COMMUNITY BASED CORAL REEF FISHERY RESOURCE MANAGEMENT IN THE PHILIPPINES: THE BALICASAG ISLAND EXPERIENCE

by

Efren Flores and Geronimo Silvestre
Department of Marine Fisheries, College of Fisheries
University of the Philippines in the Visayas
UP, Diliman, Quezon City, Philippines

ABSTRACT

This paper attempts to relate the initial success of marine conservation efforts initiated on Balicasag Island, off Tagbilaran, Bohol, Philippines. This is in order to: (1) highlight the potential utility (if not necessity) of extension activities in the success of marine conservation efforts in the Philippine situation; (2) stress the need for sustained, holistic approaches incorporating resource-user participation in conservation and management and (3) present a more practical and viable approach (if not alternative) other than coercive measures, e.g. regulations and enforcement, given the realities of marginal existence in most Philippine fishing communities. The Balicasag Island experience is put into proper perspective by presenting the case for resource conservation and management in Philippine coral reef fishery through a preceding introductory and non-technical treatment of the following: Philippine fisheries; coral reef biology; coral reef exploitation and contribution to fisheries production; stresses on coral reefs; and implications of coral reef destruction.

Introduction

Philippine fisheries policies have always emphasized a balance between the management and conservation of resources, on the one hand, and their utilization of exploitation, on the other (e.g. Fisheries Act 4003 of 1932, Republic Act 2512 of 1963, Presidential Decree 704 of 1975). In the past, however, the implementation of policies has tended to favor the expansion of harvesting capability and support infrastructure. This resulted in the relative neglect of provision of proper management of the resources upon which the expanding extractive capacities were based. A resurgence of interest and emphasis on the management dimension came about in the latter half of the 1970's (Smith *et al.* 1980, Pauly 1986). The shift in emphasis came with the consensus that harvests have largely reached, if not exceeded, the harvestable potential of the resources, especially in the nearshore traditional fishing grounds. Recognition of the necessity for more effective management was reinforced by, among others, the following: (1) increased competition and conflict between (and among) municipal and commercial fishermen; (2) the marginal existence of most participants in capture fisheries, and; (3) concern for the extent of man-induced stresses on the environment of the resources.

The renewed emphasis on better management has brought into focus the apparent inability of existing institutional structures and strategies to effect proper management towards maximization of benefits from the country's fishery resources. For instance, the extent of biological (and economic) overfishing on traditionally exploited stocks/areas remains considerable based on currently available assessments in the literature (see for example MNR 1980, Smith *et al.* 1980, Munro 1986 and references therein). For the country's nearshore demersal stocks alone, estimates of economic loss due to lack of management could be as much as US$90 million (Silvestre and Pauly in press). In addition, destructive fishing methods (such as the use of dynamite and poisons in fishing, "muro-ami" (set net), and "kayakas" (set net) are still prevalent despite laws that prohibit their use. It appears that mere legislation (and their penal provisions) do not suffice. Even vigorous enforcement (if at all feasible or

attainable) may not work given the marginal existence prevalent in many fishing communities. Long-term consequences are often ignored by fishermen in favor of immediate benefits or necessities in the absence of holistic approaches to fisheries management.

The present contribution relates the initial success of marine conservation efforts initiated on Balicasag island off Tagbilaran, Bohol by personnel of the Marine Conservation and Development Program (MCDP) of Silliman University. It attempts to highlight the relevance of the pioneering works of Dr. Angel Alcala and Dr. Alan White on Philippine marine parks/reservations to the overall management of the country's fisheries. The interest in the experience is due to the fact that it illustrates the applicability and potential utility of decentralized management systems incorporating resource-user participation and holistic development approaches in the implementation of conservation and management efforts in the Philippine situation. Presentation of the Balicasag island conservation efforts, below, is put into proper perspective through a preceding overview of Philippine fisheries and coral reefs (with emphasis on their exploitation and stresses on them).

Philippine Fisheries

Fisheries is one of the important elements of the Philippine agricultural sector, providing nutrition and employment to a significant portion of the population, as well as scarce foreign exchange to the economy. In 1984, total Philippine fisheries production reached 2,080,000 mt valued at 25.6 billion pesos. The aggregate production supplied 55% of the country's animal protein requirements, accounted for about 4% of GNP, and contributed a net balance of P2.13 billion worth of foreign exchange to the economy (BFAR 1986). Only several hundreds of the 2400 species of fish that inhabit Philippine waters are considered food fishes, and 71 species or groups are currently considered of commercial importance. The country's 1,700,000 km^2 of marine waters consist of about 270,000 km^2 of coastal waters (from shore to 200 m depth) and 1,400,000 $km^2$of oceanic waters, including areas covered by the 200 mile Exclusive Economic Zone (EEZ). Of the total area, about 127,000 km^2 are considered traditional fishing grounds. Inland waters include 68 lakes with an area of 200,000 hectares, 421 principal rivers covering an area of 31,000 hectares, 380,000 hectares of swamplands, 182,000 hectares of brackishwater and freshwater fishponds and 19,000 hectares of reservoirs (BFAR, 1983)

National agencies concerned with fisheries in the country conventionally subdivide Philippine fisheries into the marine and inland fisheries sectors. The latter includes fishing activities in inland water bodies such as lakes and rivers (i.e. inland municipal fisheries), as well as aquaculture. The marine sector include fish capture activities in bays, seas or marine areas of the country. The marine sector is further subdivided into the commercial and municipal fisheries. By definition, the former involves the use of vessels over 3 GT while the latter involves the use of boats 3 GT or less. The municipal fisheries also include fishing activities that do not involve the use of water craft. Sectoral performances in 1984 were as follows: marine commercial 513,000 mt valued at P6.52 billion; marine municipal 790,000 mt valued at P10.29 billion; inland municipal, 299,000 mt valued at P1.57 billion, and; aquaculture, 478,000 mt valued at P7.27 billion. The commercial fisheries are concentrated in large population centers and roam wide areas in search for fish. The trawl, purse seine and bagnet are the major gears used by the commercial sector. Licensing of commercial vessels is done by the national government. The municipal fisheries (marine and inland) contribute the bulk of national fish production. Municipal (i.e. artisanal, sustenance) fishing is the main source of livelihood for about 750,000 Filipinos. The fishery is carried out in coastal or inland waters usually from outrigger boats using relatively simple gears such as hook and line, gill nets, baby trawls, etc.

Smith *et al.* (1980) give a review of the municipal fisheries sector of the country. Aquaculture production is the combined yield of freshwater and brackishwater fishponds, fishpens, fish cages and other seafarms (mussels, oysters and seaweeds).

The country imported 6,100 mt of fish and fishery products in 1984 worth P50.3 million. This represented a 73% and 55% decrease in the quantity and value, respectively, of imports from the 1983 figure of about 23,000 mt valued at P110 million. Fish meal made up the bulk of imports for both years comprising 14,100 mt and 4,800 mt for 1983 and 1984, respectively. Exports of fishery products totalled 63,100 mt in 1984 valued at P2.18 billion.

The quantity of exports declined by 17% from the 1983 level of 75,600 mt valued at P1.59 billion. The 37% increase in the value of exports from 1983 to 1984, despite the fall in quantity, is attributed to the devaluation of the peso during the period. The top exports in 1984 include the following: canned tuna (P736 million), frozen tuna (P259 million), frozen shrimps (P532 million), shellcraft articles (P259 million), seaweeds (P81 million), aquarium fish (P51 million), squids and cuttlefish (P33 million), frozen miscellaneous fish (P32 million), frozen milkfish (P29 million), ornamental shells (P21 million), and shark liver oil (P20 million).

The marine fisheries sector has been consistently the most significant component of the country's fisheries. Since 1946, marine capture fisheries have contributed the bulk (i.e. between 60%-90%) of Philippine fisheries production. Landings by the marine sector in 1984 total 1,303,000 mt of fish and invertebrates (valued at P16.8 billion). This figure represents a sixteen fold increase from the 1946 level of about 80,000 mt (Silvestre *et al.* 1986). A number of works have examined the potential and status of the marine fishery resources of the Philippines (MNR 1980, Munro 1986, Smith *et al.* 1980, Silvestre *et al.* 1986, Silvestre and Pauly in press and references therein).

Estimates of harvestable potential vary widely (between 1.0 and 3.7 million mt) although the consensus is that it is probably about 1.6 million mt. Considering the magnitude of 1984 landings together with the estimated potential (and the fact that effort is concentrated on the traditional areas/resources near the coast), it is apparent that biological and economic overfishing may be considerable. For instance, Silvestre *et al.* (1986) estimate that the biomass of nearshore demersal stocks (0-100 m depth) have declined to about 30% of their biomass levels in the late 1940's. The consequent rent dissipation that such entails could be as much as US$90 million per year. Munro (1986) sums up prospects for increasing marine landings as follows:

> "The waters surrounding Palawan, the Tawi-Tawi area between the South Sulu Sea and the Moro Gulf, and the Lawan Bay area offer the best potential for increased demersal catches - mostly of reef (or other hard bottom) associated fishes. However, technological problems must be overcome such as better boats and better coral reef fishing techniques.
>
> Pelagic bagnet and ring net fisheries in the Sulu Sea, around Palawan, and in the Davao Gulf areas appear to be the best prospects for expansion. The Pacific coast fisheries are constrained by adverse sea conditions, and improvements in boats are necessary to bring these fisheries into sustained production.
>
> Most other areas, particularly those in the enclosed seas, are heavily exploited and additional effort might cause decreases in the total catch and will certainly decrease the profitability of those vessels already in the fishery."

The socio-economics of Phllippine marine fisheries has been examined in a number of works (for example Smith *et. al.* 1980; Smith and Mines 1982; Spoehr 1984 and the contributions of A. Librero and collaborators in Panayotou 1985). The marine fisheries sector provides employment for 4% of the country's labor force. Although the available literature deals primarily with the municipal fisheries, it indicates the low productivity and income of most participants in marine capture fisheries. It can be safely assumed that almost all municipal fishermen presently live below the official poverty line. Alleviation of their living conditions has been a concern for some time, but attempts to improve their livelihood using production-oriented credit schemes have failed miserably. Examination of costs and returns of major gear types from around the country provide evidence that economic overfishing may be extensive.

The overfishing problem related to the exploitation of the country's fishery resources stem directly from excessive fishing effort (e.g. too many boats/fishermen) and/or their improper disposition, and the use of small-meshed nets (resulting in very low lengths at capture of exploited species). These direct causes have been attributed, among others, to the following indirect factors: (1) open access to the resources; (2) ineffective enforcement of laws and regulations; (3) incompatible management objectives; (4) the lack of a clearly-defined fisheries management entity; and (5) the neglect of research inputs for proper management. In addition to the overfishing problem, environmental degradation from man-induced stresses (e.g. destructive fishing methods, pollution, siltation, coral harvesting, mangrove denudation, etc.) exacerbates the resource situation. The overall situation reflects the sore

need for better management of Philippine marine fisheries and highlights the urgency for more appropriate strategies and mechanisms to realize it. The marine fisheries sector contributes food, livelihood and foreign exchange to our socio-economic well-being. Hence, whatever affects the resources and the fishery ultimately affects the national life.

Philippine Coral Reefs

Biology

Coral reefs constitute one of the most productive (yet fragile) ecosystems on earth. They abound in tropical areas and are distributed globally in a narrow "coral belt" between latitude 20 degrees N and 20 degrees S. Coral reefs and associated communities cover about 600,000 km^2 down to 30 m water depth globally (Smith 1978). The fascinating biology of corals is briefly described in PFEC (1985) as follows:

> "The coral is one of the sea's most extraordinary animals. It is responsible for building the reefs. Small corals live together in large groups or colonies, while very large ones may live alone. Each colony is composed of multitudes of tube-shaped animals called *coral polyps.* A coral polyp is made up of a sack of tissue, with fingerlike tentacles surrounding a mouth at the top.
>
> There are two common types of corals - the soft corals, and the stony or hard corals. The soft coral has a fleshy or leathery body. Its skeleton is in the form of spicules, which are small needle-like structures composed of calcium carbonate embedded within the body. The hard coral, on the other hand, has an external skeleton which is also composed of calcium carbonate or limestone. It surrounds the animal like a cup and provides it with a hiding place when it is threatened. The coral polyp hides within the skeleton during the day, but emerges at night to feed.
>
> The story behind the actual building of a reef is equally fascinating. A single larva lays down the first unit of a reef when it settles in a site abundant in plankton (microscopic organisms which form the base of the food chain in the ocean). The larva feeds on the plankton until it matures into a polyp that eventually secretes its own limestone casing. The mature polyp then produces a replica of itself, called a bud. The bud later grows into a polyp and makes its own casing of limestone. This process repeats itself at an increasing rate until a colony of hundreds of thousands of polyps is formed. More colonies from other larvae may be added; and after thousands of years, their limestone casings accumulate and form spectacular reefs.
>
> Another interesting but important aspect of coral reefs is the unique relationship or symbiosis between the coral polyps and the single-celled algae known as *zooxanthellae.* These microscopic plants live within the bodies of all reef-building polyps and are vital to the growth of their hosts. Without them, the coral's growth is reduced to a tenth of the speed, making it impossible to establish the framework of a reef. Because it is a plant, the alga requires sufficient sunlight to thrive. Thus, when sunlight is blocked off, the alga dies; eventually, so do the coral polyps."

Situated in the tropical zone, conditions for optimum coral growth are all virtually present in Philippine waters (e.g. clear, shallow waters with salinities of about 35% and temperatures of about 30 degrees C). Philippine coral reefs are noted for their richness and diversity, and about 400 of the 500 or so known coral species in the world are found in the country. Corals abound throughout the Philippine archipelago, from the Batanes islands in the north down to the southernmost islands of Tawi-Tawi in the Sulu area.

Exploitation

Coral reefs are said to occupy about 30% of shallow Philippine marine waters. Total reef area has been estimated to be about 12,200 km^2 within the 10-f contour line, and 33,100 km^2 within the 20-f contour line (Carpenter 1977). Aspects of the resources, utilization and management of Philippine coral reefs are given in Alcala and Gomez (1985), Gomez *et al.* (1981), Juliano *et al.* (1982), MSI (1979), NEPC (1980), White (1979, 1981, 1984 a & b) as well as the contributions dealing on coral reefs in Aprieto *et al.* (1986). The country's coral reefs are of considerable economic, ecological and aesthetic importance. Economically, they provide basic food items

(e.g. fish, seaweeds, etc.), building materials, and industrial and pharmaceutical products that generate employment. Ecologically, they are the habitat of many marine organisms acting as their spawning, feeding and/or nursery area. The reefs promote the natural dynamic balance in many coastal areas (e.g. prevent massive soil erosion, provide protection from waves and storms). In addition, the beauty of reef habitats is of immeasurable aesthetic value and is a good tourist attraction.

Carpenter (1977) estimated harvestable yields from Philippine coral reef areas within the 20-f contour line to be between 60-165 thousand mt per year. His estimates were based on an MSY of 5 mt/km^2 (but see Munro and Williams 1985; Alcala and Gomez 1985 and Pauly 1981). Murdy and Ferraris (1980) estimated the harvest of reef-associated fish species to be about 11% of marine finfish landings of 1,160,000 mt in 1977. The 1984 BFAR landing statistics (mt) for the species/groups they used are as follows: ell/moray (1,347), grouper (24,403), sea bass (2,005), fusilier (19,817), snapper (18,840), threadfin bream (41,321), siganid (16,260), surgeon fish (5,712), wrasses (11,512), goatfish (25,368), butterfly fish (145), leaf fish (1,494), and trigger fish (1,007). Landings of reef-associated fishes come from the use of various fishing gears such as hook and line, gill nets, trawls, seives, drive-in nets and spear fishing. The use of dynamite is also prevalent. It appears that catches of coral reef-associated fishes totalled about 170,000 mt, or about 15% of the 1.20 million mt of marine finfish landings in 1984. Approximately 75% of reef associated fish landings were made by the municipal fisheries sector. The percentage contribution of reef fisheries to the country's total fisheries production may be higher than those indicated above. Others believe that coral reefs contribute as much as 20%. This may possibly be true considering that BFAR statistics do not include significant portions retained from the catch by subsistence fishermen for their own consumption, direct sale or barter trade.

Stresses

Results of an extensive survey conducted over a five year period involving 619 coral reef stations nationwide give a glimpse of the state of the country's coral reefs (Gomez *et al.* 1981). The following criteria based on percentage coral cover were used in the survey: Excellent (75-100% coral cover), Good (50-74.9%), Fair (25-49.9%), and Poor (less than 25%). The survey indicated the following results: Excellent - 5.5%, Good - 24.4%, Fair - 37.8%, and Poor - 32.3% (Table 1). A great proportion are in the poor and fair categories and confirm the perception that degradation of the country's coral reefs has proceeded at an alarming rate. Stresses on the country's coral reefs can be broadly categorized into natural and man-induced stresses. Natural stresses include typhoons, starfish predation and space competition between algae and corals. Since the Philippines is located in the typhoon zone, cyclone-driven seas cause considerable damage to corals and reef organisms. Starfish predation and coral-algal competition is prevalent in some areas although their occurrence is patchy and highly localized.

The major man-induced stresses on Philippine coral reefs include siltation, destructive fishing gears, the harvesting of corals, and dredging, filling and mining. Other stresses considered minor in the Philippine situation include thermal and sewage pollution. Siltation occurs when large amounts of soil are carried into the marine environment resulting in the death of coral polyps due to lack of sunlight and low oxygen levels. Siltation due to extensive deforestation is believed to be the greatest threat to the country's coral reefs. Trade in corals, although presently banned, continues and drives the continued gathering of corals for commercial and construction purposes (McManus 1980). The coral harvesting problem, however, is generally more localized in certain areas rather than widespread. In addition, dredging, filling and mining activities have contributed further to the alarming destruction of coral reefs in the absence of stringent environmental monitoring. For instance, two copper mines in Central Philippines have badly silted coral reefs in the vicinity of their tailings discharge points.

Destructive fishing methods refer primarily to the use of dynamite and poisons (e.g. cyanide) in fishing, and the use of "muro-ami" and "kayakas". Dynamite and poisons are destructive because they are non-selective (i.e. they kill larvae, juveniles and adults alike) and because of the damage they inflict upon the coral reef ecosystem. The "muro-ami" and "kayakas" operations are described in, for instance, Corpuz *et al.* (1983). The "muro-ami" is a Japanese gear introduced by Okinawan fishermen to the Philippines in the 1930's. It is a set net placed across reef areas towards which several hundred swimmers drive the fish. Reef damage is caused by the scareline stone weights which are dropped by the swimmers on the fragile corals in the process of driving the fish. The "kayakas"

is a local modification of "muro-ami" that is operated similarly, but additionally involves the use of long poles to overturn coral heads (causing more damage in the process). The use of all these destructive fishing methods is banned nationwide, but are still prevalent in many parts of the country.

Effects of Coral Reef Destruction

The destruction of coral reefs deprives marine organisms of their natural habitat and source of food, leading to lower fish production. Destruction of reef ecosystems means less food and income for coastal-dwellers, and poses incalculable damage to the livelihood of thousands of small-scale and large-scale fishermen. In short, destructive fishing methods, unregulated coral extraction, and other man-induced stresses if left unchecked could spell tremendous socio-economic difficulties in the long run. Efforts to save the country's coral reef resources and reverse the trend of destruction have been many, both from private and government initiatives. Most of these efforts, however, have been "on and off" affairs subject to political and/or public relations expediency. Hence, most of them end up in failure and the destruction continues unabated. For instance, the Philippines has a good battery of laws sufficient to provide environmental protection (e.g. Presidential Decree (PD) 704 prohibits destructive fishing methods and trading of such illegally caught fish; PD 979 or the Marine Pollution Decree; PD 1219 and PD 1698 known as the Coral Resources Development and Conservation Decrees; etc.), if only these laws would be properly implemented and combined with holistic approaches.

Lessons from failures in marine conservation efforts in the past (both from within and outside the country) point to the need for *sustained* efforts that incorporate *holistic* (e.g. socio-economic, political, cultural, technological factors) and *area-specific* conditions involving community or *resource-user participation.* Past experience also stresses the significance of *resource-user education* and adequate "social preparation" to minimize, if not totally discount, resistance to extension inputs. It appears that management and conservation must increasingly be viewed in the context of overall social and economic development.

What follows below recounts the initial success of such an approach initiated in the island community of Balicasag Island, off Tagbilaran, Bohol. The Balicasag experience offers insights as to the elements lacking in the management of Philippine marine fisheries in general, and gives credence to calls for more decentralized management systems (e.g. in the form of area-or resource-specific management councils under the umbrella of a clearly-defined entity responsible for fisheries).

Balicasag Marine Conservation Program

The island of Balicasag is located southwest of the island of Bohol, and is accessible from Tagbilaran City by a 90 minute boat ride (Fig. 1). Bohol is the 10th largest island in the Philippines with a land area of 411,700 hectares including the 73 tiny islands surrounding it. It is predominantly an agricultural province with a population of 806,000 in 1980 growing at about 1.2% per annum. The major agricultural products are coconut, rice, corn and root crops. Bohol has rich fishing grounds that supply the fish needs of the island province itself, and neighboring provinces as well. Tourism is considered a major industry. Cottage industries such as handicrafts, pottery, wood carvings, furniture, and garments are also important. The largest industrial projects in Bohol include: the Southern Industrial Projects Inc. that operates a galvanizing factory in Cortes; the Philippine Starch Corp. in Carmen and the Philippine Sinter Corp. (a subsidiary of Kawasaki) which processes limestone that covers about 50% of Bohol. Infrastructure in Bohol is comparatively below the average for the country with only 4160 km of mostly gravel-paved roads, only 24% of the 31,800 hectares of irrigable lands serviced by irrigation, poor port facilities, and only about half of the 1,103 barangays (village communities) served with electricity.

The 22 hectare island of Balicasag (Fig. 2) has a population of about 400 individuals grouped into about 60 families or households. Based on surveys conducted in 1983, White (1984a) described the status of the island's coral reefs and their exploitation as follows:

> "Low-lying Balicasag island is made of limestone, with coral shell sand beaches and some beach rock bordering the shoreline. Part of the classic fringing reef is distinctively narrow, with pronounced vertical drop-offs. From the northeast corner counter-clockwise around to the southern

tip of the island, the reef varies varies from 50 to 150 m in width and has steep (80 degrees - 90 degrees) slopes below the reef crest. The inner reef flat is shallow on this portion and has much coralline rock and rubble and little hard coral in good condition. The reef crest forms a distinct band. The fore-reef and reef slope zones are steep with a variety of encrusting and foliaceous corals. The reef from the southern tip back of the northeast corner is wider, more gradually sloping and sandy. The reef crest here occurs closer to shore (50 to 100 meters) and in composed of large massive, foliaceous, and branching coral out-crops with sand in between. The fore-reef is less diverse and more sandy. Some seagrasses occur on the eastern exposure in sandy substrate.

Monsoon variations do not affect Balicasag as drastically as more exposed islands. There are no spur and groove formations on the southwest side, and the sandy, wide east reef is probably associated with current flows around the island. The shallow west and northwest inner reef flats have calm waters, coralline rock has built up and branching corals live near the water surface. The northeast reef protected by Panglao island and Bohol, rarely has large waves except during major storms. Water visibility at Balicasag approaches 50 meters vertically when calm with water temperatures [of about] 32 degreesCelsius. [Transects and systematic snorkeling surveys in 1983 showed] generally poor coral cover (21%) [around the island's reefs indicating] barren or destroyed reef flats. [....] Generally [...] the shallow reefs are in poor condition. There is much rubble, dead standing coral, and blocks on all sides of the island except the southeast [observed at that time] . The reef coast and fore-reef were almost always in better condition than the shallow reef (except [... where ...] large amounts of rubble occur, probably from dynamite fishing). *Acanthaster* counts on the transects are low, although large aggregations of 20 per 100 square m near the northeastern reef crest was observed.

Damage at Balicasag was caused by dynamite fishing, muro-ami, reef walking and boat anchors. In many areas, the damage observed in 1983 was considered new and [... far ...] worse than those noted in [the 1978 survey by the BFAR Coral Reef Research Team and the 1976 survey by the Marine Parks Task Force of the National Environmental Protection Council] . General fish diversity was high at 47 species per 750 square m, but density and biomass was low. Few large individuals were observed. Schooling fish noted included caesionids, carangids, some kyphosids and acanthurids. Acanthurids were diverse [...] but not present in large numbers.[...] The Balicasag fishery potential has not been formally assessed [but is believed to be high] due to the high vertical surface area of the steep reef-drop which could support a large biomass of schooling species. [...] The Balicasag shell fishery appears good, but has also not been quantified. The quantity of shells is not as important as the rare species that occur there. These are collected from sand bottoms at 70-200 m depth off the southeast and south sides of the island. The shallow reef in sandy areas also produces less valuable collector shells which are heavily exploited by local residents."

The 60 or so families living on Balicasag are said to have mostly migrated from Bohol island during the last five decades. Balicasag was first inhabited in the 1870's when a watch tower was erected on the island to guard against Moro attacks from Mindanao. Today, the island is a naval reserve under the jurisdiction of the Philippine Coast Guard (White 1984a, Russ 1984). Sea-related activities are the major means of livelihood. Fishing is primarily for consumption and complaints of declining catch rates from fishermen are common. Food, except for fish, is scarce on the island. Water is a major problem, especially from November to May, and electricity is non-existent. Subsistence consumption is the phrase to characterize the livelihood of west of the islanders. Shell collecting gained importance in the mid-1970's with *Conus gloriamaris* and *Cypraea gultata* as the most sought after. Shells as sold either directly to buyers from Cebu or to dealers resident in Balicasag itself. Some shells are sold directly to tourists.

The approach used in Balicasag island is drawn from experience gained in marine conservation efforts in other areas by Silliman University personnel (see for example Alcala 1979, Cabanban and White 1981, Maclean 1986, Russ 1984, White 1979, 1981, 1984 a and b). The conservation effort on Balicasag island is part of the Marine

Conservation Development Program (MCDP) of Silliman University (SU), an integrated program of marine reserves and community development funded by USAID through the Asia Foundation. The program seeks to evolve means to enable communities to approach marine resource management in the context of total community development. The program focuses more on educational community building as a means to marine resource management system development. The MCDP has 5 major components, as follows: (1) institutional development of SU in the area of community development and resource management; (2) implementation of marine resource management programs in selected sites to prevent destructive fishing and increase long term yields; (3) community development programs to establish alternative livelihood projects, improve fish marketing, pursue community education, and promote reef monitoring; (4) agro-forestry and water development component; and (5) outreach and replication component to extend programs to other areas/communities and establish linkages with interested individuals/agencies.

The MCP for Balicasag officially started only in 1985 with the adoption by the island's barangay council of Balicasag as a marine reserve area. But the foundations were laid very much earlier by workers from Silliman University in coordination with Bureau of Fisheries and Aquatic Resources (BFAR) and National Environmental Protection Council (NEPC) starting 1976. The island's marine environment and socio-economic status were first surveyed to identify the problems and potential solutions. With this accomplished, Silliman University gained funding from the MCPD to cover marine conservation extension efforts in Balicasag, including Pamilacan island also off Bohol and Apo island off Negros Oriental. But first, adequate social preparation was deemed most appropriate to facilitate openness to extension inputs. In Balicasag, Silliman University in coordination with the Ilaw International Center in Tagbilaran, Bohol (funded primarily by UNICEF and USAID) handled the social preparation aspects. Groups of 20 families each were formed into three "Ilaw ng Buhay" (Light of Life) chapters and were given lectures and trainings on a variety of aspects. These included, among others, the following: the need for an organized community, collective action and benefits, leadership, child care, sanitation, family planning, nutrition, marine conservation, coral reefs and their importance, alternative livelihood means, etc. The extension/education inputs paid off in terms of increased community cohesion and awareness. Soon, the Ilaw chapters were themselves the ones asking for help in marine conservation, especially stopping destructive fishing methods on their island's reef area. Silliman University, which had earlier started conservation efforts in Apo, Sumilon, and Pamilacan, was approached by the Balicasag chapters' leadership asking that their island be made part and beneficiary of the University's marine conservation program.

Hence, in July 1985 the Balicasag phase of the MCDP was officially started. Balicasag island, through efforts of the Ilaw Chapters on the island, was made a marine reserve by the municipal government of Panglao (of which Balicasag is part) with the following guidelines:

"1. The entire habitat around Balicasag Island, from the high tide mark to a distance of 500 m off-shore is protected from all fishing methods or other uses destructive to the coral reef habitat. These fishing methods include:
   a. dynamite fishing;
   b. muro-ami type fishing or related methods using weighted scare lines or poles;
   c. spear fishing using SCUBA;
   d. cyanide or other strong poisons, and;
   e. very small mesh gill nets.
2. A coral reef "fish sanctuary" and breeding area is located on the south-western side of Balicasag Island extending for about 600 m. The following rules apply:
   a. no fishing or collecting is permitted;
   b. anchoring of large motorized boats is not permitted without an anchor buoy, and;
   c. breeding stock for giant *Tridacna* clams and several fish species placed in the areas are strictly protected from disturbance.
3. The marine habitat outside of the "fish sanctuaries" but within the marine reserve is considered and called a traditional fishing area where all destructive fishing methods and uses are prohibited

(above) but where the following traditional methods are permitted:

a. hook and line;
b. bamboo traps;
c. gill nets, except finemeshed nets;
d. spear-fishing without scuba;
e. other types of netting, and;
f. traditional gleaning.

4. The Balicasag Island Marine Reserve with the "traditional fishing" and "fish sanctuary" areas are protected by municipal resolution. The reserve is managed by the island barangay council in conjunction with the Panglao Municipal Council (of which Balicasag is part). The reserve concept receives support from the Philippine Constabulary (PC) in Bohol and management advice from the Marine Conservation and Development Program of Silliman University in Dumaguete City.

5. The rationale supporting the marine reserve and fish sanctuary as outlined is that:

a. The coral reef serves as habitat for fish and once physically disturbed it supports fewer and fewer fish;
b. A "fish sanctuary" is necessary to allow coral reef fish to breed and grow to maturity without fishing; this allows reproduction rates to increase and increased numbers of larvae, juveniles and mature fish to circulate around the island into traditional fishing areas which increases potential fish catch to local fishermen;
c. a "fish sanctuary" where increased numbers of tuna fish reside attracts SCUBA diving and snorkeling tourists to the Balicasag Island reefs; they often donate a small fee to the barangay for being allowed to visit the area;
d. the entire marine habital that surrounds the island is declared a marine reserve to help prevent illegal and destructive fishing activities done by outsiders to Balicasag, and;
e. the area on the southwest side of Balicasag was chosen as "fish sanctuary" because this topographically diverse drop-off and rich coral habitat provide good breeding grounds for fishes and ensures breeding and protection for a sufficient number of species."

The Ilaw Chapters have organized the youth and fishermen of the island into groups alternately keeping watch on the island reservation's reefs to see to it that destruction and depletion has stopped. A P50.00 (equivalent USD 2.50) fine is imposed on any person not adhering to the rules. The Coast Guard and Constabulary aid in enforcement. The community has been made to realize their rights and the benefits that will accrue to them through proper use of the island's resources. Hence, it is the community itself that conceived and is enforcing the conservation measures, with mere facilitation from extension efforts of outside agencies. One year after the conservation program was started, benefits are already evident. Fishermen interviewed in the island in July of 1986 (about 20) confirm that catches have increased from pre-conservation figures. A recent snorkeling survey indicates that grazers on the reefs have increased considerably compared to the 1976, 1978 and 1983 surveys. The reefs are also now being seeded with giant clams from Silliman University Marine Laboratory with the Ilaw Chapters taking care of growth monitoring, and harvesting later on. This is bound to contribute to the incomes of the island residents. In addition, alternative means of livelihood have been enhanced, including: pig raising, gardening, mat-weaving, etc. These activities were already being practiced on the island before. But they were enhanced with financial and technical support to make them more productive and viable. These already existing skills and activities were preferred by the extension workers over skills and activities foreign to the island which might have lesser chances of succeeding.

On the whole, the efforts at Balicasag have been largely successful, and are bound to endure when funds from the extension program of Silliman University start shifting to other areas. This can be attributed to adequate "social preparation" through the dedication of the Silliman University resident-community organizer, that has totally immersed and blended with the island population, and the utilization of community/resource-user participation and involvement overall representing an holistic approach to marine conservation and management.

It appears that destructive fishing methods have been eradicated from Balicasag. Hope, high spirits, and the sense of commitment to the collective good is evident among island residents.

Acknowledgements

This report is based on interviews with Silliman University personnel involved in the marine conservation program, the Balicasag residents, and personnel of Ilaw International Center all of whose cooperation is herein gratefully acknowledged.

References

ALCALA, A.C.,Fish yield of Sumilon Island Reserve: Coral Reef Resource Management in the Philippines. Paper 1979 presented at the symposium on "Coral Reef Resource, Utilization and Preservation", 14th Pacific Science Congress, Khabarovak, USSR, August 1979. (mimeo, 22 pp.)

ALCALA, A.C. and E.D. GOMEZ, Fish yields of coral reefs in Central Philippines. Proc. 5th Int'1. Coral 1985 Reef Congress,Tahiti, 1985. Vol. 5:521-524.

APRIETO, V., J. SAEGER, and D. PAULY (EDS.), Selected papres on Philippine marine fisheries resources 1986 (1947-1986). Technical Reports of the Dept. Of Marine Fisheries, College of Fisheries U:P. Visayas, Diliman, Quezon City. No.9: 436p.

BFAR, Philippine fisheries primer. Bureau of Fisheries and Aquatic Resources, Quezon City. 37p. 1983

BFAR, Fisheries Statistics of the Philippines. 1984. Vol. 34. Bureau of Fisheries and Aquatic Resources, 1986 Quezon City.

CABANBAN, A. and A. WHITE, Marine conservation program using non-formal education at Apo Island, 1981 Negros Oriental, Philippines. Proc. 4th Int'1. Coral Reef Symposium, Manila, 1981. Vol. 1:317-322.

CARPENTER, K.E.,Philippine coral reef fisheries. Philipp. J. Fish. 15(1):95-126. 1977

CORPUZ, V., P. CASTANEDA, and J. SY. "Muro-Ami", Fisheries Newsletter, Bureau of Fisheries and 1983 Aquatic Resources, Quezon City. Vol. 12, No. 1. p.2-13.

GOMEZ, E., A. ALCALA and A. SAN DIEGO. Status of Philippine Coral Reefs - 1981. Proc. 4th Int'1. Coral 1981 Reef Symposium, Manila. Vol. 1:275-282.

JULIANO, R.O., J. ANDERSON and A.R. LIBRERO, Philippines: perceptions, human settlements and 1982 resources use in the coastal zone. p. 218-240. *In:* C. Soysa, C. Sien, and W. Collier (Eds.). Man, Land and Sea: Coastal Resources Use and Management in Asia and the Pacific. Agr. Dev. Council, Bangkok. 323p.

*MACLEAN, J. End of a marine reserve: Sumilon revisited. ICLARM Newsletter, January 1986. p. 13. 1986

*MCMANUS, J.,Philippine coral exports: Sumilon revisited. ICLARM Newsletter, January 1986. p.13. 1980

MNR, Marine fishery resources of the Philippines - results of a Delphi approach. Ministry of Natural Resources, 1980 Quezon City. (mimeo).

MSI, Investigation of the coral resources of the Philippines: Phase II - Final Reports. Marine Sciences Institute, 1979 Univ. of the Philippines, Diliman, Quezon City. (mimeo) 300p.

MUNRO, J.,MARINE fishery resources of the Philippines - catches and potentials. pp. 19-46. *In:* D. Pauly, J. 1986 Saeger and G. Silvestre (Eds.). Resources, management and socio-economics of Philippine marine fisheries. Technical Reports of the Department of Marine Fisheries, College of Fisheries, U.P. Visayas, Quezon City. No. 10:217p.

* On this and other pages ICLARM refers to its paper as e.g. ICLARM Newsletter, International Center for Living Aquatic Resources, Manila: January 1986, p.13.

MUNRO, J. and D. WILLIAMS (Convenors), Assessment and management of coral reef fisheries: 1985 biological, environmental and socio-economic aspects. Proc. 5th Int'1. Coral Reef Congress, Tahiti, 1985. Vol. 4: 545-581.

MURDY, E. and C. FERRARIS JR.,The contribution of coral reef fisheries to Philippine fisheries production. 1980 ICLARM Newsletter, January 1980. p. 21-22.

NEPC, The Philippine Coastal Zone, Vol. 1: Coastal Zone resources. National Environmental Protection Council, 1980 Quezon City, 200 pp.

PANAYOTOU, T. (ED.), Small-scale fisheries in Asia: socio-economic analysis and policy., IDRC, Ottawa. 1985 283p.

PAULY, D.,Fish stock assessment in coral reefs - notes on the state of the art. ICLARM Newsletter, July 1981. 1981 p.19.

PAULY, D.,A brief historical review of living marine resources research in the Philippines. p.3-18. *In:* D. Pauly, 1986 J. Saeger and G. Silvestre (Eds.). Resources, management and socio-economics of Philippine marine fisheries. Technical Reports of the Department of Marine Fisheries, College of Fisheries, U.P. Visayas, Quezon City. No. 10: 217p.

PFEC, Coral reefs and mangrove forests. Philippine Federation for Environmental Concern. Primer Series (3): 1985 16p.

RUSS, G., Effects of fishing and protective management on coral reefs at four locations in the Visayas, 1984 Philippines. Phase II. United Nation Environment Program and Natural Resources Management Center (UNEP-NRMC) Coral Reef Monitoring Project, Silliman University, Dumaguete, Philippines. (mimeo).

SILVESTRE, G. and D. PAULY, in press. Estimate of yield and economic rent from Philippine demersal stocks (1946-1984). Paper presented at the IOC-WESTPAC Symposium on Marine Science in the Western Pacific, Townsville, Australia, 1-6 Dec. 1986.

SILVESTRE, G., R. REGALADO and D. PAULY, Status of Philippine demersal stocks - inferences from 1986 under-utilized catch rate data. pp. 47-96. *In:* D. Pauly, J. Saeger and G. Silvestre (Eds.). Resources, management and socio-economics of Philippine marine fisheries. Tech. Reports of the Department of Marine Fisheries, College of Fisheries, U.P. Visayas, Quezon Quezon City. No. 10: 217p.

SMITH, I. and A. MINES (eds.), Small-scale fisheries of San Maguel Bay. Philippines: economics of 1982 production and marketing. ICLARM Tech. Rep. (8): 143p.

SMITH, I., M. PUZON, and C. VIDAL-LIBUNAO, Philippine municipal fisheries: a review of resources, 1980 technology, and socio-economics. ICLARM Studies and Reviews (4): 87p.

SMITH, S.,Coral reef area and contributions of reefs to processes and resources of the world's oceans. Nature 1978 283 (5659): 225-226.

SPOEHR, A.,Change in Philippine capture fisheries: a historical overview. Philipp. Quart. Cult. and Soc. 1984 12:25-26.

WHITE, A.,Sumilon Island: Philippine marine park pilot site enjoys early success. ICLARM Newsletter, October 1979 1979. p. 10-12.

WHITE, A.,Management of Philippine marine parks. ICLARM Newsletter, July 1981. p. 17-19. 1981

WHITE, A.,Effects of fishing and protective management on coral reefs at four locations in the Visayas, Philippines. 1984a Phase I. UNEP-NRMC Coral Reef Monitoring Project, Silliman University, Dumaguete, Philippines. (mimeo).

WHITE, A ,Effects of protective management of coral reefs in the Philippines. ICLARM Newsletter, October 1984. 1984b p. 9-11.

TABLE 1. State of Coral Reefs in the Philippines (Source: Gomez *et al.*, 1981)

Location	No. of Stations	Excellent (%)	Good (%)	Fair (%)	Poor (%)
Luzon Area	229	3.5	22.7	42.8	31.0
Visayas Area	347	6.6	27.1	35.4	30.0
Mindanao	43	7.0	14.0	30.2	48.8
Grand Total	619	5.5	24.4	37.8	32.3

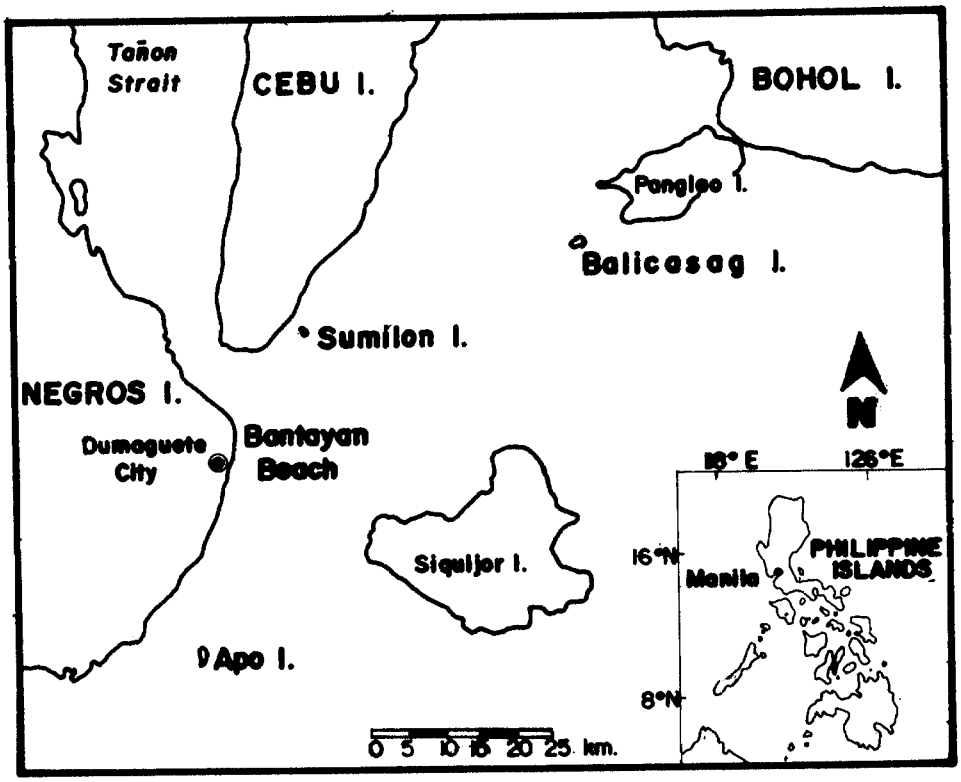

Fig. 1. The Central Philippines showing Apo Island, Sumilon Island and Balicasag Island. (Source: White, 1984 b.)

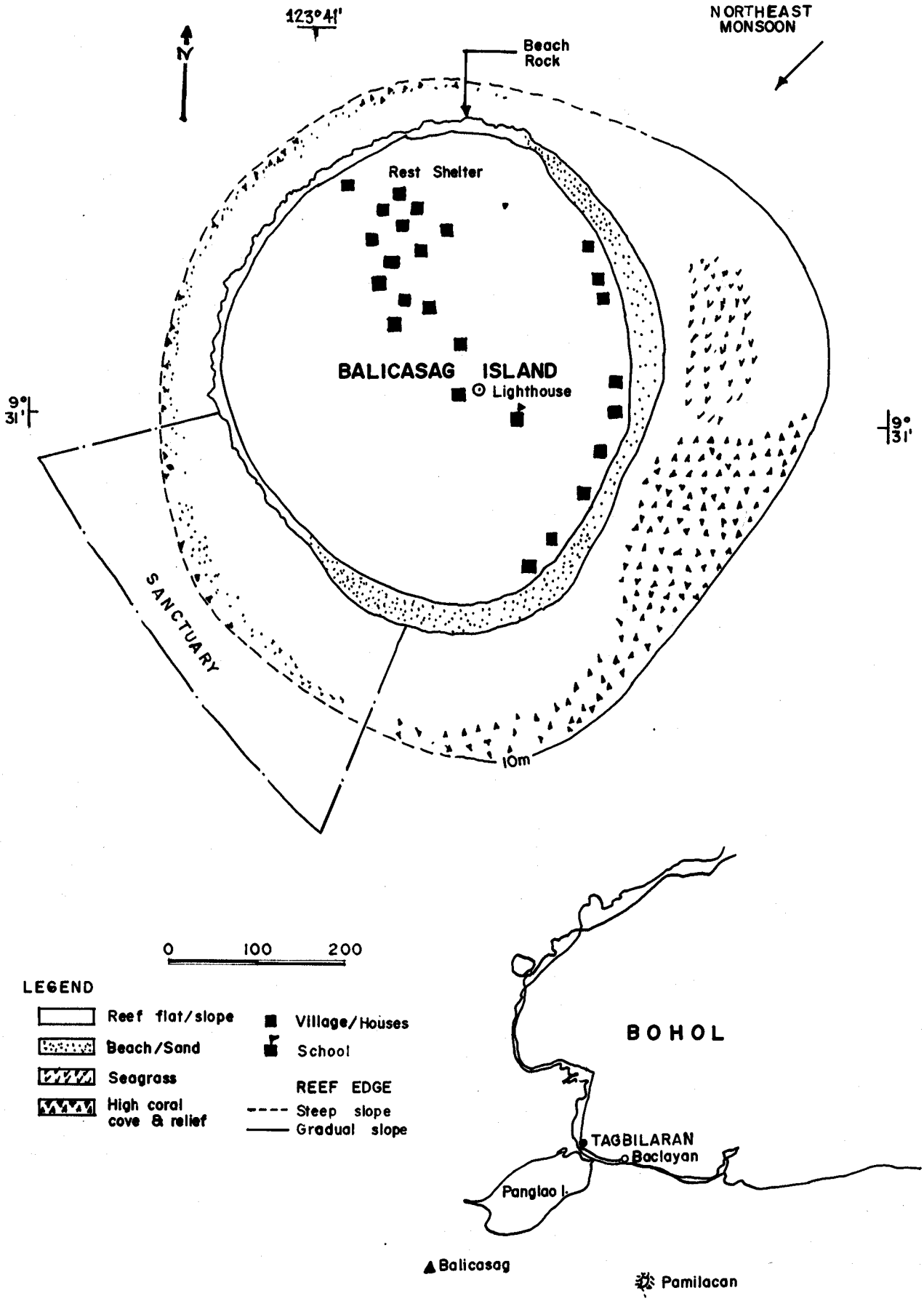

Fig. 2 Balicasag Island marine reserve. (Source: Silliman University, Primer on Balicasag and Pamilacan marine reserve)