

INDONESIA

Project Title: Marine Biodiversity Loss in Spermonde Islands, Sulawesi, Indonesia: Assessing Capacity and Impacts of Destructive Fishing Practices

Study Leader: Dr. Arief Wicaksono, International Marinelife Alliance-Indonesia

The study was conducted in Spermonde Islands, which comprises three districts: Pangkep, Maros and the Municipality of Makassar, under the Province of South Sulawesi.

The study aimed to measure the loss of marine biological diversity due to destructive fishing practices, its impact on the quality of life of local inhabitants and the productivity of marine habitats. The project also studied the socio-economic, ecological, and fisheries issues. Results of this study will become the base for comprehensive and thorough interventions to conserve the archipelago.

Of the seven islands surveyed, four have live and soft corals covering less than 40% of the area. The surveyed sites showed more than 30% dead corals and rubble. Dead corals could be a result of natural causes and/or long-term human-induced causes. Rubbles may be a result of strong and immediate natural causes and/or bombing and/or dredging.

Common fishing techniques used by local inhabitants are: hook-and-line, fish-trap, gleaning, fishing-platform (*bagan*), hookah, poisoning and bombing. Hook-and-line and fish trap are used to catch reef food fish for local market. Gleaning is commonly done by women and children during low tide, where they walk through reef flats and collect mollusks and others. Fishing-platform is operated by middlemen for collecting anchovy (*Stolephorus* spp.), and squids. Hookah is used to collect sea cucumber in the seabeds; it is a technique where a diver wears locally-made goggles and use a rubber hose connected to an air-compressor on a boat. Hookah is now a main supporting technique for cyanide fishing. Target species for cyanide fishing are ornamental fish, groupers (*Chromileptus altivelis*, *Epinephelus areolatus*, *Epinephelus fuscoguttatus*, *Plectropomus leopardus*), wrasse (*Chelinus undulatus*) and lobster (*Enoplometopus daumi*, *E. debelius*, and *Panulirus versicolor*). Fish-bombing is largely targeting fish for salty-fish processing, and for the local canned-fish industry.

In most cases, exporters loan the middlemen's capital to buy fishing vessels. Fishing gears of local fishers are distinguished by the economic values of

their catches. Small outrigger canoes and simple nets and hook-and-lines are used for subsistence needs of local fishers' households whilst motorized and big-scale fishing vessels are used to catch economic species such as groupers, wrasses, lobsters, sea-cucumbers.

Except for the exporters, most of the local inhabitants acknowledge the importance of conservation to ensure sustainability of their livelihoods. Further findings suggested that the exporters fish not only from Spermonde Archipelago, but also from other sites such as Sinjai (eastern side of lower arm of island of Sulawesi) and Taka Bone Rate, the third largest atoll in the world located in the Flores sea. The local inhabitants suggested that capital assistance should be provided to start a cooperative that would replace the exporters role in Makassar.

The study also found that very few younger inhabitants are knowledgeable about the spawning aggregations of certain economic fish species. Some elders think that the impacts of fishing would not lead to the decline of catches because they said fishing in the surrounding reefs is only for subsistence, and that local fishers go to several extensive reef flats within the archipelago to collect commercial species.

The study reached the following conclusions:

- The population of commercial fish species has declined over the past 10 years.
- Coral reef degradation is largely attributed to live reef fish operations, resulting in declines of reef-related resource stocks important both for commercial and subsistence purposes.
- Resource wastes were due to high levels of by-catch and high post-harvest mortality rates due to poor handling methods.
- The use of hookah resulted in a high level of diving-related accidents and health problems among live reef fish divers, due to lack of proper dive training and frequently sub-standard equipment.
- Increasing levels of community-level conflicts arise from the growing exploitation and commercial value of live reef fish stocks and the lack of local tenurial and dispute-resolution mechanisms to prevent or resolve such conflicts.
- Local fishermen get lower prices for live reef fish catches as compared to existing market prices, often due to the exploitative "middleman" arrangements.
- Incomplete or nonexistent data on the live reef fish trade (volume, species, harvest areas, operators, etc.) make it difficult for governments to establish effective management regimes.
- Absence of government capacities to carry out live reef fish monitoring, management and enforcement activities.

Project Title: Identification of Coral Reef Biodiversity Toward Reef Conservation of the Krakatau Islands in Lampung Province, Indonesia.

Study leader: Dr. Endang L. Widiastuti, University of Lampung, Indonesia

The study was conducted from January to December 2002 in the 11 sampling sites of the major islands: Sertung, Panjang and Rakata of Krakatau comprising about 42,608 m². It aimed to determine and evaluate the existing coral reefs and existing environmental factors closely correlated to life forms. The study showed that the average percent cover of living hard corals was 45.64%, with the highest at 71.80% and the lowest, 22.93%. Two rare species of hard corals - *Lobophyllia hemprichii* (Ehrenberg, 1834) and *Echinopora hirsutissima* (Edward & Haime, 1849) - were observed. About 43 coral species consisting of 17 genus, and at least 5 genus of the soft corals were found. The average percent cover of soft corals was 9.94%, with the highest at 22.72% and the lowest, 2.62%.

Besides the corals, fish species and planktons, other living organisms including terrestrial-based organisms were observed such as soil arthropods, terrestrial and mushrooms but in partial inventory only.

Out of the 20 species of coral fishes, *Pomacentrus moluccensis* was significantly abundant, as frequently observed on Panjang Island.

The study on planktons resulted in moderately high diversity and none dominance of certain species. It even showed moderately high diversity of plankton organisms but poor in fish species. There were more than 200 planktons identified and less than 20 fish species.

The study concluded the following:

a) Coral reefs were unevenly distributed and ranged in the Category 4 of Dahl Categorization; b) reef destruction was presumably caused mainly by dead corals with algae and rubble; c) results of most of the ambient environmental parameter measures indicated a good water quality, thus a good condition for supporting coral reef communities; d) volcanic activities of the Anak Krakatau and malfishing practices contributed to reef damage; e) The Shannon-Wiener Index of diversities revealed a moderate level of diversity in Krakatau Islands; f) morphometric relationships among hard coral species were not parallel to the genetics; and g) Krakatau Islands showed high diversity of plants and mushroom species but relatively low in soil arthropods. ■

PHILIPPINES

Project Title: Inventory of Scleractinian Corals of the Pacific Coast of the Philippines, Part 1: Eastern Visayas and Northeastern Mindanao

Study leaders: Dr. Wilfredo Y. Licuanan Marine Environment and Resources Foundation, Inc. UP-Diliman, Quezon City, Philippines

Field studies were conducted in the Philippine reefs specifically in Northern Samar, Eastern Samar and northeastern Mindanao, all situated south of the Philippines. Activities involved were collection, processing, identification, organisation of the collected samples, and educational poster development (with text in the local dialects of Borongan, Samar and Lianga, Surigao del Sur). A total of 331 specimens, representing 59 genera and 165 species were collected from the study areas, but 17 samples have yet to be identified.

The inventory found feasible new records of stony corals for the Philippines. Below is the abstract of a paper by Dr. Licuanan for the new records of stony corals from the Pacific Coast of the Philippines.

"The Philippines is the center of diversity for scleractinian corals, having the most number of species at 462, with Papua New Guinea being a far second at 380, and the Great Barrier Reef of Australia with 350. This high diversity is despite the relatively small number of endemic coral species (12, by Veron 1995) in the country. This apparent lack of endemism in the Philippines – despite having at least 13,000 km² of reefs (Burke et al 2001) and the fifth longest coastline in the world - is likely due more to relative paucity of information studies. Further, marine research in the Philippines has long focused on internal waters of the Visayas and Sulu, and lately the Western Philippine Seas/South China Sea. The Pacific Coast, in contrast, has remained poorly known."

"This paper describes four new records resulting from three inventories along the Pacific Coast of the Philippines. The three new records were species previously known only from the north (*Goniophora cellusiosa*; Japan), the west (*Stylophora danae*; the Red Sea and eastern Africa), south (Indonesia and new Guinea), and west and south (*Favites vasta*) of the country, further emphasising the Philippines' position at the confluence of Pacific and Indian Ocean faunas. *G. cellolosa* was collected from Biri, Northern Samar while *S. danae* was collected from Borongan, Eastern Samar. *F. vasta* and *A. halmaherae* were both from the Lianga, Surigao del Sur in southern Philippines." ■

THAILAND

Project Title: Strategies for Sustainable Management of Fishery Resources in the Pasak Jolasid Reservoir, Thailand through Ecological and Socio-economic Assessment

Project leader: Prof Dr. Ladda Wongrat Kasetsart University, Thailand

We are fully aware of the degradation of water resources due to impacts of various human activities such as deforestation, agriculture, aquaculture and industries. The number of reservoirs is increasing to contain more water for human consumption. But all these reservoirs are not well managed. Reservoirs are also used for fish production in most Asian countries. Reservoir fisheries provide a very important cheap source of protein for rural communities. This is true for all developing countries in the region, including Thailand. However, production of fish declines after impoundment; some fish species disappear and biodiversity decreases. Existing information and research on the reservoir ecosystem in Thailand are inadequate for policymakers to effectively campaign for conservation and rehabilitation of water resources in the country. Before any policy decision and action can be recommended, a scientific study that encompasses the reservoir's bio-chem-physical status as well as human factor responsible for its exploitation and degradation should be conducted.

Having recognized this problem, a two-year study on reservoir ecosystem was conducted at the Pasak Jolasid reservoir for management and conservation purposes. The reservoir was selected as study site because it has been keeping water since 1998. Furthermore, the river ecosystem in the area has changed from running to stagnant water. The Pasak Jolasid reservoir has been established according to the idea of His Majesty King Bumiphol in 1989 in order to control the water draining from Loei province, which normally goes into the Chao Praya River, and causes flooding in Bangkok and the nearby areas. The total area is 135,500 rais or 21,680 hectares. The reservoir also supplies water to the agricultural areas on the eastern side of the Chao Praya River covering about 2.2 million rais or 352,000 ha. In addition, the fish produced from this reservoir is an important source of protein and income for local people.

The SUMAFISH project is an interdisciplinary approach, bringing together expertise in relevant areas such as ecology, biology, socio-economics, environment, Geographic Information Systems (GIS), water

quality and management, and modelling, among others. Through more knowledge and understanding of how the reservoir and the community function, the team hopes to come up with management strategies that are sustainable and beneficial to the environment and the local population, making it also a management model for all water bodies in Thailand.

Project results are summarised according to the SUMAFISH project framework as follows: land-use, physical and chemical, biological, and socio-economic studies.

For land use studies, there are altogether 29 soil series comprising eight terrain or landform classes: floodplain, former, tidal flat, levees, semi-recent terrace, low terrace, middle and high terrace, and dissected erosion surface.

Initially, all the important biological nutrients (ammonium, nitrite, nitrate, silicate, and phosphate) and primary productivity for the surveys in February, April, and June 2002 were analyzed. Distribution patterns of nutrient concentration were found to vary with depth and time. A more detailed interpretation of the data on primary productivity will be carried out.

Initially analysed data on sediment characteristics showed that sediments in the Pasak Jolasid reservoir were composed of many sediment types (ie. coarse sand to gravels, laterite, sticky clay, and watery fine mud, etc). Such variation showed both artificial (manmade) and natural sources of deposits. Sediments of the former Pasak river line stations commonly possessed high organic condition (ca 10% total organic matters) and high acid volatile sulfide levels (ca 0.500 – 4.500 mg/g). H₂S odor was apparent at deep sampling stations especially station R₁₃. These phenomena showed an important role of oxygen depletion and pH changes above the bottom layer. Detailed study on sediments and their related effects on aquatic plant and animal distributions should be conducted.

The reservoir was found to have a total of 167 species of plankton: 97 phytoplankton and 69 zooplankton species. The dominant phytoplankton species are green algae and rotifers. The Pasak Jolasid reservoir carries as much as 36.7×10^3 – $2,382 \times 10^3$ units/litre.

Benthic fauna surveys on the other hand, yielded insect larvae. The dominant species are *Stichironomus* sp. and crustaceans. The first survey yielded more varieties than the second survey because of seasonal habitat change. The species and the number of benthic fauna found signified low fertility especially at the end of the hot season because of the decrease in aquatic insect breeding.

A total of 18 families, 40 genera and 51 species of fish were found. The dominant family is the Cypriidae with 26 species, whereas other families have one to three species. Species inhabiting the shoreline were less numerous than the ones in the middle channel: 21 species versus 31. Species found both along the shoreline and in the middle channel were numerous, signifying horizontal migration. They include Thai rivers sprat, river barb, long dorsal fin barb, hampala barb, Siamese mud carp, and *Paralaubauca harmandi*.

The highest number of species were found two metres deep. Species found at greater depth tend to be larger than the ones found in the middle and at the surface. Species inhabiting the shoreline were less numerous than the ones in the middle channel.

Socio-economic surveys reveal that all fishermen derived their revenue from fishery activities during the fishing season with an average income of 36,000 baht per year. Supplementary incomes were earned during fishing moratorium - from selling sugar cane and vegetables.

Project Title: Community forest management and rehabilitation as means of biodiversity conservation: Case study at Thung Soong community forest in Krabi, Thailand

Project Leader: Dr. Damrong Pipatwattanukul Kasetsart University, Thailand

The study is being carried out at Ban Thung Soong village located at Krabi province in the southern part of Thailand. The conceptual framework of the project focuses on a better understanding of mechanisms of man-environment interactions and their effects on biodiversity, and translate these knowledge to precise management guidelines. An inter-disciplinary cooperation among forestry, entomology, ethnobotany, wildlife, and socio-economic study assures the success of the project. As a strategy, the local people were tapped for field data collection in all the sub-projects.

The forest tree inventory done in the community forest, rubber plantation, oil palm plantation, and mixed fruit orchards showed 35 tree species. Recent field data gathered for the project showed that *Schima wallichii* (DC.) Korth was the highest IVI of trees. The sapling and seedling species that had the highest IVI was the *Vatica* sp. There were four canopy layers ($H < 8$, 8-12, 12-18, > 18 m) in the sampling plot of primary forest and 3 layers in the secondary forest. The very abundant tree species grown in homesteads were *Sandoricum koetjape* (Burm.f.) Merr., *Mangifera*

indica L., *Cocos nucifera* L. var. *nucifera* and *Parkia speciosa* Hassk.

The ethnobotany study was carried out to conserve indigenous knowledge on folkloric medicine and search for new sources of modern drug. Existing knowledge of traditional uses were recorded through interviews with native ethnobotanists and local people. During the survey in community areas, 94 kinds of medicinal plants commonly used were identified and collected. For the home garden area, there were 129 kinds of medicinal plants, which could be assigned to 3 groups including 88 dicots, 39 monocots, and 2 ferns belonging to 58 families; the largest groups (9 different plants) are Euphorbiaceae and Zingiberaceae. Medicinal plants in the community forest area are used frequently as antipyretic, carminative, antidiabetic, and hematinic, and for tonic, muscle sprain, and abcess. There were 6 kind of plants newly-recorded as medicinal plants in Thailand, namely: *Goniothalamus tenuifolius* King, *Alstonia rostrata* C.E.C. Fisch., *Peliosanthes violacea* Wall., *Freycinetia javanica* Blume,, *Psychotria adenophylla* Wall., and *Vittaria ensiformis* Sw.

Wildlife diversity was determined through habitat type classification and surveys for mammals, birds, reptiles-terrestrial, aquatic and arboreal, and amphibians. Wildlife habitats were classified into 6 types according to the land use patterns. Preliminary results showed 17 species of mammals, 79 species of birds, 14 species of reptiles, and 24 species of amphibians.

Insect specimens caught in Malaise Traps were classified into six major orders: Coleoptera, Hymenoptera, Diptera, Lepidoptera, Hemiptera and Homoptera. Minor orders were Orthoptera, Mantodea, Phasmatodea, Blattaria, Odonata, Collembola, Demaptera, Ephemeroptera, Embioptera, Trichoptera, Psocoptera, Strepsiptera, Neuroptera, Thysanoptera and Isoptera.

The first year of the project gave more emphasis on the major groups of insects. Collections from all locations comprised different members of insect families as follows: 61 Coleoptera, 38 Hymenoptera, 38 Diptera, 11 Lepidoptera, 9 Hemiptera and 6 Homoptera.

In order to promote and work in close collaboration with the local people, the project has jointly organised two training courses with Kasetsart University at the Krabi Campus. The first training course focused mainly on medicinal uses and product development. The second training course, which was conducted for the youth in the village, aimed to raise awareness on natural resources management. ■

VIETNAM

Project Title: Genetic Variation in the Threatened Cycads: *Cycas dolichophylla* and *C. ferruginea* (Cycadaceae) in Vietnam

Project leader: Nguyen Minh Tam, Nguyen T. Phuong Trang, and L. Triest
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Vrije Universiteit Brussel, Belgium

The project investigated 13 enzyme systems of two cycad species: *Cycas dolichophylla* and *C. ferruginea* in five provinces: Tuyen Quang, Thai Nguyen, Lang Son, Ninh Binh and Thanh Hoa. Six enzymes of the two species were used to estimate the levels and distribution of genetic diversity at population, sub-population and species levels. With 12 loci in 4 populations of *C. dolichophylla* examined, the proportion of polymorphic loci was 87%, with 2.4 alleles at the species level as well as per locus at population level. Similarly, with 14 loci in 8 populations of *C. ferruginea* examined, the values were lower, that is, 71% with 1.9 alleles per locus both at population and species levels. In addition, mean observed and expected heterozygosities were higher for *C. dolichophylla* ($H_o = 0.025$ and $H_e = 0.372$) than for *C. ferruginea* ($H_o = 0.021$ and $H_e = 0.322$). Observed and expected heterozygosities differ significantly within a population, indicating larger to great heterozygote deficiency. Total genetic diversity was lower in *C. ferruginea* ($H_1 = 0.395$) than in *C. dolichophylla* ($H_1 = 0.417$). There was no significant correlation between genetic distance and geographical distance for *C. dolichophylla* ($r = 0.408$ and $p > 0.05$), but significantly for *C. ferruginea* ($r = 0.408$ and $p > 0.05$).



Cycas dolichophylla



C. ferruginea

Relationships between population genetic diversity and total genetic diversity were low, with $G_{st} = 0.043$ for *C. dolichophylla* and $G_{st} = 0.109$ for *C. ferruginea*. Indirect estimates of the number of migrants among populations per generation (Nm) were 3.04 for *C. dolichophylla* and 1.82 for *C. ferruginea*, based on the mean F_{st} for each cycad species. The mean F_{is} is 0.930 in *C. ferruginea* and $F_{is} = 0.924$ in *C. dolichophylla*. Factors contributing to high genetic diversity include life form (long-lived perennials), multiple generations and outcrossing. However, the high level of mating between related individuals within small population sizes of cycads in relation to disturbed habitats and overexploitation might influence genetic structure and lead to increase frequency of rare alleles (due to genetic drift).

Project Title: Population, Habitats and Measures for Conservation, Development and Use of Beneficial Hymenopteran Wasps in or around Protected Areas in Northern Vietnam

Project leader: Dr. Khuat Dang Long
Institute of Ecology and Biological Resources

The major objective of the project was to assess the biological and economic values of two focal beneficial hymenopteran groups, namely: Vespidae, aculeate social groups as pollinators/predators; and Braconidae and Ichneumonidae, groups of wasps as potential parasitoids for biological control of target insect pests.

The selected study site for the project encompassed the Cuc Phuong National Park and its buffer zone including two communes: Yen Lac and Lac Think in the Yen Thuy District, Hoa Binh province.

Partial results obtained after one year of project implementation include the analysis of 894 specimens of brachonids and 400 of ichneumonids from 90 samples collected by Malaise traps set in different research sites in the buffer zone of Cuc Phuong National Park. Compared with 33 ichneumonid species recorded from the fauna of Vietnam, 12 parasitic species of ichneumonid wasps were identified in the research area.

The impact of environmental changes and habitat disturbances caused by activities of local communities in the buffer zone has also been studied. The threats to the diversity of beneficial wasps are: over reliance on insecticide application for pest control, and natural vegetation on hillsides surrounding the protected areas. ■