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Evaluating the management effectiveness of marine protected areas at seven selected sites in the Philippines

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ABSTRACT

Fisheries is a vital sector in the Philippine economy, providing a significant source of both domestic and export earnings while meeting essential food security and nutritional requirements. However, marine resources in the Philippines are facing increasing pressure from overfishing, destructive fishing practices, habitat destruction, declining water quality and limited management capacity. Marine Protected Areas (MPAs) are part of the management strategy to address these issues but the majority of MPAs around the world do not meet their management objectives. This paper discusses the identification and testing of management effectiveness indicators to evaluate MPA management for seven sites in the Philippines. The selection of 14 indicators was a participatory process that involved representatives from the academe, civil society groups, fishing associations, local government units (LGUs), national government agencies and research institutions. Overall, the majority of the indicators are rated positive but there is significant room for improvement, particularly in areas of resource use conflict, availability and allocation of resources and interaction between MPA managers and stakeholders. It is imperative that MPAs across the Philippines be managed and implemented as a network to maximize conservation and fisheries management. Moreover, given that the Philippines lies in the Coral Triangle area of the highest marine biodiversity in the world, increased political will and support for MPAs is urgently needed to meet global marine biodiversity targets and allow the Philippines to be an example of effective marine biodiversity conservation.

1. Introduction

Increasing pressures on marine resources around the world in general, and particularly in the Philippines, have resulted in most near shore marine fisheries being overfished along with the concomitant destruction of coral reef, mangrove, seagrass and estuarine habitats [1]. The fisheries sector is vital to the Philippine economy, providing substantial employment and income, contributing export earnings, and meeting local food security and nutrition requirements. Capture fisheries have experienced stagnation in production in recent years, especially in coastal or municipal fishing areas, where resources have been fished down to 5–30% of their unexploited level [2], causing an alarming shortfall in supplies of aquatic products as demand increases. Production from capture fisheries has levelled off since the mid-1970s due to stock depletion in coastal waters that affected municipal fisheries; commercial fishing has suffered a similar fate, as overfishing has affected offshore areas [3]. In 2008, aquaculture had the largest share of the country's total fish production at 48% while commercial and municipal fisheries had lower contributions of approximately 25% and 27%, respectively [3]. With 10–15% of marine fish production being supplied by coral reefs and for smaller islands, more than 70% of the total fish catch and most of the protein consumed by residents, MPAs and networks of MPAs can be especially effective at promoting long-term productivity of shallow-water and small-scale fisheries [4].

An essential management strategy to address habitat destruction, over exploitation, and other threats affecting marine and coastal ecosystems and the communities that depend on these resources is the establishment and implementation of Marine Protected Areas (MPAs). The International Union for the Conservation of Nature (IUCN) defines an MPA as “any area of intertidal or sub tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment” [5]. Included within the broad context of MPAs are marine reserves, sanctuaries and parks. These marine areas can serve to fulfill the goals of protecting critical habitat and improving the ability of reef fishes to mature and

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reproduce with possible spill over of larvae and adult fishes to adjacent areas outside of MPAs, sustaining or enhancing fisheries by preventing spawning stock collapse and providing recruitment to fished areas [6–8]. Despite the many potential benefits of MPAs to coastal management programs [7], MPAs have had mixed success in meeting their management objectives in terms of ecological [9,10], socio-economic [11], and fisheries [12] benefits.

The first municipal marine park/sanctuary in the Philippines was established on Sumilon Island, Cebu in 1974. Since then, there have been approximately 1100 MPAs established in the Philippines [13], but less than a quarter (25%) are achieving their management objectives [14]. Moreover, it is important to recognize that merely establishing MPAs is not enough and effectively managing and evaluating MPAs is critical to their success [15,16].

In order for the benefits of MPAs to be realized, there must be effective management within and outside of MPAs [17,18]. Management effectiveness is defined as "the degree to which management actions are achieving the goals and objectives of the protected area" and objective evaluation of management effectiveness is critical to assess future needs, adapt practices and optimize resource allocation of MPAs [17]. An international collaborative project (the *MPA Management Effectiveness Initiative*) between the IUCN World Commission on Protected Areas (WCPA) and the World Wide Fund for Nature (WWF) was conducted in 2000 which identified and described a set of 42 indicators: 10 biophysical, 16 socioeconomic and 16 governance indicators that could be used and adapted to fulfill evaluation needs while taking into consideration different resources available to MPAs [17]. This tool was used in the evaluation of some MPAs in Palawan [19]. There are also other tools being used to evaluate the performance of MPAs in the Philippines. An example of this is the Management Effectiveness Assessment Tool (MEAT) [14,20].

Out of the 42 indicators, 23 were used as a platform for a collaborative project on three MPA sites in the Philippines with funding from the U.S. National Oceanic and Atmospheric Administration (NOAA) [21]. Titled "Enhancing MPA Management Effectiveness for the Calamianes Islands MPA Network, Palawan Province, Philippines", this project was implemented with the aim of: (1) developing specific indicators and guidelines for MPA managers to use in the effectiveness of their sites; (2) using pilot projects to field test and refine the MPA management effectiveness indicators; (3) implementing lessons learned and best practices from the Global Environment Facility (GEF) and United Nations Environment Programme's (UNEP) project on "Lessons Learned and Good Practices in the Management of Coral Reefs"; and (d) increasing awareness and use of monitoring and evaluation in the management of MPAs. The NOAA project was subsequently used as the basis for conducting the project titled "Capacity Building to Enhance MPA Management Effectiveness for the MPA Networks in the Philippines" for six MPA sites covering regions IVA (Quezon/Batangas), VII (Bohol), and XIII (Surigao del Sur) led by the Philippines' Department of Science and Technology (DOST). The objectives of this project were to: (1) develop specific indicators and guidelines for MPA managers to use in the effectiveness of their sites; (2) use pilot projects to field test and refine the MPA management effectiveness indicators; and (3) increase awareness and use of monitoring and evaluation in managing MPAs. This study reduced the number of indicators from 23 to 14.

This article discusses the identification and testing of 14 indicators to evaluate MPA management effectiveness for seven sites in three provinces in the Philippines, namely: Palawan, Bohol and Surigao del Sur (Fig. 1). The evaluation process used was a refinement and adoption of the methodology used in Pomeroy et al. [17], albeit modified in terms of the number of indicators used. Moreover, key findings are presented, focusing on comparing MPA management effectiveness across all sites and offering recommendations and lessons learned on the sustainability and effectiveness of MPA management in the Philippines.

2. Methodology

2.1. Study sites

A total of seven MPA study sites were selected in three provinces. Their descriptions are provided below, grouped according to province. Each site is unique in terms of its ecosystem, the year it was established and its relative size (Table 1). All MPA sites have designated no-take areas but some include buffer zones or multiple-use zones. One or two officers per site, either stationed in a guardhouse or patrolling in a small vessel, provide enforcement for the MPAs.

2.1.1. Palawan province

All three islands/MPA sites are part of the Calamianes Islands MPA Network which is made up of about 160 islands under four municipalities (Busuanga, Coron, Culion and Linapacan). Altogether, they cover a total land area of some 1600 km^2. The Island Network exhibits some of the highest biodiversity among the groups of islands in the Philippines, comprising of extensive fringing reef, mangrove forests, seagrass beds, estuaries, shoreline cliffs, protected bays, coves and inlets [22]. All of these natural assets make the Calamianes Islands very popular for tourism-related development. However, as a result of tourism, rapid population growth, resource degradation, and consequently, declining fisheries, the very natural capital that is depended upon by local residents and so alluring to visitors is at peril for the future of the islands and the coastal communities that depend on them. The most widespread issues throughout the Calamianes are illegal and destructive fishing, such as the use of sodium cyanide as part of the live fish trade, dynamite fishing, and intrusion of commercial fishing in municipal waters. Nearshore fisheries are mainly reef-dependent and mangrove-dependent, and produce valuable catch for subsistence fishers and the live fish trade. Offshore fisheries target small pelagic species, including squid that seasonally migrate with the ocean currents of the South China Sea [23].

2.1.1.1. Sagrada-Bogtong Marine Reserve. The Sagrada-Bogtong Marine Reserve is composed predominantly of mangrove areas with patches of coral reef and seagrass beds. This MPA is located in Busuanga municipality in barangay[1] Sagrada and Bogtong. The reserve, which was established in 2006, covers an area of 392 ha (ha) with a total of 441 households (2007). The majority of these households are engaged in the fisheries sector.

2.1.1.2. Decalve Strict Protection Zone. The Decalve Strict Protection Zone is composed largely of coral reefs with patches of mangroves and seagrass beds. This MPA is located in the municipality of Coron in barangay Bintuan. The Protection Zone was established in 2004 and covers an area of approximately 62 ha with a total of 296 households (2007). Most of these households are engaged in the fisheries sector. Despite all sites having tourism-related activities, only Decalve has a functioning user fee system.

2.1.1.3. Bugor-Sand Island Marine protected area. The Bugor-Sand Island MPA is composed of coral reefs with patches of mangroves and seagrass beds. This is situated in Culion municipality, which is composed of several barangays (Libis, Culango, Jardin, Tiza, Balala, Baldat, and Osmena). The MPA was established in 2005 and covers

[1] A *barangay* is the smallest administrative division in the Philippines and the native Filipino term for a village.