.527

¹Significant at $p < 0.05$

Theme	Indicator criteria	F and p values			
		Low score (1)		High score (5)	
		F	p ¹	F	p ¹
D. Socio-economic status of village	Volume of fish caught (kg) and sold to buyers daily	0.904	0.514	2.33	0.045
	Kilogram of fish set aside for food from catch daily	2.551	0.031	0.435	0.873
	Total net income from fishing daily	0.572	0.774	2.388	0.041
	Total number of livelihoods as sources of income per month	0.808	0.587	0.759	0.625
	Total gross household monthly income from different sources	0.695	0.675	0.388	0.903
	% villagers completing elementary education annually	1.158	0.358	6.862	0.000
	% villagers finishing secondary education annually	2.747	0.028	2.994	0.019
	% villagers finishing college education annually	2.749	0.028	2.994	0.019
	Number of fishers from village fishing near MPA daily	2.330	0.046	0.997	0.450
	No. of fishing hours (including travel time) per fishing trip/day	2.043	0.076	1.231	0.312
	Fuel expenses for fishing (PhPesos) per fishing trip/day	2.043	0.076	1.231	0.312
	Annual collection from visitors' fees (PhPesos)	0.827	0.574	1.160	0.358
	Annual collection from fines (PhPesos)	1.804	0.129	1.614	0.178
	Annual number of visitors	1.230	0.320	2.488	0.040

¹Significant at p=<0.05

Table 7.5. Tukey test results showing pairwise multiple comparison probabilities with significant differences ($p < 0.05$) between communities in their responses for lowest and highest rating scores for selected indicators.

Indicator	Alumar	Asinan	Batasan	Handumon	Jandayan	Lapinig	Lomboy	Magtongtong
A. Lowest rating score and highest rating score								
1. Proportion completing secondary education	Handumon	NS ¹	NS	Alumar Magtongtong	NS	NS	NS	Handumon
2. Proportion completing college education	Batasan	Batasan	Alumar Asinan Handumon Jandayan Lapinig Lomboy ² Magtongtong	Batasan	Batasan	Batasan	Batasan	Batasan
B. Lowest rating score								
1. Financial support from village council	NS	NS	NS	NS	NS	NS	NS	NS
2. Kilogram fish caught and set aside for food	NS	Magtongtong	NS	Magtongtong	NS	NS	Magtongtong	Asinan Handumon Lomboy
3. Number of fishers fishing near MPA	Lapinig	NS	NS	Lapinig	Lapinig	Alumar Handumon Jandayan Lomboy	Lapinig	NS
C. Highest rating score								
1. Total kg fish caught	Asinan	Alumar	NS	NS	NS	NS	NS	NS
2. Income from fishing	NS	NS	NS	NS	NS	NS	NS	NS
3. Proportion completing primary education	Handumon	NS	NS	Alumar Lomboy	NS	NS	Handumon	NS
4. Number of visitors	NS	NS	NS	NS	NS	NS	NS	NS

¹NS = not significant ($p > 0.05$)

²Shaded sites in A.1 and A.2 refer to significance for lowest rating score for this indicator; unshaded sites refer to highest rating score responses.

Table 7.6. Comparison of values corresponding to highest of lowest rating scores for selected indicators defined by community participants and in the literature for the national (Philippines) and international perspectives.

Indicator	Average from interviews (n=46)	Philippines	International	Sources of info
Household income ¹	PhP3,104.70/mo or US\$58/mo	PhP5,111 or US\$94/month	\$1/day or \$30/month	www.undp.orgwww.undp.phils.org http://www.nscb.gov.ph/stats/mnsds/mnsds_food.asp
Household income ²	PhP12, 159 or \$225/mo	PhP14,765 or \$273/month		IBON Foundation. 2005. IBON facts and figures. Manila, Philippines.
Proportion completing primary education	85%	100%	100%	www.undp.org www.undp.phils.org
Fish catch ³	8.67 kg per day	Level of fishing in the 1960's was 10 kg/day in the central Philippines		www.oneocean.org
Financial support or Cost to run MPA	PhP70,000 or per MPA or \$1,285 per MPA		\$4 per sq km to nearly \$30M per sq km. with median of \$2,698 per km sq	Balmford, A., Gravestock, P., Hockley, N., McClean, C.J. and Roberts, C.M. 2004. The worldwide costs of marine protected areas. PNAS 101 (26): 9594-9697.

¹lowest score=sustain minimum basic food needs for family of five members in 2003

² highest score=sustain minimum food and no-food basic needs for family of 6 members in 2004

³restored to historical levels when it can more than sustain a family's basic needs, *e.g.* such as in the 1960 to 1970's

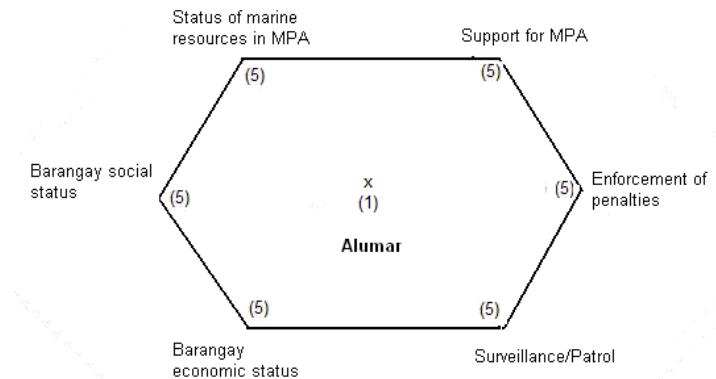
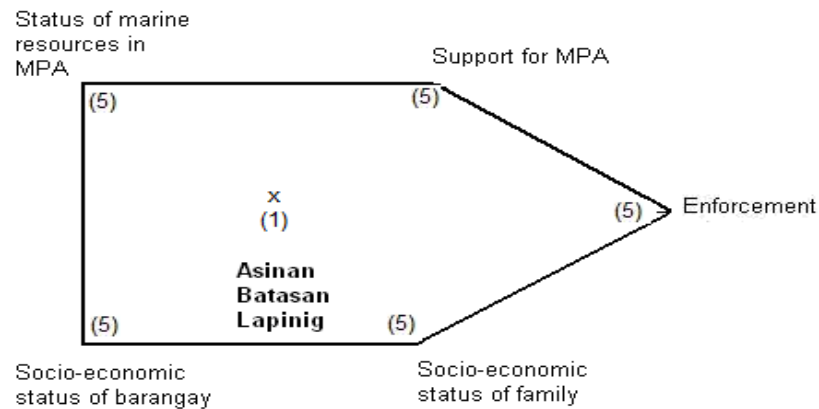
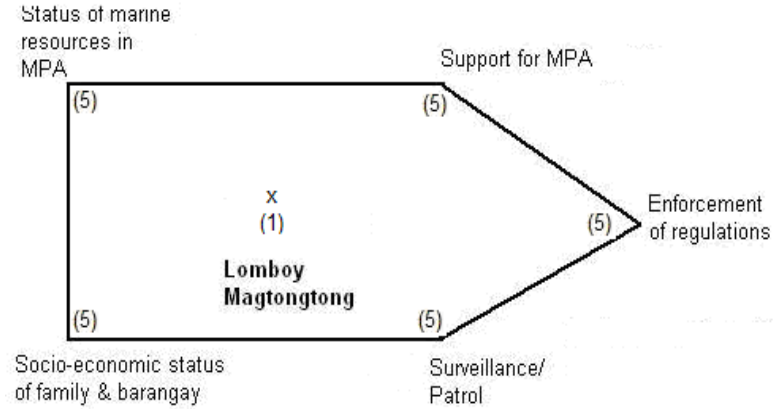
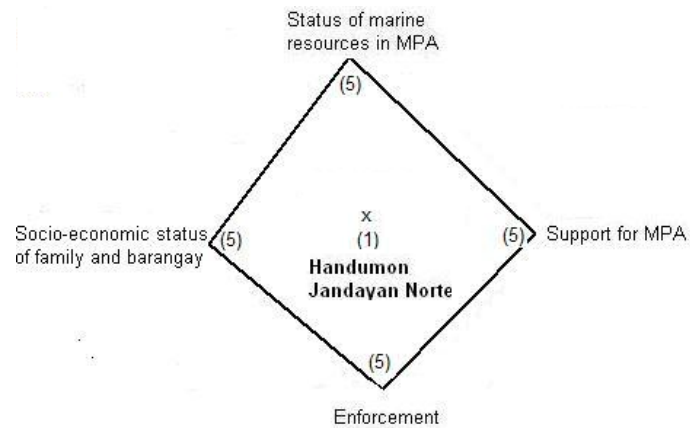


Figure 7.1. Kite models representing a visual evaluation of the MPAs based on the themes generated by eight communities during the focus group discussion (FGD). The lowest score of (1) is placed at the center and the highest score (5) is placed at the edge of the polygons.

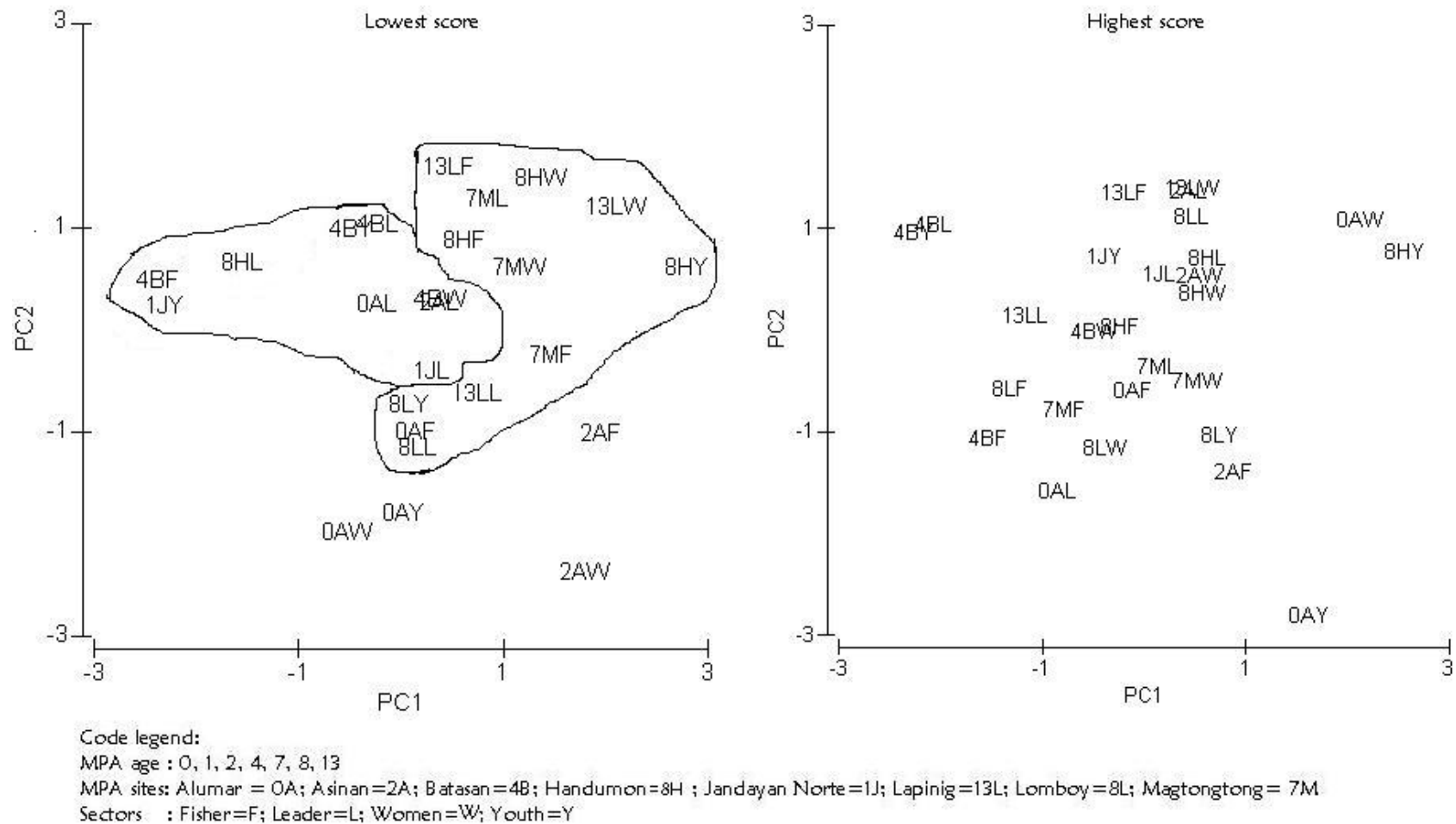


Figure 7.2. Principal Component Analysis results for values proposed by respondents corresponding to the lowest (1) and highest (5) rating scores for indicators of MPA effectiveness.

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8. Conclusion

Summary of thesis and status of research objectives

Given the global movement to establish MPAs despite significant gaps in understanding their function and utility, my findings on community-based analyses of MPA effectiveness are of global importance. This thesis identified methods and approaches that actively engaged the communities in developing indicators of the value of their MPAs. In executing this work, I met both my goal and my five research objectives, and created tools of practical utility. Realistically, however, local monitoring and management initiatives will only flourish if they receive collaborative support from the government and international community. Our challenge, then, will be to link the local with the global, such that support and understanding flows both ways.

My thesis research should help facilitate the implementation of commitments undertaken by Parties to the CBD: it provides support as they develop, adopt and implement methods, standard, criteria and indicators of effectiveness according to local conditions (SCBD 2004) which can be applied by CBMPA managers themselves. Parties to the CBD, including the Philippines, have agreed to implement the goal of evaluating the MPA effectiveness in at least 30% of their country's protected areas by 2010 (SCBD 2004). However, this commitment presents significant challenges because of the limited data available on indicators of effectiveness that have been consensually adopted by grassroots-based social networks. A current initiative by an international non-government organization, of potential relevance to CBMPA effectiveness evaluation, is the application of a rating system in the Philippines and Indonesia. However, the primary focus of this initiative is on the establishment of a geographical MPA database and providing inputs for publications and seminars on MPA effectiveness (CCEF 2009). The

findings of my research can be tested and applied on how to operationalize the CBD target with respect to CBMPAs, specifically in the Philippines.

In this conclusion, I explain how I met my research objectives, then integrate the main findings of my research, considering their implications and applications towards the improvement of MPA effectiveness. I also evaluate the strengths and applications of my research, as well as its limitations, and identify possible future directions.

Meeting the objectives

With respect to my first objective, my findings indicate that international targets on MPAs such as those set by Parties to the CBD may be unknown or meaningless to local communities because of limited localization of international and national MPA policies. To enhance MPA effectiveness, my analysis from a literature review and some case studies suggest that localization and internationalization of policies can facilitate collaborative work, information feedback, reporting accountabilities and conflict resolution (chapter 2). Centralized policies based mainly on national and international targets will likely fail (McClanahan et al. 2006, Christie et al. 2009). Fortunately, local Philippine MPA social networks currently exist to complement nationally or internationally proposed and/or endorsed ecological networks and can be facilitative in determining the effectiveness of the network of MPAs. However, these various partnerships among multi-level, nested MPA organizations from the grassroots, NGOs, and government agencies must be formally institutionalized to be sustaining and effective. Indeed these partnership arrangements should be developed as core elements of

a functional network that supplements, if not replaces, the current practice of providing technical training in support of the implementation of short-term projects.

Second, the results indicate that the identification of an appropriate, standardized set of indicators and criteria for evaluation of effectiveness across CBMPAs will be subject to change over time as MPAs and other factors evolve (chapters 3 and 7). For example, input and output indicators were the preferred type of indicators of local communities managing younger or more recently established MPAs while outcome indicators were preferred by older MPAs. Further, the results indicate that the age of MPAs influenced the criteria for evaluation, probably as an effect of shifting baselines in community expectations. Therefore, indicators have to be developed iteratively to reflect the needs and perspectives of local stakeholders, advice from external agents and new insights from the literature (Boyd and Charles 2006).

Third, an analysis of patterns in community participation for the entire cycle of participatory indicator development, monitoring and evaluation processes in CBMPA show that the strongest determinant of local participation was social association among community residents, as measured by the availability of opportunities for social contact and cohesion (chapter 4). Furthermore, the nature of local participation appears to be biased towards engagement by men and showed higher participation rates among the youth.

Fourth, my results show that in general, the suite of indicators tracked for two years did not detect any significant changes (chapter 5). They also indicate that each evolving MPA had inherent differences suggesting that broad generalizations regarding MPA effectiveness should always consider the local context (chapter 5). My findings further demonstrate that despite the limitations of the short-term tracking results, the monitoring process itself has the potential to produce action and shift the level of participation to a higher degree, from passive to active or even to self-reliance (chapters 4 and 6).

Finally, with respect to the implementation of the monitoring scheme by the communities, my results show that the collection of socio-economic data by community volunteers generated relatively few difficulties in terms of cost, time, skills and social fit while the collection of enforcement and ecological data proved to be more challenging (chapter 6). This suggests a need to target expert inputs in some areas, at least initially, while maximizing on the benefits of community involvement in others. My research explored and supported this balance between local and external engagement.

Implications

This thesis is distinctive in its focus on the development of a progressive *in situ* method and approach for local communities to identify a suite of indicators of MPA effectiveness for subsequent application in the monitoring and evaluation of their MPAs. The *in situ* CBMPA method is a step-wise iterative process that includes five phases: setting or revisiting of MPA objectives, identification of indicators, monitoring, evaluation and planning. The approaches we used in the progression included literature or secondary

sources survey, individual perception surveys, focus group discussion, participatory data collection and analysis and feedback sessions. Previous studies have not considered indicator development, monitoring and evaluation as a progressive process. Most studies on the monitoring and evaluation of MPAs focus on only one or two of the phases mentioned above. For example, there are studies that focus exclusively on the development of indicators (Pelletier et al. 2005, Boyd and Charles 2006, Fontalvo-Herazo et al. 2007), on monitoring (Jacoby et al. 1997, Obura et al. 2002, Uychiaoco et al. 2005) or on evaluation (White et al. 2004). Other studies cover two phases such as indicator identification and monitoring (Pomeroy et al. 2005) or indicator identification and evaluation (Alder et al. 2002, Wells and Mangubhai 2004). My results confirm the strong linkage between each phase in the cycle of the participatory indicator development, monitoring and evaluation (PIDME) process and underscore the need for the methods and approaches of the different phases to be sequential and in-step with each other (chapters 3, 4, 5, 6 and 7).

My results demonstrate the value of the overarching community-based participatory approach, and show that PIDME can proceed productively when supplemented by institutional, cooperative and visual approaches (chapters 3, 4, 5, 6 and 7). The institutional approach acknowledges the authority and power of locally organized groups (Agrawal and Gibson 1999). The approach used engaged local stakeholders through organized groups such as fisherfolk or women and was particularly valuable because it took account of the fact that communities have multiple stakeholders with varied interests. Institutionalized agreements, such as those tied to acceptance of a specific set of

indicators or a particular monitoring and evaluation scheme, have a greater chance of systematic and sustained implementation if they have been formally endorsed by members of an organized group. However, institutions can fail to deliver when they are weak or have regulations that are underdeveloped or poorly enforced (Jentoft 2004).

The cooperative approach engaged multiple stakeholders towards the common goal of achieving an effective MPA using the PIDME approach previously described. A centralized approach may cost less in terms of time and implementation. However, cooperation lowers the transaction costs as stakeholders provide information relevant to MPA implementation and planning (Sen and Raakjaer-Nielsen 1996). A visual approach can also facilitate the respondents' articulation of their perceptions better than narrative or numerical formats (Manning and Freimund 2004). Such techniques are also advantageous in remote communities with low literacy rates as they can empower stakeholders and encourage them to contribute useful information in monitoring and evaluation (Chambers 1993). At the same time, visual representations are usually static and may not capture the inherent dynamics of the MPAs (Manning and Freimund 2004). Therefore, a combination of methods and approaches in PIDME, including semi-informal interviews or group discussions, provides the best chance of capturing the complexity and dynamics of local community perspectives on MPAs.

The participation analysis presented in Chapters 4 and 6 indicate that participation is influenced by the characteristics of both individual participants and the community at large. Women's domestic responsibilities and a lack of recognition of their data

collection skills limit their participation. In terms of age, single or unmarried youth (19 to 25 years old) participate more actively than older adults although this was intermittent. The participants' needs, experiences and skills also accounted for differences in how communities participated. The quality of the data generated differs between participants in the older MPAs and those in younger MPAs; although the intensity of participation appears to be greater in older MPAs, the duration and consistency of participation is more critical than the actual age of the MPA.

My research provides insights into how communities can improve and sustain monitoring and evaluation. The consensus in several studies that limited resources can be a significant constraint on participation, particularly for the sustained conduct of MPA monitoring and evaluation (Hockings 1998, Stem et al. 2005, Boyd and Charles 2006) was not validated by this research. On the contrary, the community experience during the application of the indicators suggested that most of the data required to monitor and evaluate CBMPAs can be collected with limited resources. However, local capacities need to be supported and enhanced. This is particularly important since the findings of the present study indicated that, over a short term monitoring period, changes in indicators of effectiveness are not apparent. While monitoring may not detect changes over the short-term, this can yield valuable information particularly if a combination of input, output and outcome indicators are monitored that can be used for lobbying support or for policy advocacy to improve MPA effectiveness (chapters 5 and 6). The ideas that arise from the deliberation and production process can also lead to meaningful action (Innes and Booher 2000). On this basis strategies, such as the provision of long-term

incentives to support local participation or the formal institutionalization of CBMPA monitoring and evaluation, is necessary.

The findings of my research suggest that a comparison of MPA effectiveness across sites is challenging and possibly elusive because the combination of factors responsible for CBMPA effectiveness appears to be site specific (chapters 5 and 7). For example, in tracking the outcome indicators, fish abundance and coral cover did not show higher trends among older CBMPAs compared to younger CBMPAs. This has implications for top down management interventions. Coastal managers need to be cautious in implementing large-scale marine management initiatives for the purpose of fulfilling national or international targets if these are out of step with and undermine locally-driven management efforts (Christie et al. 2009). My research findings also contribute to a refinement of our understanding of two critical and commonly used indicators, i.e. fish catch and income from fishing which showed weak negative trends instead of improvements. Departures from expected trends appeared to be significantly influenced by fishing gear which in turn may be influenced by market demand. Such unexpected results support our assertion that the ecological, socio-cultural and economic conditions of CBMPAs goes beyond local political jurisdictions and therefore require solutions where vertical and nested cross-cutting scales of authority and stakeholders can work together (chapter 1).

Given their small size and the limited resources of many local communities, there are advantages to managing CBMPAs collectively as a network (IUCN-WCPA 2008). The

potential for a unified approach while maintaining the individuality of each evolving MPA has been demonstrated in this research. Standardization of methods is possible particularly on an island-wide level (e.g. in Jandayan and Pangangan Islands) or whenever stakeholders have institutionalized management bodies or committees that work together consensually for a shared purpose (e.g. when Alumar, Handumon and Jandayan Norte jointly conducted a feedback presentation to the mayor of their municipality).

Strengths and applications of this thesis research

An applied and practical contribution to CBMPAs is an important dimension of my research. The methods and approaches developed resulted from the active participation of local stakeholders, although at varying levels. This is a departure from other indicator development processes where the methods and approaches use the *a priori* strategy, i.e. the indicators and monitoring and evaluation schemes have been established by external experts in the form of a guidebook and then tested for application to sites. The *in situ* approach allowed communities to define their expectations and the means to measure those expectations by developing the indicators important to them. At the same time, the research allows us to understand the consequences of using a more constrained strategy where local stakeholders are provided with a set of indicators to choose from.

This research incorporates a potentially important advocacy dimension by encouraging and supporting local stakeholders to take initiatives for improvements in the management of their MPAs by utilizing the information generated from the PIDME process. I note that

in Alumar, the research invigorated local leaders to revive the management of their non-functional MPA. Also, the communities of Asinan, Batasan, Handumon and Jandayan Norte utilized their MPA monitoring results to obtain support from their municipal local governments (MLGs). The MLGs have responded positively to their presentations by committing support to strengthen enforcement, e.g. detailing police officers, providing fuel funds for the patrol boats and disseminating information about the supplemental livelihood programs that can be accessed. The MLGs also requested that they be provided with monitoring data on a regular basis, particularly data on enforcement. Several communities (Alumar, Lapinig and Magtongtong) also requested assistance to build community awareness by presenting the monitoring results during a community gathering. One community leader recognised this as an opportunity to use the monitoring data for a proposal to obtain support from an external funder. Thus, while the external or expert intervention represented by this study was critical to these local initiatives, they have also supported a level of community empowerment (i.e. a shift up Arnstein's ladder of participation) that could potentially enhance local community engagement in the PIDME process.

Another potential applied and practical contribution of this thesis includes MPA policy formulation using the data acquired based upon the systematic iterative monitoring and evaluation of the MPAs. These policies can be at the village level, or when two or more MPAs are involved, at broader island-wide scale or at higher levels of governance, i.e. municipal, provincial, regional or national. The PIDME also offers scope for partnership arrangements between community participants with respect to sharing of skills, resources

and experiences and supports the standardization of methods and improved management of CBMPAs. As well, this thesis offers a mechanism for engaging in partnerships particularly between communities and professional researchers or other external institutions to work collectively towards enhancing the effectiveness of MPAs.

The findings of this thesis have wider application to other developing countries where community-based management approaches are being applied. The results provide insights to how a social network of MPAs operating across several different communities can function, at least at an island-wide and municipal-wide level. The potential to influence policy formulation and implementation is also demonstrated by this study, particularly with respect to opportunities for larger scale ecological application of PIDME based upon the common interests of multiple communities. Any application of the approaches and methods used in the present study to other developing countries will need to take account of the local context and be respectful of the local culture, norms and perceptions.

Limitations of this research

This thesis was based on a limited sample size of 10 study sites (reduced to eight sites for most chapters) with a diverse and complex set of community and ecological features. Many challenges were encountered during the field research stages. The available time, financial and human resources – as well as the prevailing socio-cultural and political dynamics which differed in every community - imposed limitations on the collection of data and sometimes prevented us from conducting activities that would have strengthened our analysis. For example, the PIDME phases did not proceed in synchrony in all communities. The monitoring phase was delayed in two sites, Alumar and Lapinig,

although the PIDME methods were flexible enough to be adjusted to the political changes that occurred after the elections. Another limitation was in the diversity of the stakeholders, particularly for focus group discussions. Factors beyond our control such as the differential in power relations and economic need also imposed constraints on community participation.

Another limitation is the systematic archiving of the data for easy access by the community. Most of the summaries of the data obtained were left with the grassroots organization or the village council. However, time constraints prevented me from summarizing the most recent monitoring data collected before the conclusion of the research. Another focus group discussion would have provided a valuable opportunity to discuss how and where the information will be archived and how it can be accessed and utilized to formulate or support the implementation of policies. Maximizing the other possible uses of the records available generated from the PIDME could also be discussed. My research is part of a multidisciplinary research project implemented by Project Seahorse. The current stage of this project will culminate in a nationwide conference in 2010 that will provide an opportunity for us to present our findings to CBMPA leaders. It is anticipated that this gathering will also provide a venue for resolving data access and archival matters.

Future directions

To further guide practitioners in developing appropriate long-term management strategies for CBMPAs, future work and studies directed towards developing a network of effective

MPAs are needed. These studies should include an investigation of the integration of the MPA's locally-based ecological, social and economic indicators with larger-scale ecosystem-based indicators. The methods and approaches arising from this research will be of assistance in this regard.

With respect to the scaling up of MPA management efforts, the present study has shown that a simple summing of ecological, social and economic indicators, particularly community-based indicators from different localities, can be misleading (Brown 1999). Given the current levels of support for the establishment of a global network of MPAs, studies that provide guidance on how to evaluate effectiveness at different spatial scales (i.e. local, regional and global measures) will be needed. Exploring the development of a set of area-specific indicators developed by local communities reflecting their common needs and conditions or that can be used for higher regional or national levels of policy making such as marine tenure will provide incentives for local managers to monitor and evaluate their MPAs.

For the developing countries such as the Philippines, fulfilling its international obligation to implement the evaluation of MPA effectiveness in 30% of the established MPAs, most of them community-based, represents an enormous challenge. However, this target becomes more realistic if the methods and approaches generated by this study for implementation by local residents are applied and extended. My research highlights the range and complexity of MPAs as they evolve over time and provides a framework for caution regarding simplistic temporal and spatial expectations about MPA effectiveness.

Research initiatives that link indicators of MPA effectiveness not only to ecological but also to social and economic processes will be valuable to set the stage for no-take CBMPAs to become stepping stones for other management initiatives so urgently needed to reverse the ailing condition of our oceans and seas.

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Appendices

Appendix 1. Supplementary materials for chapter 4.

Appendix 1.1. Notes on quantifying community participation (participation level and attendance) in MPA participatory indicator development, monitoring and evaluation for eight communities.

Factors	Units	Scoring scheme ¹				
		1	2	3	4	5
PL1. Breadth of representation from different sectors (elders, fishers, leaders, women, youth)	No. sectors represented					
PL2. Intensity of engagement: average proportion of total participants contributing knowledge and skills (e.g., expressing ideas, documenting, presenting) during discussions in breakout or small group sessions	% of total attendees	1 - 20	21 - 40	41 - 60	61 – 80	81 - 100
PL3. Availability: average proportion of total attendees contributing time, i.e. present from the beginning to end of 3 focus group discussion sessions	% of total attendees	1 - 20	21 - 40	41 - 60	61 – 80	81 - 100
PL4. Consistency in involvement (number of participants involved throughout various activities in the participatory indicator development, monitoring and evaluation phases)	No. of individuals	>5	5-10	11-15	15-20	>20

¹ Participation level and attendance was calculated as the proportion of people participating (attendance) in an event compared to the total number of the estimated adult population (18 years and above) for each community.

Appendix 1.2. Notes on quantifying some factors for consideration in social association in relation to MPA participatory indicator development, monitoring and evaluation for eight communities.

Factors	SCORING SCHEME				
	1	2	3	4	5
SA1. Clustering of houses (proximity of houses in neighborhood)	Houses 5 or more clusters; fishponds and agricultural lands (3 hectares or more) separate the clusters	4 clusters separated by agricultural land and fishpond or vacant lots.	3 clusters separated by agricultural land, fishpond and vacant lots	2 clusters separated by agricultural land, fishpond and vacant lots	Houses in 1 cluster, hardly any vacant lots
SA2. Number of regular community-wide events (number of traditional annual community-wide events)	No well-attended annual festivity	At least 1 well - attended annual festivity	At least 2 well-attended annual festivity both of which are not indigenous to community	At least 2 well-attended annual festivity with at least 1 indigenous to community	2 or more well-attended annual festivities both indigenous to community
SA3. Existence of institutional support primarily for MPA management (<i>e.g.</i> , People's Organization)	PO does not exist	PO exist but is inactive for more than 1 year, no formal meetings held	PO exists but does not meet regularly, joining but not leading activities	PO exists but has irregular meetings leading some MPA or CRM related activities	PO meets regularly and regularly leads MPA or CRM related activities
SA4. extent of community support for MPA management	<10 community members involved in MPA management initiatives all of whom are elected or appointed officers of BC	>10 community members involved in MPA management initiatives all of whom are elected or appointed officers of BC	<10 community members involved in MPA management initiatives all of whom are elected or appointed officers of both BC and PO members	>10 community members involved in MPA management initiatives all of whom are elected or appointed officers of BC and PO members	Community members involved in MPA management initiatives includes broader membership from BC, PO members & non-members

Appendix 1.3. Notes on quantifying some factors for consideration in a leaders' personality in relation to MPA indicator development, monitoring and evaluation.

Factors	SCORING SCHEME				
	1	2	3	4	5
LP1. Consistency in attendance	Never attended any event but is supportive	Attended 1 to 2 events only and unable to attend due to preoccupation with matters not related to responsibilities as a leader.	Attended more than 2 events but in all events unable to stay until the end due to reasons not related to responsibilities as a leader.	Attended all events but stayed to the end in only 1 to 2 events due to personal matters	Attended all events from start to finish except when in conflict with other responsibilities as leader
LP2. Engagement in the discussion during the meetings	Physically present but does not join any discussion group	May contribute but physically leaves the group discussion intermittently	Contributes and tends to do dominate without delegating tasks such as documentation to other group members	Contributes and delegates some tasks but tends to dominate group discussion	Contributes, makes suggestions, encourages others to speak and does not dominate
LP3. Experience in public service	Newly elected, did not hold any previous elected position	Newly elected as head of BC or PO but previously held elected position as lower ranked official captain of BC or PO.	Re-elected for 2 nd term, but has not previously held any elected position prior to first term.	Re-elected for 2 nd term but previous to first term, has held other elected position	Re-elected at least for 3 rd term.
LP4. Commitment to MPA management	No involvement in MPA establishment and MPA management implementation	Sporadic involvement in either MPA establishment or management but not both	Only recently involved actively in MPA management though none or minimal involvement in MPA establishment	Has long-term involvement in both MPA establishment and management but occasionally disrupted due to personal matters	Has long-term involvement in MPAs since conceptualization, establishment and management.

Appendix 2. Questionnaire for indicator development survey.

BARANGAY: _____
 NGALAN: _____
 EDAD: _____
 SEKTOR: _____

NAG-INTERVIEW: _____
 PETA: _____
 ORAS NAGSUGOD: _____
 ORAS NAHUMAN: _____

SINUGDANAN (pakig-ilaila, tumong sa interview, katungod sa gi-interview, pananghid ug pagtugot nga ma-interview)

MGA PANGUTANA:

1. Tumong sa santwaryo (unsa'y gusto nga makab-ot sa santwaryo?)

Modaghan ang isda (naa ba'y klase sa isda nga gi-hinaut nga modaghan?) <input type="checkbox"/>	Modaghan ang kuha <input type="checkbox"/>	Mahunong ang ilegalista <input type="checkbox"/>
Mobalik ang kaanindot/kahimsug sa gasang (puy-anan) <input type="checkbox"/>	Moduol ang panagatan <input type="checkbox"/>	Permanente ang pag-gwardiya <input type="checkbox"/>
Wala'y tugaw ang santwaryo <input type="checkbox"/>	Mutaas ang kita <input type="checkbox"/>	Lig-on nga balaod sa santwaryo <input type="checkbox"/>
Itluganan/semilyahan sa isda <input type="checkbox"/>	Segurado ang pagkaun <input type="checkbox"/>	

2. Unsa'y mga timailhan nga nakab-ot na ang mga tumong sa santwaryo o epektibo na ang gi-tukod nga santwaryo?

Ka-abunda sa mga isda	Kuha sa managata'y <input type="checkbox"/>	Depensa sa ilegalista <input type="checkbox"/>
Kahimtang sa mga kagasangan/puy-anan sa mga isda	Kahimtang sa pagpanagat <input type="checkbox"/>	Pag-gwardiya <input type="checkbox"/>
Katin-awon sa dagat <input type="checkbox"/>	Pangita/Panginabuhian <input type="checkbox"/>	Balaod sa santwaryo <input type="checkbox"/>
Pagkatugaw sa santwaryo	Kahimsug sa mga tawo <input type="checkbox"/>	Mga butang sa santwaryo (guardhouse, etc.)

3. Unsa man ang una nga lima nga kina-importantehang timailhan nga epektibo na o nakab-ot na ang tumong sa inyong santwaryo?

Ka-abunda sa isda <input type="checkbox"/>	Kuha sa mananagat <input type="checkbox"/>	Pag-gwardiya <input type="checkbox"/>
Kahimtang sa puy-anan <input type="checkbox"/>	Pangita <input type="checkbox"/>	Pag-patrulya <input type="checkbox"/>
Pagkatugaw <input type="checkbox"/>	Kahimsug sa lawas <input type="checkbox"/>	Plano <input type="checkbox"/>
Pag-agni sa semilya <input type="checkbox"/>	Edukasyon nakab-ot <input type="checkbox"/>	Kasinatian sa balaod <input type="checkbox"/>
Katin-awon <input type="checkbox"/>	Panimalay <input type="checkbox"/>	Kapunungan <input type="checkbox"/>
	Panagat <input type="checkbox"/>	Pag-apil apil <input type="checkbox"/>
	Merkado <input type="checkbox"/>	Suporta sa bgy <input type="checkbox"/>
		Suporta sa gobyerno <input type="checkbox"/>

4. Unsa man ang sunod nga lima nga kina-importantehang timailhan nga epektibo na ang inyong santwaryo?

Ka-abunda sa isda <input type="checkbox"/>	Kuha sa mananagat <input type="checkbox"/>	Pag-gwardiya <input type="checkbox"/>
Kahimtang sa puy-anan <input type="checkbox"/>	Pangita <input type="checkbox"/>	Pag-patrulya <input type="checkbox"/>
Pagkatugaw <input type="checkbox"/>	Kahimsug sa lawas <input type="checkbox"/>	Plano <input type="checkbox"/>
Pag-agni sa semilya <input type="checkbox"/>	Edukasyon nakab-ot <input type="checkbox"/>	Kasinatian sa balaod <input type="checkbox"/>
Katin-awon <input type="checkbox"/>	Panimalay <input type="checkbox"/>	Kapunungan <input type="checkbox"/>
	Panagat <input type="checkbox"/>	Pag-apil apil <input type="checkbox"/>
	Merkado <input type="checkbox"/>	Suporta sa bgy <input type="checkbox"/>
		Suporta sa gobyerno <input type="checkbox"/>

5. Unsa'y basehanan sa inyong pag- pili sa kina-importantehan (pwede pud dili na tubagan)?

Appendix 3. Questionnaire for perception survey.

BARANGAY: _____
CODE SA MITUBAG _____
ORAS sugod: _____ human: _____

PETSA: _____
EDAD: _____
SEKTOR: _____

PASIUNA: Mga kasayuran sa pagdumala sa santwaryo o sa pagpanagat. Kanus-a nagsugod ug pag-apil sa pagtabang sa pagdumala sa santwaryo ug sa pag-panagat?

- a. Tuig nagsugod ug pagdumala/panagat?
- b. Unsa ang pamaagi sa pagdumala/pagpanagat/mga panagat nga gigamit sa lain tuig?
- k. Duna ba'y kausaban sa pagdumala o panagat nga gigamit sa pagdagan sa panahon?

PANGUTANA SA MGA TIMAILHAN (indicators):

1. SUPORTA GIKAN SA GOBYERNO: unsa'y kausaban sa kahimtang sa kwartang gihatag nga suporta sa gobyerno para sa santwaryo ug pagdumala sa kadagatan? Palihog ug score sa ihap 1 ngadto 10.

2004
2000
1990's
1980's
1970's
Trends (↑ OR ↓)
Ngano nausab?

2. KADASIGON SA MGA LUMULUPYO: unsa'y kausaban sa kahimtang sa kadasigon sa mga lumulupyo sa milabay nga mga tuig sa pagdumala sa inyong santwaryo? Palihog ug score sa ruler 1 ngadto 10.

2004
2000
1990's
1980's
1970's
Trends (↑ OR ↓)
Ngano nausab?

3. PAG-GWARDYA SA SANTWARYO: unsa'y kausaban sa kahimtang sa pag-gwardya sa santwaryo? Palihog ug score sa ihap 1 ngadto o 10.

2004
2000
1990's
1980's
1970's
Trends (↑ OR ↓)
Ngano nausab?

4. PAGPATUMAN SA BALAOD: unsa'y kausaban sa kahimtang sa pagpanakop sa mga nakalapas sa balaod? Palihog ug score sa ihap 1 ngadto 10.

2004
2000
1990's
1980's
1970's
Trends (↑ OR ↓)
Ngano nausab?

5. KUHA SA PANAGAT: Unsa'y kausaban sa kuha sa kada-panagat? Pangutana o isulat ang mga detalye sa halin sa una ug karon. Palihog ug score 1 ngadto sa 10.

2004
2000
1990's
1980's
1970's
Trends (↑ OR ↓)
Ngano nausab?

6. HALIN GIKAN SA PANAGAT: Unsa'y kausaban sa halin sa kada-panagat? Isulat ang mga detalye sa halin sa una ug karon: pananglit: ang masapi Php20 gikan sa 10 ka tuhog nga isda (ang 1 tuhog mosulod 5 ka isda tag-5 gramo ang usa). Palihog ug score sa ihap 1 ngadto o 10.

2004
2000
1990's
1980's
1970's
Trends (↑ OR ↓)
Ngano nausab?

7. KA-ABUNDA/GIDAGHANON SA MGA ISDA: Unsa ang dagway sa gidaghanon sa mga isda sa dagat, niadto ug karon (kung nakasalom-salom siya diha sa pwesto sa santwaryo ug gawas sa santwaryo. Palihog ug score sa ihap 1 ngadto o 10.

TUIG	SULOD sa santwaryo	GAWAS sa santwaryo
2004		
2000's		
1990's		
1980's		
1970's		
(↑ OR ↓)		
Ngano nausab?		

8. GIDAG-KUON UG KLASE-KLASE. Unsa ang kausaban sa gidag-kuon ug klase klase sa mga isdang kuha o mamatikdan diha sa dagat niadto ug karon (kung nakasalom-salom siya diha sa pwesto sa santwaryo ug gawas sa santwaryo.(pwede mogamit sa mga fish models ug ipahulagway pila kabuok ang 1 ka kilo o unsa'y gitasa-un para duna ta'y idea sa pag-usab sa sizing) Palihog ug score sa ihap 1 ngadto o 10.

TUIG	SULOD sa santwaryo	GAWAS sa santwaryo
2004		
2000's		
1990's		
1980's		
1970's		
(↑ OR ↓)		
Ngano nausab?		

9. ANG KAHIMTANG SA MGA KAGASANGAN: Unsa ang dagway sa mga buhing kagasangan? Gamiton ang butones (ang blue,buhi; ang cream, dugmok; ang light pink, humok ang grey, patay). Unsang klaseng kagasangan ang kasagarang makit-an? Palihog ug score sa ihap 1 ngadto o 10.

TUIG	SULOD sa santwaryo	GAWAS sa santwaryo
2004		
2000's		
1990's		
1980's		
1970's		
(↑ OR ↓)		
Ngano nausab?		

Appendix 4. Behavioural Research Ethics Board approval.



The University of British Columbia
Office of Research Services and Administration
Behavioural Research Ethics Board

Certificate of Approval

PRINCIPAL INVESTIGATOR Vincent, A.C.J.	DEPARTMENT Grad. Studies - Dean's Office	NUMBER B03-0019
INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT		
CO-INVESTIGATORS: Pajaro, Marivic, Resources & Environment		
SPONSORING AGENCIES		
TITLE : Understanding and Improving the Effectiveness of Community-Based Marine Protected Areas, for Marine Life and for People		
APPROVAL DATE FEB 24 2003	TERM (YEARS) 1	DOCUMENTS INCLUDED IN THIS APPROVAL: Feb. 21, 2003, Recruitment method / Jan. 2003, Version 1, Questionnaire
CERTIFICATION: <p>The protocol describing the above-named project has been reviewed by the Committee and the experimental procedures were found to be acceptable on ethical grounds for research involving human subjects.</p> <p><i>Approval of the Behavioural Research Ethics Board by one of the following:</i> Dr. James Frankish, Chair, Dr. Cay Holbrook, Associate Chair, Dr. Joe Belanger, Associate Chair</p> <p>This Certificate of Approval is valid for the above term provided there is no change in the experimental procedures</p>		