

IH 321 Reef fisheries and conservation strategies in Wakatobi, Indonesia

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Fish populations around the world are currently under increasing pressure from human harvest, with many shrinking in size and causing changes to both ecosystems and societies. The archipelago nation of Indonesia is located near the presumed center marine biodiversity and is home to over 240 million people, and some of the world's densest human populations. Marine products provide 58% of the protein in Indonesian diets and are a traditional part of Indonesian culture. However, factors such as harvest pressure, terrestrial runoff, and water-temperature changes are affecting the region's coral reef ecosystems and the human communities reliant on them. Fish are the predominant good harvested from these ecosystems, but evidence suggests many current harvest rates are unsustainable.

Sustainable fish harvest can be considered from multiple angles. Biological sustainability generally refers to the ability of the fish population to replace itself at a rate equal to or greater than the extraction rate, whereas social and financial sustainability refer to human institutional and economic factors affecting use. Fish and other marine resources are generally categorized as common-pool resources, which means they are owned and used by many people. For a variety of reasons, common-pool resources like fish are often used at a biologically and financially unsustainable rate, thus planning or some type of active management may be required.

Management or conservation strategies vary from total prohibitions on use to changes in worldview or cultural values. Much traditional fisheries management involves the restriction of species, fish sizes, and total numbers of fish that can be kept. However, successful use of this management technique requires precise and accurate ecological data and often extensive enforcement. Individual quotas are becoming more common, and this is where resources are essentially privatized and fishers buy or are given a share of the total allowable catch. Areal closures, such as marine protected areas, are also being implemented with varied success, as are direct payments for conservation, where users are by some means paid to stop extracting. Finally, promotion of goodwill or cultural value is being used in some regions, particularly in subsistence fishing contexts by outside organizations or governments.

Our project is studying subsistence reef fisheries and fish conservation strategies in Southeast Sulawesi, Indonesia. The Wakatobi region of Southeast Sulawesi was designated a Marine National Park in 1996 because of its biological uniqueness, but thousands of marine-dependent people live on the islands within the park. Our project is based on Kaledupa Island, the second island in the Wakatobi archipelago, where we are studying fishing techniques, sustainability of use, and conservation strategies.

A variety of fishing techniques are used by Kaledupan fishers. Gill nets are quite common in all communities, and are a particularly important technique for members of Bajau communities, who often cannot afford the economic startup cost of other techniques. Fish fences in particular are more expensive to construct, but have become more common around Kaledupa in recent years and require less daily input once built. Line fishing is also quite common on both reefs and offshore where tuna are abundant. Bubu traps are also used, often to supplement other techniques as is the case with spear fishing and gleaning from reef flats.

Though artisanal fishing has previously been seen as incapable of notably affecting fish populations, recent studies have suggested otherwise, and work by Operation Wallacea has indicated that significant overfishing is taking place around Kaledupa. Currently, fish prices are increasing, and fishing is a major component of local cultures, so the social and financial aspects of use are still sustainable. However, catch per unit effort (CPUE) has been decreasing and many fish are being harvested before reaching

maturity, suggesting that ecosystems cannot support current extraction rates. Data from reef monitoring also show a continuing decline in fish abundance, suggesting that current fishing is not biologically sustainable.

As a result, fishers and some local governments are becoming more interested in actively managing Kaledupan fisheries. A formal fisheries research program was started by Operation Wallacea and FORKANI, a local fishers organization, in 2007 with funding from the U.K. government. This program monitored what was being caught by fishers in 26 villages around Kaledupa. A Kaledupa Fisheries Forum comprising representatives from all villages on the island and chaired by the head of the Wakatobi Government has been formed with assistance from Operation Wallacea and other conservation nonprofit organizations. Their first meeting in August 2009 was charged with agreeing to fishery management byelaws such as limiting the numbers of fish fences, introducing minimum mesh sizes for gill nets, and setting landing sizes for various species. The fisheries data were modeled to identify potential byelaws, and these results were presented so the Forum could make decisions on which regulations were potentially the most effective. The byelaws affirmed at the August meeting were then modeled to assess their impact on the fishery. A database comprising records of 1000+ fishers across the island and their fishing gear has been established. In addition, all motorized boats used for fishing have been registered and individual identification codes painted on each of the boats (550+). There is no other area of Indonesia where such a detailed census of fishers has been completed and 100% of reef fishing boats registered.

Current work aims to continue the previous monitoring program in a subset of Kaledupan villages. In these villages, fishers using various techniques will be met by Operation Wallacea staff or students or local community members, who will record fishing techniques used and make a photograph of all fish caught for future identification, individual length measurements, and weight calculations. Some individuals of each species will also be weighed to develop accurate length-weight regressions for fish in the region and add to global databases like FishBase. The fisher database will also be revised so to include all current fishers and techniques, and a count will be made of all active fish fences around Kaledupa. Numerous aspects of specific artisanal fishing techniques could be further studied by interested students.

Conservation strategies are an additional topic of research. Ongoing fisheries monitoring will allow analysis of the effects of byelaws and any other changes or resource use plans implemented. The extent of current implementation may also be studied by dissertation students and previous data could be analyzed to determine the potential effectiveness of new management actions. Other organizations are currently conducting educational programs in several Kaledupan communities with the assistance of FORKANI, and a World Bank-funded conservation program called the Coral Reef Rehabilitation and Management Program (COREMAP II), so the effectiveness of various conservation strategies like these may be analyzed. Dissertation/thesis projects could focus on biological, social, or financial aspects of conservation action and sustainable use.

Suggested Reading

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