Effects of Protective Management on Coral Reef Fishes in the Philippines

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Coral reefs are amongst the most productive of ecosystems and yields of fishes per unit area from them are generally very high. Fishes are a major source of protein in the Philippines and it has been estimated that coral reef fishes account for 8-15% of the total catch of finfishes (see ICLARM Newsletter, January 1980, p. 21-22). Pressures on fishery resources are increasing rapidly in this country. Thus, the potential of protective management to maintain or perhaps even enhance the yields of fishes from coral reefs has assumed greater significance in the Philippines than preservation of the aesthetic and scientific qualities of the reefs. Nevertheless, yields of reef fishes ultimately depend upon the general quality of the coral reefs themselves.

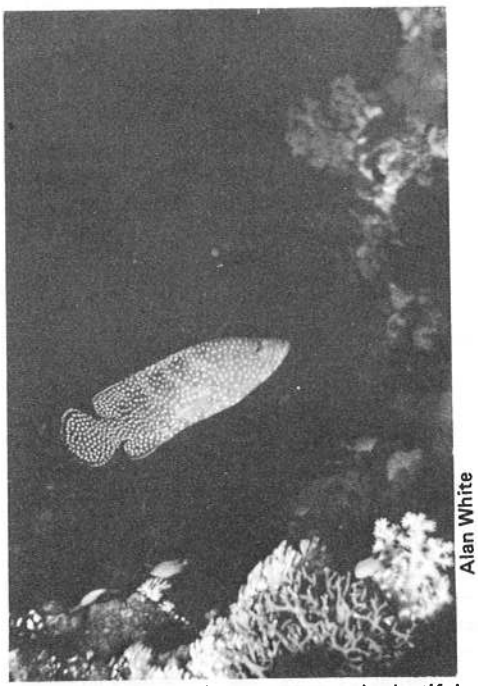
Only one study in the Philippines has attempted to relate protective management of coral reefs to yields of reef fishes.[1] The 750-m long section of reef slope on the west side of Sumilon Island, closed to all forms of fishing in 1974, enhanced catches of fish from areas adjacent to the reserve over a five-year period.[2]

The aim of the present study was to collect information on the species composition and abundance of coral reef fishes within the Sumilon Island Reserve and compare the area with the three other study areas which have had limited or no protective management. Information was collected on the overall community structure and aesthetic quality of the assemblages of reef fishes together with data on the abundance of species of fishes considered as favored 'targets' of fishermen. The study placed some emphasis on the estimation of standing crop of one family of fishes (the Serranidae, commonly called groupers or *lapu-lapu* in the Philippines) which are one of the most highly favored 'targets' of fishermen on coral reefs throughout the world. Serranids are particularly vulnerable to fishermen and their abundance is thus considered likely to be a good indicator of fishing pressure on a reef.

Fish Census Techniques

Visual censuses were made on sections of reef slope at seven sites in the four study sites in the central Visayas region of the Philippines. Five or six replicate censuses were made at each site, each replicate covering an area of approximately 750 m^2 of reef slope from the reef crest to a depth of 14 m.

A total of 117 species of coral reef fishes in 17 families were chosen for study and censused simultaneously using a modified combination of two techniques of visual census developed by the Great Barrier Reef Marine Park Authority[3] in Australia. The first technique was developed to detect differences in assemblages of coral reef fishes at different sites to provide baseline data for zoning, management and monitoring of coral reefs. The abundance of large numbers of numerically dominant and visually obvious species of fishes was assessed by placing species into abundance categories on a logarithmic scale. The second technique, requiring actual counts of individuals, was developed to determine the standing crop of species known to be highly favored targets of fishermen, e.g., serranids.



Alan White

Groupers (serranids) are tame and plentiful on the protected side of Sumilon Island.

Results

Few of the sites differed significantly in overall species richness (number of species per unit area), although the Sumilon reserve site had the highest species richness of all the sites. Thus, species richness, as detected by the current method of visual census which uses a restricted list of species, was not a very sensitive parameter in detecting significant differences between sites with different levels of protection from fishing or which are different habitats. One result of interest was a significantly higher species richness of chaetodontids at the Sumilon reserve than at all other sites. Chaetodontids are a colorful and visually obvious group of coral feeding fishes which may provide a useful index of the abundance and species richness of corals and the visual impact of a fish fauna for divers.

The Sumilon reserve had a significantly higher abundance (number/area) of fishes than all other sites. This was due to the particularly high numbers of planktivorous damselfish (pomacentrids),

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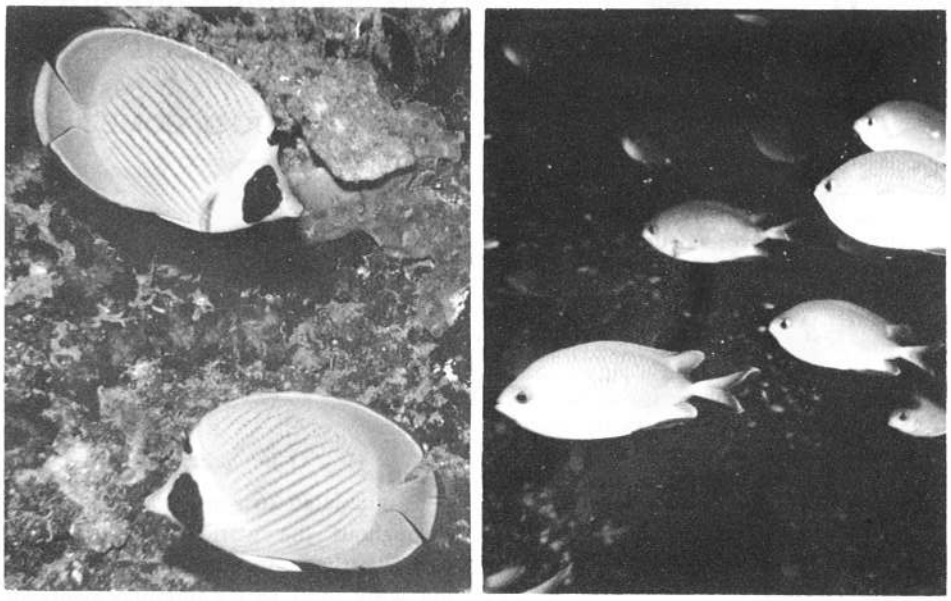
[1] Alcala, A.C. 1981. Fish yield of coral reefs of Sumilon Island, Central Visayas, Philippines. *National Research Council of the Philippines Research Bulletin* 36(1): 1-7.

[2] In a recent thesis "Some aspects of the biology of *Pterocaesio pisang* (Bleeker 1853) (Pisces: Caesionidae) in Central Visayas" by Annadel S. Cabanban, College of Science, University of the Philippines, Diliman, Quezon City, 1984, low fishing mortality rates of this dominant fusilier on Sumilon and Apo Island reefs also suggest that the marine reserves on these reefs are effective. Ed.

[3] GBRMPA. 1978, 1979. Great Barrier Reef Marine Park Authority workshop on reef fish assessment and monitoring. GBRMPA Workshop Series ISSN 0156-5842 Nos. 2 and 3, GBRMPA, Townsville, Queensland, Australia.

seabass (anthiids) and fusiliers (caesionids). These three families were numerically dominant at all the study sites, accounting for 91% of all individuals censused in the study but comprising only 33% of the species. The Sumilon reserve had the highest abundance of many species considered to be highly favored 'targets' of fishermen–snappers (lutjanids), emperors (lethrinids), jacks (carangids) and fusiliers including a significantly higher standing crop of groupers than all but one of the other sites. *Cephalopholis* accounted for 95% of all serranid individuals with *C. sexmaculatus, C. argus* and *C. miniatus* being most abundant.

There was no evidence to suggest that the limited amount of protection from fishing within the Apo Island reserve since 1982 has had any effect on the abundance of favored 'target' species. In fact this reserve has much lower abundances of such groups as serranids and lutjanids than the unprotected sites at Balicasag Island. This may reflect the fact that the economy of Balicasag Island is based on collection of precious shells rather than on reef fisheries, possibly resulting in light to moderate fishing pressure only at Balicasag Island.



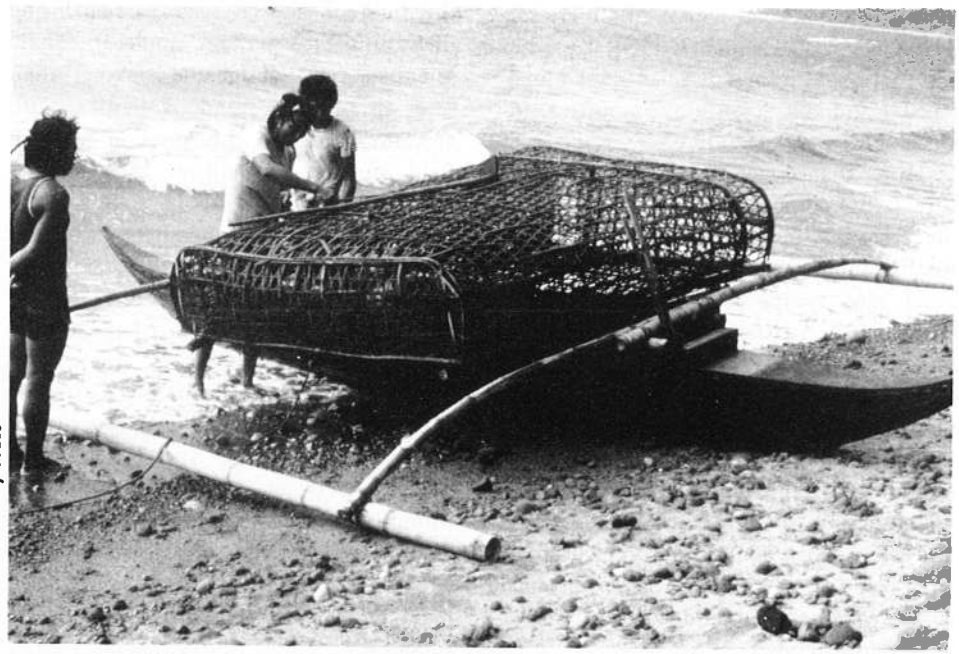
Roger Pullin

Fig. 2. *Left:* Chaetodontids, colorful, coral feeding fish. *Right:* Damselfish, one of the numerically dominant families at all study sites.

The Role of Reserves

Although Sumilon reserve had the highest abundance of fish, no data are available on their abundance before the reserve was established. It cannot be claimed that protective management is the *cause* of the high abundance and species richness of fishes at this site. In fact, the area was chosen as the site for a marine reserve because it possessed such characteristics. However, considering the very high fishing pressure on most Philippine coral reefs it could be argued strongly that protective management has been very important in *maintaining* the high abundance of many of the species of fishes. There is little doubt that the Sumilon Island reserve has been extremely successful in maintaining an area of high quality coral reef habitat.

The role of such reserves in terms of fishery management is less clear. Small sanctuaries in which fishing is banned are established in the hope that (a) the abundance and species richness of fishes will be maintained and, in the long-term, possibly increased; (b) the sanctuaries will provide undisturbed breeding grounds for fishes; (c) the sanctuaries will export fish biomass by emigration of adult individuals; and (d) the sanctuaries will export fish biomass over a wider general area by larval dispersal. The Sumilon Island reserve is a somewhat unique study in coral reef management since it provides limited evidence in support of the first three of these expectations. Confirmation of the fourth contention requires detailed research on patterns of dispersal and recruitment of coral reef fishes. More studies such as those at Sumilon Island are required, and their utility would be increased by setting aside areas for reserves larger than those being set aside presently within the Philippines. ●



Garry Russ

Fig. 3. Bamboo traps, a common method of fishing the coral reefs at some of the study sites.

A full report of this work is contained in Effects of Fishing and Protective Management on Coral Reefs at four locations in the Visayas, Philippines, Phase I by Alan White, Phase II by Garry Russ, 1984. United Nations Environment Programme and Natural Resources Ministry Council (UNEP-NRMC) Coral Reef Monitoring Project. Component implemented by the Silliman University Marine Laboratory, Dumaguete, Philippines.