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Securing Protected Areas In the Face of Global Change

Lessons Learned from the
Philippine Marine Protected Areas:
Apo-Dauin Field Learning Site

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A Report by the Ecosystems, Protected Areas, and People Project



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Cover: A view of Apo Island
seen through the window of
the Maayong Tubig Marine
Sanctuary guardhouse.
Photo: Jasper Maypa

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Foreword

The Ecosystem Protected Areas and People (EPP) Project, supported in part by the UNEP-GEF, is developing a Protected Areas Learning Network (PALNet), to enable organisations responsible for protected area policy and management to share the lessons they are learning in coping with global change factors¹. The project will develop the capacity of government agencies, NGOs, local and indigenous communities that have responsibility for managing protected areas to enact policies and manage protected areas adaptively in the face of global change, to protect them against imminent and long term threats, while capturing new opportunities to make areas more sustainable and effective in social, economic and ecological terms. The project consists of five components:

1. A PALNet Website (www.parksnet.org) to facilitate the exchange of experience among and promote interaction between those responsible for protected area policy and management;
2. A network of field learning sites (FLS) where managers and communities are actively experimenting with innovative and creative options for addressing the challenges and opportunities brought by global changes;
3. A series of face-to-face regional training workshops for engaging primary project stakeholders in the continuing improvement and expansion of PALNet, in learning to utilize its features, and in gathering, synthesising, and sharing the lessons being learned;
4. A series of brief publications that make “hard copy” reports available on the guidelines and lessons being learned, specifically designed for those stakeholders not engaged through the electronic knowledge management system; and
5. Five technical working groups² of experts that analyse lessons learned from literature, case examples, and the learning sites, prepare initial guidelines and options for adapting to global change that will reach primary stakeholders through the web site, and assist in drafting reports on this topic.

¹ Global change is a broad term that refers to the myriad of factors, primarily human driven, which alter our biological, social, and institutional environment. Some examples are: (a) Biophysical changes (climate change, sea level rise, invasive alien species, and fragmentation of forest cover/change in land use); (b) Socio-economic changes (human population growth, demographic changes and urbanization, growing demand for food and fibre, new technologies, and the impacts of globalisation on biodiversity, culture and social values); and, (c) Institutional changes (access to information, participation, decentralisation, and cooperative arrangements for area management).

² Dealing with (i) Understanding Global Change; (ii) Building the System; (iii) Equitable Protected Areas; (iv) Capacity to Manage; and (v) Management Effectiveness.

The network³ of FLS has been selected on the basis of ongoing pioneering work being done at those locations in response to one or more factors of change. Governments, universities, NGOs, and communities are already experimenting with innovative options for adapting their management approaches to one or more of the biophysical, socio-economic, and institutional changes. At each of these FLS the project engages local NGOs or other stakeholders as local partners who work with the local managers to articulate the lessons they are learning from their innovations and testing of ideas and methods. Thus, it is a cooperative programme with local stakeholders for the purpose of building on, articulating, analysing, sharing and promoting replication of lessons being learned from work already funded and ongoing.

The Silliman University – Angelo King Centre for Research and Environmental Management (SUAKCREM) is the local partner of the EPP project in respect of the Apo Island and Dauin Sanctuaries FLS in the Philippines. This publication documents the first year’s report on the lessons that have been learnt at the site in responding to socio-economic and institutional factors of change related to the management of marine protected areas and their resources that are crucial to the livelihoods of the local communities. The EPP project will track the progress being made and the lessons being learned in the process of dealing with these factors of change at the Apo Island site over the coming years and document them for sharing over PALNet for use by the global protected areas community that might be interested in the specific management issues.

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³ The FLS of the project include: Apo Island and Dauin Sanctuaries in Philippines; Terai Arc Landscape in Nepal and India; Socotra Island in Yemen; Cape Floristic Province and Kruger National Park in South Africa; Congo Basin Network in Cameroon; Zapata Swamp in Cuba; Yasuni National Park in Ecuador; and Osa/La Amistad/Talamanca in Costa Rica.

1. INTRODUCTION

The protected areas system in the Philippines, which was created in 1932 (Act No. 3915), was highly centralized, with a national Parks and Wildlife office given the responsibility for the establishment and management of parks and other protected areas (1). Most parks in the early years were terrestrial wilderness areas, and only one park established in 1940, the Hundred Islands Park, on the island of Luzon, incorporated a marine component (2). In the 1970s, local government units (LGUs) began to establish marine protected areas through local legislations. The Local Government Code (R. A. No 7160) passed by Congress in 1991 and the increased awareness of the need for environmental protection and management accelerated the process of establishing marine protected areas. There are now about 400 marine protected areas (3), of which about 40 are well-established marine parks and protected areas (**Fig.1**) (30). Under the Local Government Code, the function of protecting and managing the natural environment and natural resources was partially devolved to the LGUs. This law gave the power of local autonomy to LGUs to not only manage their natural resources together with local communities but also to levy fees and other charges to enable them to become self-reliant. However, the national government through the Department of Environment and Natural Resources (DENR) has retained the power to manage the large terrestrial and marine parks and other protected areas as done in the past and continued to create national protected areas under the National Integrated Protected Areas System (NIPAS) Act of 1992 (R.A. 7586). Under the NIPAS there are at least seven categories of protected areas, one of which is the Protected Landscapes and Seascapes covering both land and marine areas. Some marine protected areas under the NIPAS are covered by specific laws (Republic Acts) and receive budgetary allotments from Congress to be disbursed by the DENR (Appendix 1-5).

In 1998, Congress passed the Fishery Code (R.A. 8550), which mandates the full participation of communities in fishery management and promotes the establishment of fish sanctuaries. Based on these three conservation and management laws, protected areas in the Philippines are classified in two ways: (1) as national protected areas under the NIPAS law managed by DENR and (2) as local protected areas managed or co-managed by local governments and communities under the Local Government Code and, in the case of fish or marine sanctuaries, also under the Fishery Code.



Figure 1. Well-established marine protected areas in the Philippines. (Source: Marine Protected Areas in Southeast Asia, 2002)

It thus follows that marine protected areas can be declared under either the national or local protected area systems. Under the NIPAS law, there are a number of steps, including several planning and consultation activities, to be undertaken requiring a long process (2-3 years) before a site can be declared a protected area by Presidential Proclamation. After a site is declared a marine protected area, the DENR Secretary constitutes its governing board, the Protected Area Management Board (PAMB). Although the PAMB is chaired by a national official (the Regional Executive Director of DENR), it includes in its membership officials of local government units and community members, usually representing people's organizations (POs) living in or near the proposed protected site. Establishing marine protected areas under the Local Government Code is much simpler, involving only planning, consultation and coordination activities among local government units, the Bureau of Fisheries and Aquatic Resources (BFAR) and the Fisheries and Aquatic Resource Management Councils (FARMCs) in the preparation of ordinances for approval by the municipal or city councils and finally by the provincial councils. Usually only a little more than a year is needed for declaring a site as a marine protected area. The ordinances become the legal and policy frameworks of local marine protected areas.

Local communities are fully involved in both protected area systems because the membership of the PAMB for the NIPAS sites and the implementing bodies of local marine protected areas include representatives from local communities. Management issues emanating directly from the community are taken up in regular meetings of the management boards or committees. Financial requirements of marine protected areas and issues in management, including sanctions for violators, are regular items in the agenda of the managing bodies, as are projects proposed by members of the community to be funded by incomes from user fees.

2. DESCRIPTION OF THE FIELD LEARNING SITE

A. Geographic Location in the Sulu-Sulawesi Large Marine Ecosystem

The Apo Island (ca 120m above sea level) and the Dauin Sanctuaries are located in the Bohol (Mindanao) Sea in the central Philippines, the latter off the coast of the mainland of Negros Island. The Bohol Sea (**Fig. 2a, b**) defines the northeast boundary of the 900,000-km² Sulu-Sulawesi Sea, a Large Marine Ecosystem (**Fig.3**) known for its mega-biodiversity that is exemplified by some 500 species of corals, 2,500 species of fish (including the second species of the living “fossil” fish, the coelacanth), five species of marine turtles and at least 22 species of marine mammals, including the endangered dugong. In the Sulu Sea are the 33,000-ha Tubbataha Reefs Marine Park, a World Heritage Site, and the Turtle Islands, a turtle conservation site covered by a bi-nation agreement between the Philippines and Malaysia. In the Sulawesi Sea lies the 90,000 ha Bunaken National Park off Manado, Indonesia, a noted tourist destination (4).

B. Oceanography

The prevailing oceanic current in the Bohol Sea flows in the northeast-southwest direction, thus connecting the Pacific Ocean with the Sulu Sea. However, local currents in parts of southeastern Negros near the Tañon Strait flow in reverse directions. The Bohol Sea is a productive fishery area (5) probably as a result of its position in relation to the Pacific Ocean and the Sulu Sea. Surface currents around Apo Island and in the vicinity of the Dauin sanctuaries generally flow in the southwest direction (except during typhoons when direction sometimes reverses) at an average speed of about 0.5 meter per second (5,6).

C. Marine Habitats

Important marine ecosystems include fringing coral reefs, mangroves and sea grass beds. Apo Island is a high volcanic island surrounded by more than 100 ha of high quality and healthy fringing coral reef. A mangrove forest of about three hectares used to exist at the southeastern part of the island. Less than half a hectare remains at present because of conversion to fishpond. Two of the four Dauin sanctuaries have fair to high live coral cover, 36-96%. The other two have low live coral cover, less than 20%. Extensive sea grass beds and sand bottom are found outside the no-take zones (7).

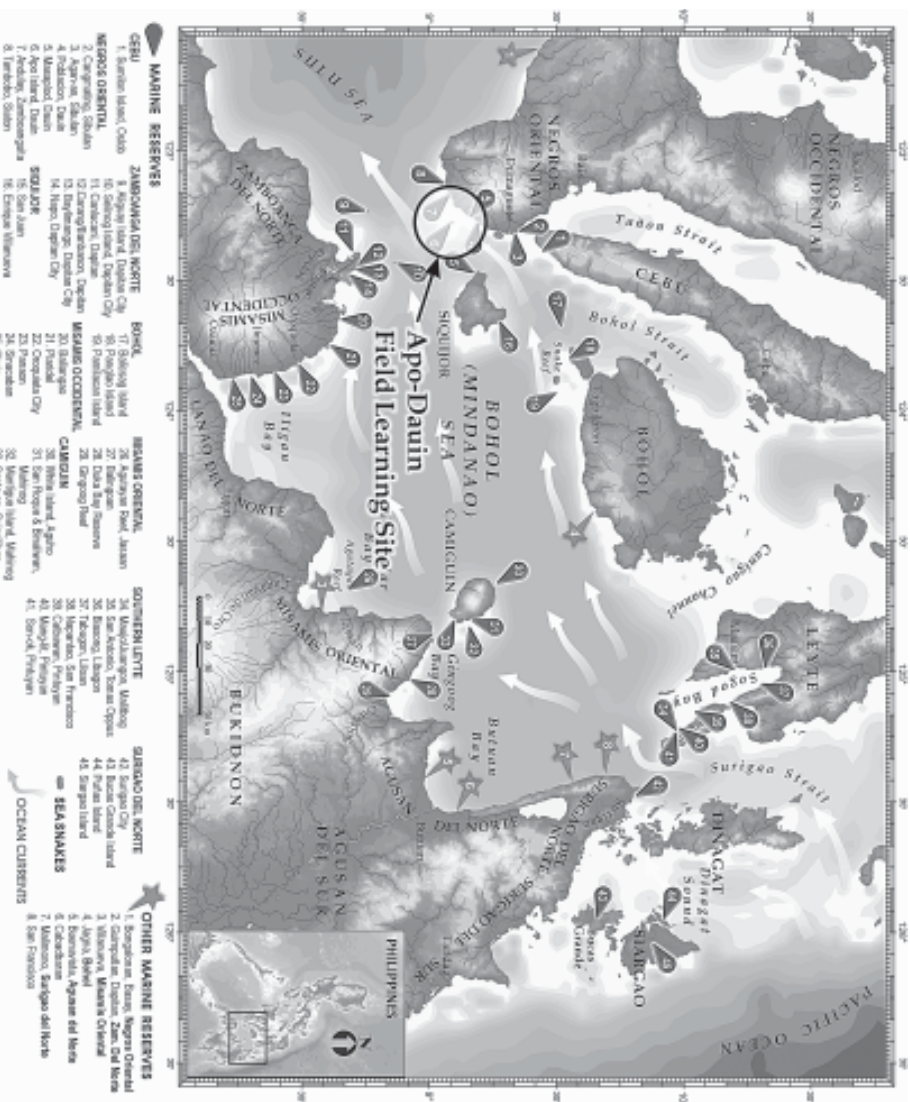


Figure 2a. Map of Bohol (Mindanao) Sea showing the locations of marine reserves, highlighted is the location of the Apo-Daun Field Learning Site. (Base map: ReefBase GIS)



Figure 2b. Map of Dauin municipality showing the five marine reserves.

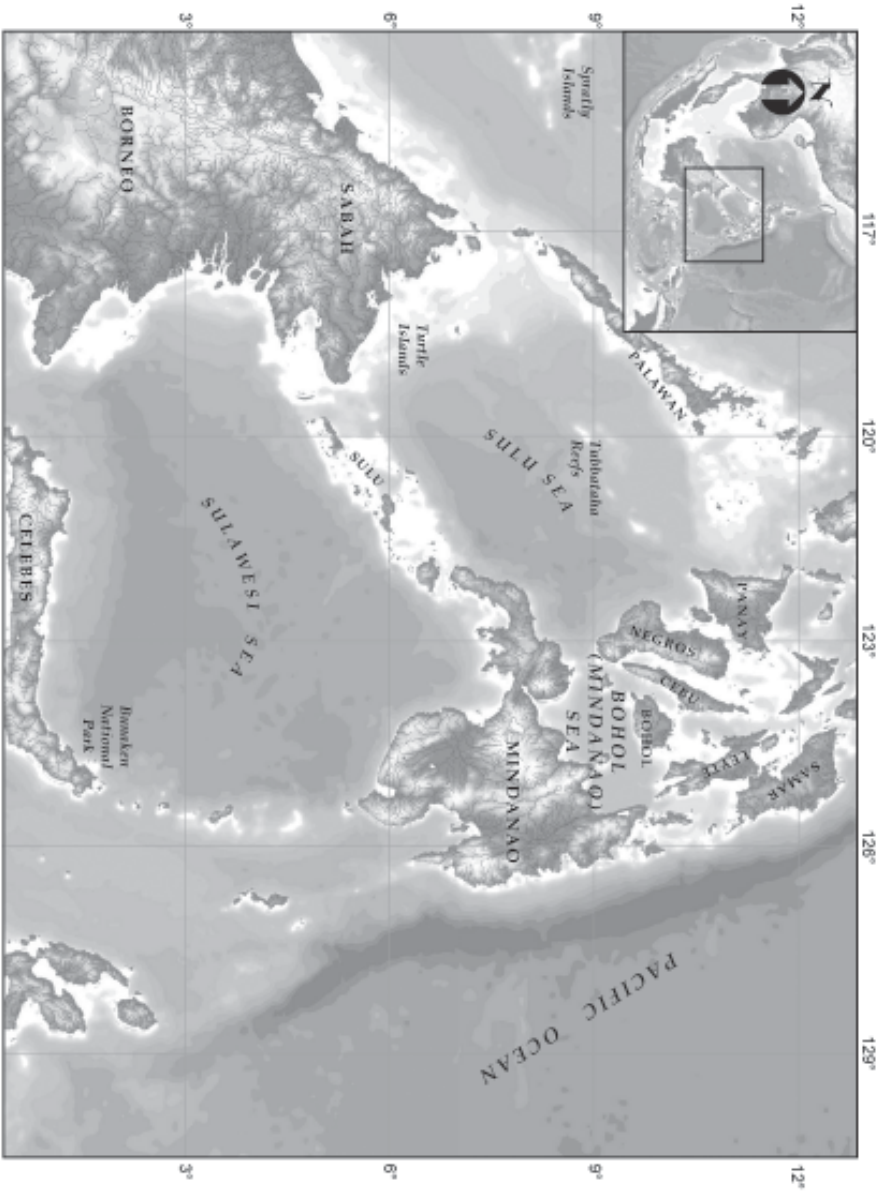


Figure 3. Map of Sulu-Sulawesi Sea where the highest concentration of marine biodiversity in the world is found (base map: ReefBase GIS).

D. Target Fish (Food Fish) Biomass and Density in No-take Zones

For Apo Island (20-21 years of protection), biomass is 120 tons/km² to 180 tons/km² (8). The mean density is 136 individuals/1000m² (9). For the Dauin Sanctuaries (3-9 years of protection), biomass at 30m depth ranges from 34 tons/km² to 42 tons/km² (10).

E. Socioeconomic and Political Context

Apo Island belongs politically to Dauin town, Negros Oriental province, and is about nine kilometers from the mainland of Negros Island. Coastal residents of southeastern Negros Island, including those of Dauin town, make their living from agriculture and fisheries. Those living on Apo Island are mainly fishers but many have been engaged in tourism-related activities, much like the people of Bohol Island and Cebu City, northeast of Dumaguete City in the Central Visayas. Cebu City is an industrial and trade center of the Central Visayas region (11).

F. Establishment and Management under the Local Government

The establishment of the Apo Island Marine Sanctuary (a no-take zone) was initiated and facilitated by biologists and social workers from the Silliman University Marine Laboratory beginning from the late 1970s to the early 1980s (12, 13). Thereafter, Silliman scientists have served only as advisers. A committee of the organized local community of Apo Island managed the sanctuary from 1982 to 1994, although the legal framework, a Municipal Ordinance, was formally passed by the Dauin Municipal Council only in 1986 and amended in 1988. In 1991, the legal basis for its establishment included provisions in the Local Government Code. The conservation management program consists of zoning the island's 106 hectares of coral reef into two, the no-take marine sanctuary of about 11 ha (soon to be increased to 15 ha) and the fished area making up the rest of the reef area. No extractive activity, including experimental manipulation of fishes and other organisms that would disturb or stress the fishes, is allowed in the sanctuary. In the area outside of the sanctuary, fishing with non-destructive gears is allowed. Controlled diving is also allowed in the sanctuary. Diving is without limitation in the non-sanctuary (fished section), provided no corals and other marine organisms are taken and divers do not disturb fishers. Divers are not allowed to bring any fishing gear or diving gloves, the latter being prohibited to discourage divers from breaking corals for souvenirs (Barangay Capt. M. Pascobello pers. comm.).

The Dauin Sanctuaries (Masaplod Norte, Masaplod Sur, Maayong Tubig and Poblacion District 1) are young sanctuaries, except Masaplod Norte (established in

1995), having been established in 2001-2002 under the Local Government Code and the Fisheries Code of 1998 under the overall leadership of the Mayor of Dauin. The legal framework for these sanctuaries is the Municipal Ordinance. They are managed by a mixed group of local government officials and members of people's organizations, almost always headed by elected Barangay (=village) Captains. This management group meets only occasionally as the need arises. Some members of the people's organizations serve as Bantay Dagat (Sea Wardens), volunteers who work with minimal daily allowance. Their main job is simply to prevent violations of the no-take zone. They stay and even sleep in the guardhouses on the beach fronting their no-take marine sanctuaries. Silliman scientists and Environment and Natural Resources Division of the provincial governor's office provide services for monitoring the effects of protection on coral reef cover and reef fish. The conservation management program was copied from that of Apo Island, that is, full protection from fishing of the no-take zones, but use for recreation is allowed. The issues in financing are more critical in the Dauin sanctuaries because of the lack of funds from the local government of Dauin. This explains the complaints of people's organizations and managers regarding lack of simple equipment like flashlights, radios and the like for patrol purposes. The people's organizations have also pointed out the need for livelihood projects to reduce the pressure on marine resources. On the other hand, the Apo Island community does not have a financial problem as it has steady sources of income from sale of fish catch and from tourism. The Dauin sites have guardhouses and small, motorized canoes Coral Reef Rehabilitation and Management Project. But they have no facilities for field research.

G. Management under the NIPAS

On August 9, 1994, the whole Apo Island (the land portion) and the surrounding marine area about one kilometer from the shoreline was proclaimed a Protected Landscape and Seascape by the Philippine President, becoming a national protected area under the National Integrated Protected Areas System Act (NIPAS), which is implemented by the DENR. The governing board under the NIPAS law is the PAMB, chaired by the Regional Executive Director of DENR Region 7 (15). The PAMB membership is composed of local government officials and representatives of non-government organizations (NGOs), local people's organizations (POs) on the island, and concerned members of the academe. For the marine sanctuary, the PAMB draws up the plans for the use of the 75% of the user fees for community projects and for the improvement of the whole protected area (land and sea) and submits these plans for approval by DENR. It decides on issues and problems that may come up from time to

time. It also formulates and approves rules and regulations on the use of the no-take and fished areas—what visitors can and cannot do—which are written in large letters on bulletin boards. It meets as the need arises but generally once every two months, and its resident members supervise the Bantay Dagat, (Sea Wardens) who watch over the sanctuary and see to it that rules and regulations of the marine sanctuary are followed. They also help guide tourists. The Park Area Superintendent from DENR visits occasionally to check the collection of user fees. Silliman scientists conduct regular monitoring and research on corals, fishes and other marine species in both no-take and fished areas. A group from the community was trained for simple monitoring of target fish species. Students from the U.S.A. and other countries spend time doing marine field research projects at Apo every year. All research activities are field-oriented and are conducted in the non-sanctuary portion, except the regular scientific monitoring which is done in the sanctuary only once a year (16).

Apo Island has two resorts catering to tourists and other visitors. The two resorts have diving facilities, and dive guides are available to scuba divers. Local motorized outrigger canoes furnish transportation to and from the island. Other buildings include a fee collection center, an information center and an office building of the DENR at the beach of the sanctuary. The Barangay (=Village) Hall is usually the meeting area. Tourists generally use the facilities of the resorts on the island. E-mail and telephones are available at the resorts. Electricity generated by a generator owned by the community is available from 6:00 P.M. to 10:00 PM.

3. CHANGE FACTORS AFFECTING THE SITE

Apo Island is primarily affected by socio-economics and institutional changes. The Philippines, like many other developing countries, has an annual population growth rate of 2.4-2.6% with a doubling time of about 28 years (Fig. 4) (17). A steadily growing population has led to an increase in fishing intensity both for purposes of food as well as for income generation. As the level of fisheries take has increased, the method for harvest has also become more destructive (through the use of blast

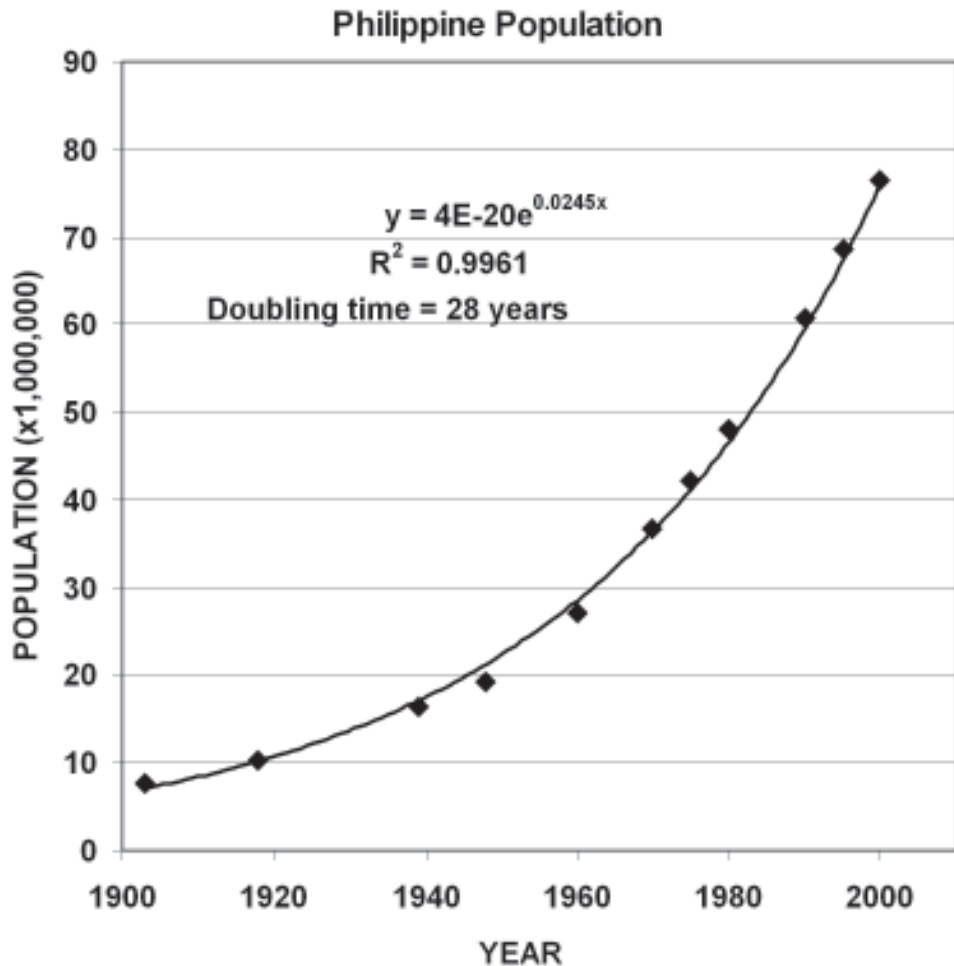


Figure 4. Graph showing the Philippine human population.

fishing, “muro-ami” and chemical poisons). The consequences of this exploitation and destruction of the fisheries resource have been a decline in available fish stocks and significant degradation of the marine environment. Much of these destructive practices occurred between the late 1940s through the late 1970s (Fig. 5), and by 1980 fish catch on the island was reduced to about 10 tons (Fig. 6) (8).

Aside from the socioeconomic factors of change that led to the sanctuary’s creation, institutional shifts within national and local governments are another dimension of change—from centrally led or dictated to community-led development projects. In the 1970s, the full participation of local communities in development programs to improve their well-being was beginning to take root (18). The initiators of the Apo conservation program firmly believed in the community-based approaches as the guiding philosophy of the Apo Island conservation program. Under this approach, the organized community, together with the local village government, is responsible for managing or co-managing the conservation program (12, 13). This explains why the community managed the Apo Island no-take marine

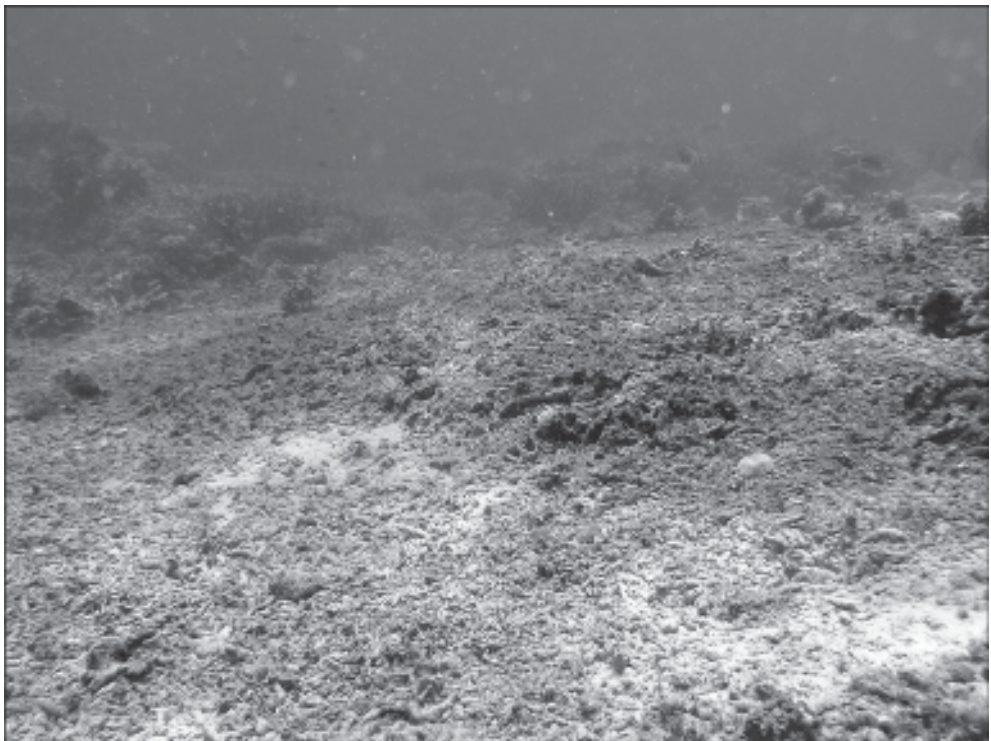


Figure 5. Photo of a blasted coral reef. (photo by JLP Maypa)

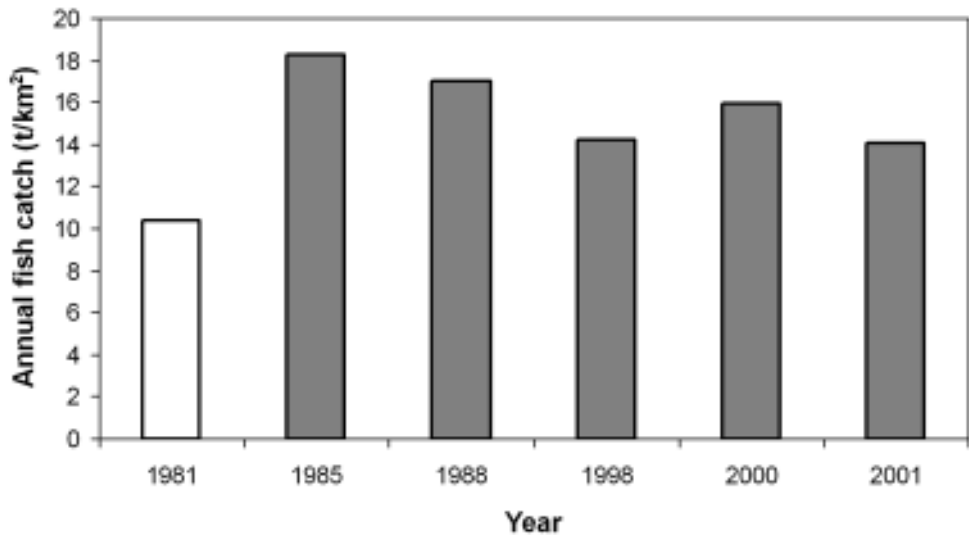


Figure 6. Annual fish catch (t/km²) on Apo Island. White bar represents catch before marine reserve protection was implemented.

sanctuary from 1982-1994. Since 1994, the island has become a national protected area under the NIPAS Act. With the PAMB as its management board, the community-based management capacity has not diminished. On the contrary, it has been enhanced by the enlarged representation from the local government. As mentioned, peoples' organizations are also members of the PAMB. This ensures community participation in management. The PAMB has generally worked well. Other than the problem of non-remittance of community share of income from user fees (see below), there has been no major problem in the management of the Apo Landscape and Seascape (15).

It is clear that if the Apo coral reef was not protected and managed by the community itself during the initial period 1982-1994, it would have degenerated and its fisheries would have been further depleted. It would not have been different from many sites in the Philippines with very low live coral cover and very low target fish biomass not unlike the biomass in unprotected reefs today (**Fig. 7**) (9, 19).

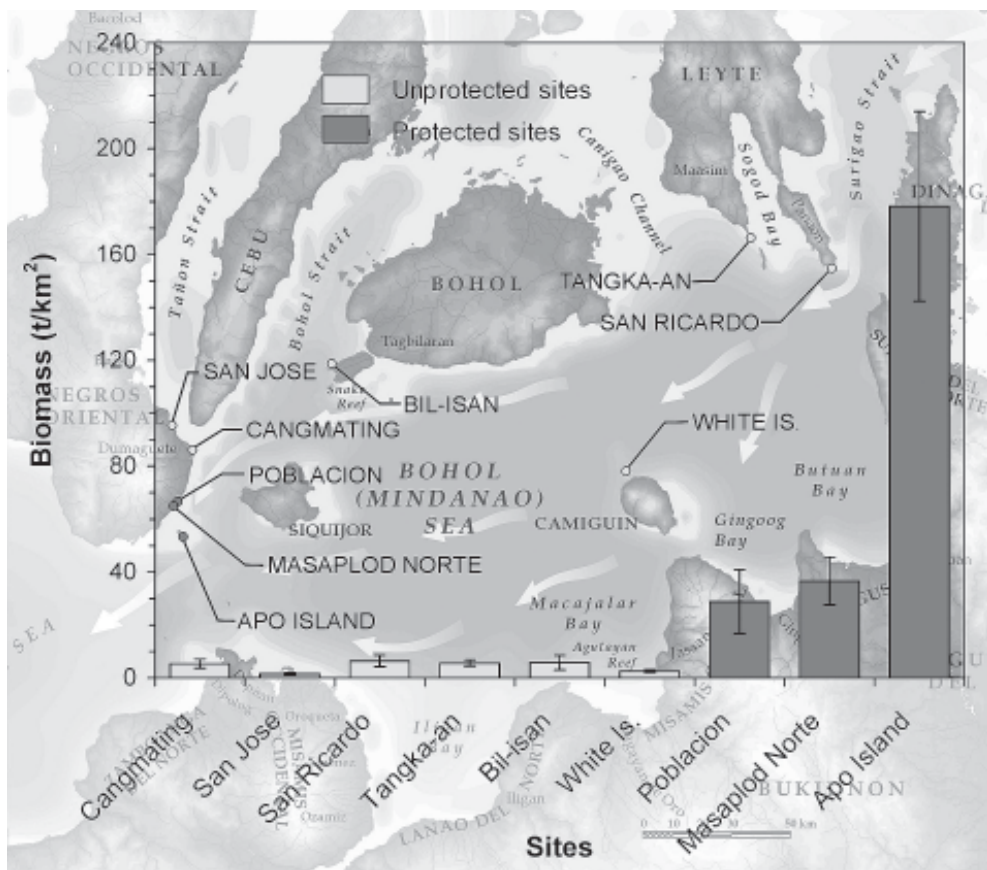


Figure 7. Target fish biomass (t/km^2) from sites in the Bohol (Mindanao) Sea. (Data from B. Stockwell, 2001-2003; Apo Is. data from R. Abesamis, 2003)

4. THE RESPONSE STRATEGIES

Although Apo Island marine sanctuary is considered as one of the few “best managed” marine sanctuaries in the Philippines, it is not exempted from management problems that require effective and immediate solutions. One of the constraints in management is the slow release of the community’s share (75%) of user fees by the national government. Another constraint is the lack of logistic support from government agencies such as BFAR and even the LGUs in preventing the encroachment of commercial fishers to areas near the sanctuaries within 15 kilometers from the shoreline. An example is failure of police to help in apprehending violators of the 15-kilometer rule. Another is lack of financial help for purchase of some equipment for use of the sanctuary guards. And still another is lack of scientific knowledge on no-take marine reserves or sanctuaries, hampering effort of managers to conduct educational campaigns on marine conservation.

Before the establishment of the Apo Island marine sanctuary, an initiative at another island off Dumaguete had shown improvement of the coral reef and the fishery resources after the establishment of a no-take reserve. In fact, the fish yield for that island (Sumilon, which politically belongs to Cebu province) was higher than that of Apo due to the protection of its coral reef. This initiative at Sumilon Island was thought to be applicable to Apo as well (20-24). Accordingly, Silliman scientists and social workers worked to convince the residents of Apo to adopt the concept of no-take marine reserve (or sanctuary) as a tool for management of the coral reef and reef fishery of Apo. It took about three years of intensive community organizing and educational campaign from 1979 to 1982 to finally convince the people to establish their no-take marine sanctuary. The FLS at Dauin were established because of the success of Apo.

The development of the Apo Island Sanctuary followed a process that involved three stakeholder groups: the community, the local government units (village and municipal), and the initiators (scientists and social workers of Silliman University). The process includes zoning the coral reef into (1) a no-take marine sanctuary which is off limits to extractive activity such as fishing and which is protected by the local community and the local government and (2) a fished area open to non-destructive types of fishing to ensure food fish for the people.

The strategy undertaken by these groups involved four elements, namely, community organizing, education, establishment and management of the protected

site, and monitoring for results of protection. The activities may be described as follows:

4.1. COMMUNITY ORGANIZING AND EDUCATION

A. Organizing, Empowering and Educating the Community

The first set of activities to facilitate planning and implementation of plans consists of community organizing and educating the community. Community organizing resulted in the empowerment of the community to take direct responsibility in protecting and managing its marine resources together with government and other development organizations. The community became what is now referred to as People's Organization (PO) with a set of officers. The goal was a community organization that can work with elected local village and town officials and other stakeholders to manage the marine protected area in a sustainable manner and initiate other development activities such as those that generate income. The focus on community organizing and education as a first step was a departure from previous government approaches in coastal resource management in the 1980s which consisted of setting up projects without first consulting the primary stakeholders, the so-called top-down approaches.

In the Philippines, where community-based resource management has been widely implemented first for agricultural resources since the 1970s, and is now the most popular choice of coastal and marine managers, community organizing and, often simultaneously with it, education are the first set of essential activities to be implemented in coastal resource management (CRM) projects. After a community is empowered and educated, all other processes needed for ensuring success of CRM projects follow. Most successful CRM projects in the Philippines are community-based and/or co-managed by organized local POs and local government units with national government support (25-27).

The Philippine model exemplified by the Apo Island marine sanctuary has been replicated in Discovery Bay, Jamaica, where fisher-volunteers protect and manage the fisheries (28), and probably in other countries as well. The Shedd Aquarium in Chicago a couple of years ago adopted the Apo Island model for its exhibit of community-managed coral reef and reef fisheries in a developing country (29). In Southeast Asia, there are too few reports on community-based coastal and marine resource management (30). This probably indicates that the top-down approach in CRM is preferred by most Southeast Asian countries. The report on a community-based project in Thailand involving the management of the dugong in the Andaman

Sea and the inclusion of community-based management in the administration of the Bunaken National Park in Manado, Indonesia, through the efforts of the University of Rhode Island group (which, by the way, made use of local people of Apo Island) are apparently exceptions to the general rule of the management of marine and coastal resources by central governments in Southeast Asia (31). Another exception is the large Indonesian programme, COREMAP (32), which has, as one of its objectives, community-management of coral reefs. However, no report on the accomplishments of this programme has yet come to our attention.

In the case of Apo, an educational campaign among the residents was conducted simultaneously with community organizing by biologists and social workers from Silliman University at the same time that they initiated the idea of a marine sanctuary. In so doing, there were social biases and misconceptions to overcome. Many community members were convinced of the inexhaustibility of fishery resources. The mind-set of most members of the community was that there was no need to protect because nature will always provide the fish they needed. Also, they failed to see the connection between degraded coral reef environment and sustainable fisheries. In other words, they only knew exploitation, not conservation for sustainable fisheries. This constraint was overcome by three years of intense community work. Two community workers lived on the island for two years meeting and discussing with members of the community, including those who had negative ideas about protection. They also talked with municipal officials regarding the need for a legal basis for protection. In these discussions, whether with single individuals or with large groups, the research results from the other protected area established earlier and aspects of marine ecology were thoroughly discussed and related to the concept of marine reserves or marine sanctuaries. For example, one of our biologists used a compound microscope to demonstrate the existence of plankton and pointed out that one effect of dynamiting reefs is to kill these organisms on which important fish species caught at Apo were dependent. Through persistent and careful explanation and demonstrations in three years, the community was convinced of the benefits of a marine reserve or marine sanctuary.

The assumptions underlying the establishment of the marine reserve (=sanctuary) are (1) that by protection from fishing and other extractive activities, the reserve (= no-take marine reserve) would improve its live coral cover, fish density, and fish biomass and would over time export harvestable fish biomass (spillover) to areas outside the sanctuary, (2) that the improved biodiversity would attract visitors who can make donations to the community and thus increase income of the people,

as envisioned in the legal framework (municipal ordinance approved in 1986, 1988) of the sanctuary.

No-take marine reserves as tools for conservation of marine biodiversity and for fishery management are one of the world's "hottest" subjects in marine resource management today. The number of technical papers and other publications on this topic has ballooned since our demonstration of the fishery-enhancing effects of these reserves on fisheries at the first working marine reserve in the Philippines and probably in the world—Sumilon marine reserve in the central Philippines. The fishery-enhancing effects are emphasized because most marine reserves in the Philippines— and I suppose other developing countries as well— have been established to enhance fishery yields. The establishment of Apo and many of the 400 other marine reserves in the Philippines was heavily influenced by Sumilon, where the "spillover" effect on fisheries was demonstrated in the 1980s (23, 24), followed later by more convincing evidence at Apo in the 1990s-2000s (34, 35). It is also possible that the recent decision of the Great Barrier Reef Marine Park Authority to declare 30% of the coral reef area of the GBR as no-take reserves was influenced by our early findings in the central Philippines. Incidentally, our first no-take marine reserve at Sumilon consisted of 25% of the total reef area. Overall, the role of Sumilon and Apo as a model of marine conservation appears to have been substantial. However, it appears that marine reserves work best under conditions in developing countries if co-managed by local community and local government, as indicated above (12, 13, 25).

B. Formulation and Dissemination of Rules and Regulations

The rules and regulations for the use of marine resources in and outside the no-take reserve were established and publicized on billboards on the island. Brochures on the Apo Protected Seascape and Landscape were produced and disseminated. An article in the journal, *Coral Reefs*, and a book describing Apo Marine Sanctuary were published by Silliman University scientists (12).

4.2. ESTABLISHMENT AND MANAGEMENT OF THE SITE

A. Delineation of No-Take Marine Reserve

One of the important activities was the delineation of the no-take marine reserve. This took some time to accomplish because of initial objections of some members of the community to the decrease of their fishing ground. But the objections ceased

when it was explained to them that the spillover of fish biomass enhances fish catches and thus compensates for the loss of fishing ground. How much area was to be non-fishing area was another issue that took time to settle. The ideal is 20-30% of total fishing ground, and in fact the consensus decision was to set up the no-fishing zone in the less fishery productive part of the island with an area less than the ideal. As it turned out later in the early 2000s, the PAMB agreed to increase the area from 10% to 15%.

B. Managing and Financing Plan Agreement

Another activity concerns the formulation of the protection plan and who in the community would be responsible for the day-to-day management. The answer to this was suggested by the community itself; a marine management committee headed by the Barangay Captain (village leader) was to be the manager. With regard to financing the management operations, the community members decided to volunteer their services. The policy and legal basis for the protected area was approved later (1986) by the Dauin Municipal Council through the combined effort of the head of the people's organization, the Silliman group and the Mayor of Dauin (12, 13).

C. Formation of Livelihood Groups and People's Organizations

In the late 1980s concern for livelihood sources came to the fore and was addressed by the Management Committee and later by the Apo Barangay Council. A number of livelihood groups and people's organizations were formed. These groups cater to tourists, including divers. Thus women sell t-shirts and offer food-catering services to tourists, and divers and boatmen serve as guides for scuba divers.

The support of various stakeholders was enlisted through community organizing activities as already discussed and through meetings to which local and national officials were invited. The resorts on the island served as venues for informal discussions with visitors. Silliman University promoted Apo Island as field laboratory for researchers and students from various parts of the Philippines and abroad. Apo has attained world-wide recognition as a model community managed marine sanctuary and has been written about by scientific and popular writers. As already mentioned, recently, the famous Shedd Aquarium in Chicago modeled its coral reef exhibit after Apo Island. Apo Marine Sanctuary has won cash prizes as a successfully managed marine sanctuary. Donors from Europe and the U.S.A. have contributed funds for Apo student scholarships.

4.3. MONITORING THE RESULTS

A. Biophysical

One important result of the response strategy is the increased fish biomass and fish yield, as predicted. Through careful monitoring and research, it was shown that the target fish biomass in the no-take marine sanctuary increased from ca 100 to 180 tons/km² during the past 20 years and the annual fishery catch increased from the initial low figure of 10 tons/km²/yr to stabilize at 15-18 tons/km²/yr (**Fig. 8**)(8). Similarly, live coral cover (hard and soft coral) in the sanctuary had increased from 62.4% in 1983 to 68.1% in 1992, to 77.5% in 1997, as compared with the fished area (non-sanctuary) with 42 to 63% from 1983 to 1995 (33). In addition, large invertebrates such as sea cucumbers, sea urchins and giant clams, abound in the sanctuary and are expected to replenish exploited populations outside the sanctuary.

B. Socioeconomic

The method of determining live coral cover is the line intercept method, which is standard for coral reef monitoring. A percentage live hard coral of 50% is considered good. For fish yield, the Catch per Unit Effort (CPUE) is the indicator data gathered through fieldwork, and direct determination of landed fish catch is done to determine total catch. The indicator for fish catch from a good reef is ca 15 tons/km²/yr, assuming a mixture of fishes at different trophic levels. For underwater surveys using standard methodology, the species richness, fish density, and fish biomass are determined. Biomass is computed using published tables on length-weight relations. The indicator for a good, nearly pristine reef is a target fish biomass of > 100 tons/km².

As a result of tourism, the whole island of Apo earns US\$200,000-\$400,000 a year. User fees collected amount to US\$35,000 per year. In addition, it earns income from the fishery of 15-18 tons a year from the less than 100 ha of reef (11, 12). This is partly due to spillover. Evidence of fish biomass spillover to the surrounding areas has been documented for certain gear types (**Fig. 9**) (34, 35). This income from fisheries and tourism has improved the quality of life of the community.

Tourism use at Apo is managed by the PAMB, from which the records to show the impact of tourism can be accessed. One social indicator for tourism is tourist user fees earned annually, or total gross income per 100 ha of coral reef. For Apo Island, these are US\$35,000 and at least US\$200,000, respectively. Based on these indicators, there is no question that the strategy used has been a success.

Other social indicators are environmental awareness as evidenced by behavior of visitors, but these have not been used as yet. Among the mainland Dauin FLS, only

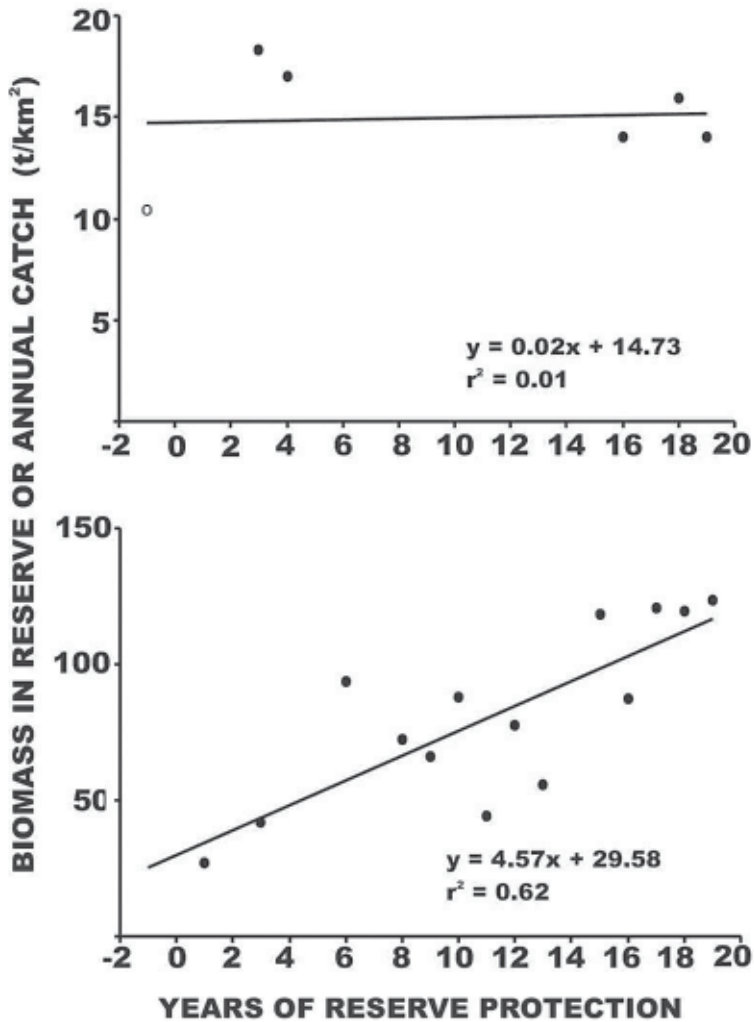


Figure 8. Graphs above show increasing biomass (t/km²) with years of protection, while fish catch remain stable.

two, Poblacion and Masaplod Norte, show indications of success in terms of increase in fish biomass and as tourist destinations, as others have not been fully functioning yet.

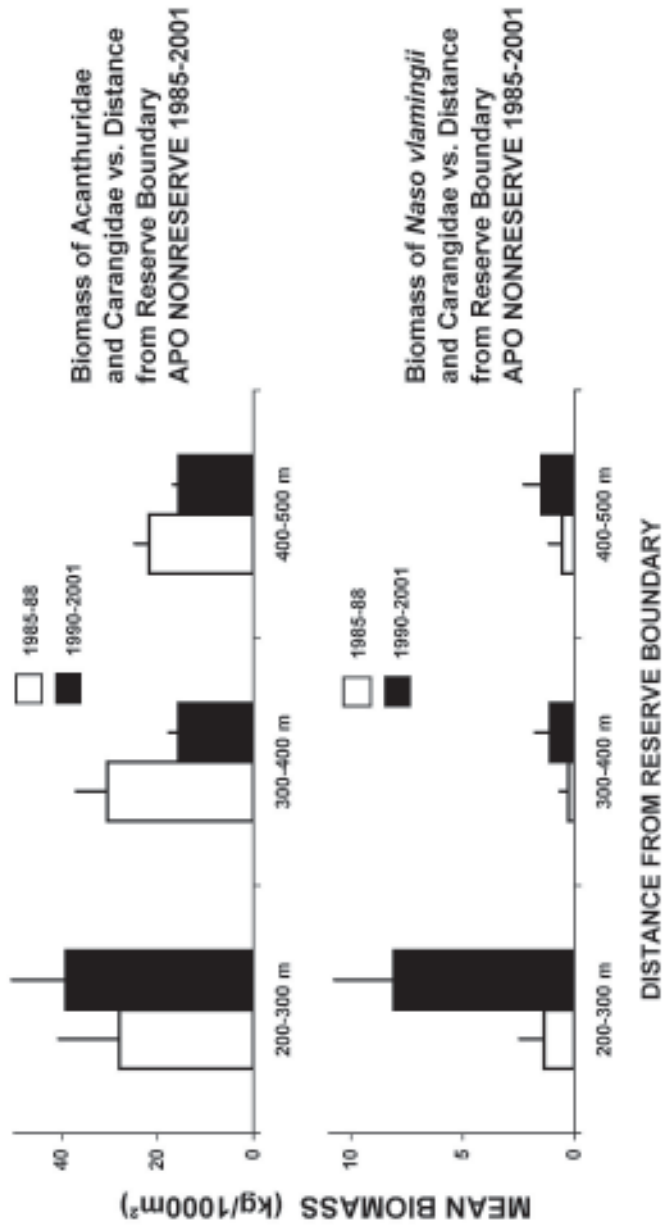


Figure 9. Graphs above showing evidence of spill-over effect.

C. Institutional

The other most important result of the response strategy is the finding through informal and formal social surveys that the Marine Management Committee successfully managed the sanctuary operation from 1985-1994, after which the PAMB took over. During the first 10 years, the Committee dealt with violations of the reserve, mostly by fishers and tourists coming from the outside, sometimes with the help of the town police. Violations gradually diminished with time. Two formal social surveys, one in 1986 and the other in 1992, showed a high degree of compliance to the rules and regulations and a confidence in the ability of the Committee to manage the protected area (36).

The involvement of the local communities and local government units appear sufficient to sustain the momentum of the protection and management effort through the PAMB. The plans for the future include sourcing more assistance to continue the drive for family planning, strengthen the capabilities of the local community to monitor their protected area, increase the proportion of the no-take zone relative to the fished area, and focus on global threats to the integrity of protected areas, such as negative effects of tourism, flooding in denuded areas due in part to erratic rainfall pattern in the case of the mainland Dauin sites, etc.

As mentioned in earlier sections, the national recognition of the protected area by placing it under the Protected Area Management Board (PAMB) is believed to strengthen the capacity of the people's organizations (organized community members) to manage the sanctuary more effectively. The membership of the PAMB comes from national officials assigned to regional offices, respected members of people's organizations, non-government organizations, the academe and local government units. The PAMB can more easily access funding and other logistic support from the national government. This is an advantage of national protected areas over locally established marine protected areas. However, it is admitted that one drawback to establishing national protected areas is the long period of time it takes to establish them (3 years), based on our experience.

Role of Population Dynamics. The role of population management cannot be over emphasized as the human population in the country grows at an annual rate of about 2.5%, exerting an increasing pressure on the sea resources over time. For the Philippines, there has been a decreasing population doubling time from 31.5 years in 1903, to 24.05 years in 1948, to 28.96 in 1990. For Dauin, the population doubling time between 1903 and 1987 was 87 years (annual growth rate 0.8%) but decreased steeply to 23 years between 1987 and 2004 (annual growth rate 3.0%) (**Fig. 10**) (17), resulting

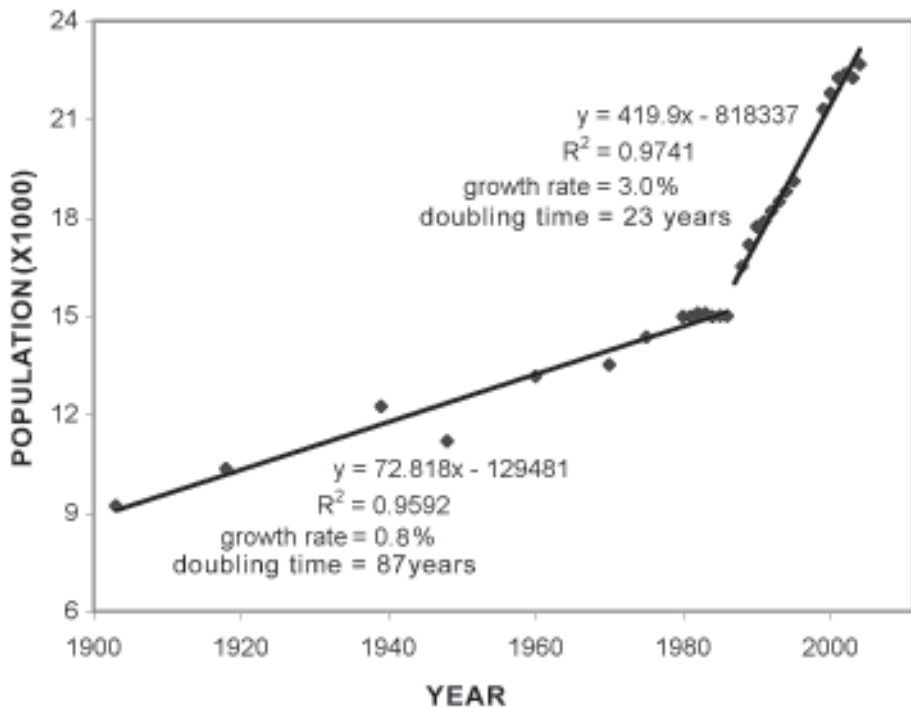


Figure 10. Graph showing the trends of human population growth of Dauin, Negros Oriental.

in more demand for marine fishery products during the latter period. An indication of this phenomenon is the increasing number of fishers and gleaners in coastal and marine areas. This has in turn resulted in the disappearance or near disappearance of fish and other shallow marine organisms used as food. One important fact generally not known to (or ignored by) western observers is that rural/coastal populations, which make up 60% of the total Philippine population, rely on fishery products that are freshly caught or collected on a daily basis.

Population Interventions. The need to improve the technology of population management as a means to meet the demands for food security has been given substance by a project known as Integrated Population Control and Coastal Resource Management (IPOPCORM). Initially, the fishers and their wives at Apo and

mainland Dauin FLS comprised the clientele of this project. It later expanded to both upland and lowland farmers of Dauin.

Three types of population control measures introduced to the clientele are bilateral tubal ligation (BTL) for women, vasectomy for men and hormone injection for women which is effective in preventing conception for a three month period. Although the indicators of success are not yet evident, there have been eight BTL and one vasectomy acceptors during a period of 14 months. However, pills and condoms have been sold extensively. The projected response to condom and pill use is 30% according to the IPOPCORM director, Dr. Fe Wale. IPOPCORM is the continuation of the family planning program of Silliman University begun in 1972.

Constraints to Implementation. The effects of high population growth rate would tend to upset the balance between exploitation and conservation in all of the FLS. The use of destructive fishing methods such as beach seine and the occasional encroachment of commercial fishers are also constraints to implementation in the Dauin mainland FLS.

5. LESSONS LEARNED

5.1. THE MAIN ACHIEVEMENTS OF THE MARINE PROGRAM ARE:

(1) Data showing that no-take marine reserves or sanctuaries do work over time to conserve biodiversity, increase fish density, and fish biomass and export fish biomass outside protected areas and potentially increase fish catches of fishers,

(2) Since time scales for restoration of coral reefs are in the order of decades rather than years, there is much sense in co-management schemes involving the three partners in long-term management of coral reef resources. Such co-management provides an intergenerational mechanism to ensure long-term protection of marine resources.

(3) For the Dauin sites, all marine sanctuaries have already been delineated and three are functional, with their management plans almost completed, and their POs organized. The challenges are to: (a) place the remaining coral reefs under some form of co-management schemes involving local and national partners (b) strengthen the management of some 400 marine reserves in the country and (c) for the Dauin sites to minimize the effect of flooding and erosion impacting their sanctuaries due to erratic rainfall pattern.

5.2. THE MAIN LESSONS THAT HAVE BEEN LEARNED BY THE PARTNERS AND MANAGERS OF THE APO ISLAND FLS THAT THEY CAN SHARE WITH OTHERS ARE:

(1) While external help is often necessary to initiate development projects, much depends on initiatives of local communities and local government units to achieve the human development objectives of food security and sustainable marine resources (directed to local stakeholders).

Once the community was educated to understand that their food and livelihood security would be increased by the development of the reserve, they were fully supportive of the project. Without their support and efforts to establish the site, the reserve would not have been protected.

(2) Interagency linkages and cooperation in the management of marine protected areas are essential (directed to all stakeholders).

While we believe these linkages are critical, the project had difficulty getting the necessary support from a number of government agencies like the Bureau of Fisheries. It was perceived as due to the tendency of this office to do its own thing. Another agency, the Philippine Coast Guard, was perceived to be not helpful when asked for assistance by the Dauin FLS. It is possible that this agency could not help in implementing the rules of protected areas because it lacks boats and personnel.

(3) Management of marine protected areas should be science-based, drawing on information from all over the world but especially from reserves in the country (directed to all stakeholders).

The University partners for the area include scientists who are especially aware of the advancements in marine biology and the applications to protected areas.

(4) Academia is useful as initiator of projects, but organized local communities and local government units should take their roles as implementers (directed to all stakeholders).

The members of academia that worked on the project are aware that their role is primarily research and other technical matters, and implementation is not their responsibility.

(5) A great deal of volunteerism is needed in successfully managing marine protected areas (directed to all stakeholders).

Although this project demonstrated the critical role of volunteers, there were also difficulties in getting some community members to contribute their time without compensation. As an explanation, we believe that poverty is so rampant that everybody expects to be paid for his labor. The solution to this issue would depend on the local situation.

(6) Periodic monitoring of protected areas and assessment of results with the use of social and biological indicators is needed (directed to all stakeholders).

Monitoring is critical to show the beneficial results of establishing marine reserve as well as to track down any necessary adaptations to management over time. This should be a combined effort of the local government units, local community (POs), and academe. Some members of the community have been trained in monitoring. Scientific monitoring has been done since the 1980s using simple (directed to the community) and standard methods (directed to scientists). Assessments of the effects will use socioeconomic and biophysical indicators that are being developed.

(7) Use of technological interventions to address human population management is needed to ensure sustainable development (directed to all stakeholders).

In addition to preserving fisheries resources at the site, it is important to address social indicators that lead to the increase in resource exploitation. In this case, we initiated education on family planning to help reduce or stabilize population growth. The success of this activity is still limited.

(8) Establishing conditions for sustainability (directed to all stakeholders).

The community-based approach has the element of sustainability because at any point in time there are several generations of people who are aware of the need to sustain the effort of carrying on the positive achievements. For example, on Apo small children have been known to tell visitors to follow the rules of the marine sanctuary. These children will grow up to teach their own children about the benefits of the marine sanctuary. Apo Island has a scholarship program supporting selected Apo college students to enable them to finish their college degrees and are required to render community service on Apo. There should be members of the local community trained in monitoring the sanctuary using simple methods and feeding back the results to the community so the community knows what is going on in the sanctuary. Part of this activity should be the development of a database for purposes of continuing the information dissemination to the community.

5.3 SIMPLE STATEMENT OF LESSONS AND PRINCIPLES TO ENHANCE UNDERSTANDING OF THE PRINCIPLES BEHIND EACH LESSONS LEARNED, THE FOLLOWING GUIDELINES ARE IN ORDER:

(1) *Marine protected areas benefit biodiversity and people, the latter by the excess production of harvestable organisms.* The evidence for this is our data showing improvement of the quality of biodiversity, the increase of fish biomass over time at Apo Island and the spillover of fish biomass to surrounding non-reserve.

Guideline: Site reserve in an area most likely to result in fish biomass spillover and improved biodiversity through production of marine propagules for the larger marine region (directly related to ultimate socioeconomic benefits of reserve). In developing countries with large populations, it may not be possible to protect large marine areas and we have to be satisfied with many small reserves. Since small reserves have localized effects, many reserves (large and small) should as much as possible be established to form networks of marine reserves or sanctuaries in order to ensure large-scale impact on marine biodiversity and fisheries and conservation of whole ecosystems, taking into consideration the oceanography of an area.

(2) Marine protected areas require decades before they can recover to the previous condition, if at all. Our 20 yr data on fish recovery from Apo and Sumilon Islands indicate this could take decades. (37).

Guideline: Conduct baseline and ongoing monitoring of both marine reserve and fished area outside no-take zone to show long term benefit of increased fish stocks. Additionally, be prepared to devote extensive time to community organization and education (in the case of Apo Island, 2-3 years).

(3) Full community and local government involvement in the management of marine protected areas is necessary for the protection of the marine sanctuary, as demonstrated in the case of the Apo Island.

Guideline: Partnership between local communities and facilitators must be balanced. Recognize the “ownership” of the project is important. Local government units must take responsibility for the legal issues and livelihoods. Facilitators (including scientists, community organizers and advocates) must be credible and have no hidden agenda.

(4) Flash floods have eroded beaches and silted coral reefs in the FLS areas, as reported by the sanctuary managers.

Guideline: Continual protection and benefit of the marine reserve requires ongoing communication and adaptation to new and emerging issues. Management committees and boards must hold regular meetings and respond to feedback and concerns from the community, as well as to determine new ways of managing against emerging threats to the reserve.

Marine reserves may be established under two sets of Philippine laws, the NIPAS under the national protected areas system, and the Local Government Code and the Fishery Code under a local government unit such as a town, city, or province. So there is a choice under what system a particular coral reef under threat from overexploitation can be protected and managed. A manager representing a local government would think that logically it would be easier for him to have it declared a local marine sanctuary because it requires fewer steps and shorter time to effect protection (see Appendices).

However, consider this case: A particular coral reef which is bounded on one side by a tropical rain forest has just been invaded by a rebellious armed group that cannot be controlled by local officials. The forest will likely be logged and cause sediment to pollute and kill the corals within a short time. One will have to opt for national protection by the DENR under the NIPAS law in order to avail oneself of a strong implementing arm of government when needed.

In this true example from the island of Mindanao, the local government and the community will follow a guideline of assessing the risk to the environment if a certain option is followed. This example illustrates the importance of social factors reinforced by global change factors (for instance, the large amount of rainfall causing large volume of sediment deposited on the reef). In deciding on a strategy of protection, the probability of success should be part of the guideline in the absence of clear evidence for superiority of one strategy over the other.

The most effective means for communicating lessons abroad is the websites but locally, the best way appears to be through visits to targeted areas, or through the radio. A study being conducted in the Dauin FLS aims to determine the best ways of communicating with local stakeholders.

6. LIST OF OPTIONS AND GUIDELINES FOR STAKEHOLDERS

6.1. FOR MANAGERS

(1) The stakeholders that are targeted by the establishment of no-take marine reserves would seem to be the small-scale fishers highly dependent on coastal ecosystems. Community-managed coral reefs as a management option, in contrast to top-to-bottom management schemes, would appear to be applicable to many developing Asian countries with coral reefs. But it also appears that more complex projects which involve a multiplicity of stakeholders and which deal with many complicated issues such as multi-use marine areas near urban centers and pollution problems would require the more complicated Integrated Coastal Management approaches, including schemes of institutionalization applicable to all types of CRM as a means of ensuring sustainability.

(2) Land-based alternative livelihood activities, provided they are not polluting, may be considered as one way to reduce the human pressure on marine resources. Examples are mat weaving activities using local materials. Apo had this livelihood activity but it fell out of favor when more lucrative activities, such as selling t-shirts, were favored by women.

(3) For Apo, which is a Protected Landscape and Seascape, another way of reducing the pressure on the diving sites for tourists is to make the land attractive. Toward this end, the forest of the island, which is the habitat of a rare pigeon and possibly other bird species can be utilized for bird watching.

(4) Legal advocacy can be a topic for discussion by the stakeholders of protected areas. In this connection, the existing laws may be discussed for possible amendments and for harmonizing conflicting provisions as well as promoting better and more efficient implementation. One hot issue is the delimitation of the 15-kilometer zone for exclusive use by small-scale fishers.

(5) A rescue plan for victims of sea disasters near protected areas and a plan for the protection of coral reefs in the event of sea accidents such as oil spills should be formulated.

(6) A plan to mitigate the effects of unusually heavy and concentrated rainfall as often happens in the country should be prepared. Some activities like identification of flood channels and other vulnerable sites and specific measures to address these events should be done.

6.2. FOR POLICY MAKERS

(1) Develop an incentive system for those directly involved in the implementation of sanctuary rules and regulation to include benefits such as scholarships for college students and non-monetary incentives.

(2) Develop an environmental plan to include waste management, reforestation, educational curricula, land use policies, etc, with other agencies and organizations such as Department of Education, Bureau of Fisheries and Aquatic Resources (BFAR), Philippine National Police (PNP), Local Government Unit (LGUs), farmers' organizations and fishers' organizations.

(3) For developing nations, particularly those in South Asia and Southeast Asia, they could profitably study the success stories of Apo Island and other small islands such as Gilotongan off Cebu Island and Balicasag off Bohol Island for use of marine resources in tourism as a means of increasing incomes of fisher communities (11, 12).

7. CONCLUSION

Marine reserves or marine sanctuaries appear to be the most viable fishery management tools for the Philippines because of their simplicity and relative ease with which they can be established, as attested to by Apo Island Marine Sanctuary, the Masaplod Norte, the Dauin Poblacion sanctuaries and many other successful marine sanctuaries. Their sustainability, however, would be enhanced if clusters of reserves in a given area are networked together for purposes of management. They are likely to be most effective if local government units and local communities are fully involved in their management under a national policy and legal framework (38). From the generally degraded condition of marine habitats in many developing countries, several human generations are required to ensure the attainment of the carrying capacity of these reserves, underscoring the usefulness of community-based approaches in sustaining human efforts at protection and management. The importance of this management option can be appreciated in the light of the fact that several other top-to-bottom modes of management tried in the past have failed, as evidenced by the depleted status of fisheries and marine biodiversity in the Philippines.

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List of Abbreviations Used

BFAR	Bureau of Fisheries and Aquatic Resources
BTL	Bilateral Tubal Ligation
COREMAP	Coral Reef Rehabilitation and Management Project
CPUE	Catch Per Unit Effort
CRM	Coastal Resource Management
DENR	Department of Environment and Natural Resources
FARMC	Fisheries and Aquatic Resources Management Council
FLS	Field Learning Site
GBR	Great Barrier Reef
IPOPCORM	Integrated Population and Coastal Resource Management
LGU	Local Government Units
NIPAS	National Integrated Protected Areas System
NGO	Non-Government Organization
PAMB	Protected Area Management Board
PNP	Philippine National Police
PO	People's Organizations
RA	Republic Act
SUAKCREM	Silliman University Angelo King Center for Research and Environmental Management

Appendices (available upon request from SUAKCREM)

- Appendix 1: Legal and Jurisdictional Framework for Coastal Management (includes discussion of R.A. 7160, R.A. 7586 and R.A. 8550)
- Appendix 2: R.A. 7160: The Local Government Code of the Philippines
- Appendix 3: R.A. 7586: National Integrated Protected Areas System Act of 1992
- Appendix 4: R.A. 8550: The Philippine Fisheries Code of 1998
- Appendix 5: Laws and Other Issuances and their Application to Mindanao Rural Development Project- Coastal & Marine Biodiversity Component (MRDP-CMBC)