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Strategies for sustainable use of living aquatic resources

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Strategies for sustainable use of living aquatic resources

These strategies aim to conserve biodiversity, maintain the integrity of the environment, protect fishery stocks, involve fishing communities in the management, and use environment-friendly technologies for enhancing fishery production.

Freshwater ecosystems

Threats to the water quality of freshwater habitats must be minimized, if not removed, if these habitats are to work for people. Sedimentation (a form of pollution) and flooding are generally caused by forest denudation in the uplands, but excessive sedimentation can result from mining. Other pollutants include waste effluents from agriculture, industries, and aquaculture. Solutions to these problems include reforestation of denuded areas and programs in flood and pollution control.

Massive reforestation restores the normal water flow in rivers that in the past harbored many species of prawns, food fish (e.g., gobies and mullets), and other animals yielding other products. Dried-up river systems could be rehabilitated to become productive again.

Another threat to the freshwater resources is overexploitation. Rivers have been dynamited or poisoned with chemicals. Lakes have been used for fishfarming, and it is not unusual to find overcrowding by fish cages. Laguna de Bay in Luzon is a classic example where species richness and fish yields have been reduced as a result of overexploitation and deterioration of water quality. Another example is Lake Lanao, which has lost most of its dozen species in eight genera of endemic cyprinid fishes before scientists could study them. Still another example is Lake Buhi in the Bicol region, home of the *sinarapan* (gobies), which are disappearing.

Aside from protection, research is very much needed. One research area is culture, ranching, and aquarium potential of endemic fish species. Another is the genetic improvement of introduced species, like tilapias and the African and Thai catfish, currently used in aquaculture.

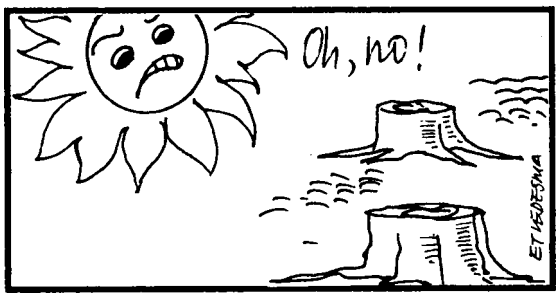
Shallow-water marine ecosystems

These productive ecosystems comprise estuaries, mangroves, seagrass beds, coral reefs, soft-bottom communities, and open waters (in part). Most of the marine production available to the larger mass of the human population occurs in shallow waters. Coral reefs, for example, produce in excess of 30 tons of fish per square kilometer per year. Mangroves through their leaf litter have an important role in fisheries by supplying 13-47% of the carbon requirement of demersal food chains.

Protective management

In recent years, several management strategies have been implemented to address environmental problems. One strategy is protective management of shallow-water ecosystems. Reserves, sanctuaries, and marine parks have been set up all over southeast Asia. Thus, portions of coral reefs, or even whole reef areas have been temporarily or permanently closed to fishing. Coral reefs have also been used for multiple purposes.

The concept of marine fishery reserves (MFRs), as applied to coral reefs, is gaining



acceptance as a viable option for sustainable coral reef fisheries. MFRs are reef areas permanently closed to human exploitation. They protect reef fish populations that serve as spawning stock and ensure recruitment of young fish to the entire reef system and reefs elsewhere. The effectiveness of an MFR in the maintenance of species richness, abundance, and community structure within the reserve and of high fish yields outside the reserve has been demonstrated by experiments in central Visayas, Philippines. In Sumilon Island, Cebu, fish yields during the period of protection were higher than during the period with no protection. There was obviously an export of fishes from the MFR to the fished area.

MFRs could be sources of fish larvae for coral reefs situated downstream of prevailing currents. This may be true of Palawan Island fisheries which could be replenished by fish larvae from the Tubbataha National Marine Park moving westward with the prevailing currents in the Sulu Sea.

Protection of mangrove ecosystems appears successful in some countries in southeast Asia such as Malaysia and Brunei. But in the Philippines, mangroves are protected on paper but not in reality. There are probably only a few small mangrove patches that have been afforded some degree of protection in the country.

The seagrass beds are still neglected, despite the heroic efforts of scientists like Miguel Fortes. There are no protected seagrass beds in the country. Similarly, no soft-bottom areas are strictly protected. However, occasional closure of certain bays to trawlers automatically protects the soft-bottom benthos.

Estuaries are generally productive areas, serving as fish nurseries. But estuaries bear the brunt of pollution, especially sediment from upstream areas, chemicals from industries, and domestic wastes. The estuarine portions of Manila Bay are polluted. River mouths to which mine tailings find their way are additional examples. There are no protected estuaries in this country.

Protection should be extended to small island ecosystems that are still almost pristine. In Malaysia, small thickly forested islands, such as Pulau Tioman and Pulau Redang, have been converted into recreational or resort islands. It is important to maintain the balance between development and conservation to assure the survival of both marine and terrestrial components of these island ecosystems.

Rehabilitation schemes

The other strategy to make our coastal ecosystems work for people is to rehabilitate degraded environments and allow the restoration of the original associated biota. Mangrove reforestation, coral transplantation, and artificial reef establishment are examples of these schemes. The Department of Environment and Natural Resources (DENR) has embarked on a national mangrove reforestation program. In coastal areas, one result of this activity is increased amount of organic matter that serves as food for organisms. The increased species diversity in coastal ecosystems makes protein food available to the dependent human population. Long before the DENR program, some island communities in the Visayas had already started planting mangrove trees for use in construction and as nurseries to attract fishery species. Southeast Asian countries such as Malaysia, Indonesia, and Brunei probably do not need to replant mangroves as they still have large areas of primary mangrove swamps.

Coral transplantation has been shown to be feasible and some corals of economic importance (e.g., blue coral) have been observed to grow well. Coral transplantation rehabilitate denuded bottom areas and attracts reef-associated organisms, including fish. Given the widespread destruction of coral reefs throughout Southeast Asia and their importance as source of valuable products and as recreation areas, coral transplantation is necessary.

The establishment of artificial reefs has been recommended with some precautions as a management tool for artisanal fishery and as a means of habitat enhancement. Experience in the Philippines has shown that artificial reefs can indeed yield a reasonable biomass of fish with relatively small effort. (This is if the AR works as a fishing gear, which is **not** what we want to happen. - Ed.)

At the experiment stage is a transplantation procedure for seagrass to hasten the consolidation of loose bottom. The UP-MSI has transplanted certain species of seagrass off Marinduque Island.