

*Country Paper: Thailand***12. COMMUNITY-BASED FISHERIES MANAGEMENT IN PHANG-NGA BAY,
ON THE ANDAMAN COAST OF THAILAND****by Jate Pimoljinda****Andaman** Sea Fisheries Development Center**1. Introduction**

Consumption demand for marine products has been rising in Thailand because of a rising population, while farming areas have been dwindling in acreage because they are being taken up for housing. The sea is therefore relied on to meet demand for protein food domestically and for exports -which could generate an annual income in excess of 85,000 million Baht. Marine fisheries could stimulate economic development as well, by helping generate jobs and incomes. Many boatyards, fishing materials and fish processing firms, ice plants and cold storage companies have been set up in recent years.

Marine fish production (through both capture and culture) went up from 2.10 million metric tons (valued at 8,622 million Baht) in 1977 to 3.20 million metric tons (valued at 92,950 million Baht) in 1995. The rapid expansion of Thai marine fisheries since 1960, particularly the introduction of trawlers into Thai waters, has led to heavy exploitation and depletion of marine resources, resource conflicts, and degradation of fishing habitats. Commercial fishing boats have been fishing illegally in prohibited areas.

On the Andaman coast of Thailand, Phang-Nga — which covers parts of Phuket, Phang-Nga and Krabi Provinces, with a total area of approximately 1,960 sq.km — is regarded as the most important bay. Its unique monolithic limestone islands and small islands scattered throughout the Bay, provide shelter and habitat for a wide diversity of the Bay's wildlife. Along the shoreline is an extensive mangrove area of about 250 sq.km, which serves as spawning and nursery grounds for a wealth of aquatic resources. In view of the dwindling resources offshore, fishing boats have been encroaching into the Bay, thereby affecting the catches and incomes of fishermen and triggering conflicts among them.

The Department of Fisheries attempted to solve these problems by implementing a fisheries development project in every small-scale fishing community in both the Gulf of Thailand and the Andaman Coast. This project comprises several activities such as infrastructure-building, construction of artificial reefs, promotion of non-destructive fishing gear, extension of coastal aquaculture, training etc. But the results did not meet expectations. The project therefore revised its implementation strategy. Community-based fisheries management was initiated early in 1996 in Phang Nga Bay as a pilot activity, in collaboration with the BOBP's third phase.

2. Fishing Activities in Phang-Nga Bay

As mentioned earlier, fishing activities in the past could be conducted freely in Phang-Nga Bay. The fishermen could fish with any type of gear available. Some even had more than one type of gear, and could use the gear suitable for the tides, the seasons and the resource abundance. Several kinds of fishing activities, both capture fisheries and aquaculture — have been conducted in the Bay such as:

1. *Trammel net*: The main fishing gear of small-scale fishermen, targeted at shrimp.
2. *Crab gill net*: Another selective fishing gear that targets mainly blue swimming crab.

3. *Sand whiting gill net*: Aims to target Sillagid species.
4. *Grouper trap*: This fishing gear aims to catch mainly small grouper for sale to cage culturists, who hope to rear them to marketable size at lucrative prices.
5. *Pushnet*: This is one of the most destructive fishing gears popularly used in Phang-Nga Bay. Aims to target shrimp, but also catches small sizes of other species.
6. *Light-luringpurse seiner*: This is one kind of commercial fishing gear operated in the outer part of Phang-Nga Bay. It uses light to attract schools of fish – mainly pelagic species such as chub mackerel, scad, sardine etc.
7. *Anchovy encircling net*: This fishing gear is designed to catch anchovy during the day. However, because of resources degradation and disturbances from light-luring purse seiners, the catch of this gear has decreased to almost zero. It was found that the purse seiners attracted all schools of anchovy within the area covered by the light, and frightened fish from schooling up the following day. In consequence, the fishermen could catch nothing. They have changed their fishing method to operate during the night, using light lures. This fishing method was then declared illegal.
8. *Trawler*: Single trawlers and twin trawlers were the most common fishing gears operated in Phang Nga Bay. The original target species were economically important demersal species. But after fisheries resources got depleted, the fishing boats changed their target species and focused on trash fish for supply to fishmeal processing plants. This would enable trawlers to at least recover their daily investment.
9. *Small otter beam trawls*: This fishing gear too targets shrimp, but also catches other species such as crab, squid, pelagic fish and economically important demersal species. This fishing gear is classified as destructive.
10. *Coastal aquaculture*: Capture fisheries apart, several aquaculture activities are carried out in the Bay: shrimp farms, shrimp hatcheries, fish cage culture of grouper and sea bass, green mussel culture, cockle culture, oyster culture.

A few other subsistence fishing gears also operate in Phang-Nga Bay.

3. Problems to be Addressed

The rapid development of commercial fisheries led to substantial expansion in fishing effort and eventually to degradation of resources. Fishing boats, particularly trawlers, encroached into the prohibited area (within 3 km from the shoreline) in Phang-Nga Bay, which served as a nursing ground for various types of aquatic resources. Conflicts have erupted between commercial fisheries and small-scale fisheries because of competition for fishing grounds. The following problems needed to be addressed:

3.1. Degradation of fisheries resources

Fisheries resources could be degraded through natural causes or human utilisation. Natural degradation occurs through natural change such as soil erosion along the shoreline, change of current, change of sea temperature and monsoon etc. These phenomena would affect fish spawning grounds, the habitat and the food chain, impacting directly on the survival and development of aquatic resources. Human utilisation of resources causes degradation through overfishing.

It is remarkable that artisanal fishing gears used in the Bay in the past — such as trammel nets, several types of gill net, traps and hook and line etc. – did not harm aquatic resources. But after trawlers were introduced to Thailand, the coastal fisheries resources underwent rapid depletion, and became over exploited in a decade. The other destructive fishing gear is the pushnet. It is a small-scale fishing gear, but its method of operation is similar to that of a trawler.

3.1.1 **Trawler:** A monitoring survey by an AFDEC Research Vessel reported that the average catch in the Bay in 1969 was 160 kg/hr, comprising 48.5 % valuable species and 51.5 % trash. The catch decreased to 38 kg/hr in 1988 (33.3 % valuable species, 30.1% small economic species, 36.6% trash fish). The decline in catch rates is a consequence of trawler encroachment into the Bay.

3.1.2 **Pushnet:** This is another destructive fishing gear operated along the shoreline, particularly in the productive area of shrimp. Over 290 pushnetters have been recorded operating in the Bay. Most of them are long tail boats 8-10 meters long, using 5-10 HP engine. Normally, pushnets operate in the night, from sunset, at a depth less than 10 meters. Each operation takes 1-1.5 hours, and night fishing goes on for 3-10 hours. But during neap tide, fishing may go on all night.

The push net is very efficient at catching trash fish, because the mesh size of cod end is only 2 cm. It is therefore classified as a heavily destructive fishing gear. The average income from pushnets was about 460 Baht/trip, while expenses amounted to 270-300 Baht/trip.

A study of the resources status of pushnets in the Bay reported an average catch of about 67.4 kg/trip, comprising mainly 85.4 % trash fish and 14.6 % economically valuable species. Of these, marine shrimp accounted for about 10.3 % or about 6.9 kg. The composition of trash fish caught was as follows: true trash fish 56.1%, small economic species 43.9 %.

3.1.3 **Small otter beam trawl:** This is another kind of bag net popularly used on the east of Phang-Nga Bay and Krabi Bay. Some 30 trawlers still operate in the Krabi area at present. This fishing gear normally operates two times in one night, with an approximate 4-5 hour/haul, except during high tide. A study showed an average catch rate of about 104.86 kg/trip/boat, comprising 32.1 % valuable species and 67.9 % trash fish. The trash fish included 38.2 % small economic species and 61.8 % true trash fish. This fishing gear is therefore classified as one of the most destructive.

3.2. Fishing Conflicts

Since the declaration of the **EEZ** by different countries in the region, the fishing grounds in Thailand have got reduced, and are too small for the fishing fleet. Therefore, fishing boats moved to coastal areas and finally encroached on to the Bay. These boats, particularly commercial trawlers, created many problems for small-scale fishermen -competition, scrambling for fishing grounds etc. As the trawler is much more efficient than artisanal boats, small-scale fishermen lose their fishing grounds and even their fishing gear, which gets swept away by the trawlers.

Apart from conflicts between commercial and small-scale fishermen, there are also conflicts among the small-scale fishermen themselves, such as the pushnet and trammel net fishermen. It was observed that wherever pushnets operated in the night, trammel nets had a tough time the following day. The pushnet was classified as another strong destructive gear, similar to the trawler. This is why small-scale fisherfolk have tried to keep trawlers and pushnetters out of Phang-Nga Bay.

3.3. Degradation of the coastal environment

The coastal environment has been degraded by several kinds of activities.

- 3.3.1. *Waste water discharged from urban and industrial areas into the Bay:* With the Thai economy developing rapidly, the coastal belt became crowded with both human settlements and industrial activities. Untreated waste water from the belt found its way into rivers or channels and flowed into the sea. Geographically, the Phang-Nga Bay is somewhat closed in. Circulation or exchange of water in the Bay is not adequate to push the wastes and other pollutants out to the open sea. Continuous accumulation of these pollutants will ultimately cause water quality in the Bay to deteriorate and affect fauna and flora.
- 3.3.2. *Destruction of mangroves:* Mangroves are the most important barrier ensuring preservation of the coastal environment. They serve as a filter for all toxic substances dissolved in the waste water that get discharged to the sea, and are also an important nursery ground for the larvae and juveniles of aquatic resources like finfish and shellfish. When mangroves are destroyed, the coastal resources and environment in the area will also be affected.
- 3.3.3. *Garbage and wastes from tourist services:* The tourist business in Thailand has developed and expanded rapidly. Every facility is sought to entertain tourists—tourist barges, floating restaurants, shore-based resorts, restaurants on land etc. The entertainment facilities that have proliferated are all sources of waste and garbage. Some of these are discharged directly into the sea. Many beaches, particularly on isolated islands, are covered with accumulated garbage washed in by wave and wind action — especially plastic bottles and plastic bags.

4. Fisheries Management Measures

The Department of Fisheries has realised these problems and attempted to establish management measures, strategies and mechanisms to reduce degradation of the coastal environment and stresses on fisheries resources in the Bay.

4.1. Legislative approach : Many “Ministerial Regulations” and “Fishery Regulations” were issued to conserve fisheries resources and control illegal fishing. A Ministerial Regulation issued on 1 August, 1979, prohibited every kind of trawler and bag net operated by a motorised boat from fishing in Phang-Nga Bay. A Ministerial Regulation issued on 11 April 1985, prohibited every size of trawler, enclosed net and gill net with a mesh size less than 4.7 cm, from fishing in Phang-Nga Bay and Krabi areas during the closed season 15 April to 15 June every year.

These regulations were not so effective initially, because the fishermen were not very clear about regulation. Both personnel and facilities (such as patrol boats) were inadequate for surveillance. But a public relations drive through posters and videos gave fisherfolk a clearer picture about management. Patrol boats for surveillance were also increased. These two measures helped strengthen enforcement.

4.2 Management measures

Many activities geared towards management of coastal resources have been implemented in fishing communities along the coast. These measures could be classified as follows:

- 4.2.1. *Infrastructure building:* These include landing site, gear repair hall, fish processing hall, fresh water stocking tanks, retaining wall etc., depending on the need of each village.

4.2.2. *Training and grouping:* Training courses by subject have been organised for three groups of fisherfolk — fisherfolk leaders, fishermen, fisherwomen and students. New technologies on fishing operation, boat engine repair, fish processing and other topics concerning fisheries, have been introduced to fisherfolk through regular training schemes. Posters and videos that help better understanding have also been disseminated to fishing communities in order to educate them on resources and conservation measures.

4.2.3. *Coastal aquaculture extension:* Coastal aquaculture, particularly fish cage culture, was introduced to fisherfolk in Phang-Nga Bay during the first phase of BOBP. They were provided with tools, materials and seeds, and technical assistance from the biologist. At present, coastal aquaculture has expanded throughout the coastal areas of both the Andaman coast and the east coast and could benefit fisherfolk. In the early stages, cage culture was very popular: species that have been commonly found throughout the coast are sea bass, red snapper and grouper. Fish fry can be collected from nature, sea bass fry from hatcheries. As the price of grouper is much higher than those of sea bass and red snapper, most fish cage farmers prefer to culture grouper instead. The only limitation of grouper is fry – it has to be collected from the wild and is rather difficult to obtain in adequate quantities.

Shrimp culture is another activity that is now very intensive; the culture area covers most parts of Phang-Nga Bay. 1992 records report that shrimp culture occupied about 2760 rai or about 460 ha. in the Bay with a production of 3.210 tons valued at 473.5 million Baht.

4.2.4. *Construction of artificial reefs:* Artificial reef construction in Phang-Nga Bay was initiated in 1983 with the use of circular concrete blocks, used tires etc. Most parts of the sea bottom in Phang-Nga Bay contain mud and muddy sand. These caused a part of the modules used earlier to be sunk, while some other modules were destroyed by the trawlers. In 1985, when the Marine Fisheries Conservation Unit was established in Phuket (it has since been transferred to Krabi) and the 'Ministerial Regulation' on closure of the area to fishing during the period 15 April - 15 June was issued, artificial reefs became an important tool of conservation.

Two types of artificial reefs have been installed along the coast. The first type is the reef constructed in front of fishing villages, which aggregates fish and facilitates better catches. The second type is the large reef, about 50 sq. km. in size, which seeks to prevent illegal fishing from trawlers in the prohibited area of 3 km offshore. It also serves as a large fishing ground for small-scale fishermen. At present, quite a number of artificial reefs have been installed in coastal areas.

4.2.5. *Awareness-building in fisheries for fisherfolk:* This important activity aims at giving fisherfolk a better understanding of conservation measures. It encourages them to protect resources and fishing grounds in front of their villages, use appropriate fishing gears, understand how to utilise resources and conduct environmental surveillance.

5. Institutional Participation

Some elderly fishermen in the area said that several missions in the past had visited their communities to collect information from them, and promised activities to improve the living standards of fisherfolk. But these promises had not been kept. This had disappointed the fisherfolk and eroded their confidence in officialdom. Restoring this confidence was important, to mobilize fisherfolk participation in development activities. No single organization could accomplish the task by itself. A sound organisational set up and close co-operation from government and private agencies was needed.

The institutions taking part in this project were:

- 5.1. **Department of Fisheries (DOF):** "DOF" includes institutions under the DOF, such as the Andaman Sea Fisheries Development Center (AFDEC), the Provincial Fisheries Office, and the Marine Fisheries Conservation Unit. AFDEC, which is directly responsible for project implementation, will be in charge of technical and technology transfer. It will co-operate with fisherfolk in development and management of coastal resources for sustainable utilization. The Provincial Fisheries Office will be responsible for legal aspects. It will issue fishing gear licenses, prevent illegal fishing operations in the area of jurisdiction, function as fishery extension supervisor, and help solve legal problems of fishermen. The Marine Fisheries Conservation Unit will be responsible for surveillance, using patrol boats to control illegal fishing, and serve as extension supervisor for appropriate fishing methods.
- 5.2. **Village leader:** Could be considered as the representative of local government responsible for all activities to be implemented in the village. Support from the village leader will help in more efficient implementation.
- 5.3. **Academic Institution:** The new generation of fisherfolk — tomorrow's fisherfolk — ought to be a major power in support of coastal resources, environmental conservation and management in future. After discussion with the school headmaster, general knowledge on coastal resources conservation was made part of the basic school curriculum. Further, students will be encouraged to help environmental protection by collecting mangrove seedlings for reforestation.
- 5.4. **Health Office:** Sanitation is an important element of living standards. Cleanliness in domestic surroundings, in the community environment, in food and clothing, is essential for the health of fisherfolk. An officer in the Health Office is in charge of sanitation in the project's target villages. He will co-operate with the project team to develop the fisherfolk's living standards by establishing a campaign to keep the community clean, and installing garbage containers and garbage stoves in the villages.
- 5.5. **Local government:** Phang-Nga Bay (considered the most attractive area on the Andaman coast of Thailand) was being exploited in an unregulated manner by many kinds of users-for fisheries, industry, tourism etc. The Governors of Phuket, Phang-Nga and Krabi realized that coastal resource conservation and environmental protection had to be undertaken immediately. Otherwise, coastal resources and the environment would be degraded, and the tourist appeal of the area would be ruined. A project for holistic and sustainable management of the entire Andaman coast was therefore initiated in 1994. Activities implemented under the project: water treatment, beach-cleaning campaigns, garbage collection from the sea bottom, campaigns to stop dumping of wastes into the sea. Consciousness has been built among small-scale fishermen from the three provinces about the need for conservation of coastal resources, and protection of the Bay from illegal fishing. The fishermen have also pledged to help conserve the environment and work toward sustainable utilisation of Phang-Nga Bay – an earnest of their participatory approach.
- 5.6. **The NGO:** NGOs can play a crucial role in facilitating a project's community approach, There are many areas in Thailand where NGOs have helped to promote development, living standards, and environmental awareness. This project too secured the co-operation of NGOs – such as the Wildlife Fund of Thailand, Volunteers for Social Development Foundation, and Small - Scale

Union of Phuket, Phang-Nga and Krabi — in energetic implementation of activities with fisherfolk participation.

6. Implementation Strategy

Community-based fisheries management

Community-based fisheries management (CBFM) was initiated in Phang-Nga Bay in 1995 by the Andaman Sea Fisheries Development Center (AFDEC) and the Department of Fisheries in collaboration with the BOBP. The CBFM strategy focused on implementation by fisherfolk after building their awareness about conservation and management, and the use of destructive and non-destructive fishing gears. Implementation was divided into several steps:

- 6.1. **Site selection:** was done on the basis of past information, two important criteria being the extent of poverty in the communities and fisherfolk participation.
- 6.2. **Public hearing:** After the site was selected, public hearings were held in every community in the area to explain the project's background and objectives, and fishermen were interviewed about their problems and how they could be solved. This information was used to set up work plans.
- 6.3. **Selection of village committee:** To enable smooth project implementation, village committees were formed in each village with five fishermen in each committee. The committees identify problems and needs, follow up on activities implemented, and report on all events organised every other month. DOF extension workers provide supervision and support.
- 6.4. **Definition of activities to be implemented:** Activities to be implemented should be defined by both DOF officers and the committees on the basis of fisherfolk's willingness and capabilities to undertake the set tasks. The activities defined are:
 - 6.4.1 *Searanching* : DOF organises collection of seeds of species such as marine shrimp, blue swimming crab and sea bass for release into the sea. The fishermen co-operate in releasing those seeds in their respective areas.
 - 6.4.2 *Mangrove conservation:* Mangroves serve as spawning and nursery grounds for aquatic animals and also provide a buffer against over-exploitation of the environment, which is one of the hottest environmental issues today. AFDEC promotes mangrove conservation in co-operation with the Mangrove Protection Office and fishermen of the target area. Notice boards have been put up around the mangrove area to prohibit felling of trees.
 - 6.4.3 *Mangrove reforestation:* Students are being paid incentives to collect mangrove seedlings in the villages during their free time. This strategy aims not only at benefiting students during their free time, but also at building awareness on the importance of mangroves among students.
 - 6.4.4 *Seagrass bed transplantation:* Normally a seagrass bed is an area abundant with living resources. But many areas that used to be rich with seagrass in the past in Phang-Nga Bay were later degraded by pushnetters that crushed the grass area. This project has been successful so far in its object of banishing pushnetters from the target area.

- 6.4.5 *Training:* Training courses were held on subjects like boat engine repair, gear assembly etc, to transfer knowledge and new technology to the community. Some general knowledge on fisheries resources conservation was also added to the school curriculum in the target area.
- 6.4.6 *Release of gravidfemales:* The project urged fishermen to return to the sea any gravid females of blue swimming crab that they happened to catch, so that they could spawn and multiply. The request was not heeded, because fishermen were not sure that other fishermen would do the same. The project then provided two cages to each community. Every gravid female caught would be kept in one cage till it spawned. It would then be sold in the market. This money would boost a revolving fund to be used for the community. The campaign has borne fruit. Production of crab in the area is now 20-40 kg/boat/day, while earlier it was only 5-10 kg/boat/day.
- 6.4.7 *Stewardship:* In the past, enforcement and surveillance in Phang-Nga Bay were not strict, and illegal fishing, particularly by trawlers and pushnetters was widespread. AFDEC, with the co-operation of the Fisheries Conservation Unit, Provincial Fisheries Office, have set up a programme to strengthen enforcement in the Bay. Meanwhile, fishermen themselves have set up their own surveillance group to keep out destructive gears and fishing methods such as trawls and pushnets.
- 6.5. Implementation:** Past experience, plus interviews with fishermen, yielded the following lessons and conclusions:
- Extension workers should maintain regular contact with the fishermen, be close to them, and win their confidence. They should be prepared to work hard and sincerely, otherwise the project will make no impact.
 - When the project began, it had to confront many problems that didn't redound to the credit of the extension workers. Further, a group of NGOs was already active in the area. To compete for the community's attention with the NGOs was difficult.
 - To win fisherfolk participation in the project, the project should co-operate with NGOs of the area. The workplans of the project and the NGOs should be dovetailed and their activities streamlined. The plans then have better chances of success.
 - A DOF floating pontoon functioned as a 24-hour service station for fisherfolk. The pontoon became a rest area for fishermen, it was a landing site for post-harvest sorting of catch, it provided shelter during the rains. Catch sampling too could be carried out accurately.
- 6.6 **Follow-up and assessment:** To follow up on project implementation, village committees met regularly with DOF officers from the Andaman Sea Fisheries Development Center, the Fisheries Conservation Unit, the Legal Office in the DOF. the Provincial Fisheries Office, also with university instructors, representatives from the Health Office and NGOs of the area. Meetings were held every second month to report on progress in each village, exchange experiences, review and help solve problems. This meeting was held by rotation in different villages. Thus fishermen in a village could learn about what was happening in the entire target area. Some communities initiated their own revolving fund through a "stock system" consisting of shares of 20 Baht each.

7. Constraints in implementation

The project has been implemented efficiently and smoothly, but some constraints still remain.

- 7.1. **Weaknesses in enforcement:** Personnel and facilities were limited. Result: rampant illegal fishing in the Bay. Patrol boat surveillance was inadequate and could not effectively cover the entire coastal area, because most of the culprit boats are equipped with modern communication equipment and manage to evade patrol boats. It often happened that a patrol boat reported illegal fishing, but the culprit boats disappeared by the time project representatives arrived. Most of the culprit boats are trawlers and pushnetters — they can always create problems for small-scale fishermen.
- 7.2. **Living conditions of fishermen:** Most small-scale fishermen live in poverty along the shoreline. Some communities lack even essential infrastructure such as roads, power and fresh water. Most small-scale fishing villages were short of fresh water during the dry season and had to buy water at a very high price. Their average daily income from fishing was about 300-500 Baht/day. To achieve better fisherfolk participation in the project, high priority should be given to increasing their incomes and improving their facilities.
- 7.3. **Education:** Fishermen of yesteryear had few opportunities to study because they were poor and their villages had no schools. Some did not even go to school. But schools exist today in many villages, and the children there have better opportunities than their parents did. But during the peak fishing season, students join their parents and go out fishing to earn more money. It is believed that the next generation of fishermen would be better educated than today's.
- 7.4. **Investor system:** It is remarkable that a lot of fishermen still rely on “investors” or entrepreneurs for supply of boat, engine, gear, fuel and other daily essentials. In return, the fishermen have to sell their catch to the investors at a price lower than that in the market. Their relationship is one of inter-dependence. Freeing the fishermen from debt is not easy. Even if they attain physical freedom, their mental dependence on the “investors” will continue.
- 7.5. **Not enough extension workers:** The project could not expand in the Bay because it was short of extension workers to implement its activities. Many villages that wanted to take part in the project and benefit from it have not been able to do so. This problem awaits solution.

8. Outcomes of the Project

After two years of the project, progress of activities is as follows:

- 8.1. **Rehabilitation of fisheries resources:** This has been done in many ways:
 - 8.1.1. Sea ranching: More than six million fry of various species — the black tiger prawn *Penaeus monodon*, banana prawn *Penaeus merguensis*, blue swimming crab *Portunus pelagicus*, and seabass *Lutes calcarifer* — were released into the mangrove areas of target villages. It was reported that fishermen could catch 5-10 kg/boat/day of shrimp compared to what they caught before the project (only 0.5-1.5 kg/boat/day).
 - 8.1.2. *Release of gravid females:* The gravid females of blue swimming crabs are now released into spawning cages after they are caught, allowing them to reproduce. More than 1,000 crabs were

released into cages. The catch rate of crabs nowadays is 20-40 kg/boat/day, compared to the figure of 5-10 kg/boat/day before the project. Further, fishermen agreed among themselves to control the mesh sizes of crab gill net to catch only marketable-size crabs. The income from the sale of the spent crabs after spawning creates a revolving fund in some villages. In some others, it is provided to the local mosque to meet its expenses.

- 8.2. Rehabilitation of the coastal environment:** Some habitats, such as those of mangroves and seagrass, have been restored. They will now help protect the coastal environment and serve as spawning and nursery grounds for aquatic resources.
- 8.2.1 Mangrove reforestation:** The mangrove is the most important eco-system for the aquatic resources life cycle. At present, mangroves are destroyed for many purposes: setting up shrimp ponds, charcoal, pile, cage frame etc. To rehabilitate mangrove areas, a reforestation scheme has been initiated. About 10 hectares of areas destroyed were reforested, using more than 50,000 seedlings. To help protect the remaining mangrove areas still in good condition, notice boards have been put up around these areas. The fishermen have agreed among themselves not to utilize mangrove trees and to prevent outsiders from cutting them down.
- 8.2.2 Sea grass transplantation:** Many areas of Phang-Nga Bay used to be abundant with sea grass in the past, and it sheltered aquatic resources such as shrimp, crab, fish and mollusc etc. With the increase in population and the introduction of modern fishing gears, there is indiscriminate exploitation of coastal resources to meet consumer demand. Trawlers and pushnetters are considered to be the most destructive fishing gears that could sweep sea grass away during fishing. Result: degradation of the sea grass bed, the habitat of coastal resources. Rehabilitation of coastal resources by transplanting sea grass from dense areas to depleted areas has been tried in different places. Remarkably enough, the transplanted sea grass could grow well, and the seagrass bed will be expanded in future to cover more areas. Hopefully, coastal resources in that area will soon recover their abundance.
- 8.3. Awareness-building among fisherfolk:** To induce better understanding among fisherfolk of resources conservation and management, awareness materials such as posters, newsletters and manuals have been distributed to villages and schools not only in the target area but also in some other villages of Phang-Nga Bay. After two years of implementation, a feeling of "ownership" of coastal resources was discernible among fisherfolk. This might be indicative of future trends.
- 8.4. Training and grouping:** Two training courses were organised in the target villages — one for about 30 participants on boat engine repair and maintenance in collaboration with an NGO; and another on sanitation and environment conservation with about 70 participants in collaboration with the health office.
- 8.5. Extension and development livelihood:** Sea-bass fry are supplied to fisherfolk, so that they may supplement their incomes with aquaculture. This activity interested many villagers in the Bay. A study has been conducted on the impact of this activity.
- 8.6. Strengthening enforcement and surveillance:** Two steps were taken. The Conservation Unit of the Department of Fisheries agreed to conduct surveillance around the Bay, in particular the target areas. Second, the idea of voluntary fisherfolk participation in target areas to protect coastal resources and the environment in the Bay was authorised by the Governor of Phang-Nga Province.

Illegal fishing — especially by push netters that encroached on fishing grounds in the Bay — came under special surveillance later. Under pressure from both the patrol boats and the volunteers, the pushnetters surrendered.

AFDEC took the opportunity to approach pushnet users and convince them to take up alternatives to push nets. Finally, about 30 push netters from the village became members of the project. To be sure that this group of fishermen had abandoned push nets, patrol boats had still to conduct surveillance in the area for a period of time. Likewise, push net communities in another part of the Bay have been approached. Fishermen in eight villages from three areas using about 100 pushnets are now waiting for the DOF to help replace their fishing gears. Hopefully, pushnetters will disappear from Phang-Na Bay in two years.

As for trawlers: Following discussion between AFDEC and the fishery association of Phuket, the major trawler-owners operating in the Bay, it was agreed that these owners would prohibit their master fishermen from fishing in the Bay. The fishery association pledged support to DOF for raising money from members to finance installation of artificial reefs on the Bay's entrance to prevent trawling operations.

Moreover, representatives from the fishery association of Phuket will be invited to join the meeting of small-scale fisherfolk. The idea is that the association should represent not only commercial groups but small-scale fishermen as well. This idea has generated a positive response from the fishery association. It is anticipated that if these two groups of fishermen collaborate in protecting and conserving the coastal resources of the Bay, the project's goal would be closer to realization.

*Country Paper: Malaysia***13. CBFM : AN ALTERNATIVE APPROACH TO
FISHERY MANAGEMENT IN MALAYSIA****by Kamaruzaman Haji Salim**

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1 Introduction

Many mature fisheries in the world currently face the problem of resource depletion. This is largely due to overfishing. Crude symptoms of overfishing include an increasing proportion of trash fish landings, complete disappearance of certain commercial species, and shrinking sizes of fish caught (Lam and Pathansali, 1977, Ibrahim, 1987). Thus, the challenge before fisheries managers is to come up with an effective management scheme for sustainable fisheries development and management.

The fishery resource is a common resource. It has two distinctive attributes: its benefits are non-excludable and rivalrous (Comes and Sandler, 1986; Gardner, Ostrom and Walker, 1990). "Non-excludability" implies that it is difficult to exclude potential users or newcomers from tapping it. This is particularly true of fishery resources – preventing some one from fishing is difficult when the area is vast and the coastline is long. When the benefits can be obtained for free, it is natural for some one to refuse to conserve these common resources.

From the individual fisherman's viewpoint, fish that he does not catch will eventually be harvested by someone else. Hence, it is logical for him to catch as much fish as possible and maximize his profit rather than being a sucker (Kamaruzaman, 1997). If all fishermen think on the same lines, the total fishing effort will grow and exceed the Maximum Sustainable Yield (MSY) threshold. Thus, the fishery resource will be eventually depleted. Hence, the challenge for fisheries managers is to motivate individual fishermen to protect their jointly owned fishery resources.

However, the benefits of fishery resources are "rivalrous" in the sense that the catch by one fisherman will reduce the quantity of fish available to others at that particular time. Fish resources are limited and renewable and subject to overfishing. This problem may occur when the exploitation rate substantially exceeds the rate of biological replenishment. When overfishing occurs, the catch rate will decline but the cost of fishing will increase. Hence, to increase or to maintain fishing productivity and profitability, all fishermen must work collectively and refrain from overusing these resources.

To refrain from overfishing means to forego the current benefits of using these resources so as to sustain future benefits. This is the cost of using the fishery resource as an input in the capture fishery production process. Hence, anybody who carries out fishing must incur this cost so that the threat of overfishing can be prevented. Clearly, there is a strong interconnection between the biological and human aspects in the fishery. Thus, an effective fisheries management scheme must not neglect the management of stakeholders, especially the fishermen. O'Riordan says in this context (1971): "...resource management is a human problem involving values, preferences and aspirations, whose details are sculptured by human behaviour and action".

The fisherman's influence on the quality of fishery resources depends on two things: the damage he does and the effort devoted to undoing (or restricting) that damage. If fishermen are unwilling to restrict their individual fishing effort, fishery resources will eventually be destroyed. However, if only a fraction

of the fishing population is willing to restrict the fishing effort, the problem of overfishing will still occur. This is because the individual action to reduce fishing effort is miniscule in relation to the overall reduction that is needed to secure healthy fishery resources. Hence, a collective effort by all fisher-men is needed to overcome the problem of overfishing. The approach of community-based fisheries management (CBFM) is thought to be relevant in achieving sustainable fisheries development.

The CBFM approach is designed to encourage stakeholder participation in managing the fisheries, in co-operation with the government. The latter will function as a facilitator in bridging any gaps that the stakeholders fail to resolve. Hence, the essence of CBFM is to promote smart partnerships between all parties concerned with fisheries management. This will lead to greater co-operation between stakeholders, strengthen management efficiency and reduce the government's burden in managing the fishery because the cost of management will be shared with other stakeholders.

2. Fisheries Industry's contribution

The fisheries industry plays an important role in the national economy and contributes significantly towards providing animal protein food, employment opportunities and foreign exchange income. Fish constitutes about 60 per cent of the national animal protein intake, with an annual per capita consumption of about 39.5 kg (Malaysia, 1985). The demand for fish is expected to increase from an annual consumption of 630,000 metric tons in 1995 to about 1,600,000 metric tons by the year 2010. In 1996, the total fish production was estimated at 1,240,000 metric tons valued at about RM 3.80 billion (Malaysia, 1997). It accounted for about 1.6 per cent of the Gross Domestic Product (GDP). The fisheries industry employed about 1.3 per cent of the country's total effective labour force.

3. Current Fisheries Management Measures

The fisheries industry in Malaysia has bright potential in view of the availability of natural resources. In line with the national Vision 2020, the fisheries industry will be developed into a modern, efficient and highly commercial industry on a sustainable basis. Hence, the development and management objective of the fishery is to increase the social benefits which, in the long-term, must include conservation (Royce, 1987). In order to achieve these objectives, the Government of Malaysia (GOM) has formulated a number of management measures which have been implemented through its legal and institutional framework.

The Fisheries Act, 1963, was the first comprehensive legal framework to manage the fisheries industry in Malaysia. This Act was formulated to integrate and strengthen all management measures related to marine and inland fisheries; to protect the natural aquatic resources; to protect the interest of fishermen as well as other stakeholders; to ensure a more equitable allocation of resources; and to back administrative activities to reduce conflicts among the fishing communities. As the industry grew and developed, more and more new activities which were not covered by the Act needed to be controlled and managed. Hence, the Act was subsequently repealed and replaced by the Fisheries Act, 1985.

Malaysia has always enforced a licensing system to implement the principle of limited entry into fisheries. Anybody who wants to carry out fishing is required by law to have a fishing licence. Hence, a fishing licence is a right to fish. Fishing without a valid licence is an offence under the Fisheries Act. This licensing system has created a well recognized group of people who share a common interest in fishery resources.

Several terms and conditions are attached to a fishing licence. These stipulate how, when and where a fishing activity can be carried out. All the measures aim to control the expansion of aggregate fishing effort in the fisheries. However, the effectiveness of these management measures depends on acceptance by the stakeholders and support from them – especially the fishermen. In the absence of such support, any management measure is doomed to fail because fishermen are ingenious and are able to circumvent most management measures (Anderson, 1986). This will make monitoring and enforcement ineffective or very costly.

4. Search for an Alternative Management Approach

Many scholars have argued that fishery resources will be over-exploited in an open-access scenario (Gordon, 1954; Scott, 1955). Hence, some form of fisheries management must be put into place. In Malaysia, as in other countries, central government management of the fisheries industry is seen as the means to achieve socially desirable results. However, there has been increasing concern about the escalating cost of fisheries management over the years, especially costs relating to fisheries enforcement. For example, the percentage of enforcement expenditure to total fisheries development expenditure in the Third Malaysian Plan was about 5 per cent. However this percentage has increased to about 22 and 24 per cent respectively in the Sixth and the Seventh Malaysian Plans.

The increasing cost of fisheries management made the government search for an effective and cost-saving management approach. Further, the Malaysian government is undertaking to restructure government agencies and make them more efficient and cost-effective. The possibility of improving the effectiveness of monitoring and enforcement activities by increasing personnel is also limited.

In order to manage the fishery industry effectively, fisheries managers require complete information about fisheries biological parameters as well as the characteristics and the behaviour of fishermen. It is impossible for the government to gather such vast and varied information because information-gathering activities are both costly and time-consuming. Without complete information, however, the fisheries managers will not be able to take correct management decisions. Hence, a new approach to information gathering on a cost-sharing basis between the government and the fishermen needs to be found.

One way to obtain more complete information is to tap the wealth of information available locally within a fishing community. Blending this local information with scientific data will make management measures more meaningful and easier to implement. Hence, community-based fishery management holds the answers to current management issues. It offers an alternative for better fisheries management.

5. Community-Based Fishery Management: Some Experiences

The Government of Malaysia is keen to implement CBFM on the basis of the experiences and the successful implementation of CBFM in countries like Japan as well as some other fisheries in Turkey, Pacific Islands, Newfoundlands etc. However, the structure and the method of implementation of the CBFM that Malaysia may introduce might be different because the underlying parameters as well as the socio-economic factors of Malaysian fisheries are different and unique. Hence, a different approach to implementation is needed to ensure its success.

In Malaysia, some form of co-operation or sharing of responsibilities between stakeholders of fisheries already prevails in some localities. For example, smart partnership relationships have existed between

fisheries stakeholders in Kukup, a small fishing village in Johor, for more than a decade. The various stakeholders basically agreed among themselves to compartmentalize their limited available fishing area. Fish farmers are allowed to keep their floating cages in the Kukup Straits. Bag net fishermen will continue to fish in their traditional fishing area between the northern Kukup Straits and Sungai Penerok, while trawlers and other fishermen are required to fish in other agreed areas as stipulated in the fishing licence.

On the basis of their **mutual** agreements, the government only needs to endorse and legalize these agreements and enforce them. It is found that all stakeholders live in harmony and work closely with one another. All parties have a strong interest to guard and protect their common fishing ground, especially from the intrusion of trawlers from other areas. It is found that fishing conflicts on fishing grounds in this area are minimal. If any arises, the stakeholders will resolve the conflict by themselves through negotiations. As a result, minimal enforcement activity is required to manage this fishery. This is because all stakeholders have arrived at a common understanding to protect the common fishing area,

As they often work together, this situation has promoted networks among the stakeholders. This leads to economic co-operation for mutual benefit. For example, trash fish caught by the trawlers was sold to fish farmers to feed fish in the floating cages. This gives trawlers assured buyers for trash fish; the fish farmers on the other hand get a quality feed locally at low cost.

It is also found that the rate of compliance with government rules and regulations is high. This is because these rules have already been agreed to by all parties concerned. They have understood the potential benefit of complying with these rules and regulations. For example, they know they have to co-operate to restrict their activities so as to prevent resource depletion. As a result, the number of floating cages and bag-net operators has remained almost constant for more than a decade. The trend of bag-net landings indicates that the shrimp resources have been harvested on a sustainable basis.

The smart partnership in the Kukup fisheries is sustained because all stakeholders in the fishery are able to work together. Through their local community committee, they are able to sit together to discuss common problems faced in the community. All stakeholders are invited to give their opinion. The role of government is to lead discussions and provide technical information as well. At the end of a series of discussions, an agreement is arrived at. Sometimes, these agreements are re-enforced by the legal system. The concept of smart partnership, such as in Kukup fisheries, has several advantages and can be implemented. It reduces management cost on the part of the government, minimizes fishing conflicts, and promotes sustainable fisheries development and management.

6. Pre-Requisites for Community-Based Fishery Management

CBFM is designed to manage both the fishery resources and the fishermen. This is because there is a direct relationship between the resource condition and what the fishermen do. If the fishermen fish excessively, fishery resources will eventually be depleted. Hence, to manage the fishermen effectively, Clowson (1972) pointed out "If people are to be managed or at least influenced in their direct use of natural resources, then resource managers will have to know much more about people, their motivation, their sensitivities and their responses to various stimuli".

Several pre-requisites must be fulfilled to implement community-based fisheries management. These are:

- (i) *It requires a clear, defined fishery boundary.*

Without a clear defined boundary, people do not know to what extent the fishery is to be managed and for whom. The boundary can be in the form of:

- ¹ Definite location or area;
- ¹ Type and number of stakeholders; and
- ¹ Type of fisheries and fisheries resources to be managed.

Under the current fisheries licensing system, nobody is allowed to fish without a valid fishing licence. There are several conditions attached to the fishing licence. One of the conditions relates to the fishing area. Fishermen from one district or state are allowed to fish only in their respective zone in the territorial waters of that particular district or state. Fishermen from other districts or states are prohibited from fishing in this area. This condition gives a certain group of people the ownership title to a fishing area. As a result, members of the group can expect that the benefits of protecting their fishing area will accrue to them, hence promote sustainable collective action among members. However, the existing boundary is rather limited. It can be broadened to cover other stakeholders.

(ii) *It must have an effective local institutional set-up.*

This institutional set-up is required to promote greater participation among various stakeholders. This body can be a local or government-sponsored association, but it must be able to promote, coordinate and harmonize its members' perceptions and goals. In order to achieve this objective, it requires an influential and effective leader with clear vision, backed by full grassroots support.

(iii) *It requires an effective information gathering mechanism*

Fisheries managers require full and complete information in order to manage the fishery on a sustainable basis. The necessary information, however, is usually in the form of bits and pieces. It becomes expensive and time-consuming to gather this information. Hence, an effective mechanism is needed to collect all necessary information, especially data. Furthermore, this mechanism must be able to disseminate information to stakeholders so that all stakeholders can access or obtain the same information. This will enhance co-operation among the stakeholders and promote a smart partnership.

(iv) *It requires some form of control mechanism to reward or punish*

A control mechanism is needed to ensure a long-lasting partnership between all stakeholders in the fishery. Without an effective reward and punishment mechanism, it is expected that some members in the group will try to maximize private benefits and may jeopardize community activities. A reward and punishment mechanism will prevent or minimize the probability of "individualistic" activities, and promote collective effort by the members (Kamaruzaman, 1997).

7. **The Community-Based Fisheries Management Plan**

CBFM is implemented in phases or stages as follows:

(i) *The promotional stage*

This phase focuses on information-gathering about CBFM. The strengths and weaknesses of CBFM are analyzed, so are current fisheries management practices. On the basis of the analysis, CBFM concepts

are identified. The information is then disseminated to relevant government officials, especially the fisheries officials at all levels. Later, various seminars and forums are conducted to enhance the understanding of the CBFM among stakeholders and to explain their individual roles in the implementation of the CBFM. Malaysia is currently at this stage.

(ii) *The Implementation Stages*

During the implementation stages, several activities have to be carried out. First, the government has to identify the development programmes that could promote collective activities by all or a majority of the stakeholders. This is important, because success in CBFM depends on getting the stakeholders to work together, thus creating a sense of co-ownership to that programme or project.

Some examples of CBFM development projects are (i) the community fish aggregating device (CFAD) (ii) the public stocking activities (iii) the artificial reefs (iv) the community freshwater cage farming, and many others. The above projects can be easily carried out on a community basis as their benefits go to everybody in that community.

For example, the development of the CFAD will directly benefit the fish purse-seiners, hook and line fishermen and other traditional fishermen. As these groups of fishermen will reap the benefits, it would be wise to organize them to work collectively in building the CFAD. The government could introduce a modern type of CFAD, using strong artificial material, to replace conventional FAD made from coconut leaves which cannot last very long. In this way the government would be promoting modern fishing technology, and at the same time encouraging co-operative work within the fishing community.

In order to implement this project, the government needs to identify the potential recipients as well as their locations. This second step of implementation is vital in order to ensure the success of the project. Without identifying the site and recipient, it is difficult to organize collective or community work. This is because who works with whom will determine whom the project will benefit. It is desirable that the site and type of fishery to be selected have some similar features so that stakeholders will find it easy to co-operate and arrive at a common decision.

The next step is to encourage and convince target groups to participate collectively in the CBFM project. Government officials would have to explain the advantages of the CFAD and demonstrate to the purse-seiners, hook and line fishermen and other traditional fishermen the benefits they would derive in terms of dollars and cents. If they are convinced, they will take up the project, but the government officials must persuade them to work collectively. The cost of the project could be shared by the fishermen. To ensure smooth implementation, the government officials should act as facilitators and coordinate the implementation of this project. In order to gain the complete respect of fishermen, the government should provide all necessary information as well as extend some financial assistance to the project. This financial assistance can be sourced from the R&D and extension programmes. The same approach applies to the other projects.

When the CBFM projects have been implemented throughout the country and have been widely accepted, the government will formally adopt them as the national fishery management approach. During the process of implementation, the government will have to monitor and supervise activities closely from the standpoint of national interest. At the same time, the government will take all necessary measures, especially legal measures, to conform to the needs of CBFM.

8. Conclusions

Community-based fisheries management has several advantages and may be used as an alternative to the conventional centralized fisheries management system. The CBFM allows all stakeholders greater participation in the decision-making process, hence it creates a more transparent management system. It will also enhance compliance, because the stakeholders will harbour a feeling of "ownership" concerning all decisions. In other words, all stakeholders will be able to internalize the external cost of using the common fishery resources. A more effective fisheries management will result, as all stakeholders will voluntarily comply with rules that they had themselves agreed to. At the same time, the government's burden in managing the industry will be reduced.

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*Country Paper: Indonesia***14. COMMUNITY-BASED FISHERIES MANAGEMENT
IN EASTERN INDONESIA**

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Background

Community-Based Fisheries Management (CBFM) may be viewed as a process by which fishers are given the opportunity and responsibility to manage their own resources; define their needs, goals, and aspirations, and take decisions affecting their well-being. CBFM strives for more active fishers' participation in the planning and implementation of fisheries management. (Pomeroy, 1994). The potential advantages of CBFM include effectiveness and equity.

CBFM can be more economical from the standpoint of administration and enforcement than a national centralized system. CBFM involves self-management: the community takes over responsibility for monitoring and enforcement. CBFM gives the community a feeling of ownership over the resource, which makes the community far more responsible for long-term sustainability of resources. Hence, community participation and fisheries management are central to CBFM.

Fisheries management is now the focus of much attention, because it is realized that fisheries resources are over-exploited and that demand from a growing population is on the rise. Fisheries management has various objectives (Panayotou, 1982). In Indonesia, the objectives are to increase fish production and consumption, obtain a positive trade balance, and increase the incomes of fishers. Management of fisheries resources includes conservation of the coastal environment and implementation of fishing strategies that will guarantee long-term utilization of fisheries resources. Thus, the aim of management is rational use of fisheries resources.

The overall responsibility for fisheries resource management in Indonesia is under the central government. The Outline of State Policy (GBHN) says that marine resources are managed and utilized by considering environmental functions and sustainability, so that the resources benefit all citizens and increase their well-being. It is also said that people's awareness of the importance of the natural environment needs to be cultivated through extension, formal and informal education, reward and punishment systems, and promoting people's participation to conserve natural resources in all social and economic activities.

The Directorate-General of Fisheries (DGF) of the Ministry of Agriculture (MOA) is the coordinating institution for management of fisheries resources. In the provincial and regencial levels, the task of fisheries resources management is partly executed by the Provincial Fisheries Service (PFS) and the Regencial Fisheries Service (RFS) respectively. But licensing is done by the DGF for all large vessels (more than 30 GT), even if they are based in a province. The task of PFS and RFS mostly concerns small-scale or artisanal fisheries. So the management of deep-sea and EEZ fisheries is looked after by the DGF, while the management of inshore waters and coastal fisheries is mostly the concern of PFS and RFS. Management in this case refers only to control on the issue of fishing licenses.

The need for people's participation in natural resource management as an aspect of the development process is also clearly stated in the GBHN. The closing chapter of the GBHN points out that national

development greatly depends on the active participation, commitment and enthusiasm of all society. Participation of the societies may be individual or collective. Fishers, as citizens who directly rely on the marine environment **and** resources for their living, should therefore participate in fisheries resource management as entrusted by the GBHN.

This study is about the participation of fishers or coastal residents in marine fisheries resource management. The area of coverage is the eastern part of Indonesia, since this region is dominated by islands. Many coastal communities rely on fishing activities.

Purposes

The purposes of this study are manifold:

- 1) To identify studies of CBFM already undertaken that could help further fisheries management.
- 2) To inventory reports, papers, student theses, and journal articles of CBFM studies which are unpublished or published locally but have a limited circulation.
- 3) To evaluate impacts of CBFM to society based on available information.
- 4) To synthesize the main ideas of the articles to arrive at policy and research recommendations.

Types of CBFM by area

The eastern part of Indonesia consists of nine provinces: Irian Jaya, Maluku, North Sulawesi, Central Sulawesi, South Sulawesi, East Timor, East Nusa Tenggara, and West Nusa Tenggara. This paper, however, is confined to the provinces of Irian Jaya, Maluku, North Sulawesi, South Sulawesi, and East Nusa Tenggara since information is available only about these five provinces. It does not necessarily mean that the other provinces do not practise CBFM. Table I summarizes the type of CBFM by province.

CBFM practices concerning a particular area are found in Maluku, Irian Jaya, North Sulawesi and East Nusa Tenggara (Nikijuluw, 1995^a; Imron, et al 1993; Patji, 1996; Saad, 1994). The area is managed by village (Irian Jaya, Maluku), by clan (Irian Jaya), by tribe (East Nusa Tenggara) and by community (North Sulawesi). Management means that people have access rights to the area, extract benefits from it, protect the area and resource from other users, control future use through covenant, and transfer ownership.

Closing and opening of fishing or harvesting seasons is found to be part of CBFM rules in Maluku and North Sulawesi (Nikijuluw, 1995; Kissya, 1993; Wahyono et al. 1993). Other CBFM rules which exist in all areas relate to what types of fishing gears are allowed, the method of fishing, the schedule for using certain kinds of fishing gear, fishing targets, total amount of allowable catch, and origin of fishers. In addition to rules on capture of resources, CBFM also contains rules on violation, penalty (punishment) and reward. Distribution of the catch or harvest is also a part of CBFM rules.

Specific area closure at particular times is a rule observed in Demta District, Jayapura, Irian Jaya. This CBFM is designed to protect coral fish which can be caught only on special occasions such as church ceremonies and cultural festivals (Imron, et al 1993). The catching of tude fish (*Selar umenothalmus*) in Sangihe Talud, North Sulawesi, is scheduled on every Monday, Wednesday and Saturday. Tude fish fishing grounds can be beyond CBFM area boundaries. In this case, fish found outside CBFM areas are driven into the CBFM area or close to the beach, where they are easily captured (Wahyono, et al. 1994).

Table 1. CBFM Types by Five Provinces in Eastern Indonesia

PROVINCE	REGENCY	CBFM	DOCUMENTS
Irian Jaya	Biak-Numfor Jayapura	CBFM managed by village CBFM managed by clan Closed Gshing season Co-management to issue fishing licenses	Nikijuluw, 1995 Imron and Ali. 1994 Imron. et al. 1993
Maluku	Central, North Southcast Maluku and Ambon Municipality	CBFM managed by village. Co-management to legalize local rules	Nikijuluw. 1994. 1995 Lokollo. 1988 Kissya. 1993 Rahail. 1993 Letelay 1993
North Sulawesi	Sangihe Talaud	CBFM managed by village community. Rules in catching "tude fish". Fishing schedule hy type of gears.	Wahyono. et al. 1993 Wahyono et al.. 1994
South Sulawesi	Bulukumba Sinjai. Polmas Pangkep, Mamuju Jeneponto, Maros, Selayar	Management of waters around rumpon Co-management between NGO and villagers. Consultations of fishers with traditional leaders.	Sand. 1994 Dja ali. 1996 Laude. 1996
East Nusa Tenggara	Alor	CBFM managed by tribe	Patji, 1996 PMB-LIPI, 1995

Collaborative fisheries management (co-management) between government and fisheries or villages was found in Maluku and Jayapura. In Latuhalat village of Ambon Municipality, the Ambon Mayor stipulated (through decree No Kep. 188.45.1322/KMA dated 23 April 1990) that he would protect the village-based rules. These rules relate to fishing permits and licenses in village territorial waters and are set out in writing. The boundaries of village territorial waters were stipulated on the Village Decree No. 3/1 990 (Masyuri, 1995).

In Jayapura, Irian Jaya, fishing licenses are issued to big enterprises by the Provincial or District Fisheries Service only after permission is obtained from the local community. Those who want fishing permits first go to community leaders (*Ondoafi* and *Dewan Adat*) to ask for a license. If these leaders agree, the enterprises concerned may seek a formal license from the Fisheries Service (Imron, et al 1993; Imron and Ali, 1994). In other words, the Fisheries Services does not issue a fishing license without a recommendation from the local community.

Collaboration between Non-Governmental Organizations (NGOs) and local fishers exists in several districts on the mainland of South Sulawesi. An NGO named institute for Maritime Assessment and Development (BPPK) has set up programs of fisheries management. The programs include improving

fisher awareness of marine environment conservation through ecologically friendly activities such as marine aquaculture (Dja'ali, 1996). Another NGO, the Center for Rural, Coastal and Society Studies (LP3M), works with local residents of Taka Bone Rata Atolls in Selayar Island of South Sulawesi. The main program of LP3M is to spread information on the importance and status of marine parks, introduce endangered and protected species to the people, and make written and unwritten reports to the police if they find illegal and destructive practices (Laude, 1996).

CBFM Organization

Organization of CBFM in eastern Indonesia is basically vested in traditional authority, whose nature varies according to social organization. CBFM bodies that have been set up recently do not depend so much on traditional authority.

Sasi as a type of CBFM existed throughout the province of Maluku. It is organized by traditional secular leaders. *Sasi* may be defined as a family of customary practices and laws (or rules) which establish limits on access to individually or collectively controlled territory or resources. To place sasi on an area means to put into effect a limited prohibition on entry and behavior within that area (Lokollo, 1988).

The head of the village is normally the leader of the sasi organization. In implementing and enforcing sasi rules, he is assisted by *kewang* (traditional rural police) corps whose members represent village clans. Although enforcement of this CBFM is the responsibility of *kewang*, in practice villagers are also involved, as they always report any violations of the system to the *kewang*.

Aside from this village-managed *sasi*, there is also a *sasi* system organized by church during a certain period of the year (Lokollo, 1988). The church-managed *sasi* is led by church leaders. This system does not lend itself to field control and surveillance. Also, it does not have a system of penalties for violations. Nevertheless, implementation of the church-managed *sasi* seems to be very effective (Nikijuluw, 1995^a).

Organization of CBFM in Irian Jaya, North Sulawesi and East Nusa Tenggara is headed by traditional secular and church leaders. The *Dewan Adat* (customary council) consisting of the head of clan, formal leaders, and church leaders, formulates and implements CBFM rights and rules in Irian Jaya (Imron et al. 1993). In North Sulawesi, the head of the village under the auspices of the village council determines CBFM rules and rights. Implementation of the rules and rights in the field is undertaken by experienced fishers (Wahyono, 1994). In East Nusa Tenggara, CBFM was once headed by the dominant clan. This system has now vanished because of several factors-migrants who did not understand the systems and therefore tended to violate them, land-based economic development on account of which people did not pay much attention to the sea, and lack of support from the village government (Patji, 1996).

Organization of the CBFM in South Sulawesi is headed by NGOs, which initiated the establishment of the CBFM. CBFM here is based on written rules and rights formulated together by NGOs and villagers. Enforcement of rules is undertaken by villagers themselves (Dja'ali, 1996; Laude, 1996). Another CBFM system in South Sulawesi is based on the rights of the owner of *rumpon* (fish aggregating device) to access and control the waters around the *rumpon*. All the villagers and fishers from surrounding places recognize this individual right (Saad, 1994).

CBFM Rules and Rights

Rules refer to prescriptions agreed on and enforced that require, forbid, or permit specific actions for more than a single individual (Schlager and Ostrom, 1993). Such rules specify fishing gears disallowed at a particular location and time.

The terms “rules” and “rights” are frequently used interchangeably in referring to utilization of fisheries resources. Basically, “rules” refer to the prescriptions that confer authority, while “rights” refer to particular actions that are authorized. “Rights” go with complementary duties. Thus, to possess a right implies that someone else has a commensurate duty to observe this right (Schlager and Ostrom, 1993). As regards fisheries resources, the most relevant operational-level property rights in utilizing coastal fisheries resources are “access” and “withdrawal” rights. They are defined as:

“Access”: The right to enter a defined physical property.

“Withdrawal”: The right to obtain the “products” of a resource (e.g. catch fish)

The collective-choice property rights include management, exclusion and alienation rights which are defined as follows:

“Management”: The right to regulate internal use patterns and transform the resource by making improvements.

“Exclusion”: The right to determine who will have an access right and how that right may be transferred.

“Alienation” The right to sell or lease either “management” or “exclusion rights” or both of them.

(i) CBFM Rights and Rules in Irian Jaya

In Teblasufa village, Jayapura, marine waters are divided from the standpoint of ownership into waters belonging to the village and free waters that are owned by everybody. The waters owned by the village are broken down into waters owned by clans. There are three clans in the village. Initially, the Serontouw clan was the only owner of the village territorial waters. The ownership rights of this clan were later shared with the other clans due to inter-clan marriage. Ownership of each clan is further subdivided into sub-clans. Currently, there are 10 sub-clans that own village territorial waters (Imron and Ali, 1994).

The people of Teblasufa have access and withdrawal rights but not collective-choice property rights. The management, exclusion and alienation rights are owned by the head of the clan (*ondoafi*). *Ondoafi* is the one that permits a particular fisher to fish even if the latter is not a member of clan or sub clan whose territorial waters are entered. The head of the village also has the right to issue permits to non-villagers to operate their fishing gears in village territorial waters. However, in such circumstances, the head of the village should consult with the three *ondoafi* in this village. The *ondoafi* can veto a decision of the village head.

Besides issuing fishing permits, the *ondoafi* also has the right to determine certain coral reef areas which should be closed for fishing at a particular period (Imron and Ali, 1994). This kind of CBFM is named *pele karang* (to put a fence over a coral reef area). The objective of this CBFM is to let fish grow

until they reach capture size. The rule related to this CBFM is that villagers are not allowed to enter this area during the closed season. The time of fishing is always connected with the need to finance a village program such as inauguration of the church, building public property, or celebrating a village festival. Hence, it can be said that villagers individually do not have a withdrawal right in this coral reef area.

Similar to Teblasufa village, the territorial waters of Endokisi Village, Jayapura, are also owned by clans. "Demena" is the biggest clan in terms of the clan territorial waters. It is the first clan that decided to stay by the sea and hence relied on the sea resources for its livelihood. The Demena clan was recognized as the first owner of the village territorial waters. Through intermarriage with other clans, however, the ownership of the village territorial waters is then shared by three other clans — "Mattiseray", "Nerokepoaw", and "Kereway". Therefore, the territorial waters of Endokisi village are currently owned by four clans (Imron, et al. 1993).

Each clan may catch fish in its own territorial waters. However, members of a particular clan may also catch fish in other clan-owned areas provided they use simple fishing gears such as hook, line and spear. Use of more modern fishing gears for commercial purposes is possible only through a permit from the *Dewan Adat*, a village council consisting of formal leaders, church leaders and heads of clans (ondoafi). In practice, the council should have first sought permission from members of the clan whose area it entered. Therefore, it can be said that clan members exercise the right of exclusion.

In implementing access and withdrawal rights, the villagers of Endokisi formulated rules concerning penalties for violators. The penalties currently applied include fine and warnings. Use of poison in fishing is strictly prohibited. Therefore, of the three collective-choice property rights, only the right of management is executed by villagers. The rights of exclusion and management are owned by *Ondofafi* and *Dewan Adat*.

(ii) CBFM Rights and Rules in Maluku

In coastal villages of Maluku, communities claim that they have access and withdrawal rights over the waters facing their village (*petuanang*). The system of local management of *petuanang* and the resource therein is called *sasi*. Villagers and their leaders together set the *sasi* rules. Basically, these rules have existed for decades. What exists now are modifications of rules made during the pre-colonial era. For instance, the amount of fines for certain violations was adjusted to present value. The rules include how, when, and where to harvest or collect the resources. In addition, there are also penalty systems for breaking the rules (Nirahua, et al, 199 1; Kissya, 1993; Lokollo, 1988).

Under the *sasi* system, most communities entertain both operational level property rights (rights of access and withdrawal) and collective-choice property rights (rights of management, exclusion, and alienation). The right of management is embodied in forms of common consent on the fishing time, the area opened to fishing, allowed and disallowed fishing gears and equipment, and allowable catch. There are also rules on environmental protection such as bans on coral head-taking. Execution of management rights is undertaken by village police named *kewang* whose members normally are representatives of each clan. *Kewang* has its own rules and organization (Lokollo, 1988). This institution may not be a part of the formal village government structure, but is controlled by villagers and customary leaders. The village head is usually appointed or chosen from informal leaders.

The right of exclusion is entertained while deciding on permits to non-villagers to enter *petuanang*. In some villages, outsiders may fish in *petuanang* or enter the *sasi* area without a permit if they fish for

home consumption and use the same fishing gears that villagers use. But the outsiders need a permit if they catch fish using commercial fishing gears. During the last 10 years, outsiders with permits to enter and fish in *petuanang* or *sasi* areas came from other provinces of Indonesia, especially from East Java and South Sulawesi (Nikijuluw, 1995^a.)

Decisions on issuing fishing permits to outsiders are made at community meetings. But nowadays, decisions on fishing rights have been taken over by the formal village government. It passes formal village rules on the subject. In other words, community consultation is left out (Nikijuluw, 1995^a, 1995^b)

There is also a tendency to transfer collective-choice property rights from villagers and village government to church organizations -especially in Christian villages. In this case, the church, through its pastors, elders, and deacons, is the body that stipulates rules for harvesting or exploiting resources. In this church-organized *sasi*, there is no *kewang* patrol. Nevertheless, this *sasi* system seems to be very efficient since there are no violations. A percentage of the harvests or fish landings of villagers must be given to the church organization. Normally, the money is used for church construction and renovation (Lokollo, 1988; Nikijuluw, 1995^a)

(iii) CBFM Rights and Rules in North Sulawesi

Bebalang village is located at Manganitu, Sangihe Talud. Residents of this village have access to certain fishing grounds near their place to catch *malalugis* fish. The rule for capture of *malalugis* fish is that fishers should use bamboo traps, locally named *seke*. The *seke* is owned collectively by villagers. In 1991, there were two units of the *seke* in Bebalang. The first *seke* is owned by those staying in the first two hamlets. The second *seke* is owned by those in hamlet number three. Aside from the *seke*, other small-scale fishing gears such as hook and line were also employed by villagers, but not for catching *malalugis* fish. (Adhuri, 1993; Wahyono, et al, 1991).

The people of Bebalang manage waters where *malalugis* fish are found by carrying out regular monitoring and surveillance. Outsiders found in these waters are driven away. If the outsiders are found to have caught many fish, they are detained and tried. The villagers have exclusion and alienation rights. By common consent, they lay down rules that permit outsiders to fish. To obtain the right to fish, outsiders should pay a fee and restrict themselves to simple fishing gears.

The use of *seke* to catch *malalugis* fish is also practised in Para Village, Sangihe Talud. In this village, however, the *seke* competes with small purse seines to catch the same species. In 1992, there were six units of *seke* and 42 small purse seines in Para village. *Seke* is owned communally, while the small purse seines are owned by individual fishers. Since *seke* and small purse seines target the same fish, the location and time for operating these two fishing gears are regulated by the head of the village. Fishing grounds for the gears are set apart. The schedule for fishing is rotated and arranged so that every fisher has a chance to operate his gear in different fishing grounds. The head of the village has ruled that only four *seke* can be operated per day. Therefore, each *seke* can be operated four times a week or about 16 times a month. Eighteen fishing grounds have been designated for use by small purse seines, and there are 18 purse seines that can be operated every day. Since Sunday is an off day, every small purse seine can be operated an average of 10 times a month. This fishing schedule is very efficient and there is almost no trespassing. The village government levies penalties for violating rules. Each violator is fined 5-10 bags of cement, these are used for public infrastructure construction in the village. On the basis of this information, one may infer that although fishers have access and withdrawal rights, they do not have resource management rights (Wahyono, et al. 1993).

(iv) CBFM Rights and Rules in South Sulawesi.

In Bulukumba, South Sulawesi, CBFM is practised for exploiting fish resources in *rumpon*. Fishing rights around waters where *rumpon* is placed, belong to the owner of the *rumpon* (*parrompong*). The area covered by each *rumpon* is about 10,000 sq. meters. The fishing gear used by *parrompong* is a small purse-seine. Other fishers are allowed to fish in *rumpon* so long as they use hook and line. The right to use the waters around *rumpon* can be bequeathed, although the *rumpon* itself has been destroyed. In this case, fishers should know the location of the *rumpon*. If other fishers want to install another *rumpon* or use the existing one, they should ask for permits (without any payment) from the previous owner (Saad, 1994). Deployment of a new *rumpon* by a new owner automatically undermines the rights owned by the previous *rumpon* owner. Hence, the deployment of *rumpon* gives the owner rights of access and withdrawal.

Collaborations between NGOs and local communities in some districts of South Sulawesi have made areas for mariculture activities accessible. At the same time, fishing activities which normally employ destructive methods have ceased. The individual fisher's right to fish has been replaced by the right to use a particular area for marine fish cultivation. Together with NGOs, villagers developed a patrol system for control of marine resources and environment from destruction by outsiders. This situation has occurred because of the increasing awareness of villagers about the importance of marine resources and environment to sustain their life (Dja'ali, 1996; Laude, 1996).

(V) CBFM Rights and Rules in East Nusa Tenggara

In Alor Kecil, East Nusa Tenggara, people historically recognized that the waters facing their village were owned by the tribe of Manglolong. This is because the first fisher in Alor Kecil was from this tribe. Currently, however, fishers are from eight native tribes in this area. Besides, there are also fishers who come from other surrounding islands. For the success of the fishing operation, there was a rule that before fishing the fishers should consult the head of the Manglolong tribe. This tribal head was the one who decided where and when to fish. But at present, everybody can fish without seeking permission from the tribal head. Transfer and sharing of fishing rights from the Manglolong tribe to other tribes happened unconsciously. Nobody knows when all residents began to share the rights (Patji, 1996; PMB-LIPI, 1995).

Factors determining establishment, existence and devolution of CBFM

The following factors that affect the establishment, existence and devolution of CBFM have been identified:

(a) Belief

CBFM on *malulugis* fish in Bebalang village in North Sulawesi is still on, because villagers believe that the fish is the playmate of the Prince of the Sea (Prince of Adang). The fish should be captured carefully, so that its environment will not be destroyed. Villagers of Bebalang, therefore, use bamboo traps (*seke*) to catch the fish. As *seke* is a passive gear, the environment apparently will not be destroyed (Adhuri, 1993; Wahyono et al. 1991).

(b) Availability of Regulations

Regulations (written or unwritten) affect CBFM. Regulations do not allow outsiders to join the fishery (Nikijuluw, 1994, 1995; Imron, et al. 1993). Rules about fishing season and fishing area specify that fishers should fish at a particular time and place (Wahyono et al. 1993, 1994, Nikijuluw, 1994, Nirahua et al. 1991). In Irian Jaya, Maluku, South and North Sulawesi, only permitted outsiders can join the fishery. In Maluku, outsiders should buy a fishing license or pay the village a penalty depending on how much fish they have caught. (Norah et al 1991, Nikijuluw, 1995). A rule on allowable catch was found in Ternate, North Maluku. The amount of catch was determined before fishers went to sea. If the catch was more than that allowed, the fishers were penalized for the excess catch. The penalties, however, were not specified. (Nirahua, 1991). Monitoring, controlling, and surveillance (MCS) guarantee proper implementation of the rules.

Community MCS was found in Maluku, Irian Jaya, and North Sulawesi. The practice of penalties imposed on rule violations by custom and local judicial systems could be included as factors that affect the existence and continuity of CBFM.

(c) Fishing Gears

Generally, villagers in Maluku still use simple fishing gear to catch fish in CBFM-managed waters. These gears cannot harm resources and their environment. If outsiders are allowed to fish, they should use the same fishing gears that villagers do (Nikijuluw, 1995; Titahelu, 1996). This condition also prevails in Irian Jaya. If fishers from one clan want to fish in the waters owned by other clans, they must use the same fishing gears (Imron, et al. 1993, 1994) The use of ring net or purse seine made of nylon fibres in North Sulawesi affects the implementation of CBFM in the capture of *malalugis* fish. The presence of ring net, which is in fact more productive and owned by individual fishers, prompted traditional bamboo trap fishers to move away from fishing activity. Fish formerly caught with bamboo traps are currently also being exploited by ring net fishers.

The fishing schedule and zonation offishing ground were finally programmed in order to avoid possible gear use conflict (Adhuri, 1993, Wahyono et al, 1993, 1994).

(d) Industrial Fisheries and Intensive Fishing Operation

The expansion of industrial fisheries considerably affected CBFM, especially the *sasi* system in Ambon and Saparua islands. In Batumerah, a village near to Ambon City, *sasi* no longer prevails. The use of coconut leaves to indicate the end of the fishing season has disappeared during the past decade (Lokollo, 1988). Batumerah village is now an industrial fishing base in 4mbon.

Similarly, the operations of a joint venture fishing company using deep sea FAD in Maluku waters have affected the availability of fish in *sasi*-managed waters. As a result, the productivity of local fishers declined sharply. Eventually, fishers encroached on *susi*-managed waters to collect and catch sedentary species. Another impact was that the closed season regulation for some fish in *susi*-managed waters was shortened, to give villagers an alternative income (Andarmari, et al. 1991; Nikijuluw, 1995).

In Kei Kecil, Southeast Maluku, villagers leased their sea territory to outsiders to be used for pearl culture. Antariksa (1995) reported that the cost of leasing the territory in Debut Village was Rp 10 million for 20 years. In Teblasufa, Irian Jaya, intensive gear operation obscured the boundaries of

waters owned by clans and sub-clans (Imron, 1994). In Alor Kecil, East Nusa Tenggara, Patji (1996) found that industrial fishing companies owned by outsiders which employed villagers as boat crews has caused the local CBFM to disappear.

(e) Change of Government Structure

CBFM existed in coastal villages of North Maluku during the era of the Ternate Kingdom. Before going out for fishing, fishers got permission from the king of Ternate. After the proclamation of independence of the Republic of Indonesia, the Ternate Kingdom no longer existed. As a result, CBFM practices vanished in some villages (Lokollo, 1988).

The *sasi* system in Maluku was essentially a village government type of system. According to that system, the head of the village was not a government official. He was a formal leader but at the same time acted as a customary leader. The structure of village government was unique for each village, depending on the number of clans and the population. The village guard (*kewang*) was placed as one of the functional institutions in the village government system. In other words, the structure of the village government system enabled a *sasi* system (Lokollo, 1988). However, since Law No. 5/1974 on the Local Government was passed, all villages in Indonesia, including Maluku, had a standard government structure. By this law, a village head could be an outsider and he is not a customary leader. This caused *sasi* to disappear from some areas.

(f) Recognition and Initiative of Government

Recognition of CBFM by government often allowed CBFM to survive. In Lathalata village in Ambon, local CBFM rules were legitimized by the Ambon Mayor through decision no. Kep. 188.45.32/KMA of 23 April 1980 (Antariksa, et al 1983).

Nikijuluw (1995) says that each *sasi* regulation made by village government in Central Maluku should be legitimized by the Regent before its implementation. In South Sulawesi, a local NGO received strong support from the Indonesian Navy and provincial government to establish CBFM in coastal villages (Dja'ali, 1996).

(g) Impact of Trade and Prices on CBFM

In Bantean, North Sulawesi, CBFM was established for the collection of milk fish fry, because outsiders came to Bantean to fish, and the villagers realized that collection of fry was a lucrative enterprise. When the price of milk fish fry was low, the coming of outsiders to Bantean did not worry the villagers. But conflicts erupted between villagers and outsiders once the villagers realized that the fry commanded a good price. Finally, outsiders were banned from entry into the milk fish fry collection ground. Villagers then laid down rules for the use of fry-aggregating devices in fry collection (PMB-LIPI, 1995).

In Saparua island, trade strongly influences CBFM relating to sea cucumber and trochus resources. Increases in the price of sea cucumber and the presence of traders in the village shortened the closed season. Traders came from as far as Java to buy sea cucumber and offered higher prices. Result: over-exploitation of resources, reflected in the smaller sizes of sea cucumber harvested later (Nikijuluw, 1995). The high demand for sea cucumber in Java brought fishers from East Java to seek this commodity in *sasi*-managed areas. In some villages, the right to exploit this commodity was leased to East Java

fishers. Within a very short period, better equipment to harvest sea cucumber resources was introduced. Since the East Java fishers did not own the resource, they were not bothered about environmental and resource sustainability (Nikijuluw, 1995^b).

(h) **Structure of Society**

CBFM was easily established and survived in areas where villagers hailed from similar backgrounds. CBFM existed in many places of Maluku and Irian Jaya, because the social structure of the villages in these two provinces was uniform in terms of origin, religion and economic status. In Alor Kecil, East Nusa Tenggara, where CBFM vanished, the structure of society was dominated by non-native residents (Patji, 1996).

Impact of CBFM

Almost all literature has dealt with descriptions of CBFM rather than examples. Therefore, not much information could be obtained to analyze the impact of CBFM on society. But some qualitative information could be obtained and utilized.

In some villages of Maluku, CBFM gave villagers an opportunity to exploit fisheries resources for their domestic needs. But in some other villages, the lease of fishing rights to outsiders reduced such opportunities. The lease fee was normally supposed to be used by village government for public purposes. From the individual fisher's viewpoint, however, lease to outsiders meant loss of income, hence negative impact.

People in North Sulawesi perceived positive impact from CBFM implementation. The landings of *seke* were distributed proportionally to all villagers. This could be done because *seke* is collectively owned by villagers. From a sustainability viewpoint, the CBFM on the use of *seke* to catch *malalugis* fish did not harm the fish resource and therefore guaranteed continuity of resource utilization.

Villagers in Irian Jaya used very simple fishing gear to exploit CBFM-managed waters. The impact on villagers was very clear since each clan or sub-clan has its own territorial waters.

In South Sulawesi, the impact of CBFM on the villagers was reflected in higher incomes and lower pressure on the resources. After CBFM was initiated by an NGO, fishermen had one more option: marine aquaculture. Working days went up, so did incomes. Excessive fishing pressure was avoided.

Implications of CBFM

Literature collected for this review was confined to five provinces of Eastern Indonesia. The area covered in each province was also limited to a few villages or localities. Except for Maluku, information on CBFM for other provinces was difficult to find. There are two possible reasons why little information on CBFM was available. The first is that CBFM was not practised. The second is that although CBFM was practised, no studies or efforts documented the system. Priority should therefore be given to documenting and preparing an inventory of CBFM in all provinces.

The studies reviewed in this report were concerned with describing CBFM. As the first step of research, describing CBFM in each area is indeed very important. But since CBFM is now thought of as a panacea to compensate for failure in fisheries resource management, the impact of CBFM should be clearly

understood. Research should be directed at evaluating the impact of CBFM on stakeholders and society. It is also important to understand sustainability of the resources managed under CBFM.

Comparative studies should be undertaken of CBFM in different areas in order to find out the factors that determine each system. On the basis of this information, the transferability of CBFM could be established into areas where traditionally no CBFM are found, or into areas where CBFM once existed but later vanished.

CBFM is a local management approach. It is unique in the sense that the same system may not be found in other areas. At the national level, therefore, CBFM could be at odds with the national resource management policy. Hence, a nationwide study should be carried out to evaluate the appropriateness of the CBFM approach with the national policy, regulation, law enforcement, and judicial system. Finally, the impact of CBFM on fisheries sector development should also be evaluated, particularly as it relates to macro-economic issues such as investment, trade, and employment.

CBFM could be regarded as a stepping stone for the government to increase people's participation in resource management. Although people's participation in development of all sectors has been cited in the Outline of State Policy (GBHN), in reality people's participation does not fully exist.

Since development in eastern Indonesia is currently being promoted, CBFM in this part of the country may become a basis for people's participation in the overall development program. In other words, from management of resources, local people could broaden their participation to cover areas of economic and community development other than fisheries and coastal zone management.

This study found that CBFM systems may survive and function better if the systems could be tied with government. Local rules would be respected more if they were given formal status. Village-based rules need to be legitimized.

The most enduring and successful CBFM exists in villages whose social and cultural identity is well established. When this identity becomes unclear, for instance due to in-migration, CBFM tended to gradually vanish. On the basis of these findings, the government should be able to control resettlement programs which do not affect the identity of local people. Conversely, resettlement or regional development should enrich the local identity. In a similar manner, fisheries development, through provision of credit schemes or a revolving fund, should not radically change resource use patterns in fisheries.

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Country Paper: Indonesia

**15. FISHING AND RESOURCE MANAGEMENT PARTNERSHIPS
UNDERTAKEN BY PT USAHA MINA (PERSERO), INDONESIA**

by Soepanto and Victor P.H. Nikijuluw

1. Introduction

Pt Usaha Mina Persero is a government-owned company established in 1973, devoted mainly to tuna and skipjack fishing. Its operations include:

- fishing, aquaculture, fish processing and marketing
- dockyard services and workshops for boat and maintenance and repair
- cold storage and ice plants
- marketing of fishing inputs.

Usaha Mina has constantly reoriented its activities during the past 25 years to make the company more economically viable. It has made the following adjustments for better performance :

- Widening fishing grounds and operation bases, from Sorong to other parts of eastern Indonesia.
- Diversifying target fish from tuna and skipjack to high-value pelagic and demersal fish.
- Diversifying products from frozen to semi-processed and processed fish.
- Installing fish-aggregating devices (*rumpon*). The deployment of *rumpon* has become an entry point to involve small-scale fishers in the company's production line. It also creates a new system of **resource** accessibility.

The company's reorientation was a response to the new approach to resource management in Indonesia. Management of fish resources is a major objective of fisheries policy. What's important is not to catch more fish, but to obtain better returns. **There** are many ways of coming up with more returns, but sound resource management seems very important. Proper management of fish resources will ensure sustained and long-term returns.

This paper highlights efforts that have been launched by Usaha Mina, the biggest state-owned enterprise, to develop its business. How these efforts impact on small-scale fishers and on fish resources management is discussed in the paper, after a short account of Usaha Mina's partnerships.

2. Partnerships as a core business

The partnership relationship between P T Usaha Mina and small-scale fishers has developed from 1985. It started in Sorong at Irian Jaya, thence spread to other parts of Irian Jaya and covers some fishing bases in Maluku and Sulawesi. This successful partnership has replaced the main activity of Usaha Mina, which focused on fishing by using its own pole and line vessel and crews. The partnership allows Usaha Mina to buy fish from fishers who employ their own vessels and fishing gears.

2.1. Partnership Institute

The partnerships developed by Usaha Mina can be divided into four stages as follows:

1. The organisation of individual fishers into groups of fishers. Individual fishers with technical capability are guided by Usaha Mina. The fishers are encouraged to form a group to benefit from economies of scale and be ready for extension and guidance.
2. The application of a co-operative management approach in developing fisher groups. The fisher groups are helped to understand and apply the principle of co-operative management prior to establishing a fisheries co-operative.
3. The development of fisher groups into a fisher co-operative. By Indonesian law, a fisheries co-operative is more powerful than a fishers group. The co-operative has access to bank credit and other government aid programs.
4. Outstanding members of the co-operative may become private fishers with fishing assets and capital, and get guidance to set up their own fishing companies. These new companies can create a system to involve other small-scale fishers.

Apart from the above system, Usaha Mina also develops partnerships with fishery-related companies, such as those concerned with fish processing and dockyard services. These relationships are established to control fishery inputs. A specific relationship is established with each partner company, depending on its activities. In other words, the relationship is based on possible integration and co-operation.

2.2. Types of Partnership

Partnership is a kind of vertical integration to cover a company's forward and backward links. In the case of Usaha Mina, the partnership emphasizes fishing. The types of partnership developed by Usaha Mina are as follows :

a. Fishing Activity

The partnership between Usaha Mina and its partners is one of mutual benefit. The goal is to promote efficiency, reflected in the increased fish catches that can be procured by Usaha Mina. Partner fishers in turn make better profits, and are more certain about the feasibility and viability of their business.

To achieve benefits for both parties, they must work hand in hand. Usaha Mina bears all the operating costs and risks of the fisher's boats. The prices the company pays to fishers should cover the investment value of the fishing boat and equipment. This model is known as a smallholders nucleus system (PIR system).

To maintain this type of co-operation, all factors determining the success of the fishing operation should be under control, then shared between Usaha Mina and the fishers. These shared responsibilities are identified as success keys of fishing. The success keys for tuna and sipjack fishing are elaborated in Table 1.

b. Procurement of Boat and Other Input Factors

To facilitate growth and development in joint or collaborative fishing between the company and small-scale fishers, a link must be established with dockyard and shipbuilding companies. This kind of link is demanded also by the dockyard company as it wants to guarantee the marketing flow of its product. A three-party collaboration was established between P T Usaha Mina, fishers and the dockyard company.

Table 1. The “success keys” (shared responsibilities) for tuna and skipjack fishing under the smallholder nucleus system

SUCCESS KEYS	RESPONSIBILITIES		
	NUCLEUS FIRM PT USAIINA MINA	COOPERATIVE/ GROUP	PLASMA INDIVIDUAL FISHERS
1. Boat procurement	<ul style="list-style-type: none"> - Financial - Boat technology - Collaboration with dockyard firm 	<ul style="list-style-type: none"> - Some financial responsibilities - Fisher screening - Select receiver for boat credit 	<ul style="list-style-type: none"> - Skills - Boat management
2. Days of operation	<ul style="list-style-type: none"> - Infrastructure - Dock. workshop - Technician - License - Boat supplies - Boat insurance 	<ul style="list-style-type: none"> - Sailing license - Crew supplies - Crew insurance 	<ul style="list-style-type: none"> - Readiness of boat and crews - Discipline on boat
3. Boat Productivity	<ul style="list-style-type: none"> - Fishing ground - Fishing technique - Operational guidance - Carrier and processing vessels 	<ul style="list-style-type: none"> - Improve crew motivation - Maintain crew balance and composition - Ensure fishing co-operation 	<ul style="list-style-type: none"> - Find out the best fishing ground - Communicate for operational management
4. Production Value	<ul style="list-style-type: none"> - Market research - Quality management - Unlimited demand - Fixed procurement price 	<ul style="list-style-type: none"> - Determine selling price to the nucleus firm - Supply local markets 	<ul style="list-style-type: none"> - Proper fish handling - Selling all fish to nucleus
5. System establishment	<ul style="list-style-type: none"> - Management of the nucleus and plasma - Inter-institutional coordination - Development of the system 	<ul style="list-style-type: none"> - Apply co-operative management approach to fisher groups - Institutional development 	<ul style="list-style-type: none"> - Apply management concepts - Suggest improvement to management

This collaboration will help fishers own more boats and thereby expand their business. It will give Usaha Mina access to more fish and the chance to advise more fishers. Boats provided by the dockyard company are credited to fishers without collateral. Management of fishing activities, marketing of catch as well as fish quality control are the responsibility of Usaha Mina. Fishers pay the dockyard company in instalments for the boats. The amount of instalment depends on the amount of fish landed. Usaha Mina deducts the credit instalment directly from the value of fish landed.

This type of boat procurement is regarded as successful for the following reasons :

1. The moneys paid for the boat by the fisher to the dockyard company depend on the amount of catch, so the risks of catch fluctuation are shared between fishers, Usaha Mina and the dockyard company.

2. The dockyard company's direct involvement in fishing prompted the company to provide boats of good quality.
3. The credit provided by the dockyard company is without collateral and does not follow formal banking procedures. The credit is based merely on the reputation of individual fishers.

c. **Processing and Marketing**

Certain products such as fresh fish (sashimi) and certain other final products (fillet and surimi) have specific market segments. To ensure marketing certainty for these products, and in order to respond to market demand, a collaboration has been established between P T Usaha Mina, including fishers and fish buyers. For the fish buyers, this collaboration guarantees continued fish supply. This arrangement is actually a four-party collaboration that involves Usaha Mina, fish buyer and processor, dockyard company, and fisher plasma.

Partnership Realization

3.1. Institution

The partnerships established by Usaha Mina are presented in Table 2. Currently, at least 16 fisher groups and co-operatives are involved in the production line at Usaha Mina. The trend so far has been that every year, a new group or co-operative is established. Those who concentrate on fishing are not only individual fishers, groups or co-operatives but also private companies. This shows that Usaha Mina is doing a good job of guiding its partners.

Three of Usaha Mina's partners are active in dockyard services, while four partners are into fish processing and marketing. Usaha Mina's relationship with these seven companies shows that both forward and backward-linked activities are crucial. The partner companies are national and multinational firms, and help Usaha Mina develop national and international marketing channels.

3.2. Business Development

The development partnerships undertaken by Usaha Mina, reflected in the size of the fleet and the amount of sales and fish landings, are shown in Table 3. The partnership started in 1985. The roles of partners grow significantly in terms of sales, landings and fishing fleets. Once the partnerships were established, the landings of Usaha Mina fleets were about 10 times that of their partners. Only in 1987 did the reverse occur, when the landings of partner fleets were about twice the landings of Usaha Mina's own fleets. In 1996, the role of partners became about seven times higher than the role of the main company. Table 3 shows that sales increased tremendously from about RP 3 billion in 1985 to more than Rp 46 billion in 1996.

4. Business Policies

Usaha Mina's main objective is to grow by letting its partners grow. In other words, mutual growth is the basis for increasing the future role and performance of Usaha Mina. To arrive at this objective, the following policies are undertaken.

Table 2. Types of Business Collaboration Undertaken by Usaha Mina.

No	Partners of Usaha Mina	Historical Trend
1. 1.	Fishers Co-operative, Tumas Jaya. Sorong	Fishers group 1985, Co-operative 1992
1.2.	Fishers Co-operative, Tunas Jaya, Bacan	Fishers group 1987, Co-operative 1993
1.3.	Fishers group, Tunas Jaya, Gorontalo	1989
1.4.	Fishers group, Tunas Jaya, Luwuk	1990
1.5.	Fishers group, Tumas Jaya, Fakfak	1992
1.6.	Fishers group, Serenia, Bacan	1992
1.7.	Fishers group Laying, Bacan	1993
1.8.	Fishers group, Ganesko, Bacan	1995
1.9.	Fishers group, Tunas Jaya, Tual	1995
1.10.	Fishers group, Mina Bahari, Bacan	1996
1.11.	Fishers group, Tunas Jaya. Bone	1996
1.12.	Fishers group, Tunas Jaya, Kajang	1996
1.13.	CV Lippopuna, Bacan	1995
1.14.	CV. Safari, Bacan	1996
1.15.	PT Ramol, Sorong	1993
1.16.	PT Tirta Khatulistiwa Farming, Sorong	1996
	Dockyard Facilities	
2.1.	PT Karya Teknik Utama, Sorong	1991, Supply 30 boats of 40-70 GT
2.2.	PT Karya Cipta Buana Sentose, Bacan	1996, Supply of 60 FRP boats of 10 CT
2.3.	PT Mahkota, Gorontalo	1996, Supply 100 FRP boxes
	Processing and Marketing	
3.1.	Aizac Co. Ltd/Mina Maluku Inc, Japan	1993, Marketing of block sashimi, Bacan
3.2.	Trimarine Int Japan	1996, Tuna Processing (loins and CC)
3.3.	PT Dharma Samudera, Kendari.	1996, Demersal Fish Processing
3.4.	CV Ome, Sorong	1995, Arabushi Processing

Notes: FRP= Fiber Reinforced Plastic

4.1 Pricing Policy

Pricing policy refers to a mechanism to determine fish prices at the fishers level. Usaha Mina, together with fishers or other partners, determines fish price in a way that it satisfies everybody and meets the following conditions.

- Fisher income is higher than the daily regional minimum wage rate as stipulated by the government. Currently, the rate ranges from Rp 3,000 to Rp 5,000 per day, depending on location.
- Payment for the boat is done in instalments. It is complete when the boat has served two-thirds of its economic life. This means the fisher uses the boat for one-third of its economic life after it has been fully paid up.

Table 3. Development of Partnerships of PT Usaha Mina

Year	Business Development						
	Sales of Usaha Mina (Rp Million)	Fish Landing (ton)		Fleets			
		U.Mina	Partners	U. Mina (>30 GT)	Partners		
	Small (<3GT)				Middle (3-30GT)	Large (>30 CT)	
1985	3269	5 239	530	29	2	5	2
1986	4 110	4 100	1106	28	2	2	6
1987	5 972	2857	4 108	29	39	41	9
1988	11644	2495	8276	29	158	63	9
1989	13472	2297	9717	24	275	82	14
1990	22069	3769	13424	43	337	74	15
1991	22862	6408	11713	35	389	78	23
1992	24897	4053	13424	30	261	79	23
1993	30375	3527	14436	27	238	81	26
1994	33239	2163	11880	27	211	91	27
1995	37852	2702	13005	27	214	71	30
1996	46 150	2 153	15041	27	156	60	35

It is not easy to apply these policies, considering that landing fluctuates highly. To cope with these problems, Usaha Mina adapts five approaches to increase the value of the landings. These approaches are constant innovations in process, product, system of management, resources, and marketing.

4.2 Out-sourcing Policy

Usaha Mina works closely with individual fishers who form a co-operative. These are not artisanal fishers, as they may have the assets to go farther out for fishing than artisanal fishers, and may be knowledgeable in both business and fishery. As they fish in off-shore and EEZ waters, one may as well say that Usaha Mina expands activities to cover off-shore and EEZ fishing.

Expanded business covers a greater variety of products, particularly those with high value added and high international demand. Expansion is done to include forward and backward-linked activities, and similar businesses. To do this, huge capital and resources are required.

Considering that local capital is limited, Usaha Mina seeks to develop partnerships with other firms which could bring in capital. Usaha Mina has developed collaborations with some international companies which help in capital (investment) as well as in processing technology and marketing information. Besides, Usaha Mina has plans to go public by 2000 AD.

4. Co-Management of Resources

Co-management refers to the sharing of responsibilities between Usaha Mina and fishers in managing fisheries resources. It is carried out at the local level and covers the waters in which fishing activities are conducted. More specifically, co-management is applied in waters around *rzmpon* or areas still affected by the existence of *rumpon*.

Before the partnership began, individual fishers fished in all coastal waters, wherever they liked. Some fishers owned gears and others worked as boat crew. The gears and boats owned by many fishers were traditional in nature, being able to catch fish only in limited areas. In these circumstances, the catch was small and volatile because fishing was determined by season and boat capacity. The landings were generally sold locally. Because of limited local demand, fish price was low and consequently did not encourage fishers to produce more.

With the partnerships developed by Usaha Mina, all these shortcomings were overcome. The partnerships brought about a new business environment; Usaha Mina, as the nucleus firm, bought whatever was landed by the small fishers. Result: bigger fisher returns and better earnings. The evaluation done by Usaha Mina and government research institutes showed that fishers' income increased several times, leading to better social and economic conditions (Nikijuluw et al 1994).

The partnership gave fishers a chance to control the fishing ground. The waters around the deployed *rumpon* were meant to be used by fishers who are Usaha Mina's partners. Other fishers, particularly those using large-scale boats and gears, are not allowed to fish in the waters around the *rumpon*. Indeed it is not an easy task to patrol the *rumpon*. However, whenever fishers go out fishing, they can recognize whether those operating their boats in the *rumpon* are their fellows or other fishers. The deployment of the *rzmpon* creates a new approach to resource management which confers rights to access fish resources or leave them alone.

It is Usaha Mina's responsibility to bear all costs related to installation and repair of *rumpon*, while the fishers are expected to use, take care of and patrol the *rumpon*. Fishers get the benefit of efficient fishing operation as fuel cost declines and catch increases. Usaha Mina benefit through greater fish supply from the fishers.

The availability of *rumpon* makes fishers change their fishing strategy. Instead of sailing around to find fishing grounds, fishers direct their boat to the *rumpon*. In other words, the fishing ground is no longer anywhere in the deep blue sea, but at a specific place. Result: many areas where *rumpon* are absent, tend to be free from fishing activities. So while fishing intensity increases in the waters around *rumpon*, fishing effort in some other areas declines.

The placement of *rumpon* indeed affects the availability and sustainability of fish. If *rumpon* are placed in spawning or nursery areas, young and mature fish may be caught. Consequently, recruitment fails and fish stock declines. This is also the result when *rumpon* are placed in paths where fish migrate to spawn. To avoid such happenings, *rumpon* deployed by Usaha Mina are in waters which have no biological

consequences, except fishing itself. The exact location of *rumpon* is determined together with the Directorate General of Fisheries, and is based on scientific information.

5. Conclusion

Business collaborations developed by Usaha Mina include fishing activity in the form of a nucleus-plasma relationship supported by dockyard and other input supply companies, processing and marketing firms. This type of collaboration is known as an integrated nucleus-estate small holder relationship.

Partnerships developed by Usaha Mina have gone on for 12 years in various fishing villages of eastern Indonesia. They include a variety of activities with different types of management involvement on the part of Usaha Mina. All these relationships are essentially based on the core business competence of Usaha Mina. Control on “success key” factors applied by Usaha Mina determines the success of fisher activities. This type of relationship can be considered a model in developing co-operation between big and small enterprises.

As the activities of fishers develop, the fisher group should be changed to a fisher co-operative. This kind of institutional development is in line with people’s participation and the idea of government to empower the grassroots. However, to change a fisher group into a co-operative is not that easy, because a co-operative should have more than one type of activity, while a fisher group deals with fishing as the only activity. A fishers co-operative which only deals with fishing as a core business may develop and succeed, provided it extends its business to cover other (forward and backward) related activities.

The deployment of *rumpon* by Usaha Mina to be used by small-scale fishers creates co-management of fish resources. Under this local co-management arrangement, Usaha Mina is responsible for providing and maintaining *rumpon*, while fishers are responsible to utilize, take care of and patrol the *rumpon*. The creation of the *rumpon* helps reduce fishing effort in areas far from *rumpon*. Yet it increases fishing intensity and economic returns both for fishers and Usaha Mina. The creation of the *rumpon* gives fishers better access to resources, they don’t have to fish blindly everywhere. The use of *rumpon* makes fishers refrain from using destructive fishing gears and methods.

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Country Paper: Philippines**16. COMMUNITY-BASED FISHERIES MANAGEMENT IN
THE PHILIPPINES : AN OVERVIEW****by Annadel S. Cabanban***Borneo Marine Research Unit, Universiti Malaysia Sabah
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"I am a Filipino - inheritor of a glorious past, hostage to the uncertain future. As such I must prove equal to a twofold task - the task of meeting my responsibility to the past, and the task of performing my obligation to the future.

I am sprung from a hardy race. Across the centuries, the memory comes rushing back to me: of brown-skinned men putting out to sea in ships that were as frail as their hearts were stout. Over the sea, I see them come, borne upon the mighty swell of hope - hope in the free abundance of the new land that was to be their home and their children's forever

This is the land they sought and found Every inch of shore that their eyes first set upon, every hill and mountain that beckoned to them with a green and purple invitation, every mile of rolling plain that their view encompassed, every river and lake that promised a bountiful living and the fruitfulness of commerce is a hallowed spot to me.

By the strength of their hearts and hands, by every right of law, human and divine, this land and all the appurtenances thereof - the black and fertile soil, the seas and lakes and rivers teeming with fish, the forests with their inexhaustible wealth in wildlife and timber, the mountains with their bowels swollen with minerals - the whole of this rich and happy land has been, for centuries without number, the land of my fathers. The land I received in trust from them, and in trust will pass on to my children, and so on until the world is no more" - from I am A Filipino by Carlos P. Romulo

Introduction

The management of fisheries has shifted from the typical catch-and-effort analysis to include other biological and ecological aspects pertaining to the resources and the manner of exploitation by its users. Information related to growth, reproduction, recruitment and predation (causing natural mortality) is now desirable for a complete evaluation of the status of the fishery and the selection of an appropriate management strategy (Sale, 1982; Sainsbury, 1982). The ecological impacts of the fishing activities, both destructive and non-destructive, are now considered just as important in addition to the knowledge of fishing effort in the fishery (e.g., Koslow et al, 1988; Cabanban, in press). The manner of exploitation, specially with destructive and illegal fishing practices, has led to the realization that fisheries management needs the co-operation of the users (Alcala and Vande Vusse, 1994).

The involvement of the community in the conservation of the marine environment and the management of resources began in the 1970s (e.g., Alcala, 1981; Alcala, 1988; Cabanban and White, 1981). Community management of fisheries as a concept is discussed in Feeny (1994), Ostrom (1994), and Rerkes (1994) and the methods to carry it out are outlined in several papers (e.g., Pollnac, 1994; Kurien, 1994; Abdullah and Viswanathan, 1994; McArthur, 1994). This concept has spread throughout the

Philippines since the 1970s and the problems encountered, lessons learned, and successes gained are recorded in Ferrer (1996). The efforts over 1984- 1994 were then reviewed and evaluated by Pomeroy and Carton (1996). This paper draws on these papers and condenses information for this workshop.

Problems in Fisheries

Fisheries production in the Philippines saw declining catch trends in the last decade. With a growing population and rising demand for fishery products, the authorities faced the challenge of sustainable management while increasing production. The government for some time infused capital to expand fisheries ventures in off-shore areas despite the advice of experts that these areas were already overfished. Eventually, the authorities also realized the limitations of managing fisheries in distant areas with limited resources from a central office.

In addition, the problems of coastal fisheries in the Philippines are not only due to overfishing but to a variety of other factors : 1) destruction of critical habitats; 2) sedimentation; 3) over-exploitation; and 4) destructive fishing practices (Gomez, et. al, 1988;). A pragmatic and integrated approach is therefore needed to address this problem. The concept of community-based resources management (CBRM) was then adopted for nearshore fisheries management (Alcala and Vande Vusse, 1994)

Context and Relevant Actors

Economic and Political Situation

The Philippines economy recorded strong growth during the 1960s and the 1970s. But the increase in the prices of oil led to an economic slowdown during 1980s. Economic development was also hampered by political instability during the 1980s. In addition, population growth increased by 23 % per year, increasing the demand for fish. Despite a wide range of fishery rules, regulations, and laws, the sustainable management and development of fisheries was ineffective. The catches of fishermen declined.

The government soon realized that fisheries management should be decentralized – a switch from the earlier centralized, top-down, and non-participatory approach to management. Government policies changed from “use orientation” to “resource management” through community-based activities to rehabilitate, conserve, and protect natural resources. Fisheries management then borrowed experiences from the management of water and forest resources.

During the late 1970s, some university experts began to stress the importance of the people in nearshore fisheries management, particularly coral reef fisheries. Dr. Angel C. Alcala of Silliman University, Dumaguete City, Philippines, is credited for this initial step in CBRM at Apo Island, Central Visayas, Philippines (Cabanban and White, 1981). Subsequently, there was a marked increase in community-based efforts in the conservation of marine resources by NGOs throughout the country (Ferrer, 1996).

The government also provided the institutional mandate for CBRM. In 1989, the Aquino government created a Presidential Commission on Anti-illegal Fishing and Marine Conservation or the Bantay Dagat (Sea Watch) Committee. This Commission was tasked to increase coordination of all governmental agencies in the enforcement of fisheries laws and the participation of fishers in management. Furthermore, the Local Government Code was passed in 1991. Under this Code, the management of nearshore fisheries is the now responsibility of municipalities and local fishing communities. Municipalities and Local

Government Units **can** now join forces with NGOs to diversify fishery enterprises, grant fishery privileges in municipal waters, and impose rentals, fees, or charges. Embedded in the 1993- 1998 Medium-Term Philippine Development Plan (MTPDP) is a strategy to implement community-based fishery management for sustainable management of fisheries.

Organizations involved in Fisheries Management

Two agencies have mandates in the nearshore marine waters. The Bureau of Fisheries and Aquatic Resources (BFAR), under the Department of Agriculture, is responsible for fisheries management in the Philippines. BFAR has regional branches throughout the Philippines. The Department of Natural Resources is responsible for the quality of marine waters and has taken up the task of applying community-based resources management under the Coastal Environment Program.

Non-Governmental Organizations (NGOs) and People's Organizations (POs)

Many NGOs and POs take part in CBRM in the Philippines (Table 2). The apparent motives of these organizations are to alleviate poverty, improve living conditions, and conserve the resource base.

Involvement in Policy or Decision-making Processes

The NGOs and POs act as catalysts and technical advisors in the decision-making process. This can be seen in the various strategies that these organizations have employed.

Solutions and Approaches to Dealing with the Challenge

Community-based resources management was implemented in various ways in the Philippines. These include research and publications, resource assessment and monitoring, education and training, community organizations, development of alternative livelihoods, resource management implementation. The sequence of the steps may vary from one site to another but the first step commonly taken is resource assessment and monitoring.

Lessons Learned

The various lessons learned can be classified under design and implementation of CBRM, Programs and Projects and CBRM interventions

A. Considerations in Design and Implementation

1. *Planning and preparation*
A good plan is essential for the three phases of the CBRM because the concept is fairly new and involves people. The project preparation, implementation, and pull-out phases must have clear-cut and appropriate short-term and long-term objectives and goals. These require a good knowledge of the biophysical and social environment; it can be picked up from the community and from experts
2. *Involvement of communities*
Community involvement is important for the success of any intervention. It ensures 1) partnership between external agencies and the community; and 2) a sense of responsibility in resource

management (through equitable dialogue and partnerships). Social preparation in the form of education, training, leadership development and formation of management groups is necessary before any technical intervention. Formal groups are necessary to implement interventions, but it will be more effective if the communities have already organized themselves so that organization by external actors is no longer needed. Community participation and feedback are important aspects of community involvement.

3. *Funding*

To ensure the success of CBRM, sufficient, regular, and sustained funding for activities is essential. This is particularly necessary for long-term activities that require external funding before results can be visible (e.g., mariculture ventures).

4. *Government support*

Local government support, particularly to implement regulations, is needed for the success of community-based activities. Further, government support can help resolve inter-agency disputes.

5. *Inter-organization collaboration and co-management*

Since the problem being addressed is multi-faceted, support is needed at many levels : technical support from government, universities and research institutions; funds from international agencies; and NGO support for assistance in education, training, community organisation etc. All these players work closely with the community. This is the essence of co-management

6. *Project monitoring and evaluation*

When CBRM is launched, the progress of interventions and activities must be monitored. During monitoring, some quantitative criteria to gauge progress would be useful. It will also provide a basis for solving problems and facilitate feedback to the community.

7. *Project staffing*

Ideally, the team should be multidisciplinary – with biologists, economists, ecologists, social workers, anthropologists, and agriculturists. The project staff must be equipped not only with technical skills but also with “inter-personal” skills. The technical staff should have experience in fisheries management and resource management as well as an understanding of the activities of the other members of the team.

B. Design and Implementation of Interventions

1. *Community organization (CO)*

The success of community organization depends a lot on the expertise, experience, and inter-personal skills of the community organizers. It would help if the CO lives in the community itself so that he acquires an in-depth understanding of the dynamics and aspirations of the community.

Several problems are faced in community organization – ranging from limited leadership and incomplete understanding of goals to poor participation. The strategies to adopt are to allow self-evolution of community groups, assist in forming core groups, or develop groups through continuous dialogue.

2. *Alternative livelihood development and credit*

If the authorities decide to limit fishing effort by closing the fishery temporally or spatially (establishing marine reserves), they must give serious thought to the question of gainful employment of fishermen and their families. Alternative livelihood projects and credit support need to be organized with the community. The pre-requisites are an organized fishers group, knowledge of the socio-economic conditions of fishers, consultation with the community, and training of fishers and household members on income-generating activities.

3. *Education, training, skills, and development*

In community-based management, the level of understanding of the community on conservation and management of resources and other activities has to be increased and constantly sustained. The strategies that can be adopted in this connection are numerous – fishers as trainers; local villagers as agents (para teachers), site visits, technical back-stopping, training of participants, and community education. Through such strategies, information gathered on the resources can be fed back to the community.

4. *Habitat rehabilitation*

Destruction of the habitats that support fisheries may be caused either by thoughtless fishing practices or by other uses of the resource (e.g., clearing of mangrove forests for fish ponds or infrastructure or cutting of branches for firewood). To rehabilitate these areas, a strategy should be developed with the community and carried out with technical support from resource managers or scientists. Benefits from rehabilitation have to be monitored and the results fed back to the communities. The monitoring of the benefits (e.g., increase in numbers of species, individuals of plants and animals), is more beneficial if conducted by the community members with the assistance of a resource manager or scientist.

5. *Technologies for increased fish production*

Another strategy to reduce fishing effort is to engage fisherfolk in mariculture or aquaculture. Implementation of technologies for increased fish production must be done jointly by fishers and experts. The technology to be transferred in the venture should be simple, compatible with and appropriate for the community. The materials used should be local and readily available. It is important to select species that can provide visible short-term benefits from culture activities.

6. *Protected area management/marine sanctuaries*

Another strategy for conservation and management of marine resources is to establish protected areas. These areas are closed to fishing and are sometimes described as marine fisheries reserves or marine sanctuaries. Before encouraging a community to develop a marine protected area, a survey of the resources must be conducted using rapid resource assessment techniques. Plans for resource management and enforcement must be discussed and developed with the community. Parallel to this, there should be a continuous campaign for environmental education. It must involve all sectors of the community.

7. *Other lessons*

Participatory research helps build rapport and trust and develop a knowledge base in the community. This approach can be implemented in assessing and monitoring resources, also in resource management and planning.

Conclusion

Marine resources are no longer as abundant as they were during our forefathers' time. Management of coastal resources is an urgent need. The partnership between resource managers in government and scientists in universities with resource users is a strategy of smart partnership for nearshore fisheries management in the Philippines. It is hoped that with this partnership, coastal resources recover from over-exploitation, are managed sustainably, and conserved for the future.

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Country Paper: India**17. FISHERIES AND FISHERIES MANAGEMENT IN INDIA****by G D Chandrapal***Deputy Commissioner (Fisheries), Ministry of Agriculture**Government of India, New Delhi.*

General Trends in the Fishery Sector: India is the seventh largest producer of fish in the world and ranks second in the production of inland fish. Fish production has increased at a cumulative growth rate of 4.2% per annum since 1950-51; this represents the fastest growth of any item in the food sector except potatoes, eggs and poultry meat. As a powerful income and employment generator, fisheries stimulates the growth of a number of subsidiary industries. Various production-oriented, input supply and infrastructure development programmes, as well as a number of welfare measures, have been promoted by government. The main objective has been to increase production.

Background and Problems: Past development plans in fisheries aimed mainly at increasing production. Subsequently, the top priorities were improved socio-economic conditions of fishermen/fish farmers, higher productivity, and increased export of fish and marine products. The emphasis on 'production oriented' programmes was replaced by a focus on sustainability in production. This is because exploitation of coastal fishery resources had reached saturation point, leading to growing unemployment and social conflicts in artisanal fisheries. In the absence of resource management measures, rivers, lakes and other impounded waters started losing their fisheries wealth. Further, the construction of numerous dams and bunds altered the ecology of inland waters, obstructing fish migration and depleting aquatic life.

Coastal aquaculture, which was considered an alternative to higher fish production in bridging the gap between demand and supply, faces opposition from environmental activists as well as from some coastal communities. It is in this context that the concept of sustainable development of fisheries and of responsible fishing assumes significance, taking precedence over the goal of augmenting production. There is greater appreciation of the fact that the future of both marine fisheries and aquaculture depends on sound management of production and resource eco-systems.

India's share in the world production of fish has increased from 3.2% in 1981 to about 4.20% in 1992.

Share of fisheries in the country's economy: The share of fisheries in India's gross domestic product (GDP) has increased from 45,580 million rupees during 1990-91 to Rs. 115,540 million during 1995-96. According to quick estimates made by the Department of Statistics, the contribution of the fisheries sector to India's net domestic product at current prices has increased from Rs. 39,440 million in 1990-91 to Rs. 101,500 million in 1995-96 (i.e. from 0.93% to 1.16%). The percentage contribution of fisheries to the agriculture sector (net domestic production) has increased from 3.10% to 3.94% during this period.

Resources: India has a coastline of 8,041 km with a continental shelf area of 0.5 million sq.km. The Exclusive Economic Zone gives India jurisdiction over an area of 2.01 million sq.km. The estimated marine fisheries potential is 3.9 million tonnes. The resource position in aquaculture is as stated below:

	(Million ha).
1. Area under tanks and ponds	2.855
2. Area under reservoirs	2.050
3. Beels, oxbow lakes and derelict water bodies	0.788
4. Area under brackishwater	1.422

The resource potential in inland waters is estimated to be 4.5 million tonnes. At present only 1.481 million ha are under freshwater aquaculture and 0.121 million ha under brackishwater aquaculture (1995).

Fishing Population: The total fishing population in the country is about 9 million according to 1994 estimates. The break-up of employment in the fisheries sector is as follows:

	1994 <i>(in millions)</i>	1991 <i>(in millions)</i>
1. No of full- time fishermen (primary)	2.39	1.87
2. No of part-time fishermen	1.44	1.33
3. No of occasional fishermen	2.12	2.42
	<hr style="width: 50px; margin: 0 auto;"/>	<hr style="width: 50px; margin: 0 auto;"/>
	5.95	5.62
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Fishing Craft

According to the information received from States and Union Territories, the number of traditional fishing craft in the country as on 1994-95 was 19 million.

There are 0.32 million motorised traditional craft and about 0.47 million mechanised boats of varying sizes. The deep sea fishing fleet (i.e vessels is above 20 m OAL and above) is estimated to be around 120.

Sustainability in Fisheries

Sustainable development is a multi-faceted concept with biological, human and technological dimensions. The rate at which fish resources are harvested should be in harmony with the rate at which they multiply. From the human standpoint, it means that principles of equity and basic needs get a high priority. Technologically it implies using means that 'augment' rather than 'displace' human skills, and utilise renewable energy resources and methods that are environmentally appropriate and less destructive. From the organizational and employment standpoints, it is a policy of increased people's participation and decentralization of investment and planning.

Fish Production

Fish production increased from 2.80 million tonnes during 1984-85 to 5.22 million tonnes (2.87 million marine and 2.35 million inland) during 1996-97, registering an annual growth rate of 5.4 per cent by the traditional sector and 65% by the mechanised sector, the balance being by the deep sea sector.

Traditional System of Community-Based Management of Fisheries

The concept of community-based (people-centred) eco-system resource management in fisheries offers exciting possibilities. The resource users are also the resource managers, and management responsibilities and authority are shared with fisherfolk. This authority is normally vested with the Government, notwithstanding old customs and traditional systems of resource management by fisherfolk, which have been in vogue in different areas at different levels—although a clear picture of management systems is not available.

Small-scale fishing communities in East Godavari and Srikakulam districts of Northern Andhra Pradesh practised management by fixing territories for estuarine fishing. Estuarine and riverine fishing are controlled by hereditary village headmen with a village council to decide on the fishing rights to each family. The nature of the rights varies; in some villages, these rights are hereditary, in some others they are not. Every shareholder exercises his right within the defined tracts of rivers and estuaries. There is, however, no system to ensure equity among villagers. The practice of defining fishing rights with stake nets is reported in the Gangetic delta of West Bengal.

Community-based fisheries management was in vogue in Kerala state, where communities enjoyed extension access to inshore waters. The free entry of capital and outsiders into traditional fishing communities was prevented by such social barriers as caste and the requirement of specific fishing skills. Similarly, lagoon fisheries for prawn and mullet in Tamil Nadu are regulated by community-based traditional management systems based on caste and gender. Among the marine beach seine fishermen of Tamil Nadu and the lagoon fishermen of Pulicat lake, a traditional system of rotating access to a fishery is practised — whereby eligible fishing groups take turns at fishing activities on allotted fishing grounds, with varying fishing rights between different gears.

Drawback of the System

This system, however, gave way to another because demographic pressure led to division of fishing grounds, more crew and higher fishing intensity. Village councils could not contemplate any control or conservation measures to prevent overfishing. Further pressure on the system was caused by the subsequent intrusion of outsiders. Consequent to the growth of the shrimp export market, what was once the exclusive preserve of traditional fishing communities who viewed the sea as their community asset, changed to a virtually open-access resource to any one who could afford to make the necessary investments in craft and gear. These traditional community-based management measures could have succeeded had there been strict regulations with a scientific basis.

Present Management Measures for Sustainability in Fisheries

The policy of sustainable development and environment protection has assumed greater significance as the level of awareness rapidly grows and spreads. Target groups participate, though not directly, in national formulation of policies, laws and programmes relating to resource management. Representatives of fishermen groups are invariably included in various committees and national bodies like the Central Board of Fisheries etc. This involvement led to some of the management measures that have been adopted in recent times in the marine, inland aquaculture and coastal aquaculture sectors.

Marine Sector

In the marine sector, the Government encouraged mechanisation of fishing craft in order to assist traditional fishermen to obtain better returns on their harvest by extending their area of operation. This programme caught on rapidly with the location of prawn grounds and the heavy overseas demand for prawns. The introduction of mechanised boats hit the traditional fishing sector, and also lowered the CPUE. Mechanised boats then started operating close to the shore, and conflicts frequently erupted between these groups.

Regulations for Demarcation of Operational Areas for Different Users

Regulation of coastal fishing activities was stepped up during the late '70s. The Marine Fishing Regulation Act was enacted during this time. It empowers the State Government to regulate crafts and gears in territorial waters in order to conserve fish resources, protect traditional fishermen and bring about law and order. Marine fisheries development was uneven. A state like Gujarat, which can take some more mechanised boats, did not introduce any legislation. In other States, the area reserved for operation of traditional craft varies from 5 to 10 kms. Mechanised fishing vessels operate beyond these areas. Fishing by deep sea fishing vessels within the territorial waters is prohibited. But implementation of these regulations was poor, so they did not accomplish what they tried to do. The Centre assisted the states to procure patrol boats to effectively implement the Marine Fishing Regulation Acts and maintain law and order in the territorial waters.

Artificial Reefs

The idea of artificial reefs was also taken up, so that communities could look after fishing areas themselves. The artificial reefs were expected to serve as a fisheries management tool rather than as a fishing gear. Artificial fish habitats were created by adopting suitable mariculture technologies. These were introduced through a centrally sponsored scheme to help increase catches, enhance fisherfolk incomes and rehabilitate environmentally degraded coastal areas. This programme was based on traditional knowledge and practices, since fishermen had for generations dumped rocks deep into the sea to serve as reefs. This traditional practice, in combination with the experience of hook and line fishermen who increased catches by fishing over sunken structures, provided the impetus for an artificial reef programme. The States have been asked to use their Marine Fishing Regulation Act and issue licences or permits for Artificial Reefs and Sea Farming programmes. These are to be implemented in close consultation with the local users' groups.

Closed Seasons and Trawling Bans during the Monsoon

The problem of indiscriminate bottom trawling was studied in detail. The Government of Kerala introduced a total ban on mechanised fishing during the monsoon in the interest of conservation of resources of bottom living fishes. This was also followed by a ban on deep sea fishing off Kerala coast during the monsoon season. The ban was also adopted by the States of Maharashtra and Goa.

A review of the ban order, in areas where commercial species do not breed during the monsoon, is being considered. The ban is an earnest of the intention of Coastal State Governments to safeguard and conserve their resources for sustainable development. There is little need for more policies and strategies to ensure successful management of coastal fisheries. What is required is effective implementation of

available fisheries management policies, strategies, approaches and methods. Awareness and education on the part of resource users is also needed.

Inland Aquaculture

Traditional fishermen still enjoy fishing rights in river and natural water bodies but these resources suffer from indiscriminate reclamation, siltation etc. Natural waterways have been affected and their ecology altered due to construction of dams that affect fish migration. Pollution of rivers and backwaters caused by incessant discharge of untreated industrial effluents is another hazard, coupled with the large-scale application of pesticides and chemicals.

These hardships apart, traditional capture fishermen are systematically losing their traditional access and use rights over water bodies as their community property. With the growing interests in aquaculture, there is an increasing tendency to privatise water bodies, especially the most productive areas. Traditional fishermen feel they are being alienated from their occupation.

Management through Fishermen Co-operatives

Formation of fishermen co-operative societies and the exclusive fishing rights bestowed on these co-operatives over certain reservoirs, lakes and other public water bodies in some States, have helped protect the interests of traditional fishermen to a large degree. But these water bodies are governed by Government rules and regulations rather than by community-based management systems. The Fish Farmer Development Agencies set up throughout the country have helped in improving inland fish production and productivity through technical and extension support as well as by arranging credit. Groups of fishermen have been selected under this programme as beneficiaries. This may in due course lead to a broad-based management system in panchayat water bodies as well.

Auction of Water Bodies

When water areas under the state and central governments and public sector undertakings are auctioned, instead of being leased out to the poor, they only help middlemen. At present, this policy differs from state to state and is largely guided by elected representatives. A uniform policy in favour of fishery co-operatives for leasing out all water areas on a long-term basis and on nominal lease, would help the co-operatives in proper development of these water bodies. It would also provide the members with the necessary means of livelihood, the long-term objective being sustainable development through community-based management.

At present, no guidelines for regulating freshwater aquaculture are in force, but the government is considering such guidelines. Some possible measures: identifying parameters that have a direct bearing on fish health, optimizing nutrient input and other management practices.

Coastal Aquaculture Management

Fishermen have been pursuing extensive traditional culture of prawns and fish in many brackishwater areas for a long time. With the decline of prawn landings in the marine sector, brackishwater prawn farming has now become all-important. It was once a community-based activity undertaken in a traditional way in estuaries, backwaters and brackishwater lands. But big entrepreneurs with heavy commercial-

scale investments gradually invaded the field. Coastal aquaculture can pose a number of social, ecological and economic problems through its fast growth. The unregulated growth of this sector can degrade the environment and threaten long-term sustainability, leading to disease outbreak.

Social issues in coastal aquaculture relate to indiscriminate conversion of agricultural land, acquisition of land from small marginal agricultural farmers, loss of employment, encircling of coastal villages by shrimp farms, loss of access to fishing areas, flooding by obstruction of natural drains, salinization of drinking water, etc. The clustering of a large number of shrimp farms and related support services may cause environmental degradation in the long run.

Guidelines for Sustainable Development: The guidelines issued by the Ministry of Agriculture to all the coastal States to develop brackishwater aquaculture as a sustainable, eco-friendly and socially acceptable activity are exhaustive and take care of all these issues. To keep the coastal zone free from pollution and to make coastal aquaculture sustainable, the Ministry will ensure that all shrimp farming units coming under the joint sector and meant to be 100% export units, obtain clearance from Pollution Control Boards in the respective states and incorporate environmental strategies. These include the Environmental Management Plan, water treatment systems etc. The government is encouraging expansion of coastal aquaculture only under scientific extensive and semi-intensive systems.

Aquaculture Authority: In pursuance of the directions of the Apex Court, an Aquaculture Authority has been set up to regulate coastal aquaculture. The Authority is to deal with the situation created by shrimp culture in the coastal states and Union Territories. The Authority shall implement the “precautionary principle” and the “polluter pays principle”. Farmers operating traditional and improved traditional systems of aquaculture and shrimp farms already in existence, shall have to obtain the approval of the Authority. State-level and district-level committees will be set up to verify the location of a shrimp farm and other factors before the Authority grants approval for the shrimp farm.

Coastal Management Plans: Coastal States have prepared Coastal Area Management Plans for the balanced development of coastal areas. They are designed to provide the best possible benefits to fishermen and other coastal populations, and the best possible protection to the environment. These plans take into account the possibility of coastal aquaculture activities in the areas, in view of their potential for strengthening the national economy, boosting foreign exchange earnings and helping the rural poor.

Coastal States have also prepared Coastal Zone Management Plans for the approval of the Ministry of Environment. The plans are to be implemented by Coastal Area Development Authority/Eco-Development Councils, with representatives from coastal ***panchayats***. Detailed guidelines will be issued to local panchayats by State Governments.

Conclusions

It must be admitted that community bonds among coastal populations have been weakened by the introduction of modern technologies in the fishing industry and the creation of excess technological capacity to increase fish production, without matching progress in the area of socio-economics. Fisherfolk do not have a feeling of entitlement about their fishery resources. But there is greater appreciation today of the need for coordination among fishing communities, Government bodies and NGOs for a comprehensive ecosystem approach for sustainable development. The methodology adopted should be

be to identify problems, integrate disciplines, skills and knowledge and arrive at decisions through consensus.

Much needs to be done to strengthen the efficiency of the indigenous people's resource management system, by promoting technological innovations and by creating awareness among fishermen/fish farmers about self-regulatory measures that will lead to sustainable development.

Country Paper: Sri Lanka

**18. COMMUNITY-BASED FISHERIES MANAGEMENT
- SRI LANKA'S EXPERIENCES**

by M T K Nagodavithana, Department of Fisheries and Aquatic Resources

Sri Lanka is an oval-shaped island in the Indian Ocean, situated between longitudes 80 - 82° E and latitudes 6 - 10°N. It is sometimes described as a "tear drop" to the south of India. It has a land area of 65,525 km². The Exclusive Economic Zone (EEZ), declared in 1976, claimed sovereign rights over an area of 536,000 km². The 1,800 km coastline covers around 1,000 fish landing centres scattered along the coast. The island's major fishing harbours are Colombo (Mutwal), Beruwala, Galle, Tanalle, Kirinda and Trincomalee (Cod Bay).

The fishing population, in an island with a total population of about 18 million, is about 150,000. They have some 600,000 dependants.

The fishery sector contributes 2-3% to the GNP. Some 65% of the animal protein consumption is from fish. There are no religious or social barriers against consumption of fish.

Coastal fisheries, mainly small-scale, accounts for 70% of the total annual production. In 1996, the total fish production was 228,550 mt: 149,300 mt. from coastal fisheries, 54,000 mt. from offshore and deep-sea fisheries, and 22,250 mt. from inland fisheries and aquaculture. The potential resource is 250,000 mt. from coastal waters, consisting of 170,000 mt. from pelagic species and 80,000 mt. from demersal species, which is presently under-exploited.

The offshore and deep-sea resource is estimated to be 70,000 - 90,000 mt. consisting mainly of large pelagic fish such as tunas, billfishes and sharks. A fair percentage of the present offshore and deep-sea production is obtained outside the EEZ of the country.

The fishing fleet consists of about 27,000 craft. About 55% of these craft are motorized. Of late, there has been a significant increase in the number of deep-sea multi-day vessels.

Inland water bodies constitute 260,000 ha of freshwater bodies. These include 70,850 ha of large irrigation reservoirs, 1,700 ha of medium size reservoirs, 100,000 ha of seasonal village tanks, 39,000 ha of minor irrigation tanks, 4,000 ha of flood lakes called villus, 8,000 ha of upcountry reservoirs, 22,000 ha of Mahaweli reservoirs and 120,000 ha of lagoons. The potential production from these water bodies is estimated at 50,000 mt.

There are 744 fishery co-operative societies with a total membership of 77,656.

The new Fisheries and Aquatic Resources Act of 1996, which replaced the earlier statutes, seeks to introduce fisheries management.

Challenges for sustainable fisheries management

Till recently, the country's emphasis was on fisheries production with arguments such as "Why can't the country be self-sufficient in fisheries with the sea around it?" The resource picture is still not clear. There is some indication of over-fishing in inshore waters.

The following factors influence the small-scale fishery:

- i Religion
- ii Multiple resource users, a phenomenon that could lead to conflicts (fisheries, tourism, construction etc.)
- iii. Open-access nature of the fishing industry.
- iv. Conflicting gears e.g. light purse seine, trawl net, bottom set net, trammel net etc.
- v. Seasonal migration of fishermen.
- vi. Restrictions imposed on fishing because of the security situation.
- vii. Destructive fishing practices. e.g. dynamiting of fish
- viii. Area conflicts.
- ix. Environmental degradation and
- x. Politics.

Some specific areas of conflict

Light Purse Seine Fishery

There is a definite conflict between small-scale fishermen and light purse seine fishermen. The light purse seine was tested in Sri Lanka under the BOBP as a method of catching bait for the pole-and-line fishery. But local fishermen used the gear to catch small pelagic fish. On the recommendation of a committee, purse seine regulations were introduced to restrict the area of operation and issue a limited number of permits on a high annual permit fee (Rs20,000). But the number of light purse seines increased considerably, and a conflict arose between traditional small-scale fishermen and the light purse seine (popularly known as light course) fishermen. This became a political issue during the last parliamentary election in the south, and legislation was brought in to prohibit even the possession of purse seine nets and associated accessories without a valid permit. The issue of permits was suspended. Meanwhile, the operation of surrounding nets for schooling small pelagics during the day, using traditional craft with outboard motors, gained popularity.

The targeted species are half beaks, herrings and small tuna. Opposition has sprung up in certain areas against these nets, and legislation is to be introduced to prevent the entry of additional units to the fishery. But scientific evidence is that this type of fishery is not harmful to the resource, since the targeted species are short-lived migratory fish.

Trawl fishery in Chilaw

The trawl fishery in Chilaw was carried out along the coast off Chilaw area (18 km) for several years. Red prawn was the targeted species. But conflicts constantly erupted between trawler fishermen and traditional fishermen. This conflict peaked in 1992, leading to violence and a law-and-order problem. The Catholic church and the government intervened. and banned trawling. The boats and trawl nets were acquired by the government after paying compensation. Trawl owners were issued with new boats and gear for deep-sea fishing under a loan scheme with a subsidy. The crew members were paid compensation.

But scientific evidence indicated that trawling is the most efficient way to exploit this resource and is not detrimental to the resource. Former trawl fishermen have formed themselves into an association, and are seeking permission to resume trawling. The National Aquatic Resources Agency (NARA) has been directed to carry out trial trawling. Its conclusions will assist an independent commission to be appointed after the trial fishing, which will make a recommendation on the subject.

Beach seine fishery

The beach seine fishery is a traditional method of fishing, in which a surrounding net with two wings, cod end and two ropes is drawn from the shore by a group of fishermen. This fishery has a lot of traditions which differ from area to area. Usually, where more than one net operates in a given area called the "padu," a rotational system is adopted. Seiners have formulated their own traditional rules to run this rotational system, and there is harmony among beach seine operators. This is a good example of management of the fishery by stakeholders. In one place on the east coast, as many as 127 beach seines operate from the same padu.

But a clash of interest occurs in certain areas, specially in the west coast, where beach seine operators protest against the surrounding net operators using small motorised craft. Local conflicts are settled with the help of fishery officers and the police, and the rights of beach seine operators are generally protected. The beach seine regulations of 1984 were enacted on the request of the Beach Seine Owners' Association to protect their rights. Generally this is a fishery dependent on community-based management.

Conflicts have occurred at times between the tourist industry, hoteliers in particular, and the beach seine operators.

Kattudel (stake net) fishery in Chilaw Lagoon

A traditional stake net fishery is practised in the Chilaw lagoon. The main species caught is prawns. Fishing rights are shared among three clans, and they have organised themselves into the Traditional kattudel Owners' Association. The three main groups are closely associated with a particular church (parish) and are allocated different fishing days. Entry to the fishery is limited, since only the male descendants of *kattudel* owners can become owners. A Government commission was set up to settle disputes and fix equitable fishing times and areas for fishermen living on the lagoon.

Stake net fishery in Trincomalee Harbour

The stake net fishery operates in the shallow waters of the inner harbour of Trincomalee. The nets are owned by families who function in harmony- there are no problems concerning the site of the net or the time of operation. The nets are periodically removed for drying, and for taking away fouling substances. In recent times, conflicts have arisen between security personnel and net owners. Such conflicts were earlier settled quite amicably.

Negombo lagoon fisheries

The Negombo lagoon is a highly productive shallow estuary, exposed to constant fishing effort throughout the year. At least 22 types or methods of fishing are in use. A majority of the traditional methods are simple and environmentally friendly. The most important fisheries are stake net (*kattudel*) and brush pile (masathu).

According to a recent study carried out by the FAO/UNDP-funded Marine Fisheries Management Project, lagoon fishermen are willing to manage the lagoon. The Negombo Lagoon Management Plan has been formulated and is before legislators. Open access into the fishery will be stopped, and the area will be declared as a management area under the new Fisheries Act. The area will be managed by the proposed Negombo Lagoon Management Committee. A licensing system will be introduced and harmful fishing methods -such as trawl nets and digging out of polychaete worms -will be prohibited.

Stake Nets in other Areas

The stake nets or *Kraals* (jakotu) in Bolgoda Lake (Moratuwa & Panadura Areas) and Madu Ganga (Balapitiya) are a form of traditional user rights fisheries (TURFs) since they are owned and operated by specific individuals. There are no major disputes among these fishermen, though at times they complain of the motorised craft plying down the river carrying tourists.

Pole and Line Fishery at Egodaunya (Panadura)

Egodaunya is an area south of Colombo located near the Panadura river estuary, commonly known as the Bolgoda Lake. The live bait fishery and other fisheries dependent on it, namely the pole and line fishery and the handline fishery, are the traditional fisheries of the area. The live bait fishery supplies red bait caught in inshore coastal waters and prawns caught from Panadura River, using stake nets (Jakotu) for the pole and line and hand line fisheries. A self-management system to manage the bait resources has been developed by the community. The use of certain types of gear is prohibited, and sanctions are applied to those who break the rules. With the prevailing security restrictions on migration to the North and East, certain fishing craft which used to migrate from the western coast (mainly Negombo area) have started to migrate to this area. This has led to seasonal disputes, disturbing the harmony among traditional fishermen of the area. Politicians, fishery officials and the police have to intervene at times to settle such disputes.

Some time ago, fish aggregating devices (FADs) were deployed off the area by NARA to facilitate the line fishery. Though the experiment was a success, the local fishermen have not organized themselves to set up such FADs.

Stilt Fishing in Kathaluwa and Ahangama (Habaraduwa)

Stilt fishing is mainly confined to two villages of Habaraduwa Assistant Government Agent's (AGA) division in Galle District. The two villages are Kathaluwa and Ahangama. The fishing method is rod and line. It is carried out by individual fishermen sitting across the bar of a vertical wooden pole (stilt) driven into the coral reef. Barbless stainless steel hooks (without bait) made by the fishermen themselves are used to catch spotted herring and mackerel. The fishing is highly seasonal, and depends on the arrival of fish to the coral reef. It is done mostly in the early morning and the late evening. Though it is not a very efficient method of fishing, the fishery is managed by the fishermen themselves. The stilt fishery is a popular tourist attraction; every tourist wants to photograph it.

Fishery co-operatives and other organizations

Fishery co-operatives were started in the 1940s, during the II World War, to enable procurement of fish from fishing villages and transport of fish to the metropolitan city of Colombo to meet food shortages

there, specially for expatriate troops. But after the War, and Sri Lanka's independence in 1948, much emphasis was laid on co-operatives to develop village-level fisheries. The fishery co-operatives went through various transformations under different governments. A number of commissions or committees were appointed from time to time to reorganize them. The last one was in 1994. The committee has proposed a working plan to reorganize the co-operatives. The plan is being implemented.

Co-operatives can help manage fisheries effectively, since their members are from the same area and provide a forum to take decisions and resolve disputes. This appears to be a viable local mechanism for fisheries management.

On the west coast, the Catholic Church plays an important role in helping fishermen to resolve their problems.

Central Government and the Provincial Councils

Fisheries is a concurrent subject, dealt with by the Central Government. Though there are separate Ministers for Fisheries in the Provincial Councils (PCC), not a single PCC has been able to enact its own statute for fisheries.

Though there is a healthy relationship between the centre and the PCC, the latter sometimes acts independently when distributing subsidies and welfare facilities to fishermen. A better partnership is essential between the centre and the PCC to ensure streamlined development of the industry. The recent debacle of prawn farming in the North Western Province is a classic example of the need for a better partnership with the centre.

Conclusions

A fair number of traditional fisheries exists in Sri Lanka. Some are widespread (beach-seine), a few are restricted to certain areas, some others - like lagoons - are site-specific.

These fisheries are Community-managed, till disputes arise from time to time. As a result, the Government had to intervene, and a number of legislations were enacted under ordinances existing then, like the Municipal Councils Ordinance, the Village Council Ordinance of 1889, the Small Town Sanitary Ordinance, the Local Boards Ordinance of 1898, Game Protection Ordinance of 1909 and Local Government Ordinance of 1921 for the management of area-specific fisheries. The first piece of legislation meant exclusively for fisheries was introduced by the British Government in 1925 -the Pearl Fisheries Ordinance. The Fisheries Ordinance No 24 of 1940 was the first legislation pertaining to the regulation of fisheries in the entire country.

Though this ordinance was amended from time to time, the need for a new legislation with greater emphasis on management was felt, and the new Fisheries and Aquatic Resources Act No 02 of 1996 was enacted, replacing all the earlier statutes.

The new act emphasises management of fisheries through community participation, protection of fish from destructive methods, management areas, closed seasons, and restrictions on the open access system by introducing a fishing operations licensing system.

In such a system, healthy partnerships among stakeholders becomes very necessary, specially in declared management areas to be managed by local management committees elected by popular vote among registered fishermen of the area. But in a highly politicized society, politics is bound to creep in.

Recommendations

With the introduction of a new Act, there is wide scope to harness community-based management and build up smart partnerships among stakeholders.

Since management is a new concept for fishermen who usually go for higher production and higher short-term incomes, well-guided and long-term awareness programmes for all stakeholders - such as fishermen, officials, law enforcement officers, the general public, politicians and students — will be necessary to make the society management-conscious. Not an easy task. This would be a slow process with a lot of patience and understanding among stakeholders to build up smart partnerships for sustainability in the fishing industry. Hence a well-managed long-term awareness programme is recommended.

Country Paper: Sri Lanka

19. DEVELOPMENT OF AQUACULTURE AS AN INTEGRATED FISHING INDUSTRY IN SRI LANKA : PROSPECTS AND PROBLEMS

By Kusul Perera

National Organiser, Hariha Darshana

In Sri Lanka, it's marine fishing that has often received the pride of place in the fisheries sector. Governments, government institutions and other organisations have paid more attention to the marine fishing industry than to inland fishing that could be developed as aquaculture. The reasons for this phenomenon should be discussed, before we discuss aquaculture in depth.

An overview: coastal fishing vs inland fishing

The "fishing community," as the fisherfolk are popularly called, have some distinctive characteristics. They are concentrated along the island's coastal belt. They belong to a single social caste, the Kauravas, whether they hail from the Sinhala-speaking south or the Tamil-speaking north. The Tamil-speaking fisherfolk include a gaggle of Christians and Roman Catholics. These factors give the fishing community an identity of its own, within a sub-culture that is both different from others and more effervescent. A collective identity has also meant political relevance through voting power. Therefore the demands of fishermen have always engaged the attention of the country's political and decision-making apparatus. This is amply demonstrated by the fisheries co-operative societies that were formed as early as 1940 in the coastal belt. In 1990, there were as many as 630 co-operative societies of coastal fishermen, as compared to only 91 among freshwater fisherfolk.

On the other hand, there is no significant concentration of fishermen in the interior of the island that can form a pressure group or demand attention the way marine fishermen do, though fishing in tanks and reservoirs was common in ancient times. That being so, most people in Sri Lanka would not think beyond "marine fishing" — everything else is considered marginal.

Yet, as marine fishing could not meet the total demand for fish consumption, and as substitutes for protein consumption did not capture public imagination, attempts were made to increase the production of cultivated freshwater fish. This was done under the auspices of the Fisheries Department, with freshwater ponds built in various parts of the island and imported freshwater fish cultivated in them for distribution.

This project under the Fisheries Ministry was given only a subsidiary status, while marine fishing still held centre stage. Big-time deep-sea fishing, which was totally controlled by private individual businessmen, won financial concessions and subsidies. This loose private sector trade could not improve service to consumers; time and again, there were state interventions through various schemes to expand and increase the productivity of marine fishing. It's these state interventions that led to infrastructure creation in the form of fishery harbours, ice factories and the like. Another approach that flowed from the economic thinking of the 1970s was the development of sales outlets through the state-owned Fisheries Corporation. This was more an attempt at controlling the retail market than an attempt to subsidise the fishing community. But it did not find favour with the free market economy ushered in after 1977 that encouraged fish "*mudalalis*" or private businessmen and reduced the role of state corporations.

Ban on Inland Fishing

Over the years, inland fishing did expand to many geographical areas, even if it wasn't very conspicuous or vibrant. The Accelerated Mahaweli Development Scheme provided new space and infrastructure to re-settle people in colonies, and international agencies like the ADB and the FAO offered assistance for inland fishery projects. Political interest in fisheries continued to be high, so fisher families from Puttalam district got resettled in areas like Minneriya and Maduru Oya to carry out inland fishing in reservoirs.

Just as freshwater fishing was gaining attention as a supplementary source of protein, especially among villagers in the dry zone, the government in power decided to close down all freshwater fisheries in July 1990. This was in response to pressure from the Buddhist clergy, which held that it would not suit Sri Lanka, a predominantly Buddhist country, to "breed fish" for consumption. Some of the inland fisheries were therefore leased out to ornamental fish breeders, as an impetus for export.

The ban on inland fishing had many consequences. First, it provided a bigger market for imported tinned fish. Two, it changed the consumption pattern of the ordinary villager, who became more dependent on tinned sardines for his proteins. Three, it reduced the protein consumption of a sizable percentage of the lower and middle class villagers, because their incomes fell. It is estimated that the inland fishing ban reduced the direct incomes of about 23,000 fisher families, members of fishing societies. It perhaps contributed to the prevailing chronic malnutrition among village children. It is estimated that about 60 per cent of the village women are anaemic. This leads in turn to about 25 per cent underweight births per year.

Another fallout of the closure of inland fisheries: many civil organisations created by state sponsorship of inland fishing disintegrated. There were over 91 active co-operative societies in 1990; these wound up when freshwater fishing was banned.

A New Orientation in Aquaculture

It is important to note that inland fishing was not carried out by traditional fisherfolk, but by traditional farmers. Marginalised as agricultural labourers, they eked out an extra income by fishing in village tanks and reservoirs. It is this scenario in the villages, and the inability of marine fisheries to cater to fish demand, that gave aquaculture projects in the villages some scope.

The government therefore sought ways and means of developing fresh water fishing in the villages, to boost jobs and incomes. Fish hatcheries were built and managed by the Fisheries Department even before the decade of the '70s. New breeds of imported fresh water fish were introduced and cultivated in tanks and reservoirs. The State was more or less the sole authority for fish cultivation; village fisherfolk were allowed to harvest on conditions stipulated by the state. Over the years, this attracted more marginalised farmers to freshwater fishing, though it was one of the less acceptable income options in villages. It is then that fisheries societies and co-operatives were promoted by the state and used as a means to regulate freshwater fishing.

Till 1990, inland fishing continued on these lines, with just a few additions and alterations. Production from inland fishing was about 40,000 mt per year by 1990. Though some claimed that this figure made up 20 per cent of the local requirement of fish, it was disputed — many substitutes had come up, because fresh fish was scarce and dear in the the retail market. This was the general situation at the time of the 1990 ban.

But one area of inland fishing was in fact heavily patronised by some in the political hierarchy: aquaculture. The government thought that the Buddhist clergy would not object to big-time farming of prawns, shrimps and crabs promoted by the government for the export market. With the “open” or heavily liberalised economy of the early 1980s, emphasis was laid on export-oriented production in the non-traditional sector. This shift in the economy was supported by the World Bank and the IMF. Aquaculture projects obtained financial concessions by way of tax holidays, loans on easy repayment, state land on lease etc. With the tourist industry catching up again after its crash following the anti-Tamil riots of 1983, and a lucrative foreign market developing for large prawns, shrimps and crabs, a minor aquaculture boom was sustained in coastal areas of Puttalam district in the northwest of Sri Lanka.

This area has a coastline of over 300 km, according to the Coast Conservation Department (CCD) - a coastline considered very suitable for prawn farming, with its abundant mangroves, estuaries, lagoons and marshes. (Table below).

Mangroves	3, 210 ha
Estuaries & lagoons	39, 119 ha
Marshes	2,415 ha

Source: Coastal Zone Management Plan, 1990

Another reason for the prawn culture boom in Puttalam district could be the influence the then Minister of Fisheries and Aquatic Resources had in this area. With more than adequate political patronage, the area was exploited to its maximum, with little regard paid to the environment and to coast conservation. The profits reaped were high.

No conservation laws were adhered to if they were in any way considered a hindrance to big-time prawn farming. Meanwhile, pressure mounted from environmentalists and other civil organisations against the severe environmental degradation due to prawn farming. In 1990, the CCD listed aquaculture as one of the reasons for coastal erosion. It laid down a condition that aquaculture projects should obtain clearance from the CCD. This meant that the CCD could grant a licence for an aquaculture project if it was satisfied that the project would take adequate safeguards to protect the environment. But independent surveys carried out later by several environmental organisations showed that most such projects either functioned illegally or obtained a licence through political interference. This, despite the Coast Conservation Act (Amendment) No.1 of 1988, specifying penalties for contravention of the Act’s provisions.

But considering the concessions granted, the shrimp culture industry hardly provided enough jobs for the unemployed in the area. Nor were people who lost their livelihood because of the 1990 ban on inland fishing, given jobs by big-time prawn farms. Most of the labour required for these farms was seasonal or temporary; the owners preferred to employ total outsiders to the area in a few supervisory and skilled grades, because they thought such a policy would be better for their farms’ security. Thus the general perception of these aquaculture projects which sought to be big foreign exchange earners, was that they symbolized the environmentally hazardous and unethical exploits of the new rich and the politically savvy.

The next phase of aquaculture: ban on inland fisheries lifted

With the change of government in August 1994, aquaculture seemingly moved out of the degraded areas of the North West and away from prawn culture farming. The ban on inland fisheries was lifted.

The previous Minister in charge of fisheries in the present government brought into legal effect Act No.2 of 1996 on Fisheries and Aquatic Resources that provided aquaculture with a little more **muscle** than it had previously. The present Minister took a step further and gave the green light to small- scale fish farming in the inlands. It is these changes that have to be dealt with before discussing the possibilities of aquaculture development.

Aquaculture is at present controlled by the private sector under a market economy, with all state departments and institutes playing only a regulatory and promotional role. The Fisheries and Aquatic Resources Act No.2 of 1996 provides the legal base for this system. Its main features:

- i. Policy-making by the Ministry and implementation of such decisions
- ii. Registration and monitoring of local fisheries committees
- iii. Licensing of fishing operations **and** aquaculture enterprises
- iv.** Co-ordination and consultation with the Provincial Minister of the Board of Ministers in charge of the subject.

The lifting of the July 1990 ban on inland fisheries did not satisfactorily reactivate local fishery societies and co-operatives that had wound up. This does not mean they functioned satisfactorily before the ban; it only means there are fewer organisations now than before. And at the ground level, the Fisheries Department is not as yet geared to organise and activate co-operatives and societies among freshwater fisher families.

In some districts, three years after the ban was lifted, fisheries officials have still to make their presence felt in providing state assistance for freshwater fishing. Inefficient deployment of officers in districts; lack of transport facilities either to distribute fry for culture or to dispose of the harvest from reservoirs and tanks without delay — all these have stifled the interest of village folk in aquaculture. And in three years, the Ministry of Fisheries has been able to commission just two of the freshwater hatcheries under its authority, out of more than a dozen that were leased out at the time of imposing the ban more than seven years ago. Of these two hatcheries, one is still under-utilised.

Fisheries is actually a “devolved subject” under the Provincial Administrative System. But the Provincial Administrations have not seized the opportunity to develop their own provincial projects on freshwater fisheries, after the Central Government lifted the 1990 ban. Nor **has** the central government shown any interest in handing over responsibility to the provinces.

Perhaps the perceptions of management and implementing agencies about freshwater fisheries have not changed during the past three years. This leads to some assumptions and conclusions about freshwater fishing. Discussions based on them could well provide new perceptions about the future development of aquaculture as an integrated fishing industry.

Concepts and Approaches

Interest in freshwater fishing has remained low, on account of a few misconceptions and misunderstandings. First, the implementing agencies have not understood what target groups they should identify to culture and harvest freshwater fish, and to develop markets for freshwater fish.

The second is that the political hierarchy suffers from a lack of credibility at the opinion-making and grassroots levels of society. This topic merits exclusive discussion. In Sri Lanka today, every movement

of society is being politicized. This political culture plays a very negative role in social development, as it leaves little room for independent decision-making. It pursues accumulation of power, and leaves civil participation in society almost anaesthetised.

It is common knowledge in Sri Lanka that it is provincial and local politicians, with links to political power at the centre, that decide who controls organisations in their areas – particularly if these receive some state patronage. This sorry state of affairs must change if fisheries co-operative societies are to function effectively. But de-politicising civil society would be a long-term project. Some other forum will have to discuss this subject. But some broad issues must be highlighted for discussion here.

Let's get back to the first issue: identifying target groups for participation in the process of fish culture. It should be mentioned that freshwater fishing should not be what it was in past years. The weather patterns and ground factors in Sri Lanka are favourable for development of freshwater fishing. There are water tanks and reservoirs of different sizes scattered at regular intervals to meet the growing interest in fish culture. Makeshift mud ponds, small, natural waterways and abandoned paddy fields could all be turned into centres of fish culture for prospective fish farmers in the villages.

This type of fish farming is not unknown. There are a few centres run by a few individuals and organisations as isolated pilot projects. But if these are to be attractive and profitable, and worth the effort of villagers, a few things have to be in their right places. One: extension services must wake up from their bureaucratic lethargy and become more efficient. What's needed is a very effective transport service, and laboratory facilities in the regional and provincial centres to train prospective fish farmers for breeding and supply of fish seeds. This means a very fast-moving servicing sector with all the needed infrastructure facilities. Another very important incentive is a subsidy or soft loan to help the villagers to get off the mark.

Two: Where can freshwater fish farmers sell their harvests? This question has never been addressed seriously by those who make policy decisions. We must remember that in our culture, any market purchase carries with it some form of social status or pride. With the market economy, competition is trickling in too. When we are talking of fish for daily consumption, everyone goes for sea fish. And fresh, unfrozen fish. Unfortunately, our local markets have very little fresh or unfrozen fish. We see them only in the "markets" on the open beach. Never in the villages. Hence the demand for tinned fish, and to a certain extent, dry fish.

Where then do the harvested freshwater fish go? In 1990, the quantity did not go beyond 40,000 mt per year. Since the ban, the harvest dropped and now stands around 12,000 mt per year. A little of this goes to the towns. A little more is converted into fish fillets that go to hotels.

If the local market is to appreciate freshwater fish, the catch must be specially treated before it reaches the consumer. This is because our consumer is very choosy about live products, especially when they are introduced as local products. There is also a cultural taboo. In our predominantly Buddhist culture, freshwater fish bred and reared for the table would not be accepted. The case of broiler chicken is a good example.

People who refuse to raise poultry for local consumption in their gardens, buy broiler chicken without any hesitation for their lunch table. They believe that broiling is not tantamount to "killing," because the chicken are merely seen frozen in the shop freezers. This simple habit could be exploited to market freshwater fish, creating a new job-generating industry that would produce not only fish but also by-products like fishmeal.

Partners in Progress

With this in mind, one would expect market forces to play the right role and encourage the freshwater fishing industry to establish itself. But if this industry is to be sustained, other players are needed. Freshwater fishing cannot be a money-spinner by itself. It has to be integrated with an assortment of animal husbandry and vegetable cultivation practices. This type of integration requires not only checks and balances but support services as well.

First, as required by the Fisheries and Aquatic Resources Act No.2 of 1996, the formation of Fishing Community Societies needs as much participation as possible from those in the fishing industry. This is a serious responsibility that has to be undertaken by the authorities.

Next, very effective consumer societies are needed that would check the products that come to the market, their quality and prices. These consumer societies need not limit themselves to fish products. Getting consumers to play such a “watchdog” role will be difficult initially, because such societies are rare even in urban areas. But if the provincial administration makes an effort, such societies could be established everywhere.

Very important: a regular forum where the village community could air its grievances on damage caused to the environment. This forum would bring all civil organisations together, with regional officials in attendance.

Most important of all is depoliticalisation. **Such** forums should be allowed to organise themselves and function professionally and independently, with politics totally out of the agenda, if they are to develop as an integrated freshwater fishing industry.

Country Paper: Maldives

20. PARTNERSHIP FOR FISHERIES RESOURCE MANAGEMENT IN THE MALDIVES

Jadullah Jameel

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Maldives is an archipelago of nearly 1,200 coral islands grouped into 26 natural islands in the centre of the Indian Ocean. It has an area of about 90,000 square kilometres and an Exclusive Economic Zone of nearly 1 million square kilometres. Only 201 islands are inhabited, and marine resources constitute the country's main natural endowment. Economic activities focus heavily on fishing and tourism. Fisheries currently accounts for 11% of the GDP, 20.6% of employment and 75% of the country's export of commodities (Ministry of Planning and Environment, 1996).

The fish catch at present is about 100,000 metric tons and comprises of tuna and reef fish varieties. Of this, 63 per cent is skipjack tuna, 11 per cent juvenile yellow fin, 10 per cent little tuna and frigate mackerel, and 16 per cent reef fish. Recently the reef fisheries has expanded because of demand from the export market. Fishing has remained traditional and in the private sector. It employs mainly pole and line with live bait for tuna, longlining for shark, and drop line for reef fish, specially grouper. Fishing vessels are under 18 metres in length and powered with inboard engines of not more than 45 h.p. Fish processing and export is done mainly by the Government-owned Maldives Industrial Fisheries Company (MIFCO), which has invested heavily in the collection and processing of frozen and canned tuna for export. The private sector exports mainly reef fish and dried tuna, and its infrastructure is limited. In 1996, export by the Government was valued at US \$28.2 million, while the private sector exported \$20.7 million.

Tuna is the mainstay of fisheries in the Maldives. But reef fisheries have developed during the last decade due to local and foreign demand for food fish. Marine resources management is now a major priority. The sea cucumber and the giant clam have been over-exploited, and there is concern over other reef resources, particularly grouper. The importance of resource management is now recognised, and some steps have been taken by the Government.

The difficulties in implementing those measures and the need for participation by all stake-holders in development has been increasingly felt. Rapid social and economic changes have broken down some of the traditional management systems. Conflicts of interest among resources users in different types of fisheries are increasingly taking place. The problems are further complicated by the fact that resources users, specially those of coral reef, are diversified and are not restricted to fisheries. New attempts are being made to introduce resources management and involve stakeholders at all levels.

Before mechanised fishing vessels were introduced, development of communication and transport in the atolls was slow. Fishermen migrated to other islands and atolls to fish, cementing traditional bonds and relationships developed over years. Fishing was carried out on most islands along with other economic activities. Fishermen focused mainly on tuna in the good fishing seasons, going for reef fish only on rare occasions. No overfishing occurred, as the technology employed was traditional. The main stakeholders in fisheries were fishermen, boat owners, processors, consumers, administrators, marketers and funding agencies.

Management of fisheries resources is quite a complex task. The legal framework of the current management system for fisheries is found in the constitution, the official mandate of relevant ministries, as well as in various laws, decrees and guidelines. The National Development Plan outlines national policies and strategies; these include priority to fisheries management, and long-term fisheries development plans. It covers a wide range of specific issues. These plans are developed by various government-related agencies, the most important being the President's Office, the Fisheries Advisory Board (FAB) and the Ministry of Fisheries and Agriculture (MOFA).

- A) **The President's Office** : plays an important role in generating and implementing fisheries policies. It provides policy directions through decisions based on the recommendations of the Fisheries Advisory Board (FAB), policy statements and laws including Presidential Decrees.
- B) **Fisheries Advisory Board (FAB)** : The FAB provides a mechanism for high-level consultation among various ministries and agencies concerned with fisheries development to ensure a more co-ordinated approach to decision-making. It is chaired by the Minister of Fisheries and Agriculture. It guides the President on matters that require major policy decisions.
- C) **Ministry of Fisheries and Agriculture (MOFA)** : The Fisheries Law of Maldives (Law No.5/87,24 August 1987) empowers MOFA to "formulate and administer regulations on matters relating to fisheries", to "explore responsibilities for the development of fisheries" and carry out the "research needed for such development" (Gozun, 1992). Hence it can be seen that MOFA bears the responsibility for proper and efficient management of the fisheries resources. It has to provide a framework for efficient resource management and collect and analyse statistical information on fisheries necessary for development and management of the sector.
- D) **Surveillance, monitoring and enforcement** : The National Security Service (NSS), coast guard section, provides monitoring and enforcement measures to deter infractions of law. It tries to ensure that nationals and foreigners honour agreements. It collects information on fishing agreements to facilitate strategic and tactical decisions about enforcement.

The modes of enforcement are air patrols, sea patrols, special observers on fishing vessels, and harbour inspection. The enforcement modes used depend on the resources available, the nature of the regulations and the characteristics of the fishery. Due to the openness of the seas where traditional fishing for tunas take place, NSS is well-equipped for search and rescue activities as well.

- E) **Other responsible bodies** : Besides the above, various other institutions are concerned directly or indirectly with fisheries. They play an important role in their respective areas of responsibility and have supportive functions in the sector. These institutions are;
 1. Maldives Industrial Fisheries Company (MIFCO)
 2. Ministry of Trade and Industries (MTI)
 3. Ministry of Planning, Human Resources and Environment (MPHRE)
 4. Ministry of Atolls Administration (MM)
 5. Ministry of Transport and Shipping (MTS)
 6. Ministry of Finance (MOF)

Ministry of Education (MOE)

Maldives Institute of Technical Education (MITE)

Maldives Monetary Authority (MMA)

Ministry of Foreign Affairs (MFA)

F) Atoll and Island Administration

Fisheries catch and effort data are collected by the island office and sent to the Ministry of Fisheries and Agriculture through the respective atoll office regularly.

Island offices regulate fishing in the island lagoons.

The fish catch share system is determined by the fishermen communities.

Registration for reef-fish holding cages is made at atoll offices.

Fishing communities contribute to the fishery and other development projects on the islands

Fishermen voice their concerns through Atoll offices to the Ministry of Fisheries and Agriculture.

Non-compliance with laws and regulations is reported by the fishermen to the island offices.

Requests for installation of navigational aids and fish aggregation devices and for deepening the harbour are made to the Government by island offices.

Management measures in use

- Export of certain marine species and products is prohibited.
- ¹ Export quotas have been fixed for certain types of tropical aquarium fish.
- Certain marine species are protected through bans on fishing.
- Cages for holding reef fish are registered.
- ¹ Prior permission is needed for use of any non-traditional fishing gears.
- A research phase is needed prior to any new fisheries or aquaculture project.
- Resource assessments are made, and fisheries information collected and analysed, for management and policy formulation.
- Consultations are held with the industry before regulation relating to fisheries management and development is introduced.
- Restrictions are in force for fishing gear types that fish under licence in the EEZ.
- Fisheries sector plans are integrated with those of other development sectors.

Main Fisheries Regulations

1. No person may fish in the lagoons of inhabited islands or tourist resorts without permission from the respective administration office.
2. Fishing is permitted from lagoons that have no islands or sand bars.
3. Nets for fishing are prohibited in the Male lagoon.

4. Any traps or weirs fixed by fishermen must be registered at the atoll office. No person may remove fish from traps or weirs, or fish within their immediate vicinity, when the traps/weirs are in operation.
5. Any new type of fisheries, or use of non-traditional gears, requires permission from the Ministry of Fisheries and Agriculture.
6. For any fisheries research to be carried out within the EEZ, permission is needed from the Ministry of Fisheries and Agriculture.
7. EEZ fishing licences are issued by the Ministry of Trade and Industries.
8. Statistical and other fisheries information must be submitted in the form required by the Ministry of Fisheries and Agriculture (MOFA).
9. MOFA is empowered to make regulations for management and development of fisheries resources within the Maldives EEZ.
10. MOFA may take conservation measures by banning fishing for different species, or by declaring closed fishing areas or seasons.
11. Penalties are imposed according to law when regulations are violated.
12. Any foreign vessel needs permission from MOFA to cross the EEZ. It should provide notice 48 hours in advance.
13. Information on any fishing vessel sighted within the EEZ should be given to the island office or Coast Guard.

Prohibitions in Fisheries

The following actions are prohibited :

1. Interference with pole and line fishing in the vicinity by trolling, long line or drop line fishing.
2. Removal of any drifting objects on fishing grounds.
3. Use of any dynamite or explosive in fishing.
4. Use of any poison to catch fish.
5. Use of any spear guns for fishing
6. Fishing for lobster by diving with deep-diving equipment.
7. Going fishing so as not to be able to attend the Friday prayers.
8. The following marine species are protected:
Dolphins, turtles, whales, whale sharks, Napoleon Wrasse, giant clam,
Triton Shells, black corals, lobsters less than 25cm in length or Berried female lobster.
9. Only bait fishing for traditional pole and line is permitted in 15 protected marine sites.
10. Wherever fish aggregating devices (FADs) are installed by MOFA, drop line fishing using live baits, shark fishing, trolling or use of silver side as bait, is prohibited within three miles of the FADs.

11. No foreign vessels or foreigners may engage in fishing within 75 miles of the coast without approval **from** MOFA.
12. Long line operations should not be carried out on the banks (shallow areas of the sea) in the southern zone as notified by MOFA. .

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Country Paper : Bangladesh

**21. POVERTY ERADICATION AND SUSTAINABLE FISHERIES
DEVELOPMENT IN COASTAL VILLAGES OF BANGLADESH**

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Introduction

Bangladesh has a coastline of 480 km. Fisheries activities extend over the entire coastline and offshore island. The coastal fisheries are exploited mainly by mechanized and non-mechanized fishing craft with traditional fishing gears operated by traditional fishermen known from time immemorial as “Jele”.

The trawl fishery, which includes shrimp and fish trawlers, constitutes the industrial fishery. It is operated by businessmen.

Marine fisheries accounts for 22.07% of the the country’s total production of 1.264 million mt. Coastal fisheries is responsible for 95% of the marine sector output.

Fisheries contributes about 4.7% of the GDP and about 60% of the animal protein consumption of Bangladesh. The country’s fish production went up from 644,000 m.t. in 1975-76 to 1.17 million m.t. in 1994 -95. Though the production increased, per capita consumption went down from 34.49 gm in 1975-76 to 20.5 gm. in 1995-96, because of the increase in the human population.

Bangladesh has a typical multispecies fishery. Some 185 species of fish are exploited by fishermen operating in estuarine waters, while some more species are caught by different gears operating in coastal waters. Coastal fisherfolk can carry out activities in depths up to 40 meters in estuaries of the Bay.

The export earnings from fishery products also increased, from 171.96 million taka in 1975-76 to 1340.9 million taka in 1995-96. Fisheries accounted for 9.12% of the export earnings in 1995.

Coastal fishing community of Bangladesh

Coastal fisherfolk live in all the coastal areas of Bangladesh (Fig. 1). The estimated number of fishermen: about 1.25 lakh. A majority of them belong to the socially neglected “Jaladas” Hindu community. Social relationships in these village communities are governed by solidarities, prejudices, superstitions and territorial affinities.

The coastal fisheries range from localized subsistence fishing to intensive mobile fishing operations that entail the use of simple crafts and traditional gear with great skill. Seasonality and unstable catch composition are prominent characteristics of these fisheries. The majority of fishermen rely on fish traders or middlemen to meet their subsistence needs, and are eternally indebted to them. They are not organized. The fishermen lack Government services. Both birth rate and death rate are higher among

them than among the general population. The average size of the fishing households is 6.5. Facilities for primary level education exist, secondary schools are located nearby.

A 1991 survey of six coastal zones revealed a high degree of illiteracy in the fishing villages — 63% overall. Illiteracy among women (75%) is higher than among men (about 50%). The study revealed that 37% of the women are under the age of 10, while 4% exceed the age of 60. About 59% belong to the age group 11-60. They constitute the village's potential work force. More than five million people including 1,25,000 fishermen live in the 869 coastal villages of Bangladesh. Their houses are temporary huts, with pole and leaf thatching and tin roofs; or mud houses with leaf thatching; or wooden houses with leaf thatching; or wooden houses with tin roofs and tiles; and a few cement houses of concrete with more than one room.

With the increasing commercialization of marine fisheries and decreasing land assets due to population pressure, a large number of people from the Muslim community have taken up fishing as a full-time occupation. Most of the motorized small-scale fishing boats are now owned by these groups. They hire the traditional fishermen as fishing crew, mostly on a catch-share basis.

Economic conditions

The livelihood of coastal fisherfolk is based mostly on fishing and fishery-related activities such as traditional fish processing and marketing. A few fishermen also serve as daily wage labourers in agriculture, livestock, construction, and petty trades, and work in private and public companies and the government. But such income-augmenting opportunities are not accessible to all fishermen. A survey reveals that 34% of the fisherfolk community depend only on fishing, 41% depend on fishery and fishery-related activities. Only 3% depend exclusively on non-fishing activities.

The annual average household income from all economic activities in six representative villages from six coastal zones was found to vary from 48,827 taka to 238,611 taka per household. Non-fishery activities contributed only 5% of the household income on an average. Nearly 400 households lived below the poverty line, only 12.7% above the level of subsistence. Female participation in fishery-related and non-fishery activities was low.

Fishery resources

Three recent surveys involving the Norwegian research vessel Dr. Fridtjof Nansen (FAO/BGD 1979-80) and R.V. Anusandhani (BGD 1983 and FAO/BGD 1984-86) provide estimates of standing demersal standing stocks that are very close — between 1,50,000 and 1,60,000 mt. Different authors estimated the shrimp stock at between 2,000 and 4,000 mt. The MSY of the penaeid shrimp was estimated at 6,500 - 7,000 mt (Table 1).

A pelagic resources survey that will provide a reliable estimate of the standing stock is still to be conducted. An acoustic survey by Dr. Fridtjof Nansen was recently undertaken by the DOF Marine Survey Wing, with technical assistance provided by the FAO/BOBP. Results are provided in BOBP's Working Papers 89,90 and 94.

The total production of marine fisheries in terms of landing from all fishing gears / craft was estimated to be 2,64,650 mt in 1994-95. The drift gill net fishery and the set bagnet fishery take the bulk of production, followed by the trawl fishery, accounting for 1,34,308 mt drift gill net, 75,910 mt and 11,715 mt respectively (Table 2).

Table 1 : The marine fisheries resource

<i>Resources</i>	<i>Stock (metric tons)</i>	<i>M.S. Y. (metric tons)</i>
Shrimp	4000	6500-7000
Demersal Fish	1,50,000 - 1,60,000	50,000 - 85000
Pelagic	90,000 - 1,20,000	Not determined

Table 2 : Production by different gears in the coastal and marine fisheries sector

	<i>Source</i>	<i>1990-91</i>	<i>1991-92</i>	<i>1992-93</i>	<i>1993-94</i>	<i>1994-95</i>
A.	Trawl Net	8,760	9,623	12,227	12,454	11,715
B(Mechanised)	Drift gillnet	1,21,966	1,22,935	1,23,680	1,25,107	1,34,308
Non-mechanised		19,983	20,078	20,210	19,247	19,602
C.	Set bagnet	68,481	70,035	71,208	73,578	75,910
D.	Longline	9,521	1,743	9,890	10,104	10,368
E.	Trammel Net	3,630	3,715	4,027	4,330	5,312
F.	Others	9,197	9,045	9,250	8,224	7,435
	Total	2,41,538	2,45,474	2,50,492	2,53,044	2,64,650

Among penaeid shrimps, the trawler fleet accounted for 76.9% of brown shrimp, 15.7% of tiger shrimp, 1.9% of white shrimp, 2% of pink shrimp, and 3.5% of mixed small shrimps. Shrimp trawlers throw **away** the major part of white fish as trash - to the extent of 35,000 - 40,000 mt. annually. If this were included in the catch figures, the trawler production of white fish would exceed 50,000 mt.

Brackishwater estuaries are the meeting points of fauna from three different ecosystems. Brackishwater species live, grow and spawn in the same environment; the marine fauna use the brackishwater area as nursery ground and pay short visits. Some fresh water fauna e.g. *M rosenbergii* and *P styliiferus*, visit the estuaries for either spawning or nursing. Fishing in this area is very intensive. The set bag net is the most extensive capture fishery.

It can be seen that with estuarine set bagnets, almost all of the marine and freshwater animals are over-exploited, a majority of them very severely, while the brackishwater species are either under-exploited or exploited at the optimum level. Penaeid shrimp, e.g. *M monoceros*, usually does not show signs of overfishing in the trammel fishery, while *P monodon* shows little sign of overfishing in the trawl fishery.

Table 3 : Number of gears in the coastal area and their contribution to fisheries

	<i>Name of the Gear</i>	<i>Number</i>	<i>Percentages of Exploitation</i>
I.	Trawl Net	201	4.88
2.	Gillnet	6,889	57.44
3.	ESBN	12,561	9.66
4.	MSBN	3,852	18.77
5.	Trammel Net	1,400	1.61
6.	Hook	3,000	3.95
7.	Other gears	3,000	3.69
	Net for shrimp larval catch	1,98,770	

Table 4 : Exports (quantity and value) from coastal and marine fisheries sector (including shrimp)

<i>Year</i>	<i>Quantity (m. t.) of exports</i>	<i>Value of exports (earnings in crores)</i>
1990-91	26,109	526.62
1991-92	22,080	524.35
1992-93	26,607	700.29
1993-94	31,835	920.96
1994-95	41,686	1306.94
1995-96	38,929	1340.94
1996-97	41,549	1457.41

Source: Department of Fisheries

The largest numbers of *P monodon* are exploited by ESBN and push nets (larval fishery). According to one estimate, the population at this stage is 33 billion post-larvae. The ESBN takes the largest population (one fourth of the larval catch), followed by the trawl fisher post-larvae, while other gears take relatively negligible numbers.

The larval fishery takes 20% of the brown shrimp population. The size of the population on entering the ESBN fishery would be around 2,190 million post-larvae. The larval fishery exploits around 10,706

million *P. indicus* (white shrimp) larvae, which is almost five times the catch of the target species. The number surviving after the push net is about 11,700 million. Of these, 18 million are caught by the ESNB.

Area and Depth of Operation

The ESNB fishery is spread throughout the channels, canals, tributaries and estuaries of Bangladesh, wherever a brackishwater environment prevails. The gear is operated at less than 5m depth, more or less throughout the year. The MSBN is generally larger than the ESNB and is operated around 20m depths, at three locations : Sonadia, Mohipur and Dubla, from October to March. Some of the large MSBN are used as ESNB during the other months.

Trammel nets are operated off the Teknaf - Cox's Bazar coast, at 5-10 m depth. The trawl fishery operates in the 40-80 m depth ranges. Beach seines are operated from the shoreline and cover depths of up to 8-10 m. This gear is operated in the Cox's Bazar, Chittagong, Noakhali, Barisal, Patuakhali and Khulna areas, but 62 per cent of the units are located in the Cox's Bazar area alone. Shrimp Fry-collection gear are widely used in the estuaries and river mouths along the coastline (Table 3).

Interactive fisheries - their effect on recruitment

All the selected species are exploited at different stages of their life cycles by the ESNB, also by any other gear that interacts with the species. Sometimes, at certain stages of their lives, the species may be exploited by more than one type of gear, depending on seasonal availability and size ranges of the species in different ecosystems.

It appears that tiger shrimp, brown shrimp and ribbonfish follow two distinct cohorts a year. It appears that all selected species enter one fishery or the other at each stage in their life cycle starting with the PN. The overlapping nature of fisheries is either due to different fisheries occurring in the same fishing ground or the same size of shrimp and fish occurring in a wide range of depths.

Resource-related problems

Coastal aquaculture for tiger shrimp has so far consumed about 1,40,000 hectares of land. More land is being utilized for the purpose. Almost the whole industry now depends on the wild source for seed supply – so far more than 200 crores of tiger shrimp post-larvae and another 20,000 crores of other species which are discarded.

The plan for transition to semi-intensive culture to boost production and enhance foreign exchange earnings will need at least 10 times the present quantity of seeds. Farmers would have to depend on natural sources of shrimp in the absence of commercial hatcheries. As a result, aquatic organism other than tiger shrimp post-larvae would also be killed.

Such uncontrolled harvest of seed stock has dire consequences for the country's marine fisheries.

Present fishing system in coastal waters

Fishing Gear Used in the Coastal Zone

Coastal fisheries includes a number of different types of fishing gears and crafts. Some of the gears are operated by mechanized or motorized boats, some by country boats (row boats or sailboats), and some

without any boat. These include five different types of gillnets (drift gill net, fixed gill net, large mesh drift gill net, bottom set gill net and mullet gill net), three types of set bag net (estuarine set bag net, marine set bag net, large mesh set bag net), trammel net, bottom longline, beach seine and many others scattered throughout the coast and estuaries which confine their operations to waters up to a depth of 40 meters. (Fig.2).

According to the frame survey of traditional and mechanized boats carried out by the FRSS (Fisheries Resources Survey System) of the Department of Fisheries in 1984-85, a total of 17,331 boats were in operation in the marine artisanal fishery. Of these, 3,317 boats were reported to be mechanized while 14,014 boats were non-mechanized. According to the Marine Wing of the DOF, about 6,000 mechanized boats are currently in operation in the Bay, of which about 4,000 are registered with the MMD (Mercantile Marine Department). According to another estimate (Nuruzzaman, 1991), the number of traditional and motorized boats in the estuaries and coastal waters of Bangladesh is 20,000 and 12,700 respectively.

The following nets are used in marine and coastal waters. They need special mention because of their major contribution to production or their major role from the management standpoint.

a. Drift Gill Net (DGN)

Drift gill nets are operated at depths varying from 20 to 40 m, exclusively for pelagic fish. The principal catch is *Hilsa ilisha*. Skipjack tuna, mackerels and sharks are caught as by-catch. The nets are made of nylon twine or tire cord. The nets are operated by motorized boats. The mesh size is around 100 mm. Hilsa drift gill nets are operated during the period March - October, other gill nets between November and February.

b. Estuarine Set Bagnet (ESBN)

This is a trawl net-type bagnet fixed at the bottom in canals and estuaries all around the coastline. It is the most widely used net in Bangladesh. The net operates throughout the year. Depth of water varies from 3 to 10 meters. This is very effective for catching juvenile/undersized species of fish and shrimps of marine origin. This gear is therefore destructive. The cod-end mesh size varies from 5 to 18 mm, and the nets are operated mainly by row boats.

c. Marine Set Bagnet (MSBN)

This net is almost similar to ESBN but the mesh size is a little bigger. It is operated in winter during mid-September to February in deeper waters from the island base e.g. from Dubla island, Sonadia island and Mohipur at 10-30 m depth. This net is operated by mechanized boats.

d. Trammel Net (TRN)

This is a three-fold bottom drifting gill net targeted for penaeid shrimps but also to catch valuable fin fish species. The net is comparatively new in Bangladesh and is concentrated along the Teknaf - Cox's Bazar coast. The mesh size at the inner wall is 40 - 45 mm.

This gear is operated almost throughout the year by country rowing boats within a depth of 5- 15 meters. The sizes of the species caught are biologically sustainable. Expansion of operations, both horizontal and vertical, could be encouraged.

e. Bottom Longline (BLL)

Bottom longlines are operated in winter between mid-August and mid-February at depths of 20-30 meters i.e. beyond 20 km from the shoreline, mainly from the Cox's Bazar base. These are operated from 6-14 HP mechanized boats. They target jewfish / croakers and also catch Indian salmon, catfish, threadfin bream etc.

f. Beach Seine (BS)

Beach seine are semi-encircling nets operated between November and February from the beach and from March to November in the estuary by country boats. These are concentrated in the Teknaf - Cox's Bazar coast, but are available throughout the country. Since the mesh size is small, i.e. 12mm in the middle, and the area of operation is very shallow, these nets catch the young and juveniles of jewfish, anchovies, clupeids and small shrimps.

g. Shrimp Seed Collecting Gears

Fine-mesh push nets, fixed bagnets and dragnets are used throughout the coastline in creeks, canals and estuaries for harvesting the larvae of *P. monodon*, the tiger shrimp. These nets are operated almost throughout the year with seasonal variations from region to region (such as January to October in Cox's Bazar, February to April in Patuakhali, January to April in Khulna, November to August in Satkhira). The catches contain larvae and juveniles of other shrimps, fin fishes and zooplanktons. The tiger shrimp larvae constitute less than 1% of the total catch. The remaining 99% are destroyed by seed collectors. This means serious damage to the resource and to the ecology. But the practice cannot be stopped because of the demand for shrimp fry from the shrimp culture industry. Monitoring and control measures are, however, being taken — including development of hatcheries for seed supply.

Present management system

The present management system focuses largely on the industrial trawl fishery. The other brackishwater and marine fisheries are not part of the management system.

In 1983, the Government of the People's Republic of Bangladesh enacted the Marine Fisheries Rules, 1983, in accordance with the provisions of the Marine Fisheries Ordinance, 1983.

The marine fisheries rules amended in 1993 provide for licensing and monitoring of artisanal and mechanized fishing boats. The monitoring of fishing vessels is done only by the Marine Fisheries Surveillance Checkpost at Patenga, Chittagong.

The main features of the ordinance are as follows:

1. Every fishing vessel should take a licence from the Department of Fisheries.
2. Every fishing vessel should supply catch and effort data regularly to the Department of Fisheries.
3. The following methods are prohibited:
 - a. Fishing by any gear with a mesh size smaller than the mesh size mentioned in the rules.
 - b. Fishing with any kind of explosive, poison or noxious substance.
 - c. Fishing with electro-lighting.

4. Mesh size : All licensed fishing vessels shall use nets of mesh size with the following dimensions:
 - a. For shrimp trawl net (boom) with low opening, the minimum mesh size shall be 54 mm at the cod-end.
 - b. For fish trawl net, mesh size at the cod end shall be 60 mm.
 - c. For large mesh drift net (MP), the minimum mesh size shall be 200 mm.
 - d. For small mesh drift net (SMD), the minimum mesh size shall be 100 mm.
 - e. For set bagnet (behundi **net**), the minimum mesh size at the cod-end shall be 30 mm.

Area for fishing

Area up to 40 meters depth is reserved for artisanal fishing gears. The industrial fishery is allowed to operate beyond 40 meters depth.

Marketing

In Bangladesh, fish marketing is handled almost exclusively by the private sector, the only exception being the limited fish marketing activities carried out by BFDC. A group of intermediaries known as aratdars (commission agents) and *mohujans* (money lenders) control and finance fish marketing operations. *Aratdars* who dominate wholesale markets have a chain of suppliers (traders) who regularly bring in catches.

To ensure regular supplies, advance payments are regularly made to catchers and suppliers. These “Aratdars” charge 3-6% commission and take 2-4 fish for every 80 fish sold (World Bank, 1991). Most fishermen operating traditional boats bring their catches directly to landing centers / wholesale markets where the catch is taken over by traders (Fig-3).

BFDC’s entry into fish marketing was primarily to develop a modern fish marketing system and provide market stability to help both consumers and producers, However, the BFDC has not been able to fully achieve these objectives, because of certain limitations.

In the coastal region, fish is landed and distributed through a large number of landing centers located in Chittagong, Cox’s Bazar, Barisal, Bhola, Patuakhali and Noakhali. BFDC operates a number of wholesale markets and landing centers in Chittagong, Cox’s Bazar, Khulna, Kheppupara and Patuakhali.

Traditional boats which fish inshore and carry out day fishing do not use ice to preserve catch. Fishermen operating small traditional crafts usually land their catch on beaches, river banks and landing places. The quality of fish landed in this way often deteriorates. The fish harvested commands a low price. Of the fish harvested, about 85% is consumed fresh; the remaining 15% is dried, dehydrated, salted or frozen.

Almost all mechanized boats which undertake trips of four to six days in coastal waters carry ice in insulated fish-holds. After landing, the fish is auctioned at landing centres and transported to different markets. These landing centers have facilities for ice boxes where re-icing and packing is done for long-distance transportation by trucks or insulated vans. Fish traders who own motorized transportation boats carry ice and collect catches from fishermen operating in rivers and estuaries.

Fishermen operating in offshore areas land their catches in temporary island camps. The catches are sun-dried. BFDC operates a number of refrigerated vans for long-distance transportation, particularly in Dhaka city.

All freezer trawlers process their catches on board for export. Some fish trawlers land their catches for further reprocessing in shore-based fish processing plants. Poor-quality fish and small shrimps are converted into fish meal at fish meal plants in Chittagong and Cox's Bazar.

Bangladesh also markets coastal and marine fisheries products including shrimp to various international markets. The export trend is strengthening. (Table 4).

Organizations and agencies concerned with management of coastal fisheries

The DOF marine wing is located at Chittagong. In 1983, the Government of Bangladesh enacted the Marine Fisheries Rules 1983 in accordance with the Marine Fisheries Ordinance, 1983. According to these rules, the DOF marine wing issues licences and monitors operation of fishing vessels. It is the Ministry of Industry, however, that is authorized to accord permission for acquisition of fishing trawlers in consultation with the Ministry of Fisheries and Livestock.

The Marine Fisheries Rules, amended in 1993, provide for licencing and monitoring of artisanal fishing boats. The rules also regulate mesh sizes, fishing areas and fishing methods. Movement of fishing trawlers, and general surveillance of the area, is carried out from a checkpost located in the Bay. For patrolling of the EEZ, the DOF procured two ships and placed them under the operational control of the Bangladesh Navy.

Besides the Ministry of Fisheries and Livestock, other Ministries / Agencies directly or indirectly concerned with fisheries management are the Ministry of Land (for leasing of public open water bodies or Jalmahals); the Ministry of Industries (for licencing and promotion of fish processing industries, trawler industries etc.); the Ministry of Commerce (for export of fishery products and import of fishery and fishing inputs); the Ministry of Irrigation, Water Development and Flood Control (for developing embankment and water control structures); the Ministry of Local Government and Rural Development (for registration of fishermen cooperative societies); and the Ministry of Environment and Forests (for management of water bodies within the Sundarbans reserve forests and conservation of the mangrove ecosystem).

Bangladesh Fisheries Development Corporation (BFDC)

The BFDC was established in 1964 with a view to promoting the fishing industry, particularly in the marine sector. The BFDC's major functions are:

- a. Develop infrastructure for preservation, processing, distribution and marketing of fish and fish products.
- b. Undertake a survey of fish resources in the sea.
- c. Acquire, hold or dispose of fishing boats, fish transportation carriers / vans
- d. Establish units for capture of fish and promote an organization for exploitation of fish wealth.

Fisheries Research Institute (FRI)

The **Fisheries Research** Institute was established in 1985 as an autonomous body under the administrative control of the MOFL. Prior to the establishment of the Institute as an independent autonomous body,

fishery research activities used to be carried out by the DOF in its own research stations. Research stations and ancillary facilities of the DOF were subsequently transferred to FRI to plan and undertake adaptive research.

Marine Fisheries Academy

The Marine Fisheries Academy was established by BFDC in 1973-74 in the fish harbour complex at Chittagong to create a core of qualified skippers, engineers and crew for operation of trawlers. The subjects taught are navigation, marine engineering, electronic engineering, refrigeration engineering and operation of trawlers. The Academy currently works under the direct control of the MOFL.

Universities

The Bangladesh Agriculture University (BAU at Mymensingh) has a faculty of fisheries for awarding B.Sc (Hons) and M.Sc degrees in fisheries. The University of Dhaka, Chittagong and Rajshahi, have their own academic programmes in fisheries. The University of Chittagong has an Institute of Marine Science that awards degrees in marine biology.

Fisheries co-operatives and associations

There are five fishermen organizations in Bangladesh :

1. Bangladesh Jatio Matshyajibi Samabay Samity (BJMSS), established in 1960
2. Bangladesh Jatio Matshyajibi Samity (BJMS), set up in 1986.
3. Bangladesh Jatiotabadi Jele Dal (BJJD), set up in 1993.
4. The Bangladesh Marine Fisheries Boat Owners Association.
5. The Marine Fisheries Association.

The BJMSS is the apex society registered with the Department of Co-operatives. It has 88 central and 4,243 primary societies. As of June 1983, the primary societies of BJMSS had a total of 537,244 individual members (BOBP, 1985).

Non-Government Organizations (NGOs)

There are several fisheries NGOs in Bangladesh. But only a few of them are active in coastal areas and work with coastal fisherfolk communities. These are:

1. Community Development Centre (CODEC), operating in Chittagong, Noakhali
2. CARITAS Bangladesh, operating in Chittagong
3. "Deep Unnayan Sangstah" operating in Hatia and Noakhali
4. "Uddipan" operating in Sandwip (Chittagong).
5. Bangladesh Samai Unnayan Samity (BSUC) in Baskhali, Satkhania (Chittagong).
6. Association of Zonal Approach Deveiopment (AZAD) operating in Cox's Bazar.

7. “Gona Unnayan Prachesta” (GUP Madaripur and Chittagong).
8. “Bandhujan Parisad” operating in Bhola.
9. Proshika Manabiuk Unnayan Kendra (Proshika-MUK) in Bhola.
10. Grameen Bank.

Dynamics of the fishery

Fishing operations in estuaries and coastal waters used to be carried out by traditional craft until the mid-1960s. From 1966, two organizations — BFDC and BJMS — started the process of mechanization by importing and introducing marine engines and nylon twine. A frame survey of traditional and mechanized boats was carried out by the Fisheries Resources Survey System (FRSS) of the Department of Fisheries (DOF) in 1984-85. According to that survey, a total of 17,331 boats were in operation in the marine artisanal fishery of which 3,317 were reported to be mechanized boats.

The problems in coastal fisheries :

1. High dependency on fishing on the part of the fishermen community.
2. Low catches and incomes from the most common gear.
3. The multi-species and multi-gear character of the fisheries.
4. Lack of access to formal credit.
5. Dependence on the Aratdar or the local money lender.
6. High interest rates payable charged by the informal system (money lenders etc.)
7. Little control over the marketing system.
8. Fishermen unable to charge market prices for the fish, since the fish are sold to money-lenders.
9. Lack of organization in the fisherfolk community.
10. Lack of proper marketing chain.
11. Lack of post-harvest facilities at landing centres.
12. Lack of knowledge in post-harvest handling of fisheries products.
13. Lack of knowledge of modern fishing technologies
14. Lack of storage, preservation and processing facilities during the peak season.
15. Fishermen do not react promptly to warnings about natural disasters.
16. Lack of shelter for fishing craft when natural disasters strike.
17. Loss of crafts and gear, both from natural phenomena and from piracy
18. Lack of facilities to mend nets, and high prices of fishing equipment, gears and accessories.
19. Lack of knowledge about health care, education, family planning, and a hygienic environment.
20. Fishermen lack understanding about fisheries management, though they are aware of decline in fisheries resources.
21. Fishermen are not pro-active about taking up alternative income-generating activities.

22. Conflicts in fishing grounds between mechanized and country boats and trawlers
23. Fishermen lack awareness about the need to save for the future.
24. Lack of trained manpower at the managerial level.

Measures taken by the Management Authority Association/NGOs

1. A project was undertaken to identify stakeholders in the estuarine set bag-net fishery and the shrimp post-larvae fishery. The perceptions of stakeholders and their modes of communication were analyzed at meetings of fishermen, Government staff and NGOs.
2. Intensive consultations were held with fishermen communities to mitigate fishing problems in the two villages of the coastal belt
3. The views of stakeholders at the highest level — national political leaders – were obtained for managing coastal fisheries, marine fisheries and development of the fisherfolk community.
4. The concept of participatory management was initiated in 1996 by the Government and BOBP.
5. A project was undertaken by the Government in 1995-96 to eradicate poverty among fishermen communities. Fund for both fishing and non-fishing activities provided from the government's own resources.
6. To ensure security of the fishing industry as well as of resources, the Government has engaged the Coast Guard and the Bangladesh Navy in carrying out surveillance of coastal areas.
7. Scientists have identified the ESNB fishery and the shrimp larval fishery as destructive fisheries.
8. A programme has been undertaken to find out alternative fishing and non-fishing activities to rehabilitate fishermen using destructive fishing gear in case these gear are banned.
9. Various NGOs have been allowed to take up projects to solve social and economic problems among the fishermen community.
10. A small project has been undertaken by the Government to mitigate managerial problems in fisheries, motivate fishermen to take up participatory management, and raise awareness-building about resource limitations and destructive gear.
11. A Marine Fisheries Ordinance is in force to conserve coastal resources for the benefit of fishermen.
12. A programme of motivation and awareness-building among fisherfolk has been launched under the auspices of a BOBP-supported project, to improve participatory management of coastal fisheries.
13. A system of joint ownership of mechanized fishing boats is being promoted whereby the boat owner provides investment, the fishing crew contribute labour, and 50 per cent of the catch earnings go to the crew. This system will provide the incentive for higher catches and better boat maintenance. It will improve the living standards of the crew, who will regard themselves as joint owners of the mechanized fishing boat.

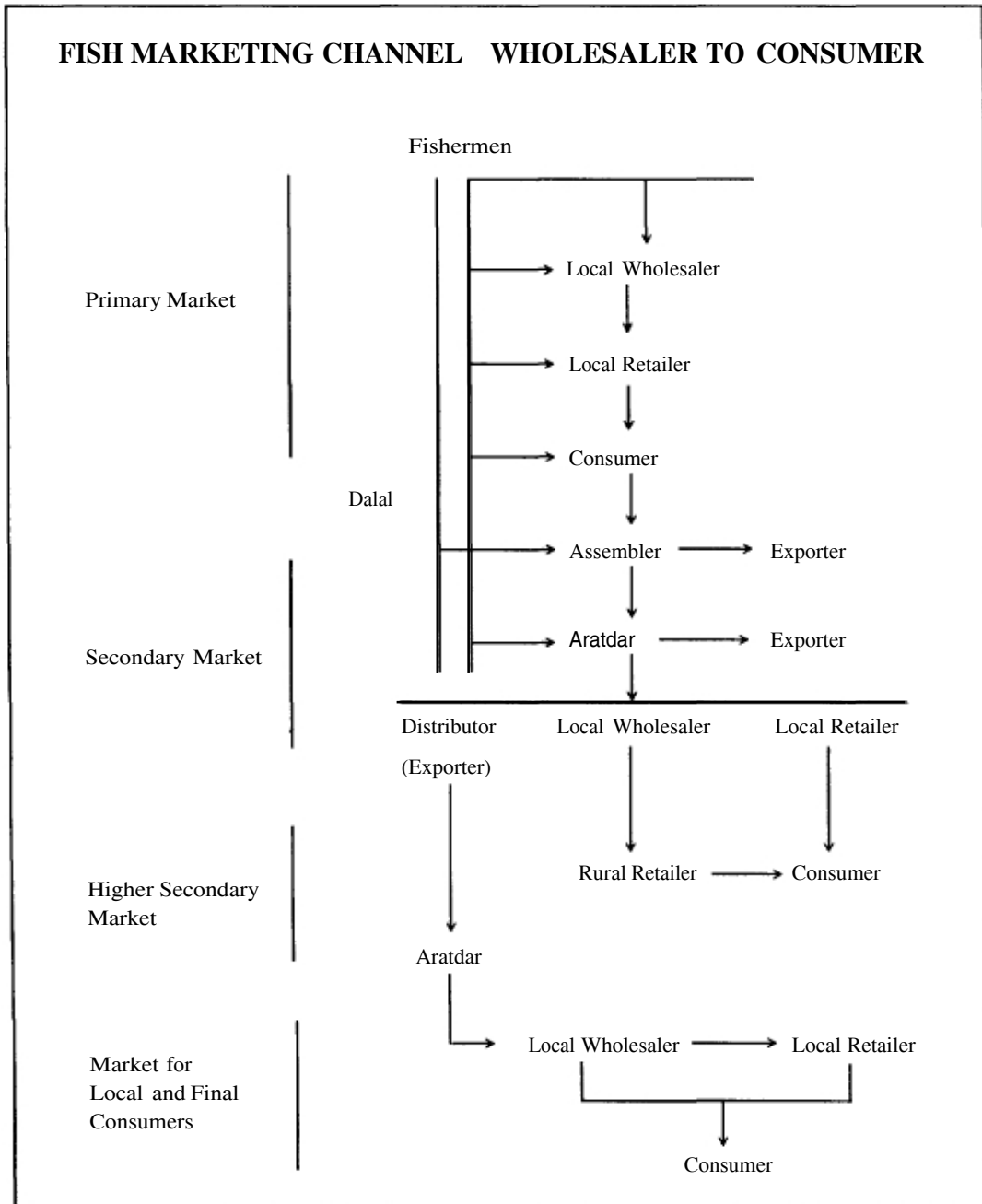
Recommendations

1. Mechanized and non-mechanized fishing boats should be issued licences for a fixed duration. When that expires, no new licences should be issued; only old ones should be renewed.
2. Hatcheries should be established to ensure regular supply of low-cost post larvae shrimp and stop collection of wild seed.
3. A rehabilitation programme should be undertaken for users of destructive gears before the gears are banned.
4. Under-exploited and unexploited resources such as tuna and tuna-like fishes, mussels, squids, octopus, crab, lobster etc. must be assessed through scientific surveys. Initiatives must be taken up for exploiting these resources, with strict monitoring and control programmes. A project in this connection should be undertaken.
5. The feasibility of extending the trammel net fishery into deeper waters should be studied. The possibility of ESNB fisherfolk engaging in viable fishing methods such as longlining should be studied in detail.
6. The government, NGOs and international donor agencies should undertake a motivation and awareness-building programme to improve the quality of life of fisherfolk, take up income-generating activities, and introduce participatory management.
7. Facilities should be established for secure shelters for fishing boats during a cyclone.
8. Restrictions on trawlers preventing them from trawling in depths below 40 meters should be implemented strictly.
9. Discharge of poisonous wastes, insecticides, and other chemicals harmful to the coastal environment should be stopped.
10. Training needs for marine fishery officers and fishermen should be identified and addressed, so that they are capable of encouraging participatory approaches to fisheries management that will prevent resource depletion.
- II. Deforestation of mangroves for any purpose should be banned. The concept of Integrated Coastal Zone Management must be put into practice for environment-friendly development of coastal zones.
12. A database management system should be established in industrial and marine artisanal fisheries, in order to bring the entire coastline under a computer network system.
13. Insurance for vessels and group insurance for all the crew should be compulsory.
14. Low-interest credit should be made available without collateral for registered craft.
15. A policy should be formulated by the Government for conservation and exploitation of coastal fisheries.

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Source Based on JR Coulter and J.G. Disney

Figure 1: Coastal Zones of Bangladesh

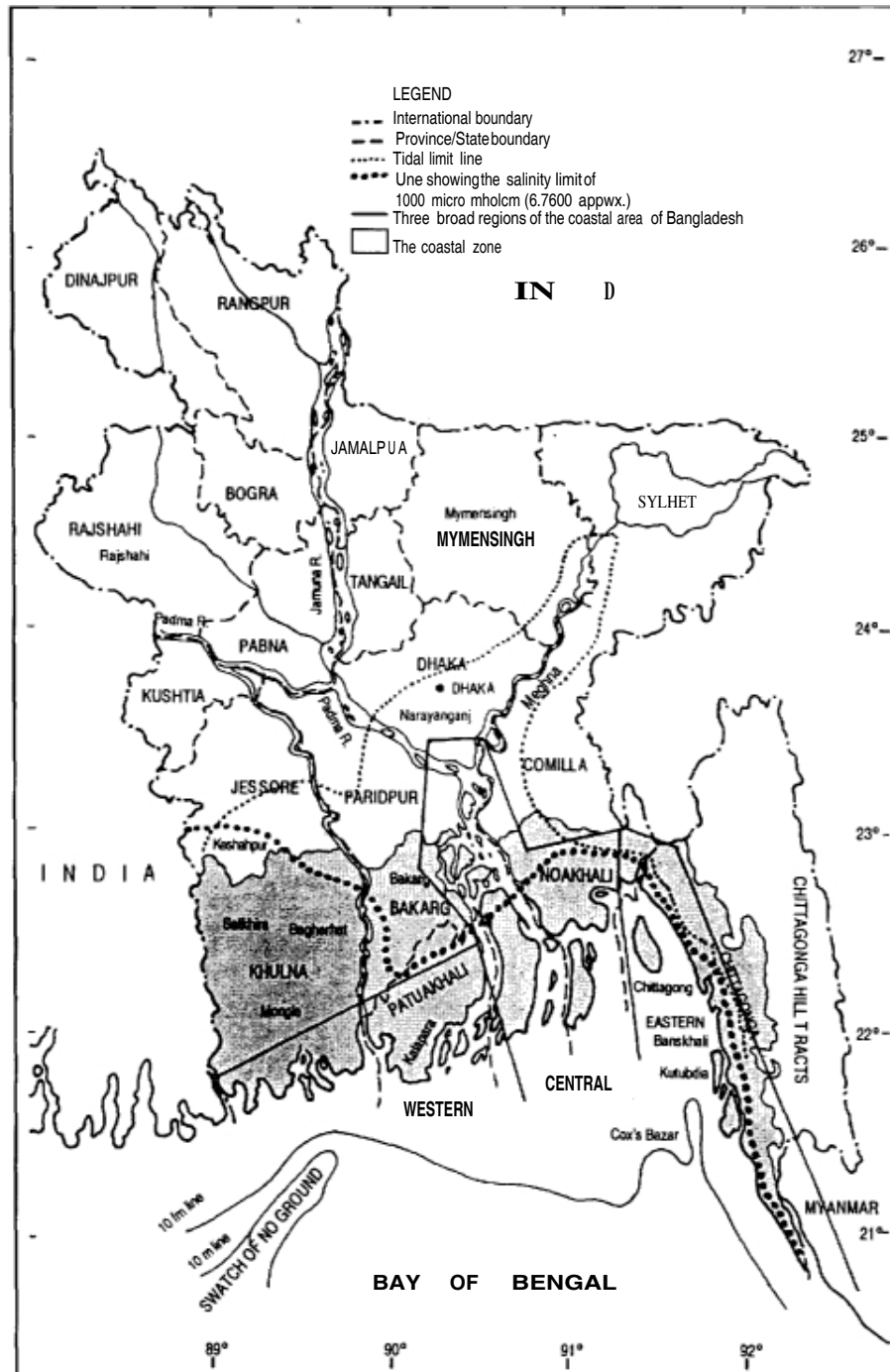
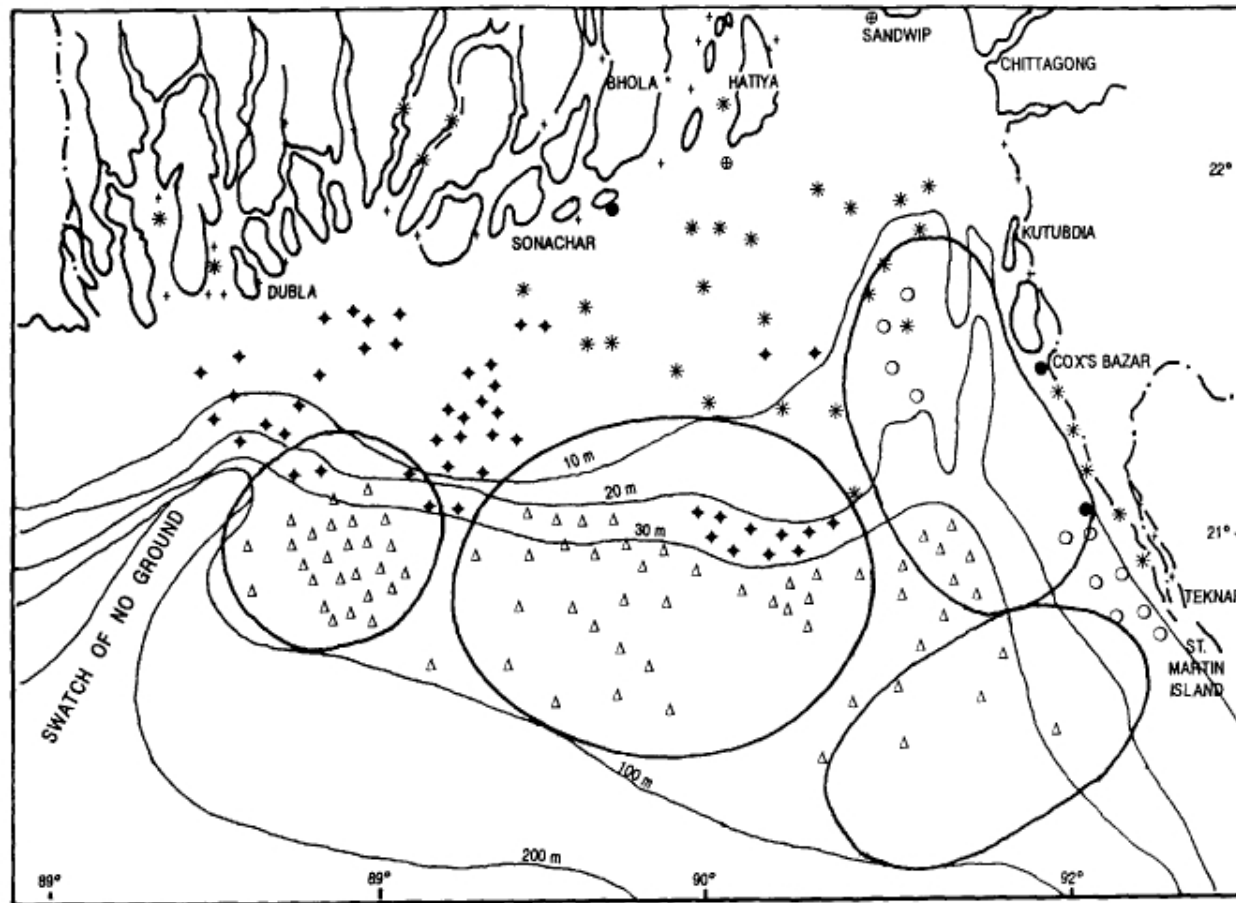


Figure 2 Area of operation of different fishing grounds



ESNB + Pushnet ● MSBN ◆ BLL * BS ⊕ Trammelnet ○ Trawl-net Δ

Figure 3 : Marine and Coastal Waters of Banglades

