Transactions National Academy of Science & Technology Philippines
Vol. 39 (2): 301-307 (2017)
ISSN 01158848

Apo Island and Sumilon Island Marine Reserves and Beyond

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ABSTRACT

As a response to the destruction of coral reef ecosystems, parts of the islands of Sumilon and Apo in Central Visayas were set up as No-Take Marine Reserves (NTMR) as a strategy of conservation for coral reef and associated marine systems by the Biology Department of Silliman University in 1974. Sumilon NTMR was managed by the University for 10 years (1974–1984) and Apo NTMR for 12 years (1982–1994). Beginning from 1983 to the present, Professor Garry R. Russ of James Cook University became Silliman's collaborator. The two coral reef systems were monitored following the methodology in the Australia-ASEAN Project manual and the genetic parentage analysis. In our work on these two reserves, we obtained the cooperation local communities in the process of setting them up. The results of the nearly annual monitoring of these two NTMRs showed that over the years the fish biomass in the NTMRs increased and fish yields of fishers likewise increased over the years. There was also evidence that there was spillover of large sized fish and fish larvae from the NTMRs to other marine areas outside the protected areas. This movement is due to ocean currents in the study areas. The results of our experiments have been published in scientific journals showing the effectiveness of the marine reserve strategy. We have influenced many people throughout the country to set up more marine reserves in addition to our work in other parts of the Visayas and northern Mindanao.

Keywords:
No-Take Marine Reserves (NTMR), marine systems, coral reef, conservation

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Plenary paper presented during the 39th Annual Scientific Meeting (July 2017) of the National Academy of Science and Technology, Philippines.

INTRODUCTION

This short review chronicles our efforts to establish marine reserves or No-Take Marine Reserves (NTMRs) in the Philippines which started more than 46 years ago.

In the early 1970s, coral reefs in the Visayas began to show damage from fishing activities of local fishermen using dynamite blasting, poisonous chemicals, and other methods destructive to hard corals, sea grass beds, and soft-bottom marine environments. Many reefs were reduced to non-productive coral rubble with very few non-edible fish species. With a small grant from the National Research Council of the Philippines, we conducted a study which confirmed that good coral reefs produced an average of 10–15 tons of fish annually compared with 1–4 tons in damaged reef and other marine ecosystems.

After this initial survey, we searched for an appropriate way or strategy of managing coral reefs that would increase and then maintain the species richness and the biomass of marine species occupying various trophic levels on coral reefs. We thought that the total biomass of fish and the species richness on a reef are critical factors in reef fishery; the greater the biomass, the more fish that can be caught by fishermen in the fishing areas near the NTMRs. This led to the idea of establishing NTMRs as a strategy to naturally build up fish biomass and fish species richness on a reef without prohibiting fishing. While marine reserves have a long history, our idea of a permanent reserve for purposes of conservation of fishery would appear to be the first.

Sumilon Island was first identified to be the experimental site in 1974 and in 1982, Apo Island became the second NTMR experimental site. (Figure 1). This paper traces the paths taken to establish the first NTMRs in the country and briefly discusses the major scientific findings and impacts of these undertakings.

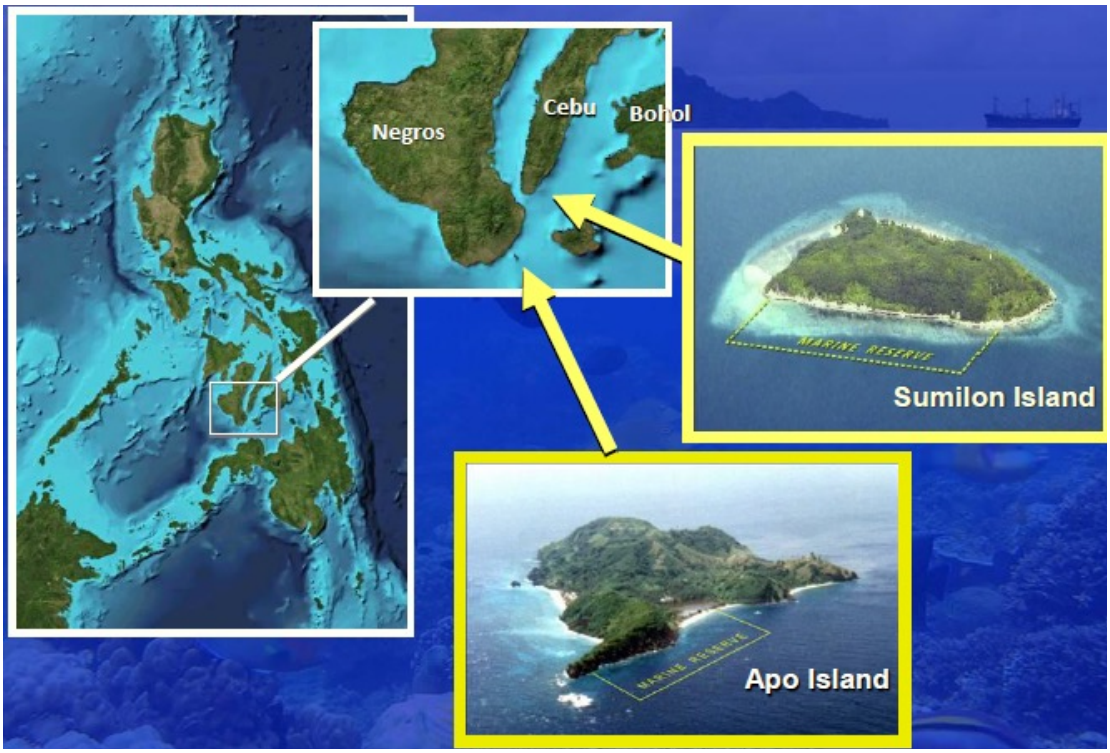

Figure 1. Sumilon Island and Apo Island.

FIRST EXPERIMENTAL SITE: SUMILON ISLAND

Sumilon Island, an uninhabited island about 3 km from the town of Oslob, off the southern tip of Cebu, was our first experimental island (Figure 1). An excellent fringing coral reef surrounds the island of Sumilon. About 25% of the 50 hectare reef on the western side was declared a no-take marine reserve and the rest of the reef was open to fishermen for fishing using non-destructive fishing gears (hook-and-line and gill net). The then Oslob town Mayor Jose Tumulak and the Oslob municipal council passed a resolution in 1974 authorizing Silliman University to establish a marine protected area for research studies and for regulating fishing and gathering of products within the island. Sumilon became the first local government unit (LGU)-based NTMR. For 10 years, our team actively managed and protected Sumilon Island from 1974 to 1984. During this period, many marine biology research projects were conducted and many visitors came to find how an NTMR or marine reserve is managed.

An assistant, Lintoy Cimafranca, was assigned to stay on Sumilon island to monitor the fish catch of fishermen during the years 1976 to 1986. Data indicate that high fish yields from fished areas adjacent to the NTMR is possible only if the NTMR is strictly protected from fishing; if protection is lacking or withdrawn, fish yields would slide down.

Studies were conducted on the coral reef and several marine species with focus on fish on Sumilon island and annual underwater surveys of fish in both the NTMR and the control sites (the fished areas) from 1983 to the present time using standard methods developed by the Australia-ASEAN Project, with the collaboration of Dr. Garry R. Russ and one of his students, Dr. Rene Abesamis, of James Cook University. These surveys show that during the ten years of strict protection of Sumilon Island, the fish biomass composed of various trophic levels rose from 50 tons before protection to more than 150 tons on the 10th year of protection. This biomass would appear to be similar to the reef fish biomass in the 1930s and 1940s when coral reefs were in near pristine condition. Along with this finding on fish, we noted that the hard coral cover remained high at about 60%. This high coral cover and other marine habitats, such as algal beads, sea grass beds, and soft bottom sediments, allowed many marine species other than fish to exist on the island. All of these marine habitats contributed to the highly productive environment.

Our important findings from Sumilon and Apo Islands have been extrapolated to show that it takes decades, not only years, of protection to ensure full recovery of fish: 20-40 years for the top carnivores to recover in strictly protected coral reef areas, requiring long term protection. It was noted that top carnivores are the first to disappear and the last to recover in NTMRs.

THE APO ISLAND NTMR

Apo Island NTMR is the first community-based reserve in the country. The community on the island participated in the management and protection of the original 10-hectare reserve. Later in the 2000s a few hectares were added to the reserve to allow more tourists to observe the two species of marine turtles and some giant clams which have become more numerous recently on the island. Apo Island is located near the southern tip of Negros and is considered a high island surrounded by soft and hard corals, sea grass beds and soft-bottom sediments and other marine ecosystems with a total area of 104 hectares. It took almost two years of community organizing led by Silliman social worker and scientists to capacitate and empower the community to actively manage their marine resources.

The reserve was established in 1982 covered by a Municipal Ordinance of the southern town of Dauin, Negros Oriental. It became a NIPAS reserve in1994 and since that time has been managed by the Protected Area Management Board (PAMB) chaired by DENR regional director for Region 7. The Apo community still serves as member of the PAMB. A Silliman faculty is member of the PAMB. Tourism activities are on-going at Apo. The Apo reserve earns about 10 million pesos a year, 75% of which goes to the Apo community and 25% goes to

the national government.

The Apo Island NMTR is one of the highly successful NTMRs in the country and is recognized as a model reserve by many people in the Philippines. It has inspired the nearby towns of southern Negros to establish their MPAs or NTMRs. The large income from tourism has improved the socio-economic status of the residents of the island. The Shedd Aquarium in Chicago, U.S.A. has showcased Apo as a model MPA in the Philippines. This gives Apo NTMR and Silliman an international recognition as leaders in marine conservation.

MAJOR SCIENTIFIC FINDINGS (1976–2017)

In terms of academic publications, about 50 technical articles and many other non-technical articles have been published on the Apo and Sumilon NTMRs in many international and refereed journals and books.

The Apo NTMR has been studied by SUAKCREM since 1983 and the studies are still continuing. The biomass of targeted fish species in the NTMR increased from 25 tons/square kilometre in 1982 to 125 tons/square kilometre 26 years later, including top carnivores. The fish yield of Apo NTMR is stable at 15–20 tons per year for 20 years. The percentage of the biomass in the reserve that adult fish spillover to the fished area has been estimated at 10%, which means that 90% of the fish caught in the fished area outside of the reserve on Apo Island comes from somewhere else (Abesamis et al.2006). There is room for more studies on the impact of NTMRs on fisheries.

Fish catch from Sumilon has continued to rise during the 10 years of protective management (Figs. 3 and 4). The adult fish spillover is indicated in Fig.3 and is approximately 20 tons per year plus plenty of fish larvae carried by ocean currents moving south to the marine waters of Sibulan town and Dumaguete. Thus far, this larval spillover has not yet been measured. However, this adult and larval spillover is certainly taking place to judge from the large volume of fish caught in the marine waters of Sibulan and Dumaguete. (It would take 20–40 years for fish to fully recover in our NTMRs (Fig. 2).

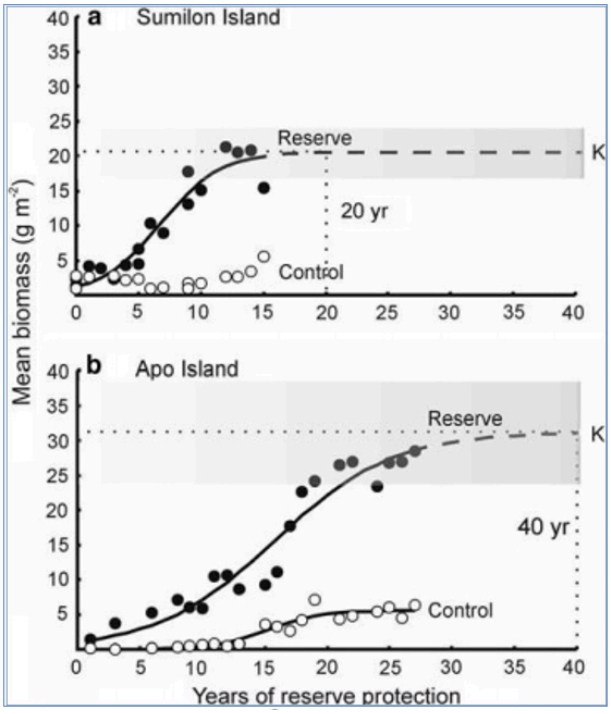

Figure 2. Biomass of fish catch at (a) Sumilon Island and (b) Apo Island from start of reserve protection.

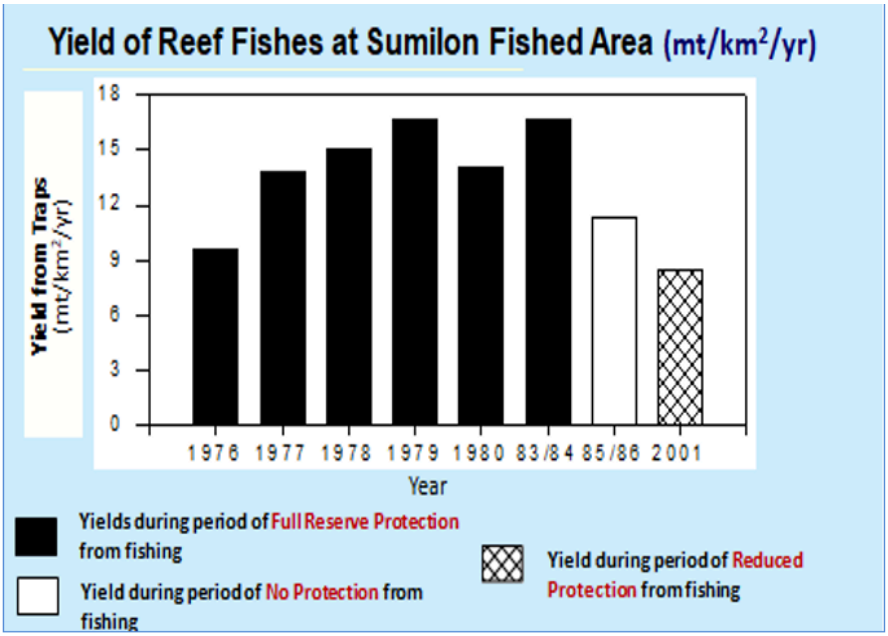

Figure 3. Yield of Reef and Reef-associated fish taken from Traps at Sumilon Island from 1976 to 2001 based on 10- to 12-month data. (Number of fishers and family composition of catch, uniform in all years; 2001 data unpublished). Data from 1976 to 1986 from Alcala and Russ (1990) (for black and white bars: one sample t-test, $t5 = 3.05$, $p < 0.05$). Maximum fish yield in '83/84 but declined in '85/86 and 2001 when protection was withdrawn, showing high yields dependent on protection of marine reserve.

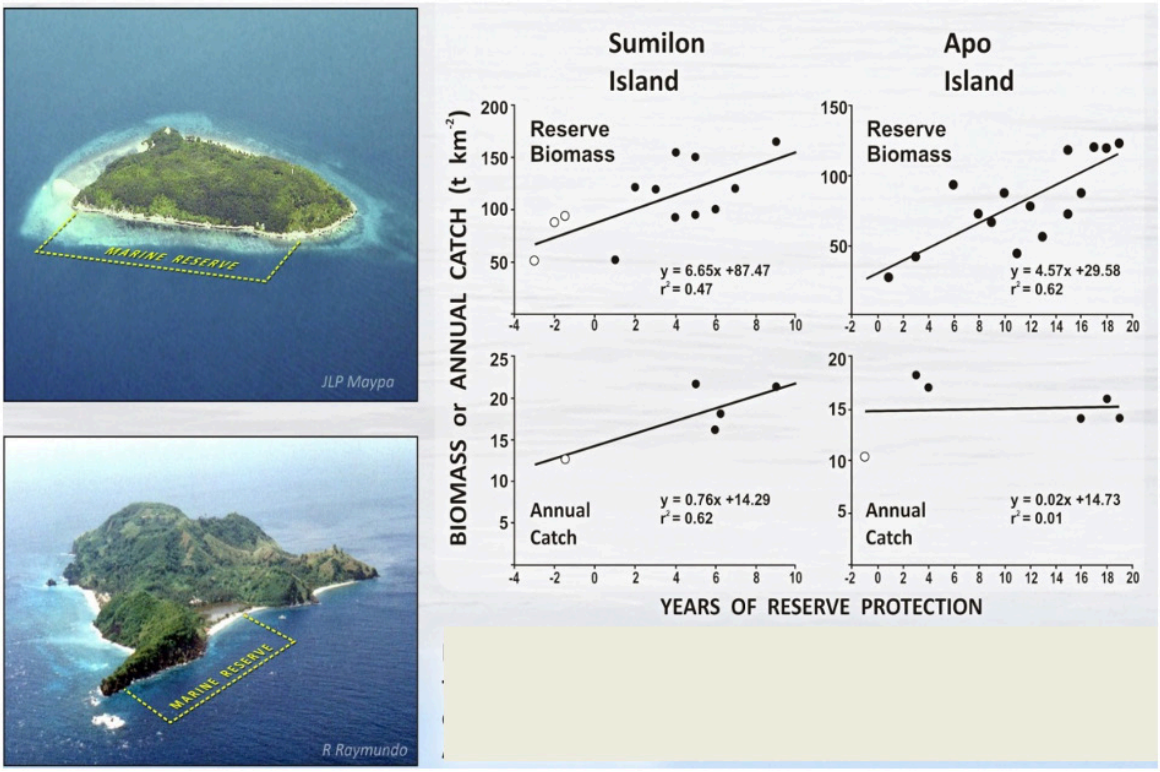

Figure 4. Annual biomass of targeted fish inside reserves and the fisheries catch of these fish outside reserve plotted against years of reserve protection at Sumilon and Apo Islands. Redrawn from Alcala and Russ 2006.

Our most recent study has shown that the Apo NTMR has been exporting not only adult fish but also fish larvae to the marine reserves and fished areas on southern Negros, 9 km away from Apo, as determined by genetic parentage analysis (Figure 5) (Abesamis et al. 2017). These larvae help ensure fishery sustainability on southern Negros.

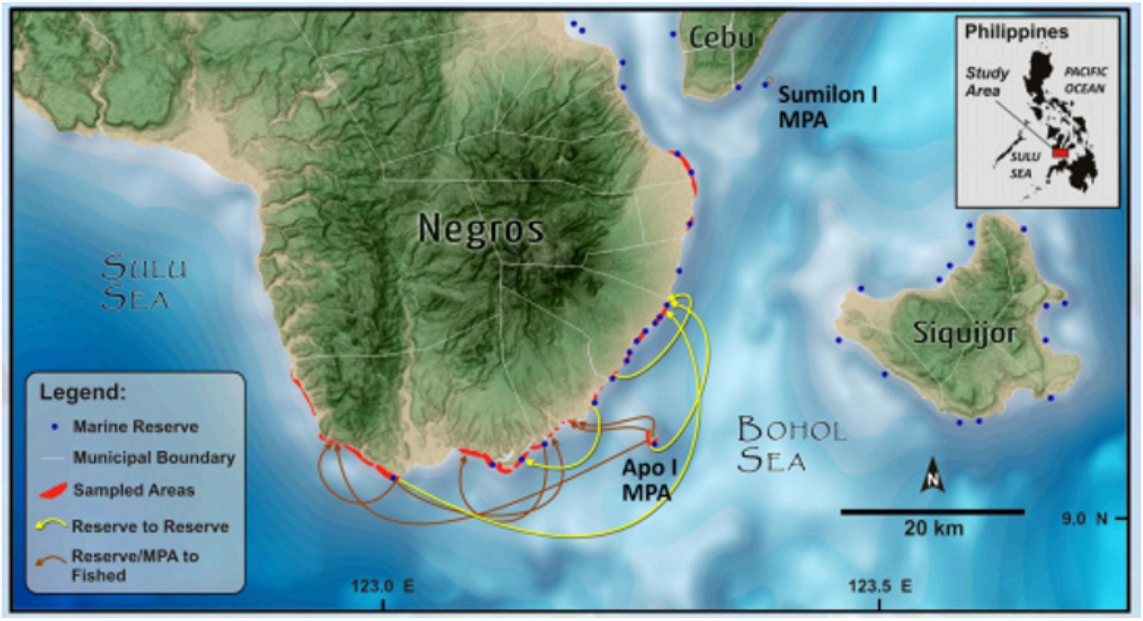

Figure 5. Larval dispersal from reserves to fished areas and other sources. Adapted from RA Abesamis.

THE CHALLENGES: BEYOND SUMILON AND APO ISLAND NMTRS

There are now more than 1600 NMTRs in the country. However, we conclude that the establishment of more NTMRs beyond the present 5% of the total coral reef area (25,000 sq km) in the country can ensure large biomass and large species richness of fish in our coastal areas. Social and ecological networking of NTMRs and their managers are needed in protective management. Government agencies dealing with fisheries, local government units, and local communities have important roles to play in making fisheries sustainable in the Philippines. The program should have the goal of protecting from fishing and other environmental disturbances at least 20% of the total coral reef area in the Philippines, which is estimated at 25,000 square kilometres.

However, we should not forget climate change, which is beyond our control. We could anticipate that typhoons and global warming can severely damage our shallow coral reefs and their associated fish species. Warmer and acidic marine waters could kill marine larvae including fish larvae. One thing we can do is to identify deeper reefs in cooler waters and protect them as well as possible sources of fish. In fact, our preliminary survey shows abundant fish at a depth of 80 fathoms. Typhoons tend to hit coral reefs in the eastern parts of islands so that protection of reef systems in the western parts of the country may be our best choice.

The Sumilon and Apo studies demonstrate that protection of the environment is the key to the sustainability of coastal and marine resources.

RECOMMENDATIONS

What should be done to conserve and maintain coral reef fisheries and associated marine biodiversity?

1. Expand the NTMRs beyond the present 5% of total coral reef area of 25,000 sq. km.
2. Empower the LGUs and NGOs for coastal management. Foster partnerships with local government units, local communities, government agencies, and other stakeholders for sustainable management.
3. Provide sufficient budget for the Department of Environment and Natural Resources and the Bureau of Fisheries.
4. Set up a monitoring system to determine progress of the program and provide interventions to solve emerging problems and issues.

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