

Chapter 12

Philippines Case Study Two



Looking into the Management Strategies of Three Philippine National Integrated Protected Area System (NIPAS) Sites

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Abstract Philippines is famous for its rich natural marine resources and was among the first countries in the region to create marine protected areas (MPAs) that addressed the need to conserve and protect these resources. The National Integrated

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Protected Areas System (NIPAS) Act implemented in 1992, along with its updated 2018 version—Enhanced NIPAS Act—, provide a comprehensive framework that brings together essential agencies under the government sector, local communities and other stakeholders to the table to discuss how to manage the coastal environment which local populations are highly dependent on. This chapter introduces three NIPAS sites, namely Siargao Integrated Protected Landscape and Seascape, Sagay Marine Reserve, Masinloc Oyon Bay Marine Reserve and the status of marine resources vis-à-vis the site-specific management practices developed by local stewards responsible for the sustainable use of these coastal resources.

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1 Introduction

Efforts to preserve the marine environment in the Philippines began as early as the 1970s—one of the first countries in South East Asia to establish marine protected areas (Alcala and Russ 2006). As of May 1, 2019, the MPA database (Cabral et al. 2014; MPA Support Network 2014) provides details of 1401 existing MPAs in the Philippines. Within this list, there exist two categories of MPAs: the locally managed MPAs, declared by local governments under the Philippine Fisheries Code (Republic Act [RA] 8550) and the Local Government Code (RA 7160), and the nationally managed MPAs under the National Integrated Protected Areas System (NIPAS) Act.

The NIPAS Act (RA 7586) was enacted in 1992 for the purpose of establishing protected areas found to be remarkable and biologically important public lands (terrestrial, wetland, or marine) with habitats of rare and endangered plant and animal species. Within this Act, the Protected Area Management Board (PAMB) is designated to be the responsible body for the proper implementation of the NIPAS Management Plan. It is a multi-sectoral body composed of the Department of Environment and Natural Resources (DENR)'s Regional Executive Director, the Protected Area Superintendent (PASu), representatives from the local provincial and municipal government, local non-government organizations (NGO)/People's Organizations (POs), the indigenous cultural community (ICC), the Bureau of Fisheries and Aquatic Resources BFAR (for jurisdiction over fishery resources), the Coast Guard (for coastal areas), and, if necessary, one representative from the Mines and Geosciences Bureau (MGB) (for mining activities). The efficient coordination and cooperation of the PAMB is crucial in the successful management of the NIPAS sites. All development and protection of the protected area is decided by the PAMB and issued through specific policies and regulations. Since the declaration of the 1992 NIPAS Act, 33 sites were affirmed as marine NIPAS areas. The NIPAS Act was updated in 2018 through the Enhanced NIPAS Act (RA 11038), declaring an additional sixty-one (61) MPAs, totaling ninety-four (94) marine NIPAS sites.

We present different management approaches of three NIPAS sites (Siargao Integrated Protected Landscape and Seascape [SIPLAS], Sagay Marine Reserve [SMR], Masinloc Oyon Bay Marine Reserve [MOBMR] (Fig. 12.1). These sites are exposed to both monsoons and typhoons and each site also experiences varying levels of anthropogenic threats. Thus, this chapter aims to present how each PAMB individually recognizes site-specific natural and human induced pressures and their approach in addressing these threats. In recent years, these sites have also become famous eco-tourist destinations making it imperative that management of the marine resources in each site be strengthened. All three sites were visited by the DENR-funded Coral Reef Visualization and Assessment (CoRVA) program as part of a

Fig. 12.1 Location of selected NIPAS sites (1) Siargao Island Protected Landscape and Seascape (SIPLAS). (2) Sagay Marine Reserve (SMR). (3) Masinloc Oyon Bay Marine Reserve (MOBMR)



national assessment on the coral reefs and associated habitats between 2014 and 2017. Here we present the data that was collected during the CORVA program to present the current status of these NIPAS sites.

In this chapter, thresholds to specifically categorize Philippine coral reef and reef fish communities by Licuanan et al. (2017a) and Hilomen et al. (2000), respectively, are used. Gomez et al. (1981) had introduced a scale based on live coral cover (i.e., hard and soft coral) which had been long used as the standard scale in the assessment of Philippine coral reefs. However, Licuanan et al. (2017a) introduced a new scale based solely on hard coral cover (HCC) taking into account that soft corals are not considered important reef builders (Licuanan and Gomez 2000). The new scale characterized HCC as poor (0–22%), fair (>22–33%), good (>33–44%) and excellent (>44%), with the exceptional Tubbataha Reefs as the benchmark in the Philippines (Licuanan et al. 2017b). Hilomen et al. (2000) utilized the fish abundance and biomass to describe the reef fish communities. Reef fish assemblages are characterized into very poor (<201 individuals/1000 m²), poor (202–676 individuals/1000 m²), moderate (677–2267 individuals/1000 m²), high (2268–7592

individuals/1000 m²) and very high (>7592 individuals/1000 m²) according to reef fish abundance. In terms of biomass, reef assemblages are categorized into very poor (<5.0 mt/km²), poor (5.1–20 mt/km²), moderate (20.1–35.0 mt/km²), high (35.1–75 mt/km²) and very high (>75 mt/km²).

2 Siargao Islands Protected Landscape and Seascape

The Siargao Islands Protected Landscapes and Seascape (SIPLAS) is located in the southern province of Surigao del Norte, Mindanao Island (Fig. 12.2). It was declared a NIPAS site on October 10, 1996, by Proclamation No. 902 and is one of the largest contiguous protected areas in the Philippines, covering 278,914 hectares of terrestrial, wetland, and marine areas. The geographic location of Siargao Island, bordered to the east by the Pacific Ocean and with the strong southward Mindanao current producing great surfing waves, has led to SIPLAS becoming known as the surfing capital of the Philippines.

Nine municipalities comprising 132 barangays (villages) can be found within the SIPLAS, with a total population of 116,587 (Philippine Statistics Authority 2015).

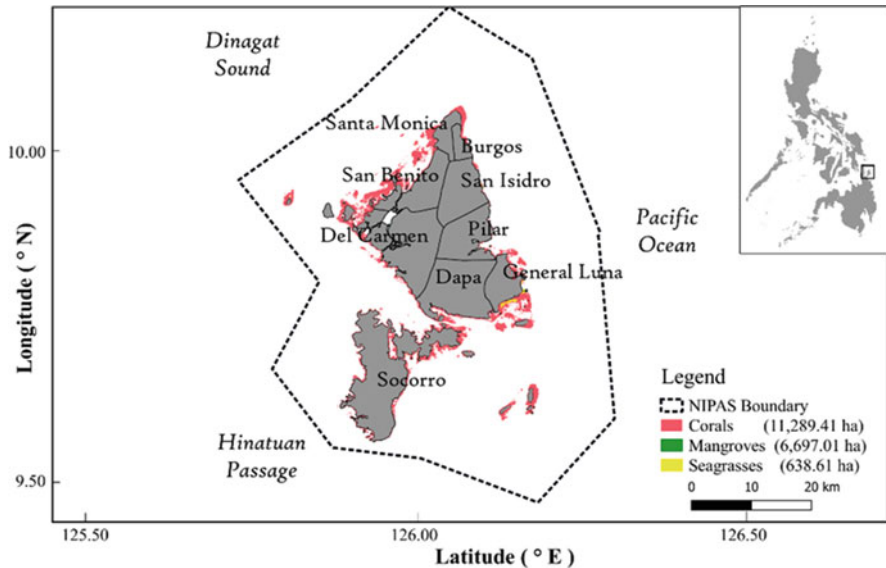


Fig. 12.2 Coastal habitats within Siargao Islands Protected Landscape and Seascape (data from CORVA9 report 2017, 2019)

Table 12.1 Typhoon Data from October 1998 to January 2015 of selected NIPAS site (Japan. . .)

NIPAS Area	No. of Typhoons passed within 200 km
Siargao Islands Protected Landscape And Seascape	24
Sagay Marine Reserve	16
Masinloc—Oyon Bay Marine Reserve	35

The municipalities are classified to be fourth to sixth class¹ with agriculture, mainly coconut, as the primary source of income. Twenty-four percent of the population is directly dependent on fishing, the second main source of income (Philippine Climate Change Adaptation Project 2015). SIPLAS experiences pronounced rainy seasons from November to January and are exposed to both the southwest (Habagat) and northeast (Amihan) monsoons. Its location also makes SIPLAS vulnerable to oncoming cyclonic typhoons that develop in the Pacific and enter Philippine territory from the east (Table 12.1).

Out of the 278,914 ha of the protected area, 76% (216,118 ha) are marine area, of which coral reefs and its associated habitats comprise only 9.14% (25,497 hectares) (Fig. 12.2). Hard coral cover (HCC) was observed to be varied in different sites within SIPLAS, with a mean HCC of 20% (Fig. 12.3). This is equivalent to a poor reef health status, according to Licuanan et al. (2017a). A high percentage of algal assemblages was present at all sites, possibly due to the high sediment load. The rare fox coral (*Nemenezophyllia turbida*), an important evolutionarily distinct, globally endangered (EDGE) species was found in Socorro (CORVA2 2017).

A total of 248 reef fish species were identified in SIPLAS. Fish assemblage inside the marine protected areas of Siargao were moderately abundant (1568 individuals/1000 m²), while fish biomass within the MPAs was moderately high (40 mt/km²). Reefs outside the MPAs had poor to high reef fish biomass (CORVA3 2017). SIPLAS is famous for one of the largest mangrove areas in the Philippines, covering

¹The Department of Finance Order 23–08 (released 2008) prescribed the income classification of Provinces, Cities, and Municipalities in the Philippines to determine the financial capability of Local Government Units (LGUs). Funding requirements for developmental projects and priority needs in their locality are based on this classification. Every four years, the LGUs are re-classified based on their average annual income. For municipalities, the income classes are as follows:

Class	Average Annual Income
1st	Php 55 M or more
2nd	Php 45 M or more but less than Php 55 M
3rd	Php 35 M or more but less than Php 45 M
4th	Php 25 M or more but less than Php 35 M
5th	Php 15 M or more but less than Php 25 M
6th	Below Php 15 M

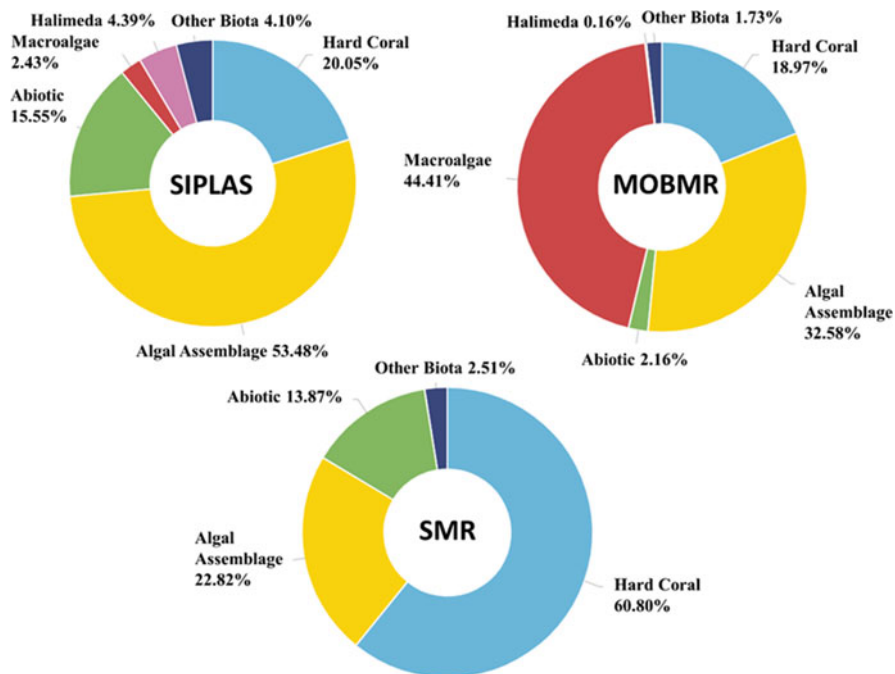


Fig. 12.3 Relative coral abundance in (1) Siargao Island Protected Landscape and Seascape (SIPLAS). (2) Sagay Marine Reserve (SMR). (3) Masinloc Oyon Bay Marine Reserve (MOBMR) (data from CORVA database, CORVA2 2017, 2019 report)

approximated 6697.01 ha (CORVA9 2019). The most abundant species was observed to be *Rhizophora stylosa*, while the most dominant species in terms of basal area was *Sonneratia alba* (CORVA4 2019). The seagrass beds are also extensive with an estimated area of 638.61 ha, dominated by *Cymodocea rotundata*. Marine megafauna such as turtles and saltwater crocodiles have been observed to visit or reside within these habitats (CORVA4 2019).

2.1 Threats and Issues within SIPLAS

The SIPLAS management plan (Philippine Climate Change Adaptation Project 2015) identified a decrease in mangrove cover from 9779.3 ha in 1988 to 7768.6 ha in 2011, either by the conversion of mangrove areas to settlement or fishponds or for use in housing or fuelwood/charcoal. CORVA9 (2019) reported a similar trend, however recent images showed there has been an increase in mangrove area (Table 12.2). This could be attributed to natural regrowth, decreased illegal deforestation or reforestation efforts from the launch of the Mangrove Protection and Information Center in Brgy. Del Carmen. These efforts stemmed from increased

Table 12.2 Change in mangrove areas in selected NIPAS sites based on Land Use Land Cover maps derived from Landsat images (CORVA9 2019)

NIPAS Area	Area (ha)			
	1990s	2000s	2010s	Present
Siargao Islands Protected Landscape And Seascape	6765.30	6433.57	6196.17	6697.01
Sagay Marine Reserve	140.04	154.62	511.38	349.47
Masinloc-Oyon Bay Marine Reserve	72.88	80.39	76.64	87.76

awareness of the natural protection provided by mangroves from storm surges after the 2013 Super Typhoon Yolanda (Haiyan).

Another threat to marine biodiversity is illegal fishing (dynamite fishing and intrusion of commercial fisheries), overfishing and the illegal collection or slaughter of marine turtles and turtle eggs. Other issues that need to be addressed in the coming future include water pollution from farming and improper waste disposal that could come about from the continued expansion of settlement areas, and proliferation of commercial and tourism establishments.

Generally, typhoons in the western Pacific are formed about east of the Philippines, ranging from 130° to 180° East and 5° to 15° North (Mei et al. 2015). In the recent years, these typhoons have been recorded to be stronger and wetter, with more southerly trajectory than normal (Holden and Marshall 2018). As such, SIPLAS' location in southern Philippines, directly exposed to the Pacific, makes it very vulnerable to climate change. Vulnerability assessments by the Philippine Climate Change Adaptation Project (2015) revealed that increases in temperature leading to erratic rainfall patterns could induce landslides, as agriculture and mangrove deforestation have denuded watersheds of the main island. Landslides would not only affect the local population but also biodiversity. Increased temperature may cause the extinction of native plants and animals. The coastal and low-lying communities would be highly prone to storm surges in light of increased storm intensities due to climate change.

2.2 Management Strategies

The PAMB and partner LGUs in SIPLAS acknowledged there is a need to strengthen climate change resilience and enhance the adaptive capacity of the communities of the nine municipalities. To fulfill this need, SIPLAS aims to focus its management strategies on five key points: management zoning, climate change adaptation, collaborative management, community-based resource management and sustainable financing. Management zoning addresses biodiversity conservation issues as well as livelihood and socio-economic development needs. In both the

Table 12.3 SIPLAS Management programs (PCCAP 2015)

Programs	Target activities
Terrestrial management program	Biodiversity conservation
	Socio-economic development
Coastal and marine management programs	Coastal habitat and species conservation
	Fisheries management
	Socio-economic development/alternative livelihood support
Cross-cutting management programs	Ecotourism development
	Waste management
	Disaster risk reduction planning and preparedness
	IEC campaign
	Sustainable financing development
Governance enhancement and institutional strengthening	Knowledge and capacity building
	PAMB meetings/policy support
	Monitoring and evaluation
General Administration & Management	Personnel services
	Capital outlay
	Maintenance and office operating expenses

terrestrial and coastal and marine zones, sustainable eco-tourism is promoted as a livelihood alternative.

Due to the high vulnerability of SIPLAS to impacts of climate change, the integration of climate change adaptation measures and disaster risk reduction is a priority. By using an integrated ecosystem approach, management programs (see Table 12.3) were developed to address short- and long-term adaptation measures.

Collaborative management of the protected area will ensure continuance of the management programs. Strengthening stakeholder partnerships, LGU participation, inter-LGU alliances and networks and co-management with willing stakeholders will encourage local communities to be active in the PA management activities. Such an approach is important for stakeholders to have direct involvement in the sustainable use and management of their resources.

One priority concern of the PAMB, PASu office and LGUs is the protection and conservation of terrestrial and marine resources. By assigning the community residents as the primary custodians, they develop a sense of responsibility for the natural resources of which they are the direct beneficiaries. To encourage sustainable alternative livelihood, the PAMB provides assistance and guidance in development of biodiversity-friendly livelihood activities and community-oriented eco-tourism programs that are initially identified by the communities based on their knowledge of the local resources.

Although the NIPAS Act and the implementing rules and regulations provide for an integrated protected area fund (IPAF), this provision is insufficient for the full implementation of the management plan. Hence, SIPLAS needs to augment this

budget by generating internal funds, e.g., through levies on development and resource use, and concessions and conservation fees for associated tourism development. Payment for ecosystem services, such as the use of water, is also explored as a sustainable funding mechanism.

2.3 Management Structure

Being one of the largest NIPAS sites with nine LGUs, the SIPLAS PAMB currently consists of 156 members, with different sectors and interests well-represented in the PAMB. Agreements between the PAMB and LGUs provide clear responsibilities and accountabilities of all parties. Administrative and financial transactions are handled by the PASu Office, with a designated Special Collecting Officer (SCO) responsible for revenues generated and received. The Provincial Environment and Natural Resources Office stands as the custodian for the IPAF PA accounts and is responsible for the accounting and administrative support of the management fund. To ease periodic reporting as well as monitoring and evaluate on of the Management Plan, the PAMB has clustered the LGUS into three groups based on location and biophysical features: a northwest cluster (Del Carmen, San Benito, Sta. Monica), northeast cluster (Burgos, San Isidro, Pilar and General Luna) and a southern cluster (Dapa and Socorro). The current management plan that has been presented here was targeted for implementation from 2015 to 2020 and is therefore due for updating.

3 Sagay Marine Reserve

The Sagay Marine Reserve (SMR) is located in the municipality of Sagay City on the northeast tip of Negros Occidental. SMR covers a total area of 32,000 hectares, consisting of the islands of Molocaboc, Diutay, Matabas and Suyac and extending to the Carbin, Macahulom, and Panal Reefs. It was declared a NIPAS site on June 1, 1995 by Proclamation No. 592 and further enacted on April 14, 2001, by Republic Act No. 9106.

Six coastal barangays of Sagay City are located opposite the SMR, with a total population of 44,895 (Philippine Statistics Authority 2015). Sagay City is considered to be a first-class municipality, with agriculture as the main source of income. Within the coastal barangays, fishing and collection of shells are the main sources of livelihood. Backyard farming is highly encouraged, thereby providing alternative food sources for these barangays.

SMR is exposed more to the northeast monsoon between November to February but can also be affected by the southeast monsoon from July to October. Being at the center of the Visayan region, SMR occasionally experiences typhoons that may traverse towards the northwestern part of the country. The coastal habitats constitute approximately 23% (7317 ha) of the protected area (Fig.12.4). Relative hard coral

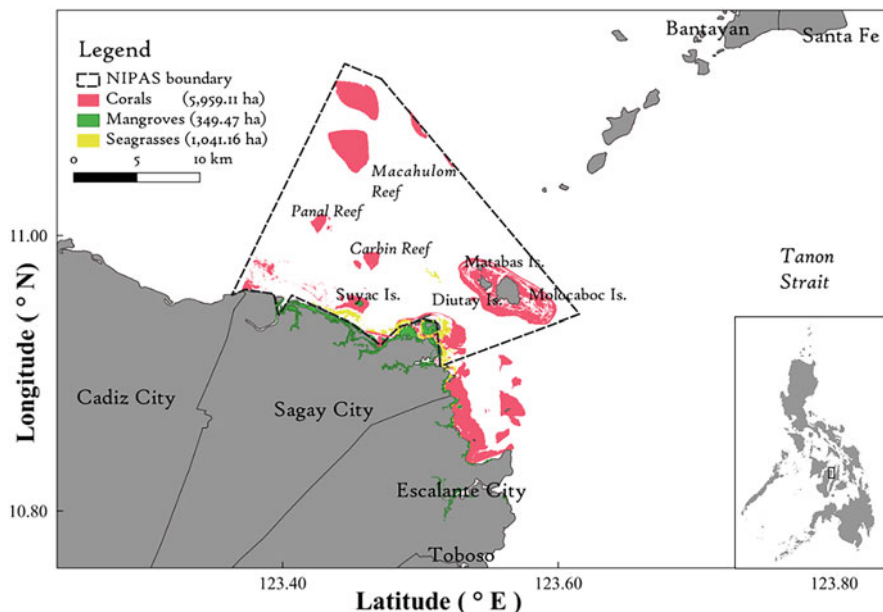


Fig. 12.4 Coastal habitats mapped within Sagay Marine Reserve (data from CORVA9 report 2017, 2019)

cover in the SMR is reported to be high at 60% (CORVA database), corresponding to the excellent category (Licuanan et al. 2017a, 2017b), with a dominance of fast-growing *Echinopora* species in the Macahulom reef while Carbin reef is dominated by massive *Porites* (CORVA2 2019). Macroalgae in Carbin reef were observed to be low, indicating the reefs may be highly resilient and have increased chances of recovery after natural disturbances such as bleaching. These reefs were severely affected by the 1998 bleaching event and were able to recover successfully (J.R. Togle, pers. comm.) The coastal barangays of SMR are lined by mangroves, with old growth of mangroves along Barangays Taba-ao, Bulanon and Vito, and extensive mangrove reforestation projects are present in the island of Molocaboc and Suyac (SMRGMP 2015). Similarly, seagrass meadows are also abundant in the coast of Sagay (1041.16 ha, (CORVA9 2019)).

3.1 Threats and Issues in SMR

The main threat within the SMR includes poaching activities and the encroachment of fishermen from neighboring cities and municipalities that use destructive or illegal fishing practices such as dynamite fishing and the use of fine fish nets. The manpower of the local coast guards, known as “Bantay Dagat,” is insufficient to monitor

the entire protected area. Potable water supply is an important issue for the island barangays of Molocaboc and Sugay, which do not have any natural water source as these islands are naturally accreted sand bars. As in most parts of the country, effects of climate change such as rising sea level and increased storm intensities are already being felt in SMR. The need to direct efforts for mitigation and adaptation, and for disaster risk reduction, is an urgent issue.

A potential development for the city of Sagay was the development of a port to increase the livelihood opportunities for the local population. The city requested for the establishment and construction of a fishing port to cater to small and big fishing vessels, and the request was approved by the PAMB in 2005. Although the port could potentially increase the city's overall income, the presence of the port has led to increased environmental stress from tourist influx into SMR and a higher potential of oil spill pollution from operational spills or the grounding of vessels in SMR's coastal waters.

3.2 Management Strategies

According to the SMRGMP (2015), the SMR considers the following two strategies to address management issues, namely site management strategy and sustainable financing. The management strategy would integrate current management activities in SMR. The empowerment of the community residents and fisherfolks and establishment of an institutionalized community-based law enforcement unit would, as in SIPLAS, provide local residents with a sense of responsibility for the protection and monitoring of the reserve. The community-based enforcement unit is supposed to be capacitated through training and support from the LGU.

Sustainable financing is a key issue for SMR, as it does not receive any allocation from the DENR to finance its management programs. Ideally, the IPAF provides each PAMB a general management fund but unfortunately, this has not trickled down to the SMR. Revenues from the user fees and eco-tourism activities such as visits to Carbin Reef and the Suyac Island Mangrove Eco-Park are collected by the LGU for sustainability of the NIPAS. Additionally, the city of Sagay has generously augmented the funds for the continued management of SMR.

To address biodiversity protection, the SMR actually has two management plans in place, formulated by the Sagay City Environment and Natural Resources Office (SCENRO), namely the Initial Protected Area Plan (IPAP) and the Coastal Fisheries Resources Management (CFRM) Plan. The IPAP was prepared by the SCENRO in 1997 to address the protection and sustainability of the marine areas and to enhance the awareness of the local community of Sagay on environmental protection. The CFRM plan, designed to complement IPAP, was crafted in 2008 with the Fisheries and Aquatic Resources Management Council (FARMC) to focus on sustainable management of marine resources within the SMR by enhancing capabilities of the local government units (LGUs) and to include other government agencies such as the BFAR and DENR.

The PAMB recognizes the need for science-based policies, hence they admit the need for a scientific research station. Although climate change is identified as a threat, the 2015 management plan of SMR lacks approaches on how to address climate change adaptation. Moreover, the CORVA program recommended that ecotourism activities, such as visits of the giant clam colony in Carbin Reef, within the reserve be regulated to ensure protection of the coastal resources.

3.3 Management Structure

The Sagay Marine Reserve PAMB is chaired by the DENR Regional Director. However, the SMR Protected Area Superintendent (PASu), who is in charge of day-to-day supervision, is sustained by the local government of Sagay, while a PASu from the DENR exists only at a deputized level. This arrangement has resulted in an ongoing conflict between the LGU and the DENR, as the LGU of Sagay appears to be managing the SMR independently. The Sagay City LGU, despite of the lack of financial and managerial support from the DENR, has made the best of the situation and appears to have been effectively managing SMR as the status of the coastal habitats has been observed to be in good to excellent condition.

4 Masinloc-Oyon Bay Marine Reserve

The Masinloc-Oyon Bay Marine Reserve (MOBMR) in the western province of Zambales was declared a protected area on August 18, 1996 (Proclamation No. 231). MOBMR has a total area of 7568 ha, covering eleven western coastal barangays in the municipality of Masinloc and three barangays in the northern portion of the Palauig municipality. The reserve has a land area of 680.97 ha comprising six islands (San Salvador, Magalawa, Luan, Panglit and Pilapir) and a marine area of 6887.53 ha.

There is a total population of 52,590 individuals living in the barangays adjoining the MOBMR (Philippine Statistics Authority 2015). Masinloc is a first-class municipality, while Palauig is a third-class municipality. The primary income source for the coastal barangays is fishing. There is an existing coal-fired thermal power plant managed by AES-MPPCL, Philippines in the northern barangay of Bani that employs at least 30% of its workforce from the local population. The company contributes a percentage of its earnings to an Environmental Guarantee Fund. Other industries in the MOBMR are generally small- or medium-scale enterprises. MOBMR is exposed directly to the Habagat (SW monsoon) from June to October. Its location also makes it prone to more typhoons coming from both the Pacific and the West Philippine Sea (see Table 12.1).

The coastal habitats comprise 16.9% of the protected area (1279.19 ha) (Fig. 12.5). Of this, about 10% has been placed under strict protection through

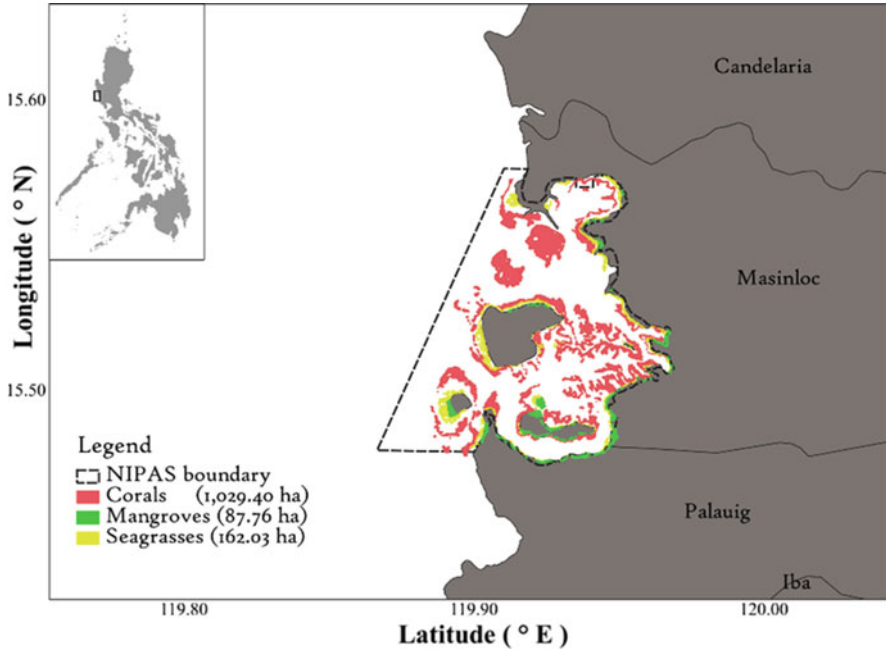


Fig. 12.5 Coastal habitats within Masinloc-Oyon Bay Marine Reserve (data from (CORVA3 2017; CORVA9 2019))

four MPAs, namely Panglit MPA, Bani MPA, San Salvador MPA and Taclobo (Giant clam) Farm. Relative hard coral cover was reported to be 19% (poor). Vulnerable corals such as *Acanthastrea ishigakiensis* and a Nemenzo coral,² *Echinopora mammiformis*, were found in MOBMR. The reefs were found to have a high *Acropora*—low *Porites* typology, with relative covers of 55% and 27%, respectively, indicative that the reef is prone to coral bleaching (Cantin and Lough 2014; Hoogenboom et al. 2017). Additionally, the high proportion of macroalgae (44%) is an indicator of high eutrophication in the reserve (CORVA2 2019; Flower et al. 2017).

The reef fish communities were found to have higher species richness within the MPAs (48 species/500 m²) over stations outside MPAs (46 species/500 m²), with an abundance of mobile invertebrate feeders and herbivores. Average total fish abundance was 331 ind/500 m². Herbivores are the highest contributors to the estimated biomass. The lowest biomass was found in the Panglit MPA (6 mt/km²), while the highest was observed in the Taklobo MPA (34 mt/km²). The mangroves of the

²Nemenzo corals are among the 375 Philippine coral species that were described by Prof. Francisco Nemenzo, the father of Philippine coral taxonomy. The complete listing may be found in Nemenzo (1986) with an online photo collection at <https://www.dlsu.edu.ph/research-1/centers/shore/coenomap/>

MOBMR (estimated 87.76 ha) are a famous eco-tourism attraction, particularly the mangrove-formed island of Yaha. The most abundant species of mangrove was found to be *Rhizophora apiculata*. Seagrass meadows are also vast in MOBMR (167.03 ha), with *Cymodocea rotundata* as the most abundant species.

4.1 Threats and Issues in MOBMR

The PAMB of MOBMR identified illegal fishing (use of dynamite, cyanide, and illegal fishing nets) to be one of the main threats to the biodiversity of the marine habitats. Mining and deforestation activities are strictly prohibited within the municipality of Masinloc. However, the MOBMR shares the watershed of the Masinloc River with the neighboring municipality of Candelaria, and MOBMR still receives a significant sediment load from the small-scale mining allowed in Candelaria.

To augment the food supply of the municipality, several fish cage operators have been allowed in MOBMR. Excessive feeds from these mariculture activities have decreased water quality within the reserve. Another source of pollution is the indiscriminate waste disposal of coastal communities and informal settlers. The heat and ash fall from the thermal power plant in Bani also threaten nearby coral reefs. Conversion of mangrove areas to aquaculture ponds was previously an issue in MOBMR. Recent findings of the CORVA9 project show that this may be competently mitigated by the PAMB, with a decrease in aquaculture structures and a corresponding increase in mangrove areas (Table 12.2) in recent Landsat satellite images.

As the population in the municipality of Masinloc increases, the issue of human encroachment into protected area becomes more substantial. A larger population would put more pressure on the marine resources as food source, and the possibility of mangrove deforestation increases in line with an increased need for lumber and space for settlement.

4.2 Management Strategies

The MOBMR PAMB aims to protect and conserve the marine biodiversity and promote sustainable development for both commercial and community-based resource enterprises. To achieve this, management strategies aim to address the following: management zoning, ecological consciousness of local communities and capability strengthening of the MOBMR management.

Management zoning permits human activities within the reserve while continuing the protection of biodiversity in the ecosystem. Proper zoning also allows restoration of degraded areas. For this purpose, there is a prescribed strict protection zone (2617 ha) wherein all human activities are prohibited except for scientific studies

Table 12.4 MOBMR management programs (MOBMR Management Plan 2017)

Programs	Target activities
Biodiversity and protection program	Habitat and biodiversity conservation
	Resource extraction regulations
	Research documentation
Economic support program	Alternative livelihood
	Ecotourism
Community organizing and empowerment program	Environmental consciousness
	Community participation in PA management
Institutional development program	Establishment of the integrated protected area fund (IPAF)
	Management institutionalization
	Formation of management system
	Supportive LGUs
Law enforcement and protection	Protection
	Wildlife/fisheries management
	Protected area administration
Climate change mitigation and adaptation	
Sustainable financing	
Research and development	

and a multiple-use zone for settlement, sustainable land use and other income-generating or livelihood activities.

A study by Dizon et al. (2013) found that there was a low level of community awareness of the existing MPAs within MOBMR. Increasing the ecological consciousness of the communities within the MOBMR could possibly improve the perception of the MPAs and enlighten the locals on the potential benefits they could receive from the proper protection of the habitats.

To further improve the management of MOBMR, strengthening the capacity of the coastal and marine managers is essential. This would assist the PAMB in implementing targeted management programs specified in the MOBMR management plan (Table 12.4).

A connectivity model simulation in the CORVA-7 project (2019) showed that the entire province of Zambales is self-seeding, i.e., both coral and fish larval recruits simulated to be released in Zambales tended to settle not far from release points (“Zambales for Zambales”). This finding provides the MOBMR PAMB the validation to push for firmer policies for habitat protection and to enhance the networking of the marine protected areas within the entire province to ensure sustained coral and fish larval supply. CORVA also reiterated recommendations on proper management of the watershed leading the MOBMR, specifically involving the neighboring municipality of Candelaria, which contributes to the sediment and nutrient input into the bay.

4.3 Management Structure

Although the MOBMR covers only two municipalities, the PAMB includes representatives from all fourteen barangays. Additionally, fisher folk organizations are also actively involved in PAMB meetings as they are the primary beneficiaries of a well-managed MPA. In the account of Vera (2004), he detailed conflicts between the fisherfolks, LGU, DENR and the Bureau of Fisheries and Aquatic Resources (BFAR) over the proliferation of mariculture cages in the reserve are described. Although the issue has been partially contained (O. Gregorio, pers. comm 2018), it is still a cause for concern for all involved parties.

5 Conclusion

The three NIPAS sites were chosen for this study primarily to represent each of the island regions, i.e., Luzon (MOBMR), Visayas (SMR) and Mindanao (SIPLAS). Each NIPAS site encompasses coral reef, mangrove, and seagrass habitats; thus, they could serve as excellent study sites for research on the interconnectivity of the coral reef and its adjacent habitats, which are currently lacking for the Philippines. The sites have been selected to have similarly vast coastal marine habitats that not only support an incredible biodiversity of marine life but also support the productive fishing industry of the nearby coastal communities. All sites were mainly rural municipalities with agriculture and/or fishing as the main occupation, and the communities in each site thus rely heavily on the marine resources either for daily sustenance or income. As in most locations in the Philippines, the three sites are all prone to the impact of typhoons, only varying in degrees of exposure.

In spite of the similarities in natural and economic resources, the main difference among the three sites that determines whether the management of the NIPAS is effective pertains to the effective exchange among the local stakeholders. The SIPLAS PAMB, being one of the largest NIPAS, consists of numerous agencies and stakeholders from nine municipalities. It was evident that good communication appears to be an important success factor in the proper management of protected areas. The open lines among the involved parties have contributed significantly to achieving management goals.

The internal conflicts involving political, financial and jurisdictional boundaries between the LGU and the local DENR office in Sagay City has been ongoing for quite some time. However, among the three sites, the status of the coral reef system was best in SMR, which was surprising given the controversies over the protected area. We observed in this case that the local government was fully conscious of the reserve's resources, and its direct involvement in the management of the MPA, independent of the governing board, appears to have contributed to optimal state of the reefs.

In the MOBMR, we observed a lack of awareness and participation of the local communities in the PAMB, which is likely to have contributed to the poor condition of the reefs in Masinloc. To address this, the PAMB has actively promoted the protected area and its ecological and economic benefits in schools and through municipal events. It is hoped that an increased recognition of these benefits would lead to active participation in the management of the local resources. Furthermore, there is an urgent need for a watershed (Ridge-to-Reef) approach to control the sediment load into Masinloc Bay. We suggest that this could be achieved by including the neighboring municipality of Candelaria as a member of the PAMB.

As the Philippines are among the countries most susceptible to climate change (OML and PAGASA 2019), climate adaptation should be a priority across all sites. However, this was not evident in the current management plans in SMR and MOBMR. Management plans at all sites were due to be updated as this chapter was being written and are expected to be climate ready.

There was a consensus at all NIPAS sites, including those not discussed here, that the carrying capacity of the ecosystem is rarely considered in management planning. These sites are becoming famous for the excellent beaches and other tourist attractions, especially with the increased affordability of airfare and better road systems in the country. Although the Department of Tourism (DoT) is technically included within PAMB, it primarily has a vested economic interest in the sites, with less consideration for ecological implications of the influx of tourists. The DENR needs to take more stringent measures to define the environment's maximum load so as not to jeopardize the state of these protected coastal habitats.

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