Increasing the Resilience of Marine Ecosystems:
Creating and Managing Marine Protected Areas in the Philippines

Karin Post
Marine Conservation Philippines

Table of Contents

Chapter 1: Introduction

Humans benefit from the marine environment in many ways: culturally and aesthetically, through the provision of ecosystem services and for food and livelihood support. However, with a growing global population and rapid economic development, marine ecosystems are facing a number of serious threats, including overfishing, marine pollution, land alteration and climate change, putting their ability to provide ecosystem goods and services in the future at risk (Wahle et al., 2003).

According to the United Nations Food and Agriculture Organisation, 30% of global fishing stocks are overexploited or depleted with another 57% being fully exploited (FAO, 2012). This poor fisheries management has caused global fishing stocks to provide far less than if they were allowed to recover, and some studies suggest that in a business as usual scenario, 100% of commercial fishing stocks could collapse by 2048 (Worm et al., 2006).

In addition to the pressures of overfishing and destructive fishing techniques, marine ecosystems are also expected to be disrupted increasingly by alterations in the physical and chemical properties of oceans as a result of climate change, affecting the long-term productivity, distribution, seasonality and efficiency of food webs (Steinacher et al., 2010). Using different approaches, Cheung et al. (2009) and Barange et al. (2014) both come to the same conclusion that the implications for global fisheries productivity will vary considerably among different regions, with production increasing initially at high latitudes, while mid and low latitudes will mostly experience a decrease in productivity.

As most Southeast Asian countries rely heavily on their fisheries sector in terms of wealth, food and employment creation and often have fewer available resource to invest in climate adaptation, this region is one of the most vulnerable to these threats (Barange et al., 2014). In addition, other stressors including land alteration and marine pollution - which are often already very high and poorly regulated - are only expected to increase due to growing population, rapid economic development and increasing urbanisation, industrialisation and tourism in coastal areas. The expected decrease in their fish catch potential will also have major global implications, as other regions in the world, including the EU, depend more and more on fishing sectors from outside their own waters (Balata and Devlin, 2014).

However, with proper adaptation programmes, restoration of previous damages and a global shift towards sustainable fisheries management, the resilience of marine ecosystems and their ability to produce goods and services in the future can be enhanced. Marine Protected Areas (MPAs) are considered a key tool for providing this type of conservation for marine

environments. By limiting extractive and non-extractive uses in specific areas of the ocean, MPAs protect the living resources therein and give them a chance to recover from previous damages, providing benefits for the environment and for local communities, such as increased fish catch potential in/around the MPA due to spill over effects, enhancement of tourism and education and research opportunities. (Angulo-Valdés and Hatcher, 2010).

However, as they usually involve restriction of specific human uses, the relative costs and benefits of MPAs have been a constant reason of debate between affected stakeholders. The World Bank (2008) attempted to quantify the benefits of conserving marine ecosystems by calculating the cost of global overfishing, adding up to US$50 billion annually and totalling U$2 trillion over the past three decades. In addition, Balmford et al. (2002) estimated the total enterprise value of intact mangrove systems in Thailand to be 70% higher than those altered for shrimp farming, and the total enterprise value of sustainable fishing practices around a coral reef in the Philippines exceeded that of destructive fishing techniques by nearly 75%.

Despite a number of successful examples, the percentage of MPAs producing benefits is still questionable (Jones, 2014), and recent studies have thus placed increasing importance on identifying factors that may contribute to the success of MPAs. Jones (2014) states that the effectiveness of MPAs depends largely on a solid governance framework which should be formed by clear and enabling institutions (laws, policies, norms) attentive to contextual factors. Furthermore, they should include a diversity of people, state and market approaches, as well as the application of different economic, interpretive, knowledge, legal and participative incentives.

Pieracini (2015) also emphasises the importance of multiplicity in the governance structure, showing that dichotomy between ecological and socio-economic aspects of conservation can create unnecessary conflicts further down in management, particularly regarding the form of participation in decision-making processes. Similarly, Turner et al. (2014) find that the application of enabling governance structures and processes can inspire community support and compliance to regulations and thereby have significant implications for the effectiveness of marine conservation management.

Finally, Bennett and Dearden (2014) state that in addition to having an enabling governance framework, the effectiveness of MPAs is largely determined by managers' abilities to recognise necessary governance, management and local development inputs, such as mechanisms promoting a fair distribution of MPA benefits amongst local people, without which MPAs either remain just 'paper' parks or are not sustainable on the long term.

They provide a framework for evaluating the effectiveness of MPAS related to these three inputs and conclude that even though their appropriate application likely leads to more ecologically productive and socio-economically beneficial MPAs, a precise understanding of how they interact with contextual factors and function in different types of MPAs is still limited and needs to be further researched.

Chapter 2: Marine Protected Areas in the Philippines

The Philippines consists of over 7000 islands and has a coastline of 33,900 km (Reefbase, 2015). It lies within the Coral Triangle, the area of highest marine biodiversity on earth, and has an extensive reef system covering 25,060 km^2 where a total of 464 reef-building coral species can be found, nearly half of all known species. Unfortunately, the Philippines have suffered severe declines in coral reef health due to poor land-use practices, rapid coastal development, overfishing and destructive fishing techniques, including the use of dynamite and cyanide. There are only a few areas remaining of high fish diversity and biomass, usually in large MPAs such as the Tubbataha National Park or in remote areas of the South China Sea such as the Spratly Islands (Wilkinson, 2004).

Generally, MPAs serve (one of) three goals: natural heritage, cultural heritage and/or sustainable production (Wahle et al., 2003). They come in many varieties, sometimes including no-take areas in which extractive uses (and sometimes all access) are restricted, or multiple use areas in which competing uses are balanced. In the Philippines, the following definitions are used (Miclat and Ingles, 2004):

Marine Protected Area (MPA)

A Marine Protected Area (MPA) is any specific marine area that has been reserved by law or other effective means and is governed by specific rules or guidelines to manage activities and protect the entire, or part of, the enclosed coastal and marine environment.

Marine Sanctuary

A Marine Sanctuary is an MPA where all extractive practices, such as fishing, shell collection, seaweed gleaning and collecting of anything else, are prohibited. It may also control other human activities, including all access, in order to protect the ecosystem within the specific site.

Marine Reserve

A Marine Reserve is an MPA where strict sanctuary conditions are not mandated for the entire area, but there is still a desire to control access and activities, such as boating, mooring and various fishing techniques. It may consist of multiple zones including a sanctuary area.

Marine Park

A Marine Park is an MPA where multiple uses emphasising education, recreation and preservation are encouraged. They are usually implemented by zonation schemes which may include sanctuary areas (White, 1988a).

The first municipal marine sanctuary in the Philippines, the Sumilon Island Marine Sanctuary, was established in 1974. All fishing practices on a portion of the Sumilon Island reef were halted for about 10 years, resulting in both living coral cover and fish abundance to more than double and yearly fish catch outside the sanctuary to increase from about 14t/km^2 to almost 36t/km^2 (Russ and Alcala, 1996a, 1996b). It was recognised nationally and internationally as a prime example of how coral reef sanctuaries can contribute to improved reef fisheries management, until the reef sanctuary was violated in 1984, leading to a fish yield decline in the years thereafter (White, 1988b, 1989; Russ and Alcala, 1996a).

Shortly after, in 1985, the community-based Apo Island Marine Reserve was established. This reserve is still considered the "poster child" for coral reef MPAs, where the fishing community continues to attest to improvements in their fish catch outside the sanctuary (Russ et al., 2004). Since then, over 600 more MPAs have been established in the Philippines (Reefbase, 2015). Many of these however are currently dysfunctional "paper parks" that are not managed properly or at all. In fact, according to Reefbase (2015), only 339 MPAs in the Philippines are actively managed. The majority of these MPAs (309) are managed at the municipal level, 29 are national level MPAs and one is managed as an individual site.

The management status of MPAs in the Philippines is documented through a common database established by a number of cooperating institutions (CCEF and Partners, 2005). However, only about 350 of all MPAs in the Philippines are documented (White et al., 2006). This lack of monitoring and documentation is one of the main reasons why so many MPAs in the Philippines are not managed properly. A consistent monitoring and evaluation of all MPAs could improve the effectiveness of MPAs by addressing challenges such as determining how to make existing MPAs form effective networks to address larger ecosystem conservation needs, how to scale up efforts to cover larger areas that are more strategically selected, or how to provide monetary and moral support to new and existing MPAs.

Chapter 3: Legal and Jurisdictional Framework

In the Philippines, MPAs are established nationally through the National Integrated Protected Areas System (NIPAS) Act or through local (municipality or city) government planning and ordinance. The three jurisdictions holding the authority to establish and manage MPAs are the Department of Environment and Natural Resources (DENR), and the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) or the local government unit (LGU) (White et al., 2006). Provincial governments are also important in helping sustain MPAs over time by helping municipalities and cities through technical assistance, training, policy guidance and funding.

Both DA-BFAR and DENR have (sometimes overlapping) responsibilities for protecting marine environments (White et al., 2006). The DA-BFAR is mandated in the Fisheries Code of 1998 (RA 8550) to manage fishery and aquatic resources with the main consideration of achieving food security. Meanwhile, the DENR has authority over the development, exploration and utilisation of marine, freshwater and brackish water environments, as well as all aquatic resources over all nationally declared protected areas by virtue of the NIPAS Act of 1992. This law checks and manages national protected areas through a Protected Area Management Board with local government and stakeholder representatives, as explained in *Philippine Coastal Management Guidebook 2: Legal and Jurisdictional Framework for Coastal Management* (DENR et al., 2001).

Though the DENR is mandated to establish and manage MPAs under the NIPAS Act, LGUs are usually the most active contributors, often with assistance of the DA-BFAR (White et al., 2006). The administrative abilities of the LGU are enhanced by the Local Government Code of 1991, which confers political decentralisation and grants LGUs power to generate and mobilise economic resource through taxes and fees. Thus, LGUs can thus control fishing activities occurring within their municipal water by establishing sanctuaries, limiting access to marine resources, prescribing zones for different uses, and collecting taxes or fees associated with different uses. However, these new conditions can never be weaker than those already set by the DENR or the DA-BFAR.

Community involvement in the planning and implementation process of MPAs plays a critical role in their success (White et al., 1994; White et al., 2002). In the Philippines, the stewards of successful MPAs are often local resource stakeholders who have received substantial mentoring and assistance to become effective MPA managers (White 1988a; Bolido and White, 1997; Hermes, 1998). Their knowledge of the community and awareness of the power inequalities and different interests existing therein helps them

recognise possible sources of conflict, resolve differences and enable various groups to arrive at a common vision for the MPA.

Chapter 4: Planning and Establishing a Marine Protected Area

As MPAs serve multiple and sometimes diverging goals, planning one often results in competition for coastal resources and issues of ownership over specific coastal and marine areas. In these cases, Integrated Coastal Management (ICM) programmes have been designed to guide the process in an ecologically sustainable fashion (White et al., 2006). Typically, ICM programmes consist of a variety of interventions addressing the needs of coastal and fisheries management, all with the underlying premise to conserve natural resources. Embracing both coastal and upland areas, ICM strives to improve and integrate the administrative, policy and regulatory processes of coastal management by breaking down the barriers of traditional management of natural resources and the divide among different stakeholders (local government, national agencies, community groups, NGOs).

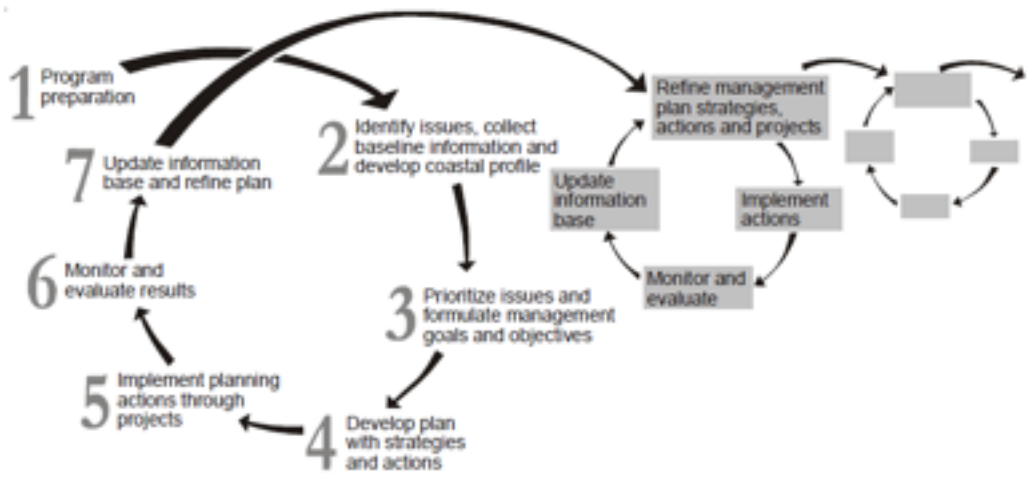

Figure 1: Cyclical ICM data collection, planning, implementation and monitoring (source: White, 1997; Olsen et al., 1998 in: White et al., 2006)

Depending on community needs and the context of the ICM plan, MPAs can be designed within ICMs to fulfil multiple purposes, allowing for various management options (White et al., 2006). For example, in Donsol, Sorsogon, the entire municipal waters have been declared as a whale shark sanctuary. Whereas, the ICM programme for Balayan Bay addresses multiple long and short-term threats faced by the conservation areas and sanctuaries found in Mabini and Tingloy municipalities, including land form changes, offsite pollution, incompatible land uses between towns, watershed impacts on coral reefs, sedimentation, foreshore developments, oil spills and destructive fishing (Tongson, 2004).

Establishing and managing and MPA within ICM occurs in different stages that have been adapted from the coastal planning process described in *Philippine Coastal Management Guidebook 3: Coastal Resource Management Planning* (DENR et al., 2001). Though each MPA is unique, the techniques for encouraging community support and establishing an MPA are widely applicable. The general process and activities for establishing and managing an MPA are outlined in table 1.

Phases of Coastal Management	Stages for MPA Establishment and Management
1. Issue identification and prioritisation and baseline assessment	- Issue recognition and program preparation - Integration with the community and assessment of issues 1. Community organisation and mobilisation 2. Conduct of baseline studies 3. Information, education and communication
2. Project preparation	1. Formation of the core group 2. Definition of goals and objectives 3. Preparation of management strategies 4. Determination of MPA boundaries and zones
3. Project implementation	1. Formalising the MPA 2. Managing the MPA 3. Enforcing rules and regulations 4. Implementing permit and user fee systems 5. Strengthening community involvement
4. Monitoring and evaluation	- Monitoring and evaluation - Refining the management plan
5. Information management, education and outreach	- Reviewing MPA status - Refining education programmes - Developing outreach programmes

4.1 Phase 1: Issue identification and prioritisation and baseline assessment

4.1.1 Issue recognition and programme preparation

The recognition of the need for an MPA in the Philippines can come from within a community itself or from outside the community, such as from local conservation organisations, from scientists, or from the LGU (White et al., 2006). The latter was more common in the past, but after the initial success

Table 1: Stages for MPA establishment and management (source: White et al., 2006)

of a few MPAs, more and more communities have started initiating discussions and investigations about protecting their natural resources themselves. Once the need and desire for an MPA has been recognised, communities will usually ask assistance from conservation groups, universities, development projects and government agencies to start the programme preparations for establishing their own MPAs.

4.1.2 Integration with the community and assessment of issues

As locals usually have a deep understanding of traditional resource patterns and the ecology of the target species and their critical habitat, their inclusion in MPA planning can be very beneficial (White et al., 2006). In addition, including locals at an early stage of the MPA planning also improves the likelihood that they will feel ownership of the MPA. Therefore, it is important to integrate with the community and include locals with the assessment of issues when preparing to plan an MPA.

1. Community organisation and mobilisation

In order to integrate with the community, a trained community organiser (CO) can enter the affected *barangays* ('municipalities') for a significant period, usually at least 6 months, to introduce and/or develop the idea of an MPA, meet local leaders, attend meetings, and become familiar with the local culture and possible management issues (White et al., 2006). During this stakeholder-ship management phase, the CO investigates who will win and who will lose if an MPA is established and tries to determine who will become the institutional anchor for the MPA. They also collect information to determine the scope of the baseline studies needed to form a coastal environmental profile about the proposed management site.

Some important factors the CO will consider about the proposed MPA are (Agardy, 1997; Hermes, 1998; Kelleher, 1999; Salm and Clark, 2000):

- Relative naturalness: is the area in good condition?
- Representativeness: does the area include important ecological functions (such as spawning, nursery or feeding areas) and/or vulnerable species?
- Biodiversity: is there a high diversity of species and/or ecosystems present in the area?
- Vulnerability: does the area have rich resources and/or biodiversity that are relatively vulnerable to disturbance & destruction?
- Fisheries value: is the area strategic for enhancing fisheries?
- Tourism value: is the area strategic for enhancing appropriate recreational uses and tourism revenues?
- Social acceptance: would an MPA receive acceptance from all stakeholders?

- Practicality of management: would an MPA be practical to manage?

2. Conduct of baseline studies

A coastal environmental profile facilitates discussions about the goals and objectives of the MPA by presenting a full description of the area, including physical features, natural resources present, socio-political setting, economic sectors, institutional and legal framework and management issues and opportunities (White et al., 2006). As the profile will form the basis for the management plan and will be used later in its development to evaluate the site, baseline data collection and scientific studies of the area should start early in the process of establishing the MPA. Moreover, the method of collection should be repeatable and the studies should include indicator criteria for monitoring progress, tracking changes and evaluating the effectiveness of the MPA.

Important considerations for baseline data collection include (White et al., 2006):

- What information about habitat conditions, activities, and program achievements is needed?
- When should the information be collected as a baseline for later comparison?
- Who needs the information and how will the information be used?
- Who will generate the various types of information?
- What are the procedures for collecting, storing, retrieving, and analysing the data?
- What kind of qualitative and quantitative information indicates improvements in the environment, people's awareness about their environment, and the socioeconomic condition of people?

As local residents can often provide great detail on seasonal variations of species, distribution of marine ecosystems, resource use and weather patterns, they should be encouraged to contribute to baseline data collection, for instance through a participatory coastal resource assessment (PCRA) (Deguit et al., 2004).

The local academic community can also be a valuable partner at this stage, as it can provide local technical knowledge and bring its own institutions into the process, providing lab facilities and student volunteers for gathering data and community outreach (White et al., 2006). Eventually, they may align their research interests with those of the proposed MPA, which can also help to increase interest in and acceptance of an MPA (White and Vogt, 2000).

3. Information, education and communication

In addition to opening discussions about the MPA and using PCRA to collect data for a coastal environmental profile, COs can also stimulate involvement from the community through information, education and communication activities. The initial focus of these activities should be on explaining the basic principles of marine ecology and resource management (White et al., 2006). Further along, the topics may shift to learning about the political process, funding options, management strategies, and enforcement and monitoring. Different approaches should be used so that all members of the community – men and women, elders and youth – are engaged in the process.

4.2 Phase 2: Project preparation

After the main issues have been identified and prioritised and a coastal environmental profile has been prepared, all with participation of the community, the next step of establishing an MPA is preparing a management plan. This plan should include an introduction, the coastal environmental profile, the goals and objectives of the MPA, the management interventions the implementing structure, and the monitoring and evaluation methods (White et al., 2006).

After the introduction and the coastal environmental profile, the goals and objectives of the MPA should be clearly specified (White et al., 2006). Next, the management interventions should include strategies and activities for habitat management, for management zones (if applicable), for constituency building and for compliance and enforcement. It may also include strategies for other interventions such as user fee systems, alternative/supplemental livelihood programmes, shoreline or foreshore management and solid waste management.

Then, the implementing structure should include a description of the management board and the committee or council, as well as a division of duties and responsibilities, an organisational chart and a budget for each management intervention (White et al., 2006). Finally, the management plan should describe the monitoring and evaluation methods, institutional and scheduling arrangements, budgetary and equipment requirements and reporting and feedback mechanisms.

1. Formation of the core group

The first step in preparing a management plan is appointing a local committee ("anchor") committed to planning, implementing and managing the MPA (White et al., 2006). Such a committee (often referred to as a Sanctuary Management Committee, or SMC) can be initiated by the CO and must be recognised by the LGU to be effective. Small subgroups may form in the committee to increase the diversity of interests and create more

management interventions in the management plan, strengthening the base of support in the community. However, the capabilities of small committees are easily overwhelmed and overloading should thus be avoided.

2. Definition of goals and objectives

Next, the goals and objectives of the MPA should be defined. The goals should clearly state the overall purpose for establishing the MPA, and objectives should be measurable and stated explicitly (White et al., 2006). Examples may include: protecting critical habitat from physical damage, increasing fish abundance and diversity, stabilising and improving living coral cover, increasing fish catch outside the MPA, and attracting diving tourism to generate income.

3. Preparation of management strategies

Once the management committee has been appointed and the goals and objectives of the MPA have been defined, the management strategies can be prepared. This preparation will consist of multiple steps, including: defining responsibilities of the management committee, reaching a consensus on permissible activities and boundaries of the MPA, defining community enforcement, drafting a local ordinance, developing resource restoration schemes, planning and implementing educational activities, fund raising or clean-up events, and conducting monitoring and research studies to refine and fill in missing data (White et al., 2006).

4. Determination of MPA boundaries and zones

The final step in the management plan preparation is determining MPA boundaries and zones. It is important to delay the drawing of MPA boundaries for as long as possible, as boundaries tend to polarise stakeholders and draw away attention from the real issues (White et al., 2006). Discussion and negotiations should initially be focused on the objectives and general uses of the MPA and how to manage the area. Once there is agreement on these issues, then lines can be drawn.

Factors to consider when defining MPA boundaries include the management objectives of the MPA, the desired size and shape, which species are targeted, prevailing currents and possible opportunities or issues of enforcement (White et al., 2006). First of all, MPAs should have clearly defined boundaries in order to prevent inadvertent fishing and to simplify enforcement. They should also be large enough to offer true protection for the target species, avoiding fish to migrate out too often and be susceptible to over fishing. An MPA should also include all types of habitat important to marine life, including sea grass beds, mangrove fringes and reef areas, as

many species migrate between these habitat types during various life stages.

Furthermore, MPAs should preferably be located upstream of important fishing areas to optimise the replenishment to areas outside the MPA, as larvae and excess individuals will travel on the current to repopulate these areas (White et al., 2006). The management board may also consider proper management of the adjacent shoreline of the MPA. Finally, there should be no enforcement issues in the area.

When an area is large enough to justify different forms of management and uses, a zoning plan can provide the basis for MPA management, such as in a Marine Reserve or a Marine Park. By providing a gradation of restriction, a zoning management scheme can be easier to establish and regulate since it can satisfy the requirements of a range of stakeholders (White et al., 2006). An example of an effective multiple-use zoning plan is that of Olango Island, Cebu.

Though there is no definite structure for a zoning scheme, it usually includes both a core 'no-take' sanctuary, in which all destructive and/or collecting activities may be prohibited, and a 'traditional use' buffer zone that controls various activities (White et al., 2006). The buffer zone provides a transition space between the inner core sanctuary and the outer non-sanctuary or less managed areas. Less strict regulations apply to the buffer zone and a combination of different uses may be included, such as appropriate recreational activities, ecologically sound exploitation methods, non-disturbing research and education activities or closely regulated breeding and spawning activities, depending on the needs of the area to be managed.

As the regulations in the no-take zone will be stricter, the MPA will be more effective in maintaining ecological processes and species diversity the larger this core sanctuary is. Where Salm and Clark (2000) suggest a minimum sanctuary size of 300ha to successfully maintain coral species diversity, there have been reports of effective MPAs with sanctuaries as small as 10ha (Roberts and Hawkins, 1997). Most importantly, for a sanctuary to be effective it should encompass the general vicinity in which all species are certain to be found and reproduce (White and Vogt, 2000; Arceo et al., 2004).

4.3 Phase 3: Project implementation

The third phase of planning and establishing an MPA is implementing the management plan. This phase includes five key steps: formalising the MPA,

managing the MPA, enforcing rules and regulations, implementing permit and user fee systems and strengthening community involvement.

1. Formalising the MPA

The first step of implementing a management plan is formalising the MPA by incorporating the management plan into a municipal or city ordinance (White et al., 2006). In order to legally create an MPA, the proposed plan should not create any legal or jurisdictional conflict. It is thus important to consult thoroughly with key stakeholders and ensure that the LGU supports the management plan to complete municipal ordinance. This process will usually take between 6-12 months.

2. Managing the MPA

Once the management plan is formalised, the management strategies can be implemented. Some of the most common MPA management strategies include setting limits on fishing methods, placing permanent mooring buoys, designating boat trails or travel ways in heavily visited areas, and establishing regular embarkation points to control access to sanctuaries (White et al., 2006).

First of all, damage from fishing can be managed by setting limits on fishing methods. In MPAs, fishing methods should always be non-destructive as well as limited in the type of equipment used and the amount of effort made (White et al., 2006). Fishing methods normally permitted in designated MPA traditional use areas or zones are:

- Hook and line using traditional equipment
- Throw nets and gill nets with mesh size large enough to allow the escape of small fish species and juveniles of larger fish
- Traps that are place and maintained without disturbance to coral
- Reef gleaning in ways that do not overturn or break corals, stir up sediments, or crush corals while walking

Fishing methods normally *not* permitted in designated MPA traditional use zones (and often not within municipal waters either) are (White et al., 2006):

- Use of scuba or hookah diving for underwater gathering and spear fishing
- Any active gear where sweeping the water to drive fish or motorised pursuit is involved
- Beach seine drag or throw nets that tend to disturb bottom habitat
- Reef gleaning when the potential impact from many reef walkers is excessive
- Any illegal method such as use of poison, explosives or bottom trawls

Another management strategy is placing permanent mooring buoys in tactical areas to which boats can attach themselves, thereby minimising coral damage from dropping anchors and chains. In addition, these buoys will centralise diver activity so that coral damage due to divers is also less dispersed (White et al., 2006).

Furthermore, heavily visited sites which can only be reached through limited routes (such as barrier reefs) can be assigned a fixed trail to help boat captains avoid damage by accidental grounding (White et al., 2006). Sensitive sites can also be managed by setting visiting hours based on tide cycles.

Finally, establishing regular embarkation points facilitates collection of entrance fees, allows boat queues for passenger pickup and also provides a central point for boat inspections and communication of MPA regulations (White et al., 2006). Damage from boat docking is also minimised to one area.

3. Enforcing rules and regulations

After implementing the management strategies, the rules and regulations of the MPA need to be enforced. The SMC and *Bantay-Dagat* ('sea watch') deputised for coastal law enforcement are key to successful enforcement of the MPA, as well as the amount of support from within the community (White et al., 2006). Though enforcement through local incentives and disincentives and peer group pressure is often more effective and less costly than government enforcement and legal prosecution, government assistance may be necessary in some instances. The need for this assistance can be reduced through education and monitoring, as long as there is adequate enforcement through regular police presence, action to avoid harassment suits that may be filed against the *Bantay-Dagat*, and an effective penalty system for offenders.

In order to keep a close watch on an MPA, the SMC and the police can work together with local community watch groups (White et al., 2006). These can consist of a simple network of observers or be formed by people deputised with the authority to assist in enforcing regulations. Ideally, the group should derive some direct benefits from their vigilance as an incentive to maintain close watch on the area.

4. Implementing permit and user fee systems

Permits and user fee systems can be applied as a management strategy to avoid overexploitation of marine resources and/or to generate revenue. By setting conditions for the use of the resource, such as harvest limits, methods or seasons, permits are an effective way to limit access to something that would otherwise be free and open to all (White et al., 2006).

Putting a price on the permits furthermore sets tangible values on coastal waters and resources, provides the community with an economic incentive to protect and manage these resources, regulates and limits the extraction of these resources and generates funds for the continued implementation of coastal resource management.

In setting permit fees, LGUs must consider the value of the resource as well as the costs for research and monitoring the impacts of MPA management, following the basic assumption that without management the resource would be destroyed and net revenues from coastal activities would eventually fall to zero (White et al., 2006). Fees are often based of the cost of administering the procedure and of conducting surveillance to ensure compliance, but rarely include the true value of the resource. This encompasses not only the marketable goods they produce, but also the services and benefits they provide, many of which are difficult to quantify.

The cost of the fees should be high enough to reflect willingness-to-pay and act as a barrier for casual users (White et al., 2006). A multiple-tier fee schedule can be used, for instance having tourists pay more for accessing an MPA than a local resident, as they can probably afford to (and are willing to) pay more. A trading scheme can also be put in place to allow users to exchange permits between one another in return for financial benefits. Finally, it is important that the total number of permits should be limited to ensure a sustainable use of the resource.

The generated revenue from the permits can be used to support the continuous management of the MPA, such as at Tubbataha Reefs National Park or in Gilutongan Marine Sanctuary in Cordova, Cebu, where revenues are shared between the barangay community (30%) and the municipal treasury (70%), of which the latter covers all expenses for maintenance of the sanctuary such as salaries, marker and anchor buoys, guardhouse and others (White et al., 2006)

5. Strengthening community involvement

After the initial planning an MPA, interest from the SMC and the community often tends to subside. It is important to sustain this interest throughout the whole process through positive feedback, community outreach and partnerships.

One of the most effective ways to strengthen community involvement is by providing positive feedback and publicity about the success of the MPA (White et al., 2006). A stewardship agreement that stipulates the community's role in managing the MPA together with the LGU, other agencies or NGOs working in the area will provide this type of feedback, strengthening motivation and helping resolve conflicts about the roles of

various stakeholders in the management process. Furthermore, when problems do arise, support must be provided in a way that is accepted by the community and abrupt take-over of activities must be avoided.

Exchange programmes with other communities involved with MPAs can generate further interest as people can learn from each other's experiences (White et al., 2006). The MPA can also be used as a training site, using key local individuals as part of the training team for other communities interested in establishing an MPA.

Partnerships with the private and public sector can strengthen community involvement by fostering dialogue and understanding among various members of the community and bring them to a consensus on certain principles, issues and resolutions (White et al., 2006). Partnerships build on the unique strengths of different groups toward the achievement of a common goal and can mobilise resources and funding for implementing programs and activities. Furthermore, they provide opportunities to push for local policy reform.

Schools, NGOs and local media can provide printed materials, newsletters, T-shirts, and special events as a way to reach the broader community, while the private sector can help to fund, construct and maintain visitor facilities and exhibits, signs, and trails (White et al., 2006). Another popular strategy is to establish and adoption campaign that enables people and concerned businesses to support the MPA. Involving a broad range of community groups fosters support for an MPA and increases the likelihood of the MPA remaining effective on the long run.

4.4 Phase 4: Monitoring and evaluation

4.4.1 Monitoring and evaluation

Once an MPA has been established, it is important to continuously monitor and evaluate the area. The goal of monitoring and evaluation is to assess the effectiveness of the management process and to determine future strategies (De la Cruz and Militante, 1996; White et al., 2004). On Balicasag Island for example, the beneficial impacts of the marine reserve are clearly indicated by improvement in living coral cover and fish abundance (White et al., 2006). Furthermore, changes in a standard list of governance indicators can also reveal how well the MPA is being managed.

4.4.2 Refining the management plan

The MPA management plan is not a static document. Goals and strategies often need to be modified to reflect changes in the MPA conditions, the surrounding community, or based on new knowledge and experience (White

et al., 2006). This information provides a foundation for future program development and can be used to guide policy changes.

4.5 Phase 5: Information management, education and outreach

4.5.1 Reviewing MPA status

As mentioned previously, very few MPAs in the Philippines are documented properly. All information related to an MPA, including monitoring and evaluation results, should be collected regularly and the data should be stored and managed effectively to support long-term efforts (White et al., 2006). Effective management of this information will highlight how well the MPA is being managed and if benefits are being derived from its management.

4.5.2 Refining education programmes

The education materials used to inform the community about planning and implementing MPAs should be updated constantly with information obtained from monitoring and evaluation activities (White et al., 2006). For instance, when the data is showing improvements in the area of the MPA, this information should be shared with the community and stakeholders as evidence of success. This evidence can also serve to convince local government officials about the importance of supporting the MPA and providing needed assistance to maintain the area.

4.5.3 Developing outreach programmes

Finally, outreach programmes based on a successful MPA can help other communities establish their own MPAs (White et al., 2006). This can be achieved though hosting study tours and teaching about the management approaches implemented, as done by the Apo Island Marine Reserve for example.

Chapter 5: Creating Marine Protected Area Networks

Since the 1980s, a major objective for the establishment of MPAs in the Philippines has been to enhance coral reef fisheries. In fact, 294 of the 339 actively managed MPAs in the Philippines are dominated by coral reef habitat (Reefbase, 2015). Habitat protection allows reef fishes to grow to mature sizes, leading to enhanced reproduction and spill-over of larvae and adult fishes to adjacent areas of the MPA (Russ et al., 2004). More recently, additional benefits have been identified including enhanced livelihood opportunities for tourism and related economic activities associated with an MPA, as well as protection for species of special concern and seascapes (Aliño et al., 2002; White et al., 2002).

MPAs are generally more effective and successful when implemented within the context of an integrated coastal management (ICM) regime, especially when various governance hierarchies, the private sector, and local communities are included in managing the MPA (White et al., 2006). An important advantage of such networks is that they allow MPAs to complement each other through synergistic effects within their local and regional ocean environment, enhancing fisheries management and biodiversity conservation beyond what individual MPAs can achieve alone (Palumbi, 2003). Not just any collection of MPAs can be called an MPA network: an MPA network is a collection of MPAs that *interact* in a meaningful manner to enhance fisheries and biodiversity conservation (Palumbi, 2004). Therefore, MPA networks must be guided by knowledge of ocean currents, larval movements, spawning areas and other factors in coordination with social acceptance considerations.

There are two main types of MPA networks. Social networks are formed by coordinating the administration and planning of an MPA and sharing monitoring and evaluation results, while ecological networks are formed by a natural connection between and within sites that enhances the ecological functions and benefits of one or more MPAs (White et al., 2006).

Ecological connections between MPAs can include (White et al., 2006):

- connection of adjacent or continuous habitats such as coral reefs and sea grass beds
- connection through regular larval dispersal in the water column between and within the MPA sites or regular settlement of larvae from one MPA to inside another MPA
- movements of mature marine life in their home range from one site to another or because of regular or random spill over effects

MPA networks are usually set up to achieve biodiversity conservation and/or fisheries enhancement (White et al., 2006). For biodiversity conservation, MPAs are selected on the basis of bio-geographic and habitat representation

and presence of species or populations of special interest (e.g. threatened and vulnerable species). For fisheries enhancement, MPAs are also selected on the basis of the size necessary to protect viable habitats, presence of exploitable (target) species, vulnerable life stages of selected species, connectivity among MPAs and links among ecosystems, and provision of ecosystem services to people.

5.1 Advantages of an MPA networks

MPA networks have biophysical and ecological advantages over individual MPAs. The advantages depend on ecological linkages, but can include (White et al., 2006):

- Ensuring that the most valuable marine habitats are at least partially protected as reflected by habitat quality and species richness
- Ensuring that some of the larvae dispersed from a given MPA will either end up settling back inside the MPA or another MPA within the dispersal range or spatial neighbourhood of the typical species residing in it
- Ensuring that threatened, vulnerable or overexploited species of a given area will have adequate habitat space to reside and be able to continue reproducing and to disperse larvae into surrounding areas as a result of the MPA network (e.g. giant clams, grouper, lobsters)
- Enhancing fisheries production for a given management area through larval production and dispersal, and maximising fish spill over effects through planning to the benefit of both fisheries and conservation

In addition, MPA networks also provide a rationale for individual MPA stakeholders and communities to coordinate with each other and share their experiences, enhancing efforts in managing and protecting their MPAs and promoting the networks' viability and longevity (White et al., 2006). The world heritage marine park 'Tubbataha Reefs' is an important example of fulfilling both source and sink functions for the marine ecosystem, and its connection with other areas contributes to the maintenance of high biodiversity in adjacent areas.

5.2 MPA network design

Before establishing an MPA network, it is important to understand which features enhance fisheries production and conserve ecosystems and species in a given area in relation to the social and cultural context. Criteria for determining sites of a series of MPAs are similar to those of one MPA (see 4.4.2 *Integration with the community and assessment of issues - Community organisation and mobilisation*). In short, sites must have relatively intact,

natural, representative and diverse resources. In addition, if there are fisheries and social economic values associated with the area, the likelihood of good management will be enhanced (White et al., 2006).

In an MPA network, all MPAs must fulfil these criteria to be effective in their own right and contribute to biodiversity conservation. In addition, if the goal of the MPA network is to protect fisheries habitats and enhance fisheries production, additional criteria that may weigh a decision towards a specific area are (White et al., 2006):

- Habitat quality: areas with generally superior habitat quality (e.g coral cover, seagrass, water quality)
- Fish habitat: areas that maintain higher than average abundance, density, and species richness of fishes or contain spawning aggregations of fish
- Oceanography: areas with favourable currents that tend to aggregate larvae and organisms inside the sanctuary but with periodic flushing to the outside
- Biodiversity: areas with higher than average biodiversity and range of animals on the food chain
- Size: areas that cover at least 10ha (but preferably 20ha or more) of critical fisheries habitat
- Social acceptance: areas that will not remove the most desired fishing ground from a community an do not create unnecessary social conflicts
- Practicality of management: areas where no fishing and extraction can be enforced given the resources that will be available for protection
- Quality of management: areas where the rules are sufficiently enforced to ensure tangible fisheries benefits

The above criteria will provide relative assurance that each MPA will contribute significantly to fisheries enhancement and general conservation in its area of operation. Furthermore, for MPA networks to be effective, each MPA should cover a critical minimum area (5-10%) of the total planning area, management bodies must be connected to each other through environmental and social arrangements, and finally, the management system must be both horizontal and vertical with local governments playing key roles (White et al., 2006).

5.3 Social, information and administrative networks

One of the greatest challenges for implementing an MPA network is demonstrating that an ecosystem is important enough for multiple management bodies to work on. Shared evaluation results and overlays of

maps with important spawning events and fishing practices can help illustrate the importance of a network (White et al., 2006). These maps should include sensitive areas of highest threat that need protection combined with enforcement areas to guide joint inter-LGU ordinances or common provincial action plans. An example of this can be seen in the efforts to link community-based MPAs in the Bohol Sea (Indab and Agpilla, 2004).

In the Philippines, a network for marine-associated communities (newsletters, e-mail, and a growing list of participating organisations) facilitates this type of information and experience sharing. The Philippine Coral Reef Information Network for example operates nationally, and there are also local networking efforts of several site-based peoples' organisations (POs) (White et al., 2006).

5.4 Field approach and process

The basic approach for forming an MPA network generally follows the CRM and MPA planning process explained in chapter 4. As most individual MPAs will require some level of assistance to help make them become sustainable in their own right, their management bodies will need to be strengthened by partners who are involved with CRM and can assist with the implementation of an MPA network (White et al., 2006). These partners should work in coordination with other projects and stakeholders operating the area and consult with local governments and communities throughout the different stages of establishing and managing the MPA network.

5.5 Creating sustainable MPA networks

In order for MPA networks to evolve over time, biophysical and socio-economic factors should be considered when planning the network (WWF-SSME Program, 2004). In addition, strategic interventions can help ensure sustainability of the MPA network. These may include (White et al., 2006):

- Providing support for MPA monitoring and evaluation as summarised in the MPA Report Guide (Uychiaoco et al., 2001; White et al., 2004).
- Summarising all relevant data in a geographical and graphic manner for feedback to communities and for use in planning and education
- Training and capacitating local stakeholders to perform the tasks of planning, implementing, monitoring, and evaluating the MPAs using tested protocols (e.g. the MPA Report Guide)
- Conducting targeted research studies on the effectiveness of the MPAs, social acceptability of the MPAs, oceanography of area and

location of fish aggregation areas as deemed relevant for planning and education

- Mentoring all targeted MPA management bodies in a systematic but strategic manner to ensure that management is progressing to a higher level
- Sponsoring workshops and informal meetings among MPA managers, management bodies, and other stakeholders to help establish social networks for MPA implementation and support
- Linking all existing and future MPA data and results with national programs, such as the Protected Area and Wildlife Bureau of DENR, the MPA Database of the Coastal Conservation and Education Foundation, Inc. and Partners, and others that may assist in making local efforts more sustainable

Chapter 6: The Challenge of Sustainability

The Philippines is home to many unique and valuable habitats and associated fish populations that provide irreplaceable benefits to its population. Sadly, the quantity and conditions of these ecosystems are steadily declining as an expanding population increases the pressure on the coastal and marine environment and unclear ownership of coastal resources and conflicting mandates for their protection have made their management difficult. However, effectively managed MPAs and MPA networks can help establish an integrated management structure which identifies the value of coastal and marine habitats and assigns responsibility for their management, both on a local and national level.

Establishing an MPA requires an integrated and participatory management process that includes various stakeholders. Consensus must be the driving force behind the process. The perceived and real issues need to be prioritised, seeking solutions that are consistent with environment, social and political realities of the local area of concern (White and Vogt 2000, Arceo et al., 2001).

To summarise, the key aspects of successful MPAs in the Philippines are:

- Community preparation: do the community and local government understand the need for and process of implementing the MPA?
- Resource assessment and mapping: has the area been assessed and mapped so that everyone concerned knows the location and condition of resources and the potential boundaries for the MPA?
- Stable and functional core groups: has a functional core group been identified and empowered to manage the MPA at the local level?
- Clear goals and objectives: are the objectives for management clear to all the stakeholders and generally agreeable to the majority of the community members?
- MPA boundaries and zones: are the boundaries in accordance with the habitat assessment and are the boundaries and zones sufficient for management and generally agreeable to the stakeholders?
- Management strategies for implementation: are the strategies simple and easy to implement within the local context of the MPA and reflected in the ordinance legally supporting the MPA?
- Law enforcement and monitoring: is a group assigned to watch the MPA, monitor all activities, collect fees, and assess changes in the marine environment on a regular basis?

- Ongoing education: Does the education program address the needs of the community and stakeholders so that benefits are highlighted and that questions regarding the need for the MPA are addressed?
- CO-management in place: is the local government supporting the MPA together with community a mutually beneficial manner?
- Monitoring and evaluation: have baseline data on the condition of the habitat and the status of management been updated and changes noted? Has this information been incorporated into a standard database for comparison in the future and into an education programme for the community and local government?'

The success of MPAs can for a large part be explained by the involvement of communities in the immediate area of concern and the direct benefits derived from the MPA (White et al., 2006). In addition to these benefits, MPAs also offer opportunities and hope as they provide challenging means of empowerment for many communities by building collaborations with their LGUs or other partners. Though there are already many small scale examples of successful MPAs in the Philippines, there is still an urgent need to increase this number and create efficient MPA networks.

References

AGARDY, T.S. (1997): *Marine Protected Areas and Ocean Conservation*. Academic Press. California, USA.

ALIÑO, P.M., PALOMAR, N.E., ARCEO, H.O., UYCHIAOCO, A.T. (2002): "Challenges and Opportunities for Marine Protected Area Management." In: *Proceedings of the 9th International Coral Reef Symposium 2002*. 2. pp 636-640.

ARCEO, H.O., ANGUINALDO, M.S., ALIÑO, P.M (2001): *An Orientation on Marine Protected Areas: Coastal Resources Management Tools.* Marine Environment Resources Foundation Inc., Marine Science Institute - University of the Philippines, Royal Netherlands Embassy and International Development Research Centre.

ARCEO, H.O., CAMPOS, W.L., FUENTES, F., ALIÑO, P.M. (2004): *Proceedings of the Workshops Towards the Formulation of the Philippine Marine Sanctuary Strategy (PhilMarSaSt)*. Marine Science Institute - University of the Philippines. Quezon City, Philippines.

ANGULO-VALDÉS, J.A., HATCHER, B.G. (2010): "A New Typology of Benefits Derived from Marine Protected Areas." In: *Marine Policy.* 34. pp. 635-644.

BALATA, F., DEVLIN, S. (2014): *Fish Dependence: The Reliance of the EU on Fish from Elsewhere*. 2014 update. New Economics Foundation. London, UK.

BALMFORD, A., BRUNER, A., COOPER, P., COSTANZA, R., FARBER, S., GREEN, R.E., JENKINS, M., JEFFERISS, P., JESSAMY, V., MADDEN, J., MUNRO, K., MYERS, N., NAEEM, S., PAAVOLA, J., RAYMENT, M., ROSENDO, S., ROUGHGARDEN, J., TRUMPER, K., TURNER, R.K. (2002): "Economic Reasons for Conserving Wild Nature." In: *Science*. 297. pp. 950-953.

BARANGE, M., MERINO, G., BLANCHARD, J.L., SCHOLTENS, J., HARLE, J., ALLISON, E.H., ALLEN, J.I., HOLT, J., JENNINGS, S. (2014): "Impact of Climate Change on Marine Ecosystem Production in Societies Dependent on Fisheries." In: *Nature Climate Change*. 4. pp 211-216.

BENNETT, N. J., DEARDEN, P. (2014): "From Measuring Outcomes to Providing Inputs: Governance, Management and Local Development for More Effective Marine Protected Areas." In: *Marine Policy*. 50. pp. 96-110.

BOLIDO, L., WHITE, A.T. (1997): "Reclaiming the Island Reefs." In: *Tambuli*. 3. pp. 20-22.

COASTAL CONSERVATION AND EDUCATION FOUNDATION (CCEF) AND PARTNERS (2005): *Marine Protected Area Report Guide for Marine Protected Areas*. CCEF. Cebu City, Philippines.

CHEUNG, W.W.L., LAM, V.W.Y, SARMIENTO, J.L., KEARNEY, K., WATSON, R., ZELLER, D., PAULY, D. (2009): "Large-scale redistribution of maximum fisheries catch potential in the global ocean under climate change." In: *Global Change Biology*. 16. pp. 24-35.

DE LA CRUZ, M, MILITANTE, M.C. (1996): *Marine Reserve Monitoring Manual for Communities*. Guiuan Development Foundation Inc. Tacloban, Philippines.

DEGUIT, E.T., SMITH, R.P, JATULAN, W.P., WHITE, A.T. (2004): *Participatory Coastal Resource Assessment Training Guide*. Coastal Resource Management Project of the Department of Environment and Natural Resources. Cebu City, Philippines.

DEPARTMENT OF ENVIRONMENTAL AND NATURAL RESOURCES (DENR), DEPARTMENT OF AGRICULTURE-BUREAU OF FISHERIES AND AQUATIC RESOURCES (DA-BFAR), DEPARTMENT OF THE INTERIOR AND LOCAL GOVERNMENT (DILG) (2001): *Philippine Coastal Management Guidebook Series*. 1-8. Coastal Resource Management Project of the DENR. Cebu City, Philippines.

FAO (2012): *The State of World Fisheries and Aquaculture 2012*. Fisheries and Aquaculture Department - Food and Agriculture Organisation of the United Nations. Rome, Italy.

HERMES, R. (1998): *Establishment, Maintenance and Monitoring of Marine Protected Areas: A Guidebook*. Philippine Business for Social Progress. Manila, Philippines.

INDAB, J.D., SUARES-AGPILLA, P.B. (2004): "Community-based Marine Protected Areas in the Bohol (Mindanao) Sea, Philippines." In: *NAGA*. 27 (1-2). pp. 4-8.

JONES, P.J.S. (2014): *Governing Marine Protected Areas: Resilience through Diversity*. Abingdon, Oxon: Routledge.

KELLEHER, G. (1999): *Guidelines for Marine Protected Areas*. World Conservation Union (IUCN). Gland, Switzerland and Cambridge, UK.

MICLAT, E., INGLES, J. (2004): "Standardized Terms and Definitions for Use in Marine Protected Area Management in the Philippines." In: ARCEO, H.O., CAMPOS, W.L., FUENTES, F., ALIÑO, P.M. (eds): *Proceedings of the Workshops Towards the Formulation of the Philippine Marine Sanctuary Strategy (PhilMarSaSt)*. Marine Science Institute - University of the Philippines. Quezon City, Philippines. pp. 3-8

PIERACINI, M. (2015): "Rethinking Participation in Environmental Decision-Making: Epistemologies of Marine Conservation in South-East England." In: *Journal of Environmental Law*. Published online January 21st. Available from: http://jel.oxfordjournals.org/content/early/2015/01/21/jel.equ035.full?keytype=ref&ijkey=vDgykW12zQztpMj [Accessed October 2nd, 2015]

OLSEN, S.B., TOBEY, J., HALE, L.Z. (1998): "A Learning-based Approach to Coastal Management." In: *Ambio*. 27 (8). pp. 611-619.

PALUMBI, S.R. (2003): "Population Genetics, Demographic Connectivity, and the Design of Marine Reserves." In: *Ecological Applications*. 13. pp. S146-S148.

PALUMBI, S.R. (2004): "Marine Reserves and Ocean Neighborhoods: The Spatial Scale of Marine Populations and their Management." In: *Annual Review of Environment and Resources*. 29. pp. 31-68.

REEFBASE (2015): *Regional Summary Report for MPAs in East Asia and Micronesia*.

ROBERT, C.M., HAWKINS, J.P. (1997): "How Small can a Marine Reserve be and Still be Effective." In: *Coral Reefs*. 16 (3). pp. 150.

RUSS, G.R., ALCALA, A.C. (1996a): “Do Marine Reserves Export Adult Fish Biomass? Evidence from Apo Island, Central Philippines.” In: *Marine Ecology-progress Series*. 132. pp. 1-9.

RUSS, G.R., ALCALA, A.C. (1996b): “Marine Reserves: Rates and Patterns of Recovery and Decline of Large Predatory Fish.” In: *Ecological Applications*. 6 (3). pp. 947-961.

RUSS, G.R., ALCALA, A.C., MAYPA, A.P., CALUMPONG, H.P., WHITE, A.T. (2004): “Marine Reserve Benefits Local Fishers.” In: *Ecological Applications*. 14 (2). pp. 597-606.

SALM, R.V., CLARK, J.R. (2000): *Marine and Coastal Protected Areas: A Guide for Planners and Managers*. World Conservation Union (IUCN). Gland, Switzerland.

STEINACHER, M., JOOS, F., FRÖLICHER, T.L., BOPP, L., CADULE, P., COCCO, V., DONEY, S.C., GEHLEN, M., LINDSAY, K., MOORE, J.K., SCHNEIDER, B., SEGSCHNEIDER, J. (2010): “Projected 21st century decrease in marine productivity: A multi-model analysis.” In: *Biogeosciences*. 7. pp. 979-1005.

TONGSON, E. (2004): “ICM as a Strategy to Enable MPA Management: The Case of Balayan Bay.” In: *Proceedings of the 2nd International Tropical Marine Ecosystems Management Symposium*. Department of Environment and Natural Resources. Quezon City, Philippines.

TURNER, R.A., FITZSIMMONS, C., FORSTER, J., MAHON, R., PETERSON, A., STEAD, S.M. (2014): “Measuring Good Governance for Complex Ecosystems: Perceptions of Coral Reef-Dependent Communities in the Caribbean.” In: *Global Environmental Change*. 29. pp. 105-117

UYCHIAOCO, A.J., GREEN, S.J., DELA CRUZ, M.T., GAITE, P.A., ARCEO, H.O., ALIÑO, P.M., WHITE, A.T. (2001): *Coral Reef Monitoring for Management*. Marine Science Institute - University of the Philippines, United Nations Development Programme Global Environment Facility - Small Grants Programme, Guiuan Development Foundation Inc., Voluntary Service Overseas, University of the Philippines Center for Integrative and Development Studies, Coastal Resource Management Project and Fisheries Resource Management Project. Cebu, Philippines.

WAHLE, C., LYONS, S., BARBA, K., BUNCE, L., FRICKE, P., NICHOLSON, E., ORBACH, M., POMEROY, C., RECKSIEK, H., URAVITCH, J. (2003): *Social Science Research Strategy for Marine Protected Areas*. National Marine Protected Areas Center - MPA Science Institute. Santa Cruz, California.

WILKINSON, C. (2004): *Status of Coral Reefs of the World: 2004: Volume 1.* Australian Institute of Marine Science. Townsville, Queensland, Australia.

WHITE, A.T. (1988a): *Marine Parks and Reserves: Management for Coastal Environments in Southeast Asia*. International Center for Living Aquatic Resources Management *(*ICLARM) Education Series. 2.

WHITE, A.T. (1988b): “The Effect of Community-Managed Marine Reserves in the Philippines on the Associated Coral Reef Fish Populations.” In: *Asian Fisheries Science*. 1 (2). pp. 27-42.

WHITE, A.T. (1989): “Two Community-Based Marine Reserves: Lessons for Coastal Management.” In: CHUA, T.E., PAULY, D. (eds): *Coastal Area Management in Southeast Asia: Policies, Management Strategies and Case Studies*. International Center for Living Aquatic Resources Management (ICLARM) Conference Proceedings. 19. pp. 85-96.

WHITE, A.T. (1997): “Planning for Integrated Coastal Management: What are the Steps?” In: *Tambuli*. 3. pp. 15-19.

WHITE, A.T., HALE, L.Z., RENARD, Y., CORTESI, L. (1994): *Collaborative and Community-Based Management of Coral Reefs: Lessons from Experience*. Kumarian Press. West Hartford, Connecticut, USA.

WHITE, A.T., VOGT, H.P. (2000): “Philippine Coral Reefs Under Threat: Lessons Learned After 25 Years of Community-Based Conservation.” In: *Marine Pollution Bulletin*. 40 (6). pp. 537-550.

WHITE, A.T., SALAMANCA, A., COURTNEY, C.A. (2002): “Experience with Marine Protected Area Planning and Management in the Philippines.” In: *Coastal Management*. 30. pp. 1-26.

WHITE, A.T., MENESES, A.T., OVENDEN, M.F. (2004): “Management Rating System for Marine Protected Areas: An Important Tool to Improve Management.” In: DEPARTMENT OF AGRICULTURE-BUREAU OF FISHERIES AND AQUATIC RESOURCES (DA-BFAR) (eds): *In Turbulent Seas: The Status of Philippine Marine Fisheries*. Coastal Resource Management Project. Cebu City, the Philippines. pp. 226-231.

WHITE, A.T., ALIÑO, P.M., MENESES, A.T. (2006): *Creating and Managing Marine Protected Areas in the Philippines*. Fisheries Improved for Sustainable Harvest Project, Coastal Conservation and Education Foundation Inc., Marine Science Institute - University of the Philippines. Cebu City, Philippines.

WORLD BANK (2008): *Sunken Billions: The Economic Justification for Fisheries Reform*. The World Bank. Washington D.C.

WORLD WILDLIFE FUND FOR NATURE - SULU-SULAWESI MARINE ECOREGION PROGRAM (WWF-SSME) (2004): *Framework for a Network of Marine Protected Areas in the Sulu-Sulawesi Marine Ecoregion*. WWF Sulu-Sulawesi Ecoregion Conservation Program. Quezon City, Philippines.

WORM, B., BARBIER, E.B., BEAUMONT, N., DUFFY, E., FOLKE, C., HALPERN, B.S., JACKSON, J.B.C., LOTSZE, H.K., MICHELI, F., PALUMBI, S.R., SALA, E., SELKOE, K.A., STACHOWICZ, J.J., WATSON, R. (2006): “Impacts of Biodiversity Loss on Ocean Ecosystem Services.” In: *Science*. 314. pp. 787-790