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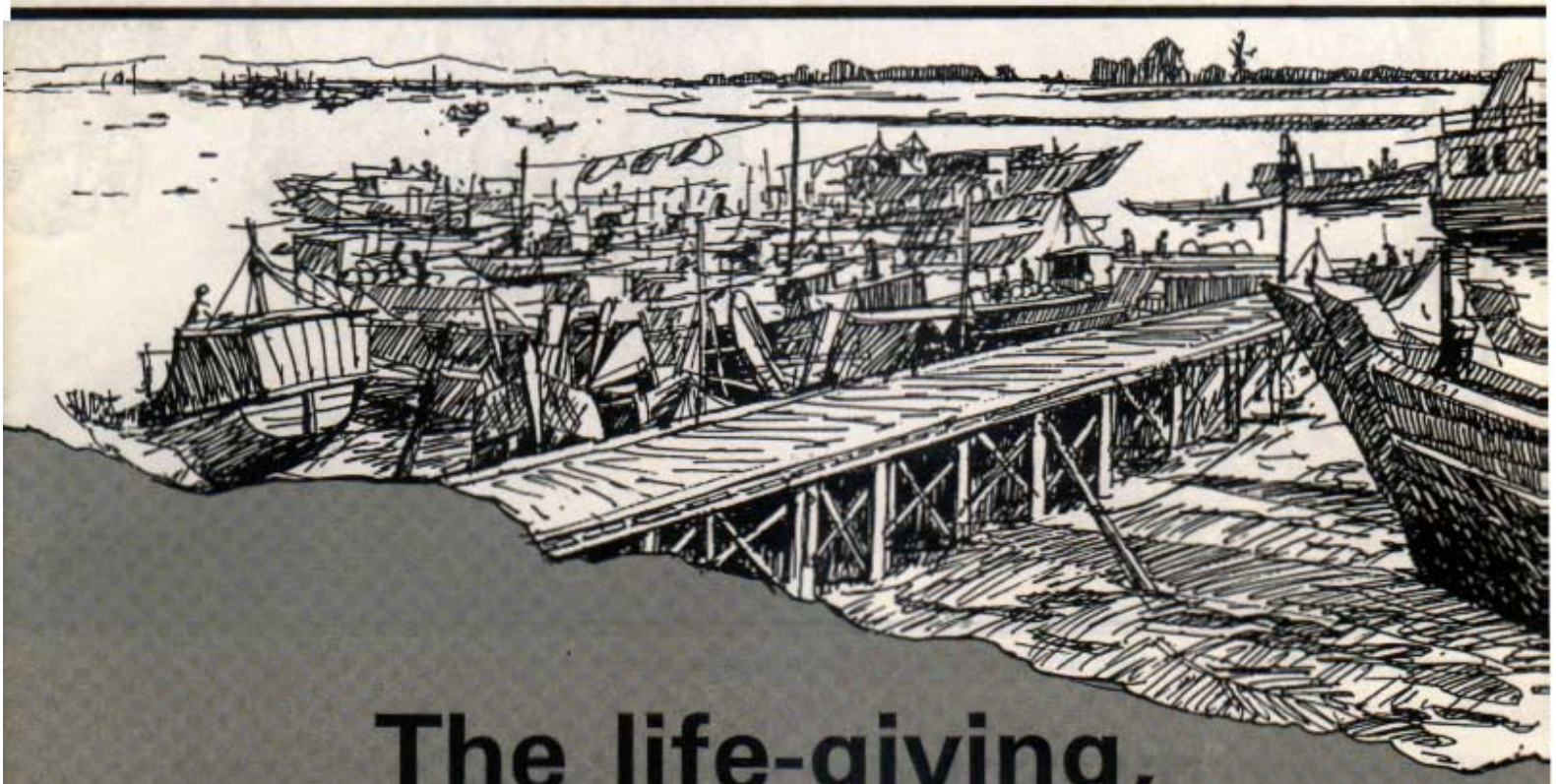
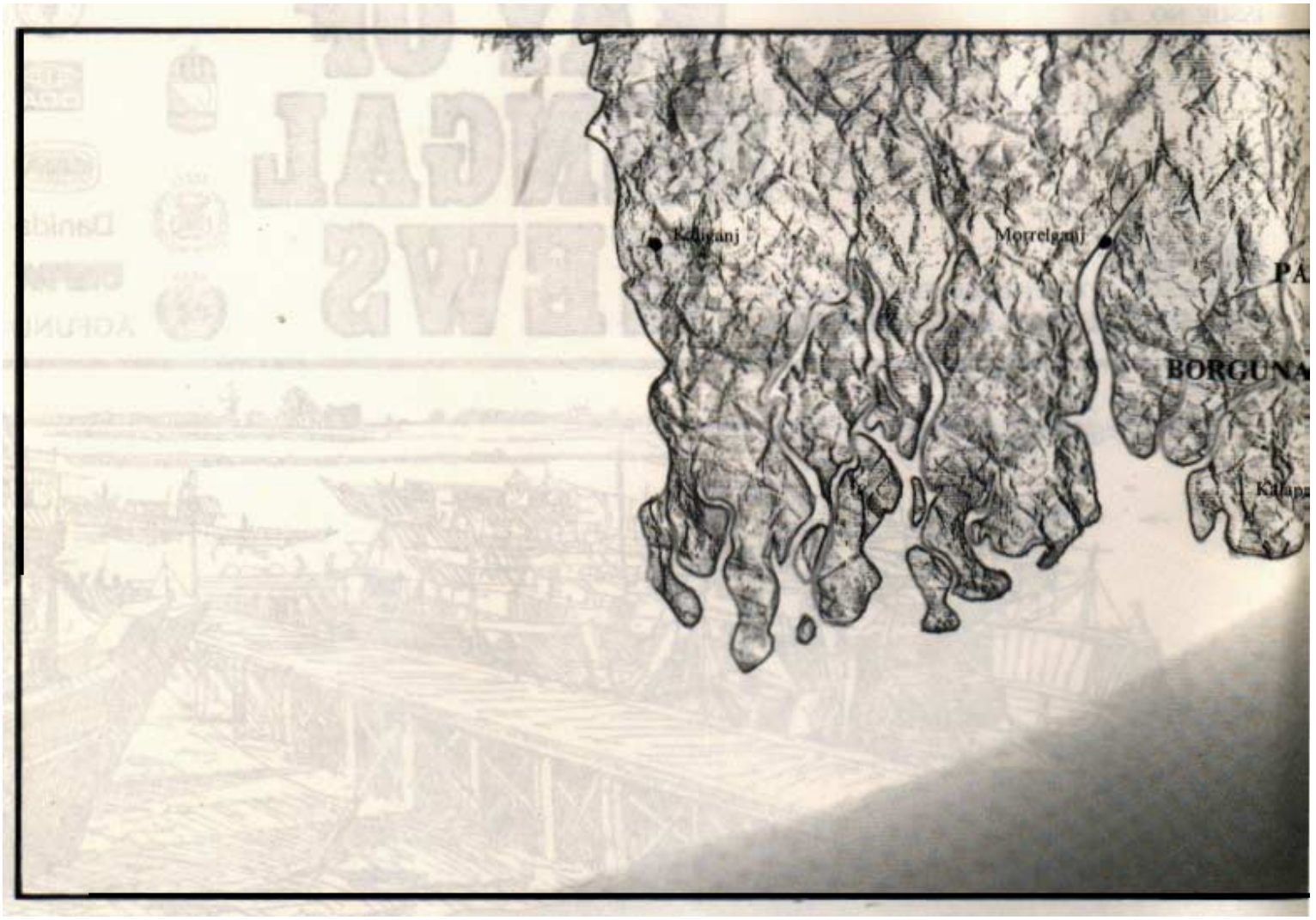


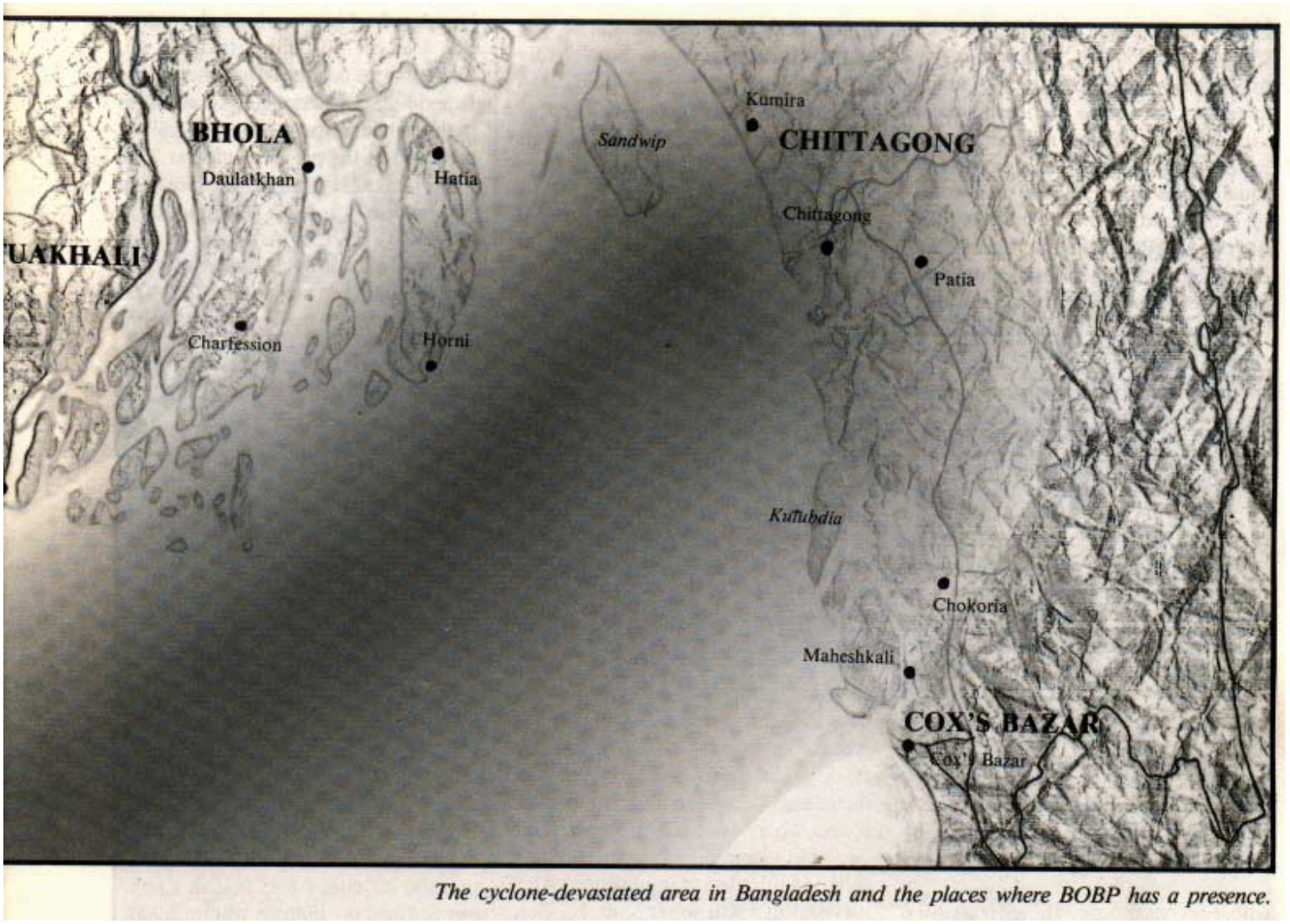
The life-giving, death-taking WATERS OF BANGLADESH



The life-giving, death-taking WATERS OF BANGLADESH

by S Muthiah
* Photographs by Syed Raqibul Mom

The author, who made a short visit to Bangladesh in the aftermath of the April cyclone and May floods, spoke to scores of fisherfolk, who were the worst affected, government officials in the field, donor agencies and Non—Government Organizations(NGOs) trying to bring order out of chaos.They spoke in many voices, but there were a few suggestions that they all agreed on. These, they felt, needed immediate implementation, and it is these unanimously agreed on strategies that are emphasized here.



The cyclone-devastated area in Bangladesh and the places where BOBP has a presence.

In no country is life more influenced by its waters than in estuarine Bangladesh, perched at the top of the inverted funnel that is the Bay of Bengal. Its giant rivers, the Padma (Ganga) and the Jamuna (Brahmaputra) flowing out to the sea as the Meghna, the Madhumathi and scores of other tributaries, the hundreds of lakes and the thousands of man-made tanks and village ponds, the water-logged hectares of paddy, the waters of the Bay that wash the long serrated coast and lap the myriad islands off it, they all nurture and nourish the rice farms and orchards, jute plantations and bamboo groves and the marine and inland fisheries. These fisheries provide the country with over 80 per cent of its protein, a livelihood for over five million people in 1100 coastal villages and hundreds more inland, and a substantial amount of its foreign earnings, making it one of Bangladesh's major industries.

But while the waters of Bangladesh provide its 110 million people with sustenance, they have also been the cause of more deaths than by disease and accident. Floods and cyclones and tidaiwaves are a way of life in a country where water is one of the most disastrous forces on earth. The denudation of the forests of the Himalaya and changing atmospheric and climatic conditions in the world have contributed to making Bangladesh a perennial flood victim. The funnelling of the winds of the Bay add to its woes by making it one of the most cyclone-prone countries of the world and a victim of numerous tidal surges.

The cyclone of April 29th, the 7-8 metre high tidalwave that surged over Bangladesh's south-eastern coast and the weeks of rain and floods that followed is the latest in the series of major disasters that have stricken the country. Those who remember natural disasters going back to the independence of the subcontinent rate this cyclone and tidalwave the most powerful in memory, and the floods that followed, they say, make it one of the longest periods of continuing travail in the last fifty years. Yet, despite the casualties and losses, many see a silver lining; death and destruction has been nowhere near as heavy as in the 1970 cyclone. It is in the reasons for this that local and international observers see hope for a country which has no option but to live with its death-dealing waters and has to find ways and means of adapting to, not defying, Nature. In Bangladesh, the fisherfolk especially, live where they should not, but they have no alternative if they are to earn a living. Thus, their problem, like that of millions of others on the coasts and islands, is not how to avoid death and destruction completely, but how to minimize it.

In the 1970 disaster, deaths were assessed at anywhere between half a million to a million people. Livestock was lost in the millions and the fisheries fleet was wiped out. This time, in the 79 upazillas of the 18 affected districts, about 150,000 have died, it is officially stated, though estimates by

NGOs put the toll at anywhere between 250,000 and 350,000, with about five times that number injured. As many livestock have also perished, these sources state. Three million people have been affected in an area of 1600 square miles where 160,000 taka worth of crops and over 2.5 million taka worth of embankments have been destroyed. The biggest losses, however, have been suffered by the fishing community, most of them small-scale fisherfolk.

It has been officially estimated that 65,000 fishermen have beçn badly affected with 30 trawlers and 2156 mechanized boats lost or in need of major repair and 6532 country craft lost and almost as many battered. Over 8500 nets have also been lost. The value of mechanized boats lost is stated to be about 920 million taka, of country craft 250 million taka and of nets 240 million taka. Over 30,000 hectare of shrimp fanns — major foreign exchange earners — were inundated with an estimated production loss of 750 million taka. In all, Government assesses the loss to the fisheries and fisheries-related activities in the public sector at being 300 million taka and in the private sector at 7380 million taka. if a major rehabilitation programme is not immediately launched in the fisheries sector, Government states that fish production loss would be an additional 3000 million taka till the end of the year.

With the April cyclone sweeping up

Fisheries sector suffers $ 130 m damage

— and may lose another $ 100m

The cyclone and tidal bore that hit the coastal districts of Bangladesh on the night of April 29, 1991 took an enormous toll. Some 150,000 persons have died, 10 million made homeless, 1.2 million houses either fully or partly damaged, over a million head of cattle killed and about 400,000 acres of standing crops fully or partly damaged in 79 *upazillas* of 18 districts. Worst hit were the districts of Cox's Bazar, Chittagong, Bhola, Patuakhali and Borguna.

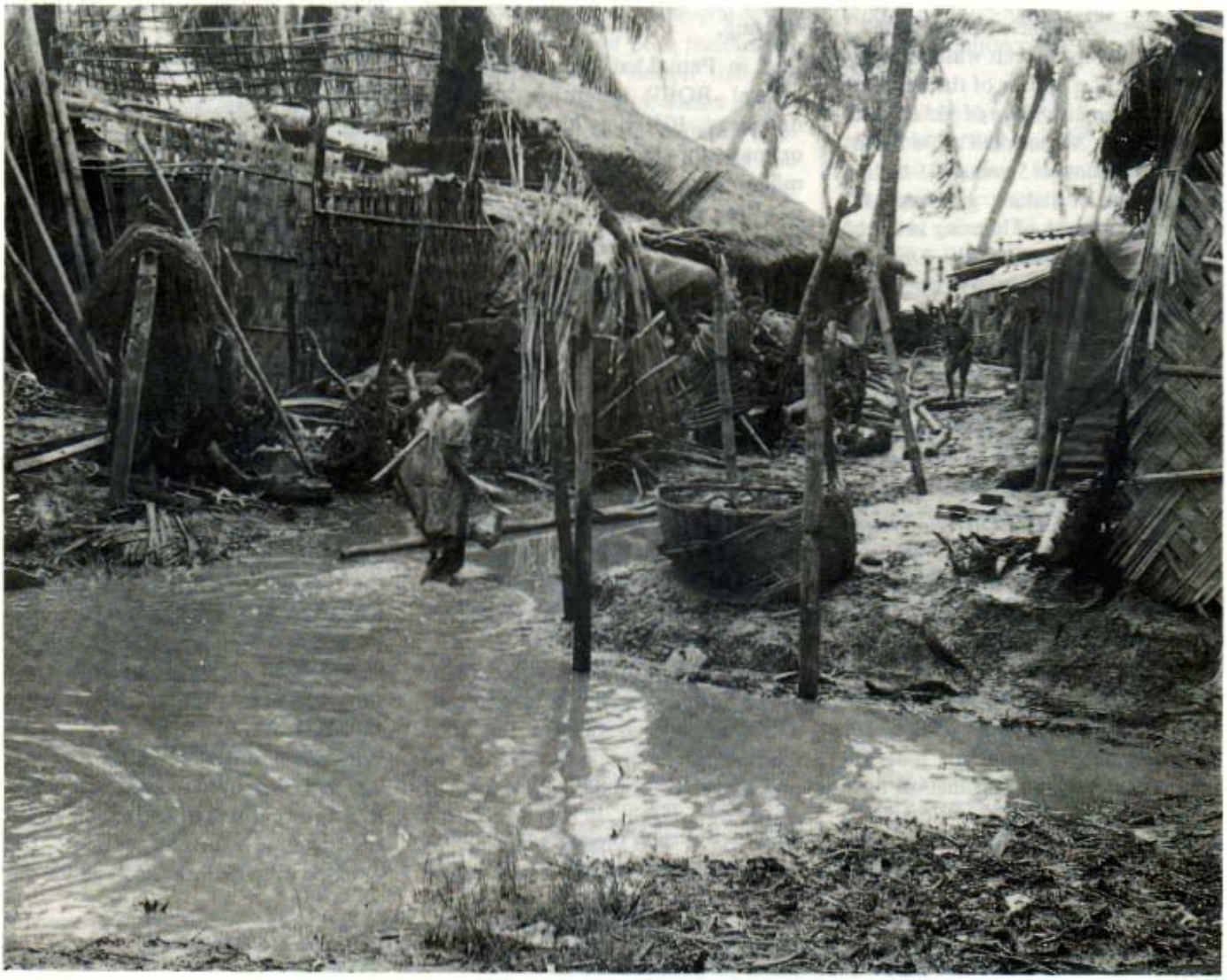
Besides damage to educational institutions, roads, bridges, culverts and flood embankments, both the fisheries and poultry sectors have been badly hit. The fisheries sector, in particular, has sustained colossal damage, both in man and materials. This damage is estimated at nearly Taka 4,400 million (US $ 130 million appx).

The small-scale fisherfolk community inhabiting the islands, low-lying coastal areas, river banks and embankments suffered the most. The seven to eight metre high tidal bore inundated entire areas where fisherfolk lived and worked, turning fresh water ponds saline and depriving those who survived of fresh water sources. Fish processing plants and fish-base industries in Chittagong and Cox's Bazar Districts were also badly damaged.

The infrastructural damage suffered by the Department of Fisheries is, according to preliminary estimates, nearly Taka 300m (US $ 9m). The tidal surge caused a loss of 4000t of culture shrimp production valued at US $ 20 million in foreign exchange in an area 30,000 ha in extent. Of the 53 trawlers in the area, six sank, 26 were grounded and 14 were damaged. Partial or tidal damage to 2150 motorized boats and 6,550 non-motorized fishing boats was caused. If rehabilitation is not initiated speedily, estimated loss in fish catch over the next six months will be 3,300 million Taka(US $ 100 million appx.), making a total loss for the period from April 29 of about Taka 7,700 million (US $ 230 million).

The estimated damage to the fisheries sector

S.No.	*Item*	*Quantity*	*Estimated loss (million Taka)*
1.	Infrastructural loss to DOF (peripheral dykes of shrimp estates, hatchery and nursery buildings, fish seed farms, laboratories, survey vessels etc.)	—	297.5
2.	Private shrimp farms (production & infrastructure)	30,885 ha	1,601.5
3.	Private shrimp fry collectors & nurseries	—	14.5
4.	Processing plants	34 nos	730.5
5.	Freshwater culture fisheries	5,830 t	175.0
6.	Trawlers	46 nos	410.0
7.	Motorized boats	2,156 nos	916.5
8.	Non-motorized boats	6,532 nos	247.0
9.	Estimated catch loss in next 6 months		3,285.0
		TOTAL	7,677.5



* *Days after the cydone in Kumira ... 'streets' remain waterlogged, homes are a shambles.*

from the south-west in a north-eastern direction and lashing south-east Bangladesh, the worst hit areas were the islands east of the Sunderbans and the coastal upazillas of the Chittagong and Cox's Bazar Districts. The island Sandwip, smack in the path of the storm, was hardest hit, and islands on either side of it, Kutubdia and Hatia, were only a little less affected. In these islands the tidaiwave surged over the sturdy 3 and 4m high embankments built since 1970, and swept away all in its path. Who would have expected a wave 25 feet high, scientists, engineers and officials keep asking themselves! How high do we build the next embankment and what happens if the next wave is even bigger, they wonderingly keep asking other. There is, in fact, no answer to the freak wave or the rogue storm. But in areas where the Bay of Bengal Programme is working, and where committed NGOs like the Community Development Centre (CODEC) and UBINIG, play an active role, there are some answers from people who realize they have to live with Nature and there is nowhere else for them to go. "We can't fight water; we have to live with it, but we must discover the best way to live with it and learn to prevent it taking too heavy a toll," says speaker after speaker among those who live and work in the fishing villages. They also emphasize that living with water must also be only in a way compatible with the traditional ecological, natural and social systems of coastal Bangladesh; sudden change is not what any of them seeks.

Some of these villages in the path of the storm are where BOBP has ongoing programmes. These are now considerably set back and the villages are in immediate need of relief to get life going again. As in this entire storm-devastated area, the biggest losses in these villages too is housing, galvanized iron and thatch homes gone with the winds. In Kumira village, where BOBP had a set bagnet study underway, it is a heart-rending sight to see people living in rain and mud in shanties built with the leftover pieces salvaged from miles around and in five tents an NGO has provided for 335 families. Yet, at the community centre, which is a part of the village temple, speaker after speaker at a village gathering endorsed the headman's words: "We are not asking for relief; give us the means to rehabilitate overselves." With the fishing season just beginning and likely to get into full swing by August, what they want is the means to repair their boats – about a third of which are lost or damaged – and for new nets to replace the more than half that have been.lost.

Kumira, where 22 boats have been lost and 31 heavily damaged, is typical of the worst-affected villages where BOBP has a presence. Here, housing

has been blown away to the value of 3 million taka and nets worth about *2.5* million taka have been washed away. This is the lion's share of the 6 million taka damage the village of 335 families has suffered. Maheshkali's 136 fisherfolk families lost 115 boats, *3.5* million taka worth of fishing gear and 1.2 million taka worth of housing in a total damage estimate of nearly 8 million taka. In Horni, Hatia, 35 boats were lost and 40 partly damaged, gear worth 2.5 million taka was lost and housing worth 1.7 million taka was washed away, the 348 families losing in all about 5.5 million taka worth of property. All these are villages where BOBP's set bag project is underway.

In Bhola District, BOBP has been working on a project to motorize *chandi* boats. Here, in Charfession, 238 families are directly connected with the project and 196 are indirectly connected. In Daulatkhan, there are 83 families directly connected and 198 families indirectly connected. Together they operated 73 motorized units till the great storm and had met all their rapayment dues. Now they find themselves with 5 boats lost, 48 badly damaged and over 2.5 miffion taka worth of loss in craft, gear and housing.

And in Patuakhali, where there are several BOBP extension projects underway, 105 boats have been fully or partially damaged and nearly 3 million taka worth of property in all has been lost. A similar scenario can be written for about 300 fishing villages on this coast. But what strikes an observer from outside is the amazing resilience of the fisherfolk in village after village. There is neither despair nor loss of hope; unlike the beggars who dominate the urban scene in Bangladesh, there are no mendicants in these villages. "Give us the craft and gear or lend us the money for it; we will pay it back," every speaker proudly reiterates at village meetings with officials and NGOs. They see themselves not as paupers, but as professionals.

Discussions are underway and plans are being drawn up by the government and international donors for 1000 mechanized boats and gear to be provided to fisherfolk to allow them to start fishing again. BOBP has started work on a FAO-backed project to build 100 new country craft, repair another 100 and provide 200 fishing nets to the most needy in the area of its operations. All this, however, is only trying to make good the damage. Serious discussions are still not underway to further minimize the losses in the event of future such catastrophes. In fact, all plans drawn up in the past few years, and now ready for implementation, have been to protect the cities and the farmlands. No attention has been paid to the poorest of the poor who make a living from the waters.

Nevertheless, it is universally recognized that the steps taken after the 1970 disaster helped contain the 1991 catastrophe somewhat. Miles of embankments had then been built, several cyclone shelters had been constructed, the cyclone warning system had been improved and cyclone preparedness lessons had been taught. But none of it had been enough. And the same story was heard over and over again to explain why.

While Government's weather forecasting had improved considerably and Red Crescent had organized an efficient cyclone warning system, the Cyclone Preparedness Programme did

ESTIMATE OF LOSS AND DAMAGE IN AREAS WHERE BOBP HAS A PRESENCE

	Boats lost	Boats damaged	Value*	Nets lost Value	Housing lost Value	Total
Chandi Boats						
Daulatkhan (83 families) Charfession (238 families) (73 motorized craft)	5	48	0.6m	0.5m	0.3m	1.4m
Charfession 1% associated families				*	*	1.im
Daulatkhan (Bhola Dt) 198 associated families				*	*	im
S B N Projects						
Kumira (335 families) (Chittagong Dt)	22	31	0.6m	2.5m	3m	6.1m
Maheshkali (136 families) (Cox's Bazar Dt)	115	2	3m	3.6m	1.2m	7.8m
Horni,Hatia (348 families) (Noakhali Dt)	35	40	1.2m	2.7m	1.7m	5.6m
Extension Projects						
Patuakhali (117 families)		-105-		*	*	2.8m
Borguna (130 families)				*	*	0.4m
Aquaculture						
Chokoria	project wiped out					

Note: The TCP project is being looked at for Bhola-Noakhali, Chittagong and Cox's Bazar.
* Takas, rounded off.

not prove as *effective* in practice as had been hoped. The official warnings were not heeded by thousands, who had got blasé after repeated warnings but no storms. It was, many alleged, a case *of* crying 'Wolf' too often. On the other hand, Red Crescent warnings in several areas were responded to with alacrity, wherever its volunteers had successfully established a rapport with the villagers. CODEC claims that in most of the 70 fishing villages it works in that were affected, there were only five deaths, its workers and the villagers responding as a team to the Red Crescent warnings. However, in certain very orthodox villages there was heavy loss of life, when families either did not want to abandon their worldly possessions or women were reluctant to move into shelters where they would be herded together with men. Conservativeness cost lives in several villages, said a CODEC executive.

Where refuge was taken in the cyclone shelters built in the last ten years, there was considerable saving of life. But there were insufficient shelters — it is said that only 10 per cent of the shelters planned were built — or the shelters were too far away, or, in several cases, the shelters had not been maintained and were a greater danger than the open. One World Bank shelter atop a hill needed almost an hour's trudge from the village and went unused. On the other hand, the several shelters that were used were buildings the villagers had become familiar with — through use as a school or as a dispensary or as an adult education centre and, as a consequence, had also been maintained fairly well. In these villages, a cyclone shelter was not a bad word tainted with an aura of doom.

Multipurpose shelters, said Farhad Mazhar of UBINIG, was the need. If they were built to serve as school, community hail and primary health care centre, with a protected tubewell in its precincts, the two-floored buildings on pillars would soon become familiar local landmarks and would not be shunned when the necessity arose, he suggested. Such buildings would entail considerable investment and constant maintenance costs, but this is an investment that cannot be avoided in coastal Bangladesh and its islands. It is also investment that would be less than on the grandiose flood prevention plans that have been drawn up.

Simultaneously, the Cyclone Preparedness Programme must be strengthened by introducing educational and community components to it, felt Mazhar and Khursid Alam of CODEC. While Mazhar felt its lessons needed to be introduced in the school syllabus, Alam felt it could be taken to every village through video and simple study aids for non-formal education classes. Video films supplied with portable battery viewing sets, and comic books — which BOBP is experimenting with for dissemination of knowledge about the fisheries resource and environment — were seen as means which could be used to get the villagers of coastal Bangladesh better prepared for the dangers of a cyclone, get them to react promptly to cyclone warnings and then get them to team together to pick up the threads of life after the cyclone has passed.

In many villages those threads have already been picked up. In Kumira, the few undamaged boats left have begun putting out to sea, nets are being

* *Home L~a tent ... and five tents like these were distributed in Kumirá where 335 families live!*

* *Material salvaged from miles around has been put together to make a temporary home for this family in Kumira.*

pooled and the children have begun to dredge the paddies for fish, all notwithstanding the rains that continue to pour. But with the limited fishing craft and gear left – and there will be damage to this in every cyclone, points out Alam of CODEC, because where do you find safety for these? – the income of the fisherfolk could be increased quite considerably if they had supplementary equipment. This would help them to earn as a group, with less equipment, as much as they could working individually in better times. An inexpensive, lightweight ice box suitable for country craft and a larger sturdy ice box for storing ice in the village – to be supplied to the boats – is seen by Alam as necessities that would help small-scale fisherfolk at this juncture and would then become part of their routine. Revolving funds that would help with equipment purchases were also seen as a necessity.

A third area that is already being looked into but which needs greater attention paid to is the various aspects of economic rehabilitation. While a great deal of attention is being paid to the small-scale fisherfolk – not always meaningfully or with the benefit percolating down, since many NGOs through whom most aid is filtered, often dole out too little to too few in a village so that they can spread aid over a greater land area – little heed is being paid to the richer fishermen who own mechanized boats or several country craft. The wherewithal of such fisherfolk is entirely in their craft and gear – though a few might have land or other means of income. Wiped out by the forces of Nature, these fisherfolk now find little aid coming their way. Institutions, such as banks, need to take a closer look at this problem and funds need to be made available to such fisherfolk upon whom several others in the community depend.

In this connection, a complete survey of the 79 u$azillas is necessary to arrive at a detailed picture of the exact needs and why the losses occurred. Banks are probably the best organizations to conduct such evaluation surveys, but an alternative programme could be considered using NGO teams strengthened with a bank officer or two. Such a survey – on a war footing would enable the exact needs and their extent to be identified and would also provide information on how the losses occurred, which information could be used as data while studying future preventive action.

Such a study might draw attention to two aspects of flood protection to which my notice was first drawn by Petet Myers, Resident Representative of the FAO. One is the effect the destruction of the mangrove forests has had and the other is the 1200 kilometres of coastal embankments that were built after the cyclones of the early Sixties and which now have collapsed in many places and been damaged badly in several others. Thereafter, whomsoever I spoke to, appeared to consider afforestation and embankment building as priorities of a level with the Cyclone Preparedness Programme if Bangladesh was to have an easier time in the future with water-caused disasters.

The destruction of the mangrove forests began when Bangladesh sensed the immense export potential of shrimp and launched a massive programme of shrimp farming. Chuck Angel!, BOBP's Senior Aquaculturist, feels that the mangroves and shrimp culture could have thrived side by side. It is npt

too late for afforestation and shrimp and fish culture to work together in Bangladesh. In fact, he points out, mangroves have been used as nursery grounds for shrimp in Java, where the Dutch had used them not only on bunds and dykes but also to protect coastal embankments by forming a barrier against the sea about a hundred yards ahead of the embankments. In Malaysia and Venezuela too, controlled growth of mangroves had enabled, as in Java, fish as well as shrimp culture. The mangroves themselves will earn their keep by providing fuel wood, cattle fodder and tannic acid.

With most of the embankments of shrimp farms badly damaged or destroyed, this would seem the opportune time for a study of how mangroves and aquaculture farms could coexist. Such a study and immediate afforestation plans would appear to be priorities in getting Bangladesh in a state of preparedness to face future floods.

Farhad Mazhar, however, points out that mangroves are only one part of any social forestry programme that might be looked at. Homestead forestry should also be looked at more carefully, he suggests. In the days after the great April deluge, coconut and date palms played an important role in providing succor to the foodless. Increased planting of these pliant palms, that can withstand the fiercest winds, should be made a part of life in every coastal homestead, he advocates.

Mazhar also suggests a major programme of embankment forestry that will enable the strengthening of the country's hundreds of miles of embankments with not only mangroves but other trees that could offer additional benefits. The denuded hills east of Chittagong also need to be reforested. Families made landless by the disaster of '91 could be settled in these areas to implement these programmes. In fact, a proper afforestation programme in Bangladesh would need the mobilization of ten million men, women and children, Mazhar is convinced.

The other preventive measure that needs looking at is Bangladesh's miles of bunds. Some of the embankments are well built, many are poor earthen dams that wash away with the first thrust of angry waters. Those embankments, however, are of several varieties. There are the paddy field embankments and the shrimp farm bunds, there are island embankments and riverside ones, there are major embankments and the minor ones round man-built tanks and ponds. The Water Development Board cannot handle all this variety and pays little attention to most of them. Knowhow could be passed on to the NGOs that proliferate in Bangladesh on how to preserve and protect the minor bunds, while the WDB concentrated its efforts on the major embankments.

This is as good a time as any for that effort to also take another look at the design of embankments in Bangladesh. It could well be that embankment materials and designs need relooking at. So should the programme of looking after the dykes of Bangladesh. Holland has shown that the sea can be tamed and several other countries have adapted the Dutch experience. It is time for Bangladesh to pay far greater attention to this aspect of flood prevention than it has hitherto. Bangladesh certainly made a beginning towards this end in the early Sixties, but not much else appears to have been done after .the early Seventies. The massive aid it has sought worldwide might best be channeled into such a programme of dyke renewal along the most modern lines, but aimed at the entire country and not merely at Sits urban and agricultural areas.

Curiously, hardly anyone met mentioned housing as a priority in putting Bangladesh's coastal communities back on their feet. In fact, permanent housing was a subject that hardly cropped up. Yet the most visible impact of the cyclone disaster noticed by any outsider is the flattened hoUsing and the fight for survival in lean-tos being made from scavenged salvage as

* *The village gathers in Kumira's community centre, a hail in front of its temple, and discusses rehabilitation with Abdul Kashem (white shirt, standing centre) of BOBP.*

the rains still pour down and make the homestead clearings little seas of mud. The common refrain on the subject of housing, however, is that when the fisherfolk rebuild their houses they should be advised never again to use galvanized iron. Apparently flying sheets of galvanized iron — a favourite construction material because it can be bolted down to withstand the perennial strong winds of Bangladesh — caused large numbers of casualties. The material suggested by almost every relief agency is the traditional grass or straw thatch. When it collapses, it floats — and several saved their lives by clinging to floating thatch, it was repeatedly pointed out.

With shelter not being considered a major problem — no matter how vital it seems to outsiders — and with food and health care also under control — thanks to the major helicoptering operation by the Americans, who were able to rush in supplies in time, an operation which points to the need to enhance the emergency transport capabilities in the country as well as the need to establish permanent relief 'warehouses' in different parts of the disaster prone areas — the immediate need everyone agrees is to get the fisherfolk back to sea. With the July to December season for fishing with traditional craft on them and the season for fishing with mechanized boats — August to March — just ahead, the immediate thrust must be on repairing boats and nets and supplying additional nets. Simultaneously, boat-building must begin, with the emphasis on traditional craft, more of which could be built quicker to provide succour to a larger number of families,, rather than the 1000 mechanized craft government is talking about; after all, traditional boats and owners of them are the worst affected fishermen.

Faced with a situation of fewer craft having to feed many more families, it is also necessary to maximize the saleable catch by providing ice boxes, ice storage bins and such marketing support as revolving funds.

Rehabilitation more than relief, then, is the first priority. Thereafter, the future needs to be looked at in terms of the findings of studies that should be conducted into the lessons of the past. And implementation must begin of three major strategies already identified that could reduce the tragedy the waters cause Bangladesh.

The first of these three strategies is education for cyclone preparedness which will become effective only if multi-purpose community — not cyclone! — shelters are established in substantial numbers. As it is, in many places where cyclone preparedness lessons have been taught, the question keeps arising: Where do we take shelter?

The second strategy will have to be a massive tree-planting exercise, mangrove afforestation in the coastal areas the first step in this plan of action. And the third strategy must be to re-design and build embankments better suited to meet the demands of ravaging floods.

To implement all these, Bangladesh has a plethora of NGOs, many of them functioning satisfactorily. Donor agencies, technical assistance organizations and the policy-makers of government need to get together and examine how best and how fast they can team with identified NGOs to get the fishing fleets out again and the shrimp back in the farms. Aid in terms of money there appears to be in plenty; what appears to be missing is a grand plan of action that everyone concerned agrees on as the best solution to the present woes of the fisherfolk and to prevent a recurrence of the same. Bangladesh cries for action, not money in the banks and talks at the round tables.

The BOBP-sponsored shrimp hatchery in Chokoria was wiped out, but reconstruction has begun.

There seemed no hope

By Kazi Raquibuddin Ahmed

Field Researcher, UBINIG

in the Cox's Bazar District's Badarkhali Union of Chokoria Upaziia, the Bay of Bengal Programme has been rissisting the shrimp fry catchers of Magnamapara village in nursery rearing of P. Monodon *shrimp fry. BOBP has been working with UBINIG, a research organization-cum-NGO, in this venture. Field researcher Basu Dev and I were in Badarkhali and Magnamapara on the night of the cyclone. This was our harrowing experience:*

I was in Cox's Bazar on the morning of April 29th. The weather was very bad. There were regular announcements being made: "No. 7 danger signal. Everyone should go to safer places". But I had to go to Kutubdia, because Basu Dev was working at the nursery cage in Magnamapara. I had to bring him to a safer place.

I started for Badarkhali at 8 a.m. in a service launch. The river was very rough and it took about five hours to reach Badarkhali ghat, I saw that the ghat was already under water and that the water was rising. I started walking to Magnamapara village, which is about 4 kilornetres from the ghat. The wind was very strong and, together with the rain, made walking difficult.

By 4 p.m. I realized that I could not reach Magnamapara and that it would be better to stay the night in Badarkhali. The weather forecast was being announced regularly by Red Crescent workers using megaphones. Although the weather was showing all the danger signs, and danger signals were being repeatedly announced, the people refused to believe that they would be affected. However, even if they believed the announcements and reacted to them, where could they go? There were riot many *pucca* (permanent) buildings in the area.

By 7 p.m., the wind was blowing at a speed of 8090 km per hour I could not stay outside any more and took shelter in a small, two-storied hotel in Badarkhali bazar. The speed of the wind was increasing rapidly. At 9 p.m. it was *150* km per hour, then increased to 200 km per hour (it was later stated to be 250 km per hour). I saw trees being uprooted. I watched drums of edible oil roil out of a grocery shop and vanish into the darkness. *Katcha (temporary)* houses and semi-pucca houses began collapsing.

At 11 p.m. it was the time of high tide. The speed of the wind, the high tide and the *purnima* (full moon) all aggravated the situation. Screaming people were running helter-skelter for shelter. Many people came to the hotel to take shelter but it could hold no more than sixty. Soon the ground floor was under water. All of us moved to the first floor. The blowing wind, the taste of the sea water in our mouths, the screams of people, the cries of cows, goats, buffaloes there just seemed no hope.

Some time after 2 a.m. the water stopped rising, though the strong wind kept blowing; then that too gradually died down. As day dawned, I could not believe that I had survived the nightmare. There was 3 to 4 feet of water in the bazar. Only the *pucca* buildings were standing. All the *katcha* houses were no more.

I had to find Basu Dev. I started walking toward Magnamapara in four feet deep water. There were hundreds of other people like me looking for someone, looking for their near and dear. At 10 a.m. I found Basu who was walking towards Badarkhali in search of me.

Rasu had been in the office of the nur-;ery along with two other participants in the nursery cage culture project. They had been hoping to guard the cages. But then the nursery collapsed. Re moved to the embankment together with others from the village – that, they said, was the only place which would remain over water level. But soon the embankment was also under water, and the people began treading water to find safety.

Basu swam in the saline water trying to find a tree or house. Finally he found a *semi-pucca* house about 700 metres from the embankment. The house was almost under water, but he and several others got on the roof and on the trees in its garden. The next morning they found themselves alive.

Having found each other, we decided to see what had happened to the participants in the nursery cage culture project. We went to Magnamapara. The cages were no more. Only the photovoitaic was standing in all its glory. But the battery was under water.

People were running around looking for their relatives. We began searching for our participants. None of their houses were standing We met Syed. His son was dead. His wife had been washed away, but had survived. Two daughters took shelter in trees and had survived. Syed was not able to see because he had been under saline water for a long time.

Shamsu was crying. He had lost his wife, four sons and three daughters. We did not see any other participants at that time. Everywhere, there was only debris and carcasses. We treaded our way through these.

In the evening, Basu and I came back to Badarkhali bazar. The next morning we left Badarkhali in a motorized boat.

The days of the *kattumarams* are numbered

by K Sivasubramaniam

The small *kattumaram* must go. It should be replaced as quickly as possible by bigger craft, such as motorized and more appropriately equipped *nava* or *teppa.* This is indicated by a study the Bay of Bengal Programme recently undertook in Andhra Pradesh, India.

It was found, in the area studied, that nearly 40 per cent of the population is below the poverty line. And fisherfolk, who are owners and crew of small *kattumarams,* comprise the largest part of this population. These fisherfolk usually put out to sea with unsuitable gear or have only one kind of suitable gear when at least three kinds are needed. If their lot is to be improved, both their craft and gear have to be upgraded, it was obvious.

The traditional ***kattumaram***

To appreciate the problems of the poverty-stricken user of the small *kattumaram,* the *kattumaram* and its capabilities, as revealed on this stretch of coast, need to be examined briefly.

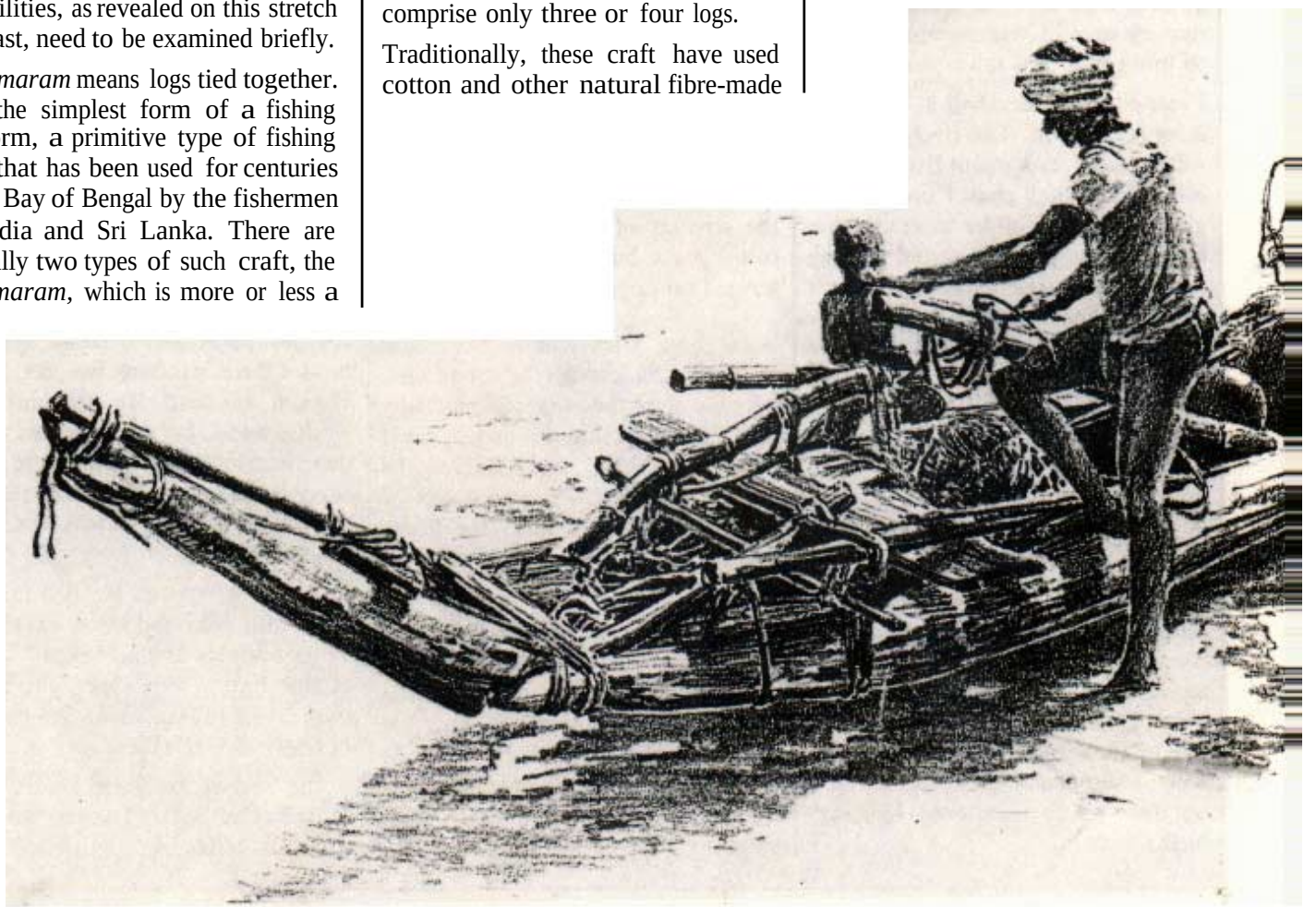
Kattumaram means logs tied together. It is the simplest form of a fishing platform, a primitive type of fishing craft that has been used for centuries in the Bay of Bengal by the fishermen of India and Sri Lanka. There are basically two types of such craft, the *kattumaram,* which is more or less a flat raft, and the *teppa,* which acquires a curved boat-shape when the logs are tied together. The former is prevalent on the Tamil Nadu coast and in southern Andhra. Pradesh, upto Chirala, while the latter is common along the northern Andhra Pradesh and Orissa coasts. In Sri Lanka, the *kattumaram* exists on the northern coast, adjacent to Tamil Nadu, while what is known locally as the *teppam* is found on the west and north-west coasts, though it is rapidly disappearing even here.

In India, the log rafts are the most common traditional fishing craft, comprising nearly 71% of the total fleet in Tamil Nadu, 63% on the Andhra coast and *50%* in Orissa (West Bengal has none) – a total of over 57,000 log rafts on the peninsular east coast alone! Large rafts are 6-8 m long and madeup of five or six logs, while.. the smaller ones are shorter and comprise only three or four logs.

Traditionally, these craft have used cotton and other natural fibre-made driftnets, bottom set gillnets and scoopnets, and hook and line to catch such varieties as skates, rays, guitarfish, sharks, rockfish, queenfish, flyingfish, sardines and anchovy. Fifty years ago they operated successfully in an environment where there was less fishing pressure and a greater abundance of fish in the coastal waters, while the fishing seasons were mainly influenced by sea and weather conditions.

The endangered *kattumaram*

This scene has changed considerably over the last three or four decades. Not only have new types of craft, new types of material for constructing craft and fishing gear and new types of gear been added, but the numbers of traditional fishing craft, such as *kattumaram,* have also simultaneously increased with the fisherfolk population. As a



consequence, the least efficient of the fishing systems, chiefly the *kattumaram* fisheries, show signs of going under to the more efficient new systems.

Shortage of suitable timber *(Albizzia spp., Erythrina spp.)* for construction of *kattumaram*, increasing competitive and interactive fisheries, the diminishing status of the coastal resources and waning trends in the performance of the *kattumaram* fisheries all point to a dim future for this kind of craft. However, its role and life in the small-scale fisheries, which is dependent on the rate of expansion of modern fisheries, may be extended somewhat longer by

- identifying suitable alternative material for construction,
- improving its performance by motorization,
- exploitation of pockets of underutilized resources,
- improving catch rates by shifting the existing fisheries to deeper waters, and
- supplementing the income of the *kattumaram* fisherfolk with additional income-generating activities in their respective areas.

A *Kattumaram* at Kothapatnam – *its days are numbered*

It was to examine all these issues and discover the future of the *kattumaram* that the BOBP instituted a study in Kthapatnam, Andhra Pradesh, that aimed at:

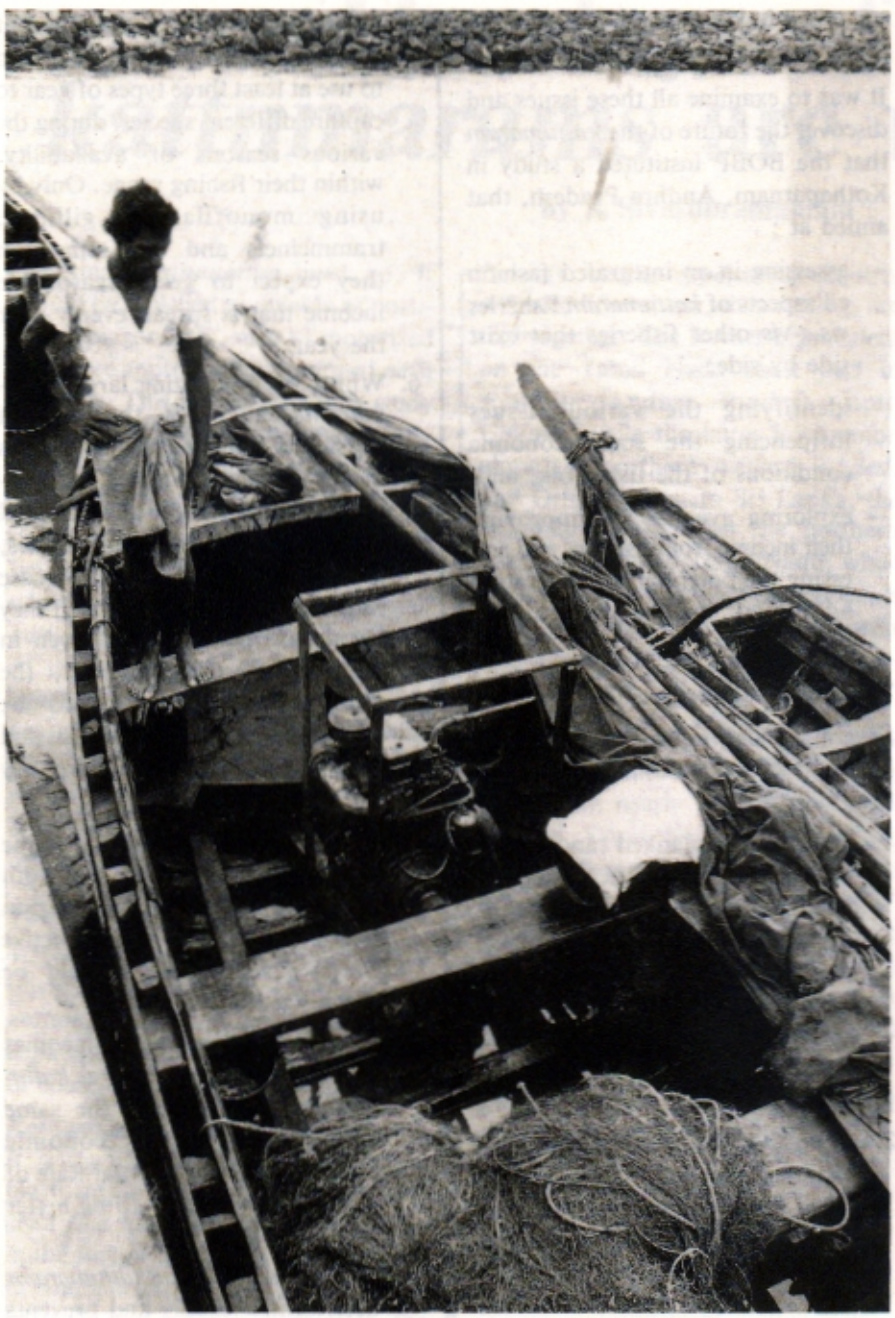
- assessing in an integrated fashion all aspects of *kattumaram* fisheries *vjs-a-vis* other fisheries that exist side by side,
- identifying the various issues influencing the socio-economic conditions of the fisherfolk, and
- exploring avenues for improving their income from fisheries and assessing the potential for generating additional income from other sources.

The study's findings

Several salient points soon became apparent in this study. They include the following:

1. *Navas* (of the planked canoe type), beachlanding craft (BLCs), migrant *teppas*, shrimp trawlers and even pushnets, all interact or compete with *kattumarams* and affect their catch of such commercial species as penaeid shrimps, croakers, ribbonfish, catfish, pomfrets, mackerels etc.
2. There are pockets of underutilized resources beyond the presently fished range of the non-motorized *kattumarams.* These,could be made accessible if some of the *kattumarams* were motorized. This would help to increase the catch rates/revenue of the resources already being exploited by the non-motorized craft.
3. There are 18 combinations of craft and gear in the village, including as many as twelve for *kattumaram* alone. The various combinations show significantly different levels of earnings. There are also monthly variations in income within each category.
4. The assets of each household, as well as the income from such other activities as fish marketing, fish processing, agriculture, livestock rearing etc, are proportionate to the income from fishing.
5. The limitations *kattumarams* face in terms of area covered and the amount of time they can stay out at sea make it necessary for them to use at least three types of gear to capture different species, during the various seasons of availability, within their fishing range. Only by using monofilarnent gillnets, trammelnets and boat-seine can they expect to get a reasonable income that is spread evenly over the year.
6. While, by motorizing large *kattumarams,* there is the distinct possibility of increasing catch rates in the existing fisheries, exploiting the pockets of underutilized resources and increasing incomes, this Will not prove to be the case with small *kattumarams* even if they are motorized. However, even in the case of the big craft, the economic viability should be established on an areawise basis and suitable gear identified before they are introduced.
7. Active gear, such as the boat-seine and dragnets operated by both small and large *kattumarams* in shallow waters, are very destructive to the juveniles and should be discouraged.
8. The *teppa* provide better incomes to fishermen than large. *kattumarams,* operating in the same areas, though the economic performance (the Internal Rate of Return) may appear to be better for the latter.

   The soft wood of the *kattumarams* deteriorates rapidly and prevents them from staying out at sea long. This restricts the distance they can reach and compels them to fish in over-fished areas. Asecond major restricting factor is the space in a *kattumaram* – with a full crew the space for the catch is not much. Despite the restricted catch, the IRR of a *kattumaram* looks better because of the inexpensiveness of the craft. But, in absolute terms, the earnings are negligible compared with those of the *navas* and *teppas* that can bring in substa.ntial catches each time they put out to sea.
9. As Beach Landiug Craft qualify for loans, owners of large *kattumarams* either obtain BLCs through the loan-cum-subsidy schemes or operate BLCs lowned



Motorized navas like this one will prove a better proposition in the long run, says the author.

by middlemen/fish merchants. They are thus tied to the sea. *Nava* owners, on the other hand, who earn a relatively high fishing income in the case study area generally invest their earnings on shore, in agricultural or other property.

10. There is an increasing heterogeneity revealed not only in the structure of the fisheries activities in the area but also in the income disparities within the community.

    Incomes of households owning craft and gear range between Rs 2600 and Rs 166,000 per annum. Households with only crew members have incomes ranging between Rs 660 and Rs *24,500* per annum, depending on the type of fisheries they are engaged in.

    Those households with higher incomes from fishing, invest proportionally more in other income-generating activities and this further increases the diversity within the community. (Craft and gear owners have incomes varying from Rs.6,000 to Rs.182,000, while crew households with other incomes have incomes ranging from Rs.3,300 to Rs.27,000 per annum.)

    Heterogeneity in small-scale fisherfolk communities of developing countries generally seems to increase with modermsation of fisheries. The following are some of the reasons that cause this wide-ranging diversity:

    - Modern fishing craft and gear operating in the same area as the traditional fleet;
    - Replacement of traditional fishing craft and gear in an area with modern ones;
    - Modern gear, new materials for craft and advanced methods of operation being used by traditional craft side-by-side with traditional gear and fishing craft;

      The increase in the number of combinations of gear operated by each type and size of craft; and
    - Fishing households earning higher incomes utilizing these incomes for income-generating activities not connected with their traditional occupations.

A community-based approach

To alleviate these problems a community-based approach to management and development is necessary. This calls for people's understanding and participation.

With over a third of the community below the poverty line, or at subsistence level, it is understandable that they will utilize whatever resources are available to them to meet their immediate needs for survival rather than opt for long-term management plans. With the poorest of the community *kattumaram* fishermen, they will be less amenable to restrictions on usage of gear, closed seasons etc. Not only *kattumaram* and other categories of fishermen but also non-fishing households in the community are engaged in fishery-related, income-generating activities, such as fish processing, marketing, boat-owning, being middlemen, shopkeepers, transporters etc. In these circumstances, a generalized approach to fisheries development and management cannot be implemented, as it may be in conflict with the heterogeneous condition of the communities. Only a community-based approach can tackle these varying management and developmental issues in a collective manner as well as help to organize other relevant fishery and non-fishery activities, out of which these benefits could emerge

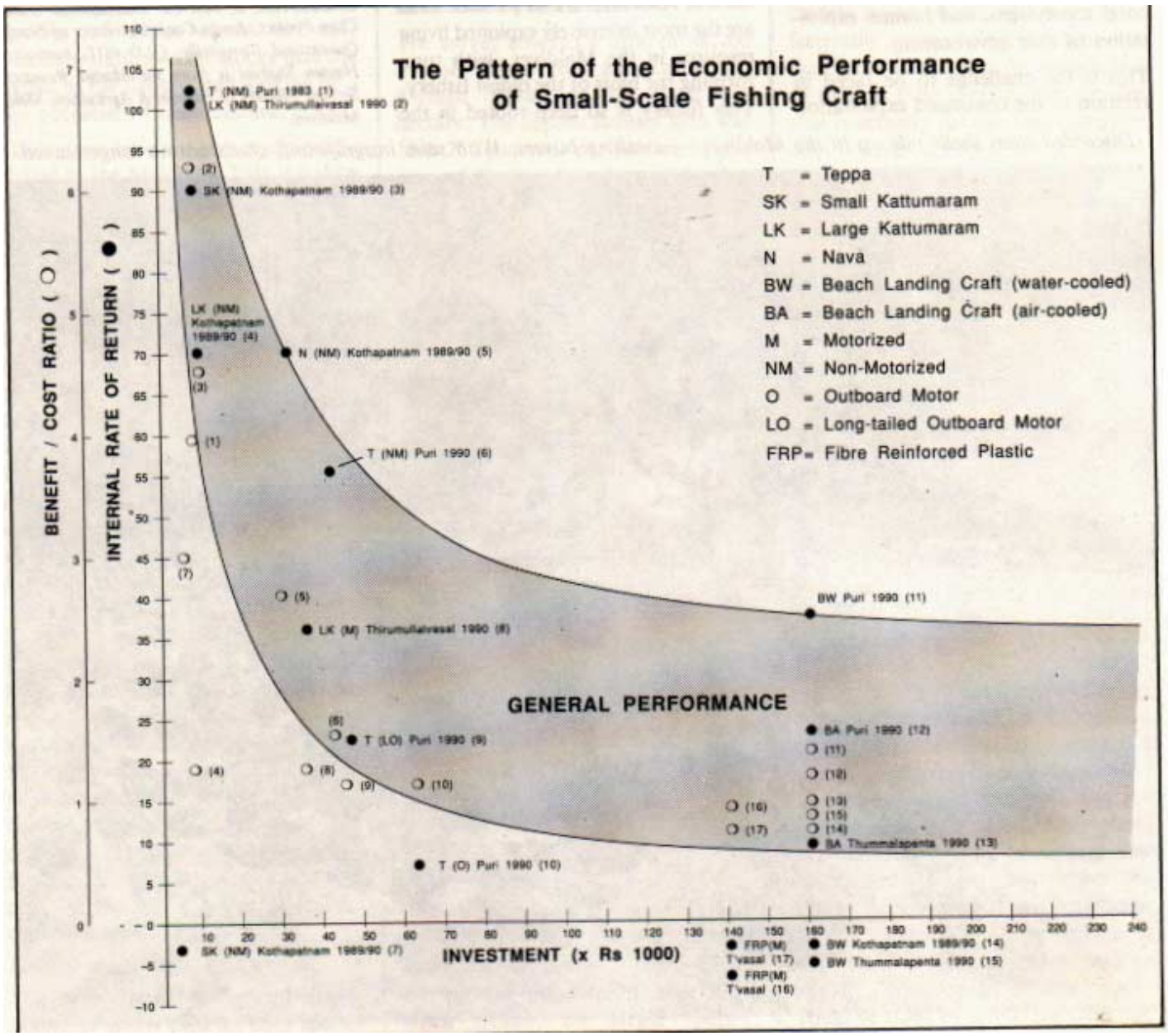
Better values for fresh penaeid shrimp and some finfish with better handling and the use of ice.

- Higher prices for dried non-penaeid shrimp and finfish with better handling practices and clean drying places/platforms. This could also lead to saving about 50 per cent of it from rejection.
- The development of small, additional income-generating activities, such as utilization of fish waste to make fish meal, organizing fish marketing, rearing livestock, improving agricultural practices etc.

All this could be encouraged through a participatory approach that would stimulate local initiatives to make decisions and generate action. The initial step towards such an approach must be to mobilize individuals into groups. This will have a very significant impact, because governments in most of the countries around the Bay of Bengal cannot provide sufficient funds and facilities necessary for development and management activities. If, through participation and cooperation by the fisherfolk, even a reduced input from government could be utilized more efficiently, then a big step forward would have been taken.

It must, however, be remembered that variations and deviations of economic performance indices are influenced by the status of abundance of the resource or catch rate, the commercial value of the species exploited, and other fisheries exploiting the same resources, in a specified area. This is illustrated in the figure below, which indicates that there is a certain pattern of variation in the economic performance indices in relation to the level of investment in small-scale fishing craft. The figure also shows that the returns on the investment on a particular type of traditional craft or motorized boat may differ significantly, depending on the cOmbined effect of such factors as skill of crew, gear used, resources exploited, commercial value of the species 'involved and the area fished. This would therefore mean that -any economic feasibility established would be valid only under the conditions prevailing at a particular time.

Despite this caveat, there nevertheless exists very real reasons for replacing the *kattumarams* with bigger, motorized craft equipped with suitable gear. Without this change-over, the fisherfolk using the small *kattumarams* are likely to be swamped and will only sink into deeper poverty; it would only take a little longer for that to happen to those using bigger *kattumarams.*



GIANT CLAM FISHING: CONCERN IN THE MALDIVES

Jeremy R. Barker and Hassan Shakeel*

Economic growth requires the diversification of the fisheries activities in the Maldives. But if the Maldives is to diversify these activities, it has to face one of the major challenges of today's world – the exploitation of a limited living resource at a sustainable level. Achieving this is not a new problem, but the solution requires a compromise between maintaining the natural environment, in this case the fragile coral. eco-system, and human exploitation of that environment.

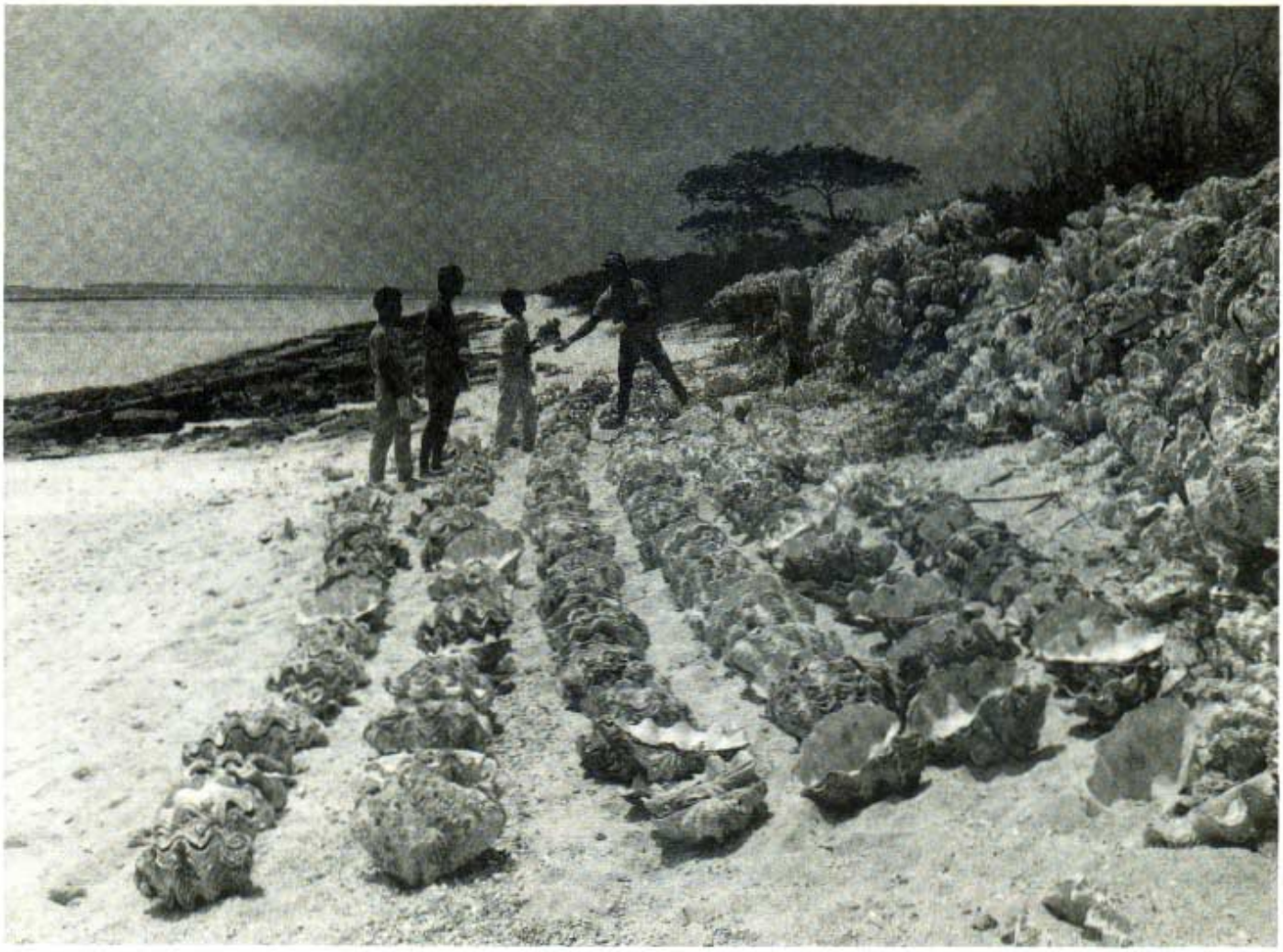
This is the challenge to be faced in relation to the continued exploitation of a non-traditional fishery in the Maldives, the giant clam. This fishery is only a year old, yet many people in different non-fishery professions – tourist resort owners, divers and, of course, environmentalists – have already shown great concern about its long-term effects.

About 99.5% of the Maldives territory constitutes ocean and nearly all of its natural resources are in its seas. Fish are the most intensively exploited living resource in the Maldives, with tuna forming the basis of the oldest fishery. This fishery is so deep-rooted in the country's economy that the Maldivian language (Dhivehi) uses the same word, *mas* (meaning fish), as a blanket term to cover all fish, including tuna.

Today, the tuna fishery is still the dominant one in the Maldives. However, fishing for non-traditional

* *The authors were part of a team that early this year conducted a survey on giant clams in the Maldives.* ***Jeremy*** *Barker, a scientist sponsoredby UNDP/FAO, is with the International Giant Clam Project, James Cook University of North Queensland, Townsville, QLD 4811, Australia. Haswan* ***Shakeel*** *is* ***from*** *the Marine Research Section, Ministry of Fisheries & Agriculture, Mak, Maldives.*

Discarded clam shells pile up in the Maldives – awaiting buyers. With sales insignificant, shells are no longer saved.



organisms is becoming popular and the tuna fishery seems to be losing its absolute dominance. The reef fish, which were caught exclusively for domestic consumption, are now an important export. The sea-cucumber too is mainly exported. Tourism provides a• domestic market for live lobsters.

These new fisheries provide the fishermen with the choice of new areas of major employment or alternatives when tuna fishing is poor. Without the alternative flsheries, fishermen usually have had to shift to non-fishery activities during times of poor tuna catch.

It was this concern that led to the Marine Research Section of the Ministry of Fisheries and Agriculture, Maldives, and a UNDP/FAO sponsored scientist recently carrying out a survey on giant clams. The survey in four of the northern Maldivian atolls — Shaviyani, Raa, Lhaviyani and Kaafu — aimed at identifying the species of giant clams present, assessing natural clam stocks and the extent of the fishery, and looking into the potential of clam culture.

Giant clams have not been traditionally fishe.d in the Maldives. This is unlike the island nations of the tropical Pacific who have used clams as a readily available high protein food source for local people. Due to the ease with which the giant clam is fished, they have come near to extinction in some areas of the Pacific and complete extinction in others. In the Maldives there are areas that represent untouched stocks of giant clam; however, there are other areas that have recently been heavily fished to satisfy an export market and are, consequently, depleted to an extent of as much as about 60 per cent. No assessment of total stock was, however, made because the abnormalities of the densities in some areas leave doubt about which areas may or may not have been fished, the situation in unsurveyed atolls cannot be taken for granted and no other surveys have been conducted in the Indian Ocean for comparison and establishment of density patterns. But that the Maldives has substantial clam wealth and that this is now being overexploited in certain areas is clear.

The species found

The Dhivehi term for the giant clam is ***Gaahakar*** and is used for both species found in the Maldives, namely the fluted clam, ***Tridacna squamosa,*** and the fugose clam, ***T. maxima.*** The former is the larger species, growing to an average of about ***45*** cm, although a ***54*** cm shell was seen in Shaviyani Atoll. It is this species that has been fished so far. The latter species reaches approximately 35cm in length and is characterized by its brilliant colours and semi-burrowing habit. It is found predominantly on the reef flat and near the reef crest. ***T. squamosa*** tends to occur a little deeper, with individuals found at 16 meters in the Maldives.

The stock position

The survey showed that there were very few, and frequently no, ***T. squamosa*** on fished reefs (mostly Raa and Shaviyani Atolls). This species was found only on 33% of the surveyed reefs. Overall, their average density had been reduced to about a third that of unfished populations.

The survey covered a total of 38,700 m^2 of fished reef and found an average density of 3.4 clams per hectare. The highest density seen was 18.8 ***T. squamosa*** per hectare in one area of R. Maadhunifaru. All other sites on this reef had no ***T. squamosa.***

T. squamosa was seen in 93% of the unfished reefs in the area surveyed (mostly within Shaviyani and Lhaviyani Atolls). 46,050 m2 of unfished reefs were assessed to have an average density of 10.6 clams per hectare. Some of the resort islands in Kafu Atoll also showed relatively high densities of this species.

The other species of giant clam, ***T. maxima,*** has not been targeted by the fishermen and is reasonably abundant in all the areas surveyed. An average density of 29.9 clams per hectare was seen in fished areas and 39.6 clams per hectare on unfished reefs.

The fishery

The fishery was started in June 1990 by a private local company and still operates today. It exports only the adductor muscle; the clam meat and shells are discarded.

The company conunissions fishermen to collect whole clams. As the Taiwanese buyer will not accept adductor muscles weighing less that 100 g when frozen, the larger species, ***T.. squamosa,*** has been preferred for fishing . The fishermen skin-dive to collect the giant clams from the reefs they return with many live animals to the island where the local buyer, after grading the catch, pays for them. The adductor muscle of the clam is then removed and frozen prior to shipment to Male. To date, a total of 9.8 tonnes of frozen adductor muscles have been exported by this company.

In the first seven months of operations, the shells were stored on the beach for possible future sale. There are approximately 40,000-50,000 pairs of shells in these piles. They do not represent the entire catch, as the practice of saving the shells ceased in February 1991. Now the meat is removed on board the ***dhonis*** and the shells are left on the reefs.

Another local company recently started buying both dried adductor muscle and mantle tissue. Again, the buyer preferentially accepts only large clams, but the tissues are dried in the islands and so there is little control over the size that is actually fished. This company does not have a licence for the .export of clam products and is currently stockpiling the dried tissue. It also has a stockpile of shells, totalling almost 13,000 pairs.

At present, the only Govermnent dontrol over the clam fishery is through the issue of export licences that allow companies to sell -clam products to a foreign market. Local buyers are entirely reliant on export, as there is no domestic market. The only export licence issued so far has been to the company that originally started the fishery. The Ministry of Trade and Industries has temporarily stopped issuing export licences, pending the completion of a detailed study of the status of the clam fishery.

The consequences

Local collectors mistakenly believe that there is only one species of clam and that the smaller ones will grow to replace the larger ones that they are fishing. However, the smaller clams are ***T. maxima*** and there are few ***T. squamosa.*** Therefore, where the larger ***T. squamosa*** have been completely removed from a reef, it is unlikely that the stocks will recover rapidly. The recovery of these stocks could be aided by artificial restocking,

A dose-up view of a giant clam on the reef.

possibly through the development of culture programmes.

There is also the potential for damage to the reef structure during the harvesting of clams. *T. squamosa* grows in sandy areas or is loosely attached to coral, often within areas of staghorn coral, *Acropora* species. Thus, collection of this species may cause localized structural damage to the reef. If *T. maxima* is harvested the situation would get even worse; as *T. maxima,* due to its semi-burrowing habit, requires breaking up the surrounding coral to rembve it from the reef, any harvesting of this species will cause major damage to the reef.

It is the threat of damage to the coral reef and the removal of too many clams that has brought the tourist industry into conflict with the clam fishery. It is not pleasant for the resort operators, for whom the reef is their major advertisement, or overseas divers, to see damaged reefs, without the coral. Nor is it good for them to find that all the giant clams have been removed from their popular dive sites, or, even worse, to see shells remaining but with their beautiful mantles removed.

Cultural potential

Culture of the giant clam has been successful in the Pacific and appears to be technically feasible in the Maldives. The obvious candidate for future culture activities is *T. squamasa,* as it is the fastest growing of the two species found in these waters and has an established export market.

The successful culture of the giant clam depends predominantly on finding suitable sites for a hatchery facility and growing areas sheltered from severe weather activity. Suitable sites need to be identified and monitored, but at least pne potential site has been located in Shaviyani Atoll.

Seeking a compromise

For there to be harmony between the fishing and tourism industries and for a continued supply of giant clam adductor muscles and mantles to be ensured for the established overseas markets, there has to be a degree of compromise. A number of options are available to the decision- makers in the Maldives:

(a) Allow an open fishery to continue. The clam stocks would probably be fished out within a few years at the current level of fishing pressure. This offers only limited short-term gains to a few operators. It could also result in localised extinction of *T. squamosa*

(b) Totally ban the fishing of giant clams. This, of course, would preserve the natural stock , but could prevent one part of the diversification of fisheries activities.

(c) Ban giant clam fishing in specific atolls, notably the tourist zones, thus minimizing conflict between the two industries.

(d) Restrict the issue of export licences.

(e) Restrict the size and number of giant clams to be harvested annually.

(f) Establish a culture programme, thus easing the pressure on natural clam stocks and preventing conflict with the tourist industry.

Currently, there is a large standing stock of giant clams in the Maldives; the utilization of this resource needs to be rationalized to prevent its over-exploitation, as has happened in many areas of the Pacific.

CREDIT FOR THE UNBANKABLES

by Apisit Buranakanonda

extension sub-project set out to improve the lot of small-scale fisherfolk in Ranong, Thailand, in 1986, it ran into the problem of the fisherfolk not being able to raise credit. The project met the challenge by starting a revolving fund to be managed by those who needed the banking most. Despite several problems the results have been heartening, repayments being around 75 per cent, and would seem to indicate that here is a way to offer credit to the unbankables which should be followed through.

The sub-project had set out to develop and test models for improved extension services that would enable integrated fisherfolk development. The idea was to learn by doing. Given that the target group was poor, artisanal fisherfolk, the obvious route to development was comes, either by improving their existing enterprises or by introducing new technologies. To increase their incomes, a Department of Fisheries survey of artisanal fisherfolk in 17 villages found that at least half thOse involved felt that credit — primarily to buy and mend fishing gear but also for other enterprises — would go a long way. In the early stages of the project, the staff spent a lot of its time working with fisherfolk in developing and testing technologies such as oyster culture, new and more efficient crab traps, crab fattening and cage culture of fish. But as the technologies reached a stage when they were ready and the fisherfolk were eager to take them up, the inevitable question of credit to finance such enterprises arose and had to be addressed.

the Fish Marketing Organization of the DOF, the Bank of Agriculture and Co-operatives and a few prominent commercial banks to determine the credit possibilities for the fisherfolk. While all of them were there to help, they saw two major hurdles : fisherfolk, especially the poorer ones who were involved with the project, did not have any assets to offer as collateral; also, the banks found it expensive to service a lot of small loans. This meant the project was back to square one. The obvious option of depending on savings of the people also did not work out, as savings were low, where they existed at all, and not sufficient for the types of enterprises planned.

The option was to create the project's own credit scheme. The idea, in theory, was rather simple. Villages or groups

of fisherfolk would be organized. Grants in cash or kind would be extended to individuals or groups to undertake particular enterprises. The people would return the funds along with a small service charge to the groups or village communities who, in turn, would lend out money to others. In other words, a simple revolving fund based on an initial grant which could, at least in principle; perpetuate itself in the community and help the community to get access to low-cost credit to enable it to take up enterprises which, in turn, would help increase incomes. It was hoped that such credit would not only act as an incentive to fisherfolk to take up new technologies, but would also absorb possible uncertainties and even encourage the communities to add to the funds from their savings.

In 1989 the revolving fund schemes came into being. They were managed basically in two ways: one, wherein a group accepted an outright grant and managed the revolving fund as a group activity, and, two, where a village committee under the direction of the village headman took the responsibility for the fund. The service charges varied from group to group and were between 1-3 per cent. The DOF and its cooperating agencies, like the Community Development Departthent, supported the activity by supervising and monitoring the activity and by helping the fisherfolk to manage the funds. These departments have had to, and do, support similar credit schemes of their own and it was hoped that with the experience in Ranong, they would take it upon themselves to expand such services to poor fisherfolk. The fund grants came from BOBP funds and were supplemented to some extent by DOF funds.

As the table shows, 24 revolving funds were set up in 19 villages supporting eight different types of activities and benefited a total of 291 fisherfolk. A total of Baht 245,556 (about US $ 10,000) was granted. The repayments overall has been a shade over 75%. Thirteen of the 24 groups have reinvested the repayments in enterprises. The defaults, or, rather, delays in repayments, occurred in eleven of the 24 groups, but even here the repayment was *55%*, which is very good compared to the experience of commercial banks in the region dealing with artisanal fisherfolk.

With the project nearing its end, it is time to take stock of the revolving funds and to learn from the exercise.

What makes a revolving fund succeed? The most obvious reason, of course,. is the economic viability of the enterprise they undertake. Successful enterprises such as shops selling petrol, fishing gear and other consumables in remote areas, squid traps, the culture of oysters *(Saccostrea)* had almost no problems. Crab fattening ran into technical problems in the sense that the environmental conditions and resource questions plagued its success. Crab traps faced lesser problems. Oyster culture of *Crassostrea* had problems of seed availability and marketing, not to mention low salinity conditions. And fish cage culture had disease problems and faced fluctuating market prices for the fish.

In the FIRST place, therefore, training and supporting fisherfolk to select viable enterprises, which can be sustained through local resources and the products of which have good and accessible markets, becomes vital. In extension terms, the readiness and the economic viability of technologies become prerequisites before extension should be contemplated. It also means extension staff have to build up their economic and enterprise management skills in order to help and support fisherfolk.

SECONDLY, a group that works well together, seems to earn well together and repays on time. The organization and mobilization of groups, ensuring good and just leadership and cohesive action, does play a crucial role in the success of revolving funds. In Ranong, some of the oyster culture groups fell apart because of internal conflicts which, sometimes, needed intervention and, occasionally, even re-forming groups and helping them to seek fresh leadership. Group building and supporting is a difficult, time-consuming

INVESTMENT AND REPAYMENT

Activity	*No. of Villages*	*No. of Beneficiaries*	*Fund (Bahts)*	*Repayment*	*% Repaid*	*Reinvestment*	*Remarks Regarding Default*
I. CULTURE							
1. Crab fattening	9	13	65 000	34 800	*53.5*	2 of 9 groups	6 (0.2~60%)**
2. Oyster culture (S)	3	81	6 450	6 280	97.3	3 of 3 groups	1 (93%)**
3. Oyster culture (C)	2	21	28 000	20 890	74.6	2 of 2 groups	2 (71-81%)**
4. Fish in cages	1	6	29 466	11 322	38.0	1 of 1 group	1 (3801o)**
II. FISHING GEAR							
1. Crab traps	5	68	21 900	19 766	90.2	2 of 5 groups	2 (56-76%)**
2. Squid traps	1	10	4 720	4 720	100.0	0 of 1 group	No defaults
III. GENERAL							
1. Petrol/Gear shops	2	56	40 020	40 020	100.0	2 of 2 groups	No defaults
2. Cooperative gear shops	1	46	50 000	50 000	100.0	1 of 1 group	No defaults
TOTAL	19*	291	245 556	187 798	76.47	13.of 24	11 Defaults (55.1%)

(* In 5 villages there were 2 activities each)

(** Indicates range of repayment levels by groups who have defaulted)

and essential task and extension services, hoping to succeed, need to arm themselves with the necessary interpersonal skills and the patience to deal with it.

THIRDLY, credit received is sometimes used for purposes other than planned. Given the lack of resources, it is not surprising that this happens. An old unpaid loan, an illness in the family or the sudden demand from another of the family's enterprises, often diverts funds and leads to trouble. Close follow upand guidance can, and did, solve some of the problems, but, on some occasions, with the groups and the leadership's support and consent, such diversions had to be regularized and the loan rescheduled to ensure its repayment. It is not enough to look at the enterprise alone but the family and all its enterprises as a whole to ensure success. And close and regular follow-up by extension staff cannot be over- emphasized. Building awareness, through training in simple accounting and record-keeping, and better management of the enterprise and of the group go a long way in building the group's ability to develop.

LASTLY, and not the least, is the participation of the fisherfolk in determining needs and priorities, in setting objectives, in planning the effort, organizing it themselves and implementing and monitoring it. This seems to be not only a way to overcome hurdles but also a way of ensuring sustainability. Ultimately, the fisherfolk will determine their development. Not extension services.

So how has the project fared? Not as well as BOBP would have liked. But well enough to keep working and hoping for the best. The real test is going to be in the future when fisherfolk will have to independently run their funds. Of course, they will receive support and help from the DOF and the Community Development Department. How much time and effort can be given, how good the follow-up is and how well they are able to train and guide the fisherfolk will determine the sustainability of the programme, and, perhaps, generate more such programmes. Revolving funds, given the right context and support do seem to be a way of giving credit to the unbankables. But only the future will tell.

BlO-ECONOMICS

BOBP's newest project

Bio-economics of Small-Scale Fisheries *– RAS/91/(N)6* is a new regional project for the Bay of Bengal area that has been approved for UNDP funding and execution by the FAO under the umbrella of the Bay of Bengal Programme. This project, with atotal budget of US $ 1 million, officially commenced on May 1, 1991 and will run for about three years.

The term 'bio-economics', as used in any project, includes the investigation of both the 'bio-economic' as well as the 'socio-economic' aspects of the subject. Such a combined investigation is now becoming known as a 'bio-socio-economic' study.

The exploitation of fisheries resources and their management were once considered only a biological aspect of fisheries. This has now evolved into 'bio-economics',through beingjointly considered with the fisheries of economics.

It is becoming more and more evident that an understanding of the socio-economic factors in small-scale fisheries, as well as the participation of small-scale fisherfolk in these processes, are necessary for the effective development and management of small-scale fisheries. This envisages not only the investigators understanding the ideas, views and needs of the fisherfoik but also the fisherfolk understanding the concepts of resources and their management.

By linking the socio-economie component of the fisheries with the bio-economic assessment in one study, a better understanding could be achieved of the communities, the exact way the components of the communities are affected and what assistance or support they need. It would also be possible for the investigation to identify potential alternatives or additional income-generating opportunities for the community and, at the same time, find out what the appropriate media should be to enlighten the fisherfolk on the fishing resources and their management.

It was decided that the above-mentioned two-pronged approach shall be initially made through case studies identified according to each country's priority. A regional meeting in May 1990 and a regional workshop in October 1990, both held in Penang (Malaysia), helped to identify these case studies and prepare proposals and workplans for their execution.

The case studies identified were:

1. An examination of the bio-econornic and socio-economic impacts of fish aggregating devices in the *Maldives.*
2. The bio-economics of pelagic fisheries in *Sri Lanka.*
3. The bio-economies of set bagnet fisheries in ***Bangladesh*** (already commenced under the regional project on Small-Scale Fisherfolk Communities).
4. A study of bio-economics of small-scale fisheries in an artificial reef area in Ranong, ***Thailand.***
5. The bio-economics of shrimp fisheries in Larut District, Perak, ***P. Malaysia;*** and
6. A bio-economic and socio-economic study of shrimp fisheries on the east coast of N. Sumatera, ***Indonesia.***

Better feeds for small-scale shrimp farmers

by Tim Bostock

With its eye constantly on increasing earnings from export, and shrimp being an important foreign exchange earner, the Government of India has been encouraging shrimp farming in several of its coastal states by offering land to the weaker sections of the community for this purpose. The ODA-funded Post-harvest Fisheries project of the Bay of Bengal Programme, working with several public and private institutions on a study of how best this small-scale farming industry could supplement the substantial marine catch of shrimp, has found that there is need to develop a prawn feed industry if farming is to thrive.

Frozen tiger shrimp *(Penaeus monodon)* earned India some Rs.4.4 billion in foreign exchange in 1988 from the *55,976t* exported. Of this, some *55%* was from marine sources, while the remainder was from brackishwater aquaculture. To increase the volumes of shrimp exported, the Government of India has identified 100,000 ha of poorly utilized coastal lands mainly in the states of Andhra Pradesh, West Bengal, Kerala and Goa, for the development of shrimp farming. These lands are being released at low annual rents to members of coastal fishing communities whose income has fallen through declining sea catches, to those from financially weaker groups — such as scheduled castes and those whose family income is less than Rs. 6,000 — as well as to private entrepreneurs and self-employed technocrats. The proportional division of these new land opportunities is: fishing communities and weaker groups 60%, self-employed technocrats 20% and entrepreneurs 20%.

Lands granted to the weaker groups are supplied with the basic common infrastructure to commence farming, including help in pond construction, pumps, power and, for the first year, seed and feed at zero cost. Proceeds from the first crop are earmarked for use as operating capital for further crops and pond improvement.

Small-scale shrimp culture in **Andhra**

In Andhra Pradesh, of the total 17,000 ha identified as having potential for development, some 150 enclosed ponds, each of 1 ha, have so far been allotted to the weaker groups. A further 1,100 ponds are proposed for construction. At the time of writing, submissions for a further 140 ponds are awaiting a decision. In addition, there are approximately 6,000 ha already being operated by the private sector.

Cultured. shrimp are reared in suck ponds dug in low-lying areas near the sea or in brackishwater estuaries, which provide the irrigation water that is required for healthy growth. A good water-tight pond is usually constructed where the soil has a high impervious clay content.

In Andhra Pradesh, where the tidal amplitude is insufficient to ensure good gravitational pond filling, draining and irrigation, simple pumping systems are used which lift the water from a supply channel or creek and fill the ponds to about im depth. The irrigation water helps to keep the dissolved oxygen (DO) levels in the pond water at optimum levels. The action of pumping water also helps to aerate the water. These small-scale farmers do not use any of the specialized aeration systems used by more intensive shrimp farming operations.

Once the pond has been filled, it is stocked with shrimp post-larvae (seed), which are collected by netting in the local creeks or obtained from the increasing number of hatcheries being established with financial support from the Indian Government. Seed collection is an important source of employment for some 500 fishermen in this part of Andhra Pradesh.

Daily feeding is an essential part of shrimp farming if the farmer is to reduce losses due to mortality and increase shrimp growth rate (and, thus, yields and income). Small-scale shrimp farming in Andhra, developed over the last 20 years, is generally distinguishable from that in many other states by the practice of supplementary feeding.

In West Bengal, for example, where a long-standing tradition of rice-cum-fish/shrimp culture exists, supplementation is usually restricted, to pond fertilization with oil seed press-cake and rice bran. In Andhra, however, locally procured raw materials, such as low-value wet fish, dried fish, beef, oil-cake rice bran and wheat flour are prepared by the individual farmers into moist, hand-formed 'dough-balls' which are then offered to the shrimp for direct ingestion (Fig. 1).

For four to five months after stocking, the growing shrimp are fed daily with these locally prepared dough-ball mixtures which are placed in clay pots and sunk to the pond bottoms at regular sites. Estimating the quantity of feed to be placed in a pond is imprecise, as the exact number of shrimp in a pond, and their average size at any one time, can only be determined roughly.

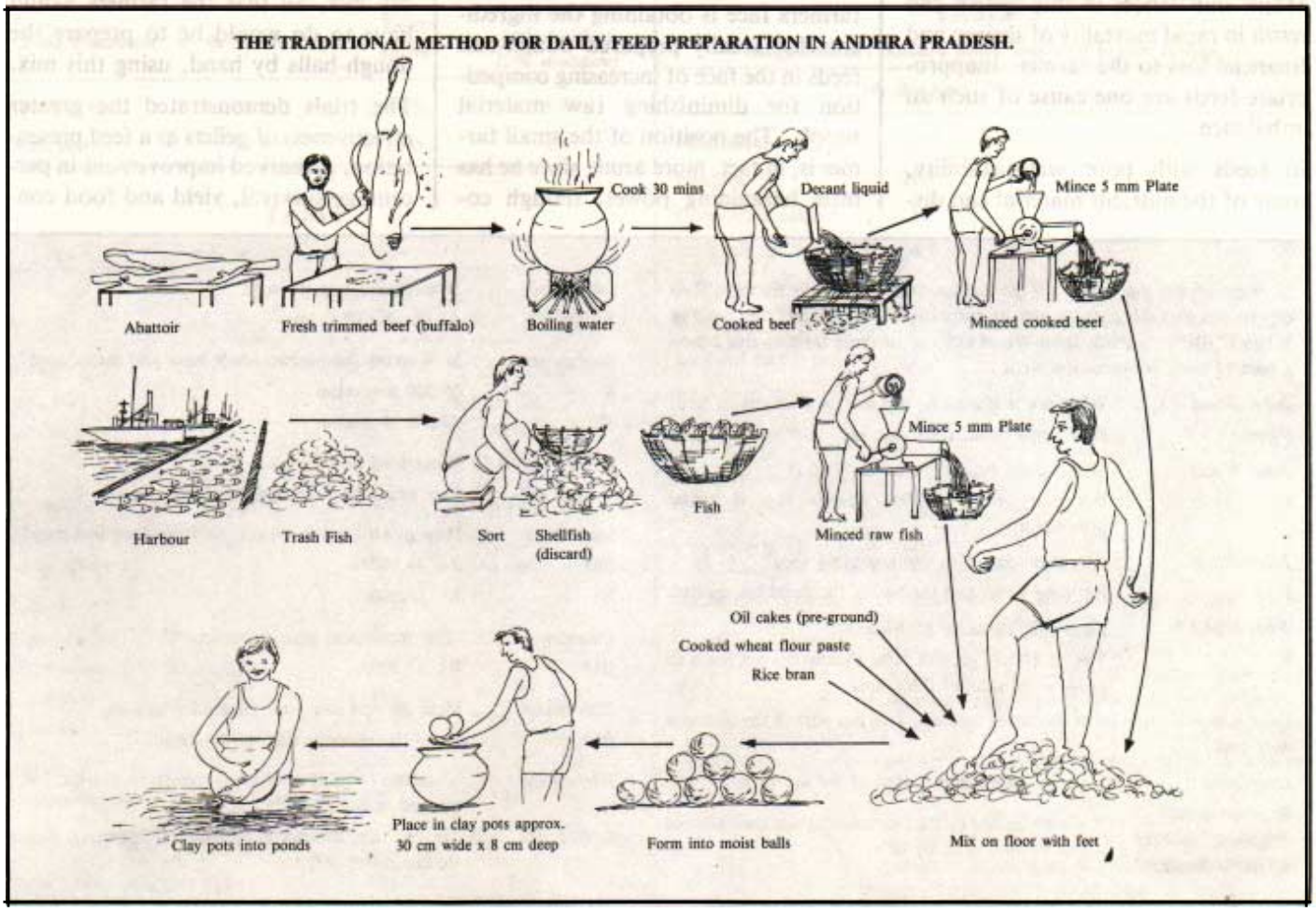
Once the shrimp reach a marketable size — an average weight of 25 to 35 g/individual — it is time for the harvest. The first stage usually begins early in the morning when the sluice gates of the pond are opened to allow the water level to drop. In general, the ponds can only be emptied at low tide, when the level of water in the supply creek is lower than the level of the pond bottom.

Once the water level drops to about a foot, cast-netting commences. This is a taskthat a farmer cannot successfully accomplish alone and he is often assisted by his fellow shrimp farmers, hired fishermen and labourers. It is a time-consuming task and the harvesting of one hectare of water may take six hours to complete. The subsequent hand-picking of shrimp in very shallow water, after cast-netting is completed, is a laborious process as the sun rises higher in the sky, but is necessary as at least half the crop is to be found in these muddy waters.

After the harvest, the shrimp are weighed, then iced. Many of the packing plants provide ice to maintain the shrimp in good condition during transport from pond to processing plant. For some farmers, the catch must be carried by boat to a convenient off-loading point, there transferred to the packer's vehicle and packed in more ice for the road journey to the plant. As dusk falls, the shrimp peelers begin preparing the day's catch for processing and freezing for export.

Although farming by this ***extensive/semi-miens/ye*** method at the small-scale level can be profitable, bearing in mind the good price paid for export-

Making the 'dough ball' at a shrimp farm in Andhra Pradesh.



quality shrimp and the small operational inputs required, productivity is usually low, with yields in Andhra only around *350-500* kg/ha per year from a single crop (see box). Low salinities, due to heavy monsoon rains during six months of the year, do not favour a second crop as survival rates are likely to be low.

How, then, can such low productivity be effectively increased? For some time now it has been generally recognized that increased productivity is being hampered by such factors as:

- The lack of seed/juvenile supply;
- The lack of good quality, low cost, locally manufactured feeds; and
- The lack of established pond management regimes.

The BOBP-ODA Post-Harvest Fisheries project has been attempting to address some of the issues related to *feed* and *pond management.*

Shortcomings of traditional feeds

The pond does not contain only pure water and shrimp. It is a dynamic, constantly changing environment which requires a good oxygen supply, a feed source and a means of control and disposal of metabolic wastes. Major imbalances in this system can result in rapid mortality of shrimp and financial loss to the farmer. Inappropriate feeds are one cause of such an imbalance.

In feeds with poor water-stability, some of the nutrient material can dissolve and become lost to the environment. Water currents caused, for example, by the shrimps' movement, can also distribute around the pond bottom food particles which are too small for the prawn to eat. Thus, much of the feed – apart from, that consumed by animals higher in the shrimp's own food chain – can easily get wasted. This waste can cause more harm than good, for, by decomposing on the pond bottom, it creates anaerobic conditions which are toxic to shrimp growth and cause rapid depletion of DO levels in the pond.

Locally made dough-ball feeds often pollute the ponds because of their low water-stability. Nutrients are quickly lost in the pond environment and reduce the availability of oxygen to shrimp, resulting in stress and mortality unless water is exchanged more frequently by pumping. This problem is compounded where water quality management is neither practised nor understood and where many prawn-farms are operated close to each other. Moreover, pumping out pond water with low oxygen content and possible high nitrogen levels into creeks pollutes these important water supplies.

Another problem both big and small farmers face is obtaining the ingredients for locally prepared dough-ball feeds in the face of increasing competition for diminishing raw material supply. The position of the small farmer is, in fact, more acute, since he has little bargaining power, though co-operative buying of raw materials has been of some benefit to him.

The need in this situation is, therefore, for a feed with improved water stability, which will be easily available, and at the right price too.

Better feeds to improve farming

To address these feed-related problems, initial research trials were co-ordinated through ODA's Natural Resources Institute (NRI) and in collaboration with the Central Institute of Brackishwater Aquaculture (CIBA), Madras, and the Institute of Aquaculture, Stirling, (lAS), UK. The trials were carried out in 0.027 ha ponds at CIBA's Kakdwip Research Centre in West Bengal during the first quarter of 1990. The intention was to demonstrate the growth response to an Indian-manufactured high nutrient specification water-stable feed ('ODA mix'), presented either as pellets or hand-formed dough-balls, under the prevailing conditions of small-scale culture in Andhra Pradesh. The dough-ball alternative was considered because of the high capital costs and production constraints associated with pelletization; by milling and compounding raw materials at the local level, for a dry mix, all that the farmers would have to do would be to prepare the dough-balls by hand, using this mix.

The trials demonstrated the greater effectiveness of pellets as a feed presentation. A marked improvement in percentage survival, yield and food con-

Shrimp farmers interviewed in the Kakinada area candidly narrated their experiences with this growing activity and offered several significant insights. When BOBP consultant John Wood met one of these farmers this is how a part of their conversation went :

John Wood : What raw materials do you use for your prawn feed?
Farmer : Beef, soya bean, trash fish etc.

John Wood : What is the Feed Conversion Ratio?
F : For every 10kg of feed, there's 1kg of prawn production.

John Wood : Any problems with disintegrating feed?
F : Both the water and the bed of the pond get spoiled.

John Wood : Does salinity cause problems?
F : Yes. It affects growth. The shrimp do not seem to grow when salinity fluctuates.

Later a BOBP interviewer met three farmers. This is a part of the dialogue they had :

Interviewer : How did you get this idea of shrimp farming?
Satyanarayana, Bhaisava Moorthy, Bhaisava Swamy : We were trained by the Government and each allotted a one hectare tank by it.

Interviewer : Where were you trained?
S, BM, BS : At the BOBP farm.

Interviewer : How many *(monodon)* seeds have you introduced?
S : 25,000 monodon
BS : 40,000 monodon

Interviewer : What feed do you use?
S, BM, BS : Rice bran, oil cake, trash fish, beef etc.

Interviewer : How much income did you get from your first crop?
BM : Rs. 38,000/-
BS : Rs. 15,000/-

Interviewer : How much was your expenditure?
BM : Rs. 12,000/-

Interviewer : How do you pay your electricity bills etc.?
BM : From the money saved in the bank.

Interviewer : Is shrimp farming profitable compared to what you worked at before?
S, BM, BS : Yes. We used to work as agricultural labourers. Now we are better off.

version was shown (see Table 1). The yield of 713 kg/ha for the short grow-out period of 79 days is a remarkably good performance compared to those obtained locally. However, an important difference was the increased stocking density of 100,000 shrimp/ha compared to the 30-50,000/ha commonly found in the small-scale sector. The poorer overall results demonstrated by the doughcball presentation were mainly due to the rapid dispersion of the pulverized ingredients. Although neither presentation demonstrated a financial gain, the treatment with the highest mean yield (pellets) was near the break-even point.

Further trials were then conducted in Andhra and completed early this year in cpllaboration with the Directorate of Fisheries. Larger, farm-scale ponds of *0.75* ha were used to assess the effectiveness of the locally prepared dough-ball feeds (based on buffalo meat, waste fish, oil cake and ice bran) compared with the 'ODA mix' pellets as used previously in West Bengal. It was expected that the larger ponds and greater ability to control water quality would result in improved production and better profitability especially for the ODA pellets. Table 2 summarizes the findings and Table 3 details the formulations used.

In this case, yields of shrimp were 2-3 times greater than those usually found in farms using supplementary feeding in Andhra, indicating once again the potential advantages of an increased stocking density in combination with regular water quality monitoring. But what was not expected was that growth rates for both feed regimes would be similar!

TABLE 1

Feed performance in 0.027 ha ponds for two presentations of the same high nutrient formulation (N = 35%) as pellets and dough-balls over 79 days

Feed Treatment	*% Survival of P.monodon kg/ha*	*Yields*	*Apparent FCRs**
ODA mix as :			
Dough-ball	53	445	3.3
Pellets	64	713	2.9

* weight of added feed ÷ weight of *P. monodon* at harvest.

TABLE 2

Feed performance in 0.67 ha ponds for two presentations of different feeds — a high-nutritional pellet (N = 35%) and hand-formed local feed (N = 24%) over 140 days

Feed Treatment	*% Survival*	*Yields kg/ha*	*Apparent FCR (calculated at 10% moisture)*
AP local feed	58.5	1410	5.6
ODA pellets	49.8	1345	4.4

TABLE 3

Feed formulations used in trials

	ODA pelleted feed (%)	*Andhra feed (dry basis %)*	
Wheat flour	19.25	Wheat flour	0.7
Soya meal	39.00	Soya meal	8.0
Broken rice	5.00	Rice-bran	37.5
		D O Bran	28.8
Fishmeal	10.00	Trash fish	10.1
Shrimp head meal	10.00	Beef	2.6
Squid meal	5.00	Dried fish	12.3
Fish oil	3.00		
Soya lecithin	2.00		
Mineral mix	2.00		
Vitamin mix	1.00		
Chlorine chloride	0.25		
Plaster of Paris	2.00		
Sodium alginate	1.50		
Protein content (N)	34%		27%
"Sale" price (Rs. per kg)	**15.35**		**5.5**

TABLE *4*

Broad comparison of financial returns for a high-nutrient specification pellet with a locally produced hand-formed feed based on results of farm trials in Kakinada

(near values for two ponds)

	Using	
	Pellets Rs.	*Andhra feed Rs.*
Feeding costs	67,204	32,227
Seed	5,250	5,250
Other costs	3,890	3,890
Revenue	87,207	88,640
Profit	+10,863	+47,273

TABLE 5

Suggested dry Andhra pellet feed with binder system.

(% dry basis)

Meat meal	2.7	
Fishmeal	21.8	
Groundnut cake	3.2	
Soya meal	4.8	
Wheat flour	0.7	Possible separate input as 2-component system
Rice bran	34.3	
De-oiled rice bran	29.0	
Plaster of Paris	2.0	
Sodium alginate	1.5	
Estimated sale price (Rs/kg)	**7.8**	
Protein content	34%	

Table 1 — Source : J Wood and J Brown : *The potential pond productivity of the tiger shrimp from semi-intensive artisanal culture in India.* (Report on a visit to India, June 13-25, 1990 — R 1607; Natural Resources Institute and BOBP Post-Harvest Fisheries Project.)

Tables 2-5 — Source : J Wood : *The pond productivity of the tiger shrimp cultured under experimental conditions of potential application by artisanal shrimp farmers in India.* (Report on a visit to India, Feb. 2-22, 1991 — Report II; Natural Resources Institute and BOBP Post-Harvest Fisheries Project.)

Despite the pellet's better Feed Conversion Ratio (FCR) of 4.4: 1 compared to *5.6:1* for the local feed, the FCR was still considerably higher than the *2.5:* 1 expected from theoretical calculations and the West Bengal trials. Although any improved performance of the pellets could have been marred by a degree of overfeeding which occurred due to the difficulties encountered in the field of assessing survival and stocking levels, when the financial implications based on these results were considered (see Table 4), they indicated that the profitability of the local feed could be far superior! Whereas revenues were similar, feeding costs for local feeds were almost half. The results, far from those expected, may indicate that a high-nutrient specification feed, such as the **ODA** pellet, is not required in this type of semi-intensive culture system. Indeed, the local prawn farmers appear to have themselves developed a feeding system which is both economical and easily within their socio-economic and technical capacity to produce.

The trials, however, clearly demonstrated that the better water stability of the pellet resulted in less direct feed loss to the environment. While ponds which received local feed had soiled bottom sediments due to feed disintegration (the mud was black in colour), the ponds where pellets were used had clean mud bottoms, indicating little nutrient loss.

Could then a more cost-effective feed based on the Andhra type be developed, which would both overcome the local problems described and have less potential for causing environmental damage?

Possible avenues for development

If it is accepted that a lower nutrient specification feed could be adequate for this small-scale culture system, the making of simple Andhra-type feeds in pelletized but water-stable form on a centralized basis might solve several problems. It would ensure:

- Economies of scale that would help keep the feed price reasonable enough for the small farmer;
- Farmers having to spend less time on feed preparation, thus releasing them for other activities, including improved water quality management; and
- Less environmental damage and improved feed conversion through reduced nutrient loss.

This type of feed used in combination with good water quality management – i.e. regular measurement of DO, salinity and BOD/COD – could offer considerable benefits to small-scale farmers.

A suggested improvement of the local feed, which could be mass compounded into a pelletized water-stable form, is given in Table 5. The slightly higher cost of this, compared to the Andhra-type wet feed, could well be offset by the advantages outlined above.

An alternative would be a simple two-component system in which the rice bran and oiled rice bran are added *in situ* as a fertilizer and the remaining components compounded into pellets by the feed manufacturer. This would further cut costs due to reduced processing and transport charges.

In order to test, develop and later manufacture and promote this and other feed options, concerted action is necessary by feed compounders, the government and the farmers. Only when this is carried out will significant improvements in small-scale culture be possible.

The ingredients that go into the making of a better quality Andhra shrimp feed formulation.

glimpses into BOBP projects

Sri Lankan fishermen get pension scheme

Sri Lanka has joined the ranks of those few countries in the world who have pension and social security schemes exclusively for their fisherfolk. Sri Lanka's Pension and Social Security Benefit Scheme for fisherfolk was inaugurated on April 21, 1991 by President Ranasinghe Premadasa.

Very few of Sri Lanka's 110,000 fishermen and the 400,000 persons working in related activities earn enough to save. As a result, most are poor and destitute when they reach old age. It is to supplement the meagre assistance from scant poor-relief provided by the State that the Ministry of Fisheries formulated the Pension and Social Security Benefit Scheme which was passed by Parliament in June 1990.

The Scheme aims at:

(a) providing social security to fisherfolk during old age or times of disability;

(b) providing relief to the dependents of fisherfolk when they die;

(c) encouraging fisherfolk to continue in their occupations;

(d) attracting young persons to the fishing industry; and

(e) inculcating the habits of saving and thrift among fisherfolk.

Thereby, it hopes, the overall economic condition of the community will be improved.

Anyone making a living from fishing or fisheries related activities, provided he or she is between 18 and 59 years of age, may join the Scheme. However, those fisherfolk who are economically well off are excluded from the Scheme.

The Scheme will provide a periodic pension benefit to any member when he or she gets too old to work. It also provides insurance against physical disablement or death, in the form of a gratuity, which will be paid if incapacitation or death takes place before the age of retirement.

The pension will be provided through the funds of the Scheme, which will consist of the member's own contributions as well as contributions from the state. The disablement and death gratuities will be provided through a Group Life Insurance Scheme operated by the Insurance Corporation.

The Scheme, which is both voluntary as well as contributory, will depend on its members and the government for funding. Each member between the ages of 18 and 54 will pay a fixed quarterly contribution until he or she reaches the age of 60 or is incapacitated before that.

A person who is eligible may join the Scheme at any time. If he joins when he is 18 years he will qualify for a pension of approximately Rs. 12,500/= per quarter when he is 60, if he completed his 168 quarterly contributions. A person joining the Scheme when he is 54 years will qualify for a quarterly pension of Rs. 800/= on completion of his 24 quarterly contributions.

The Scheme will be implemented jointly by the Ministry of Fisheries and Aquatic Resources and the Agricultural Insurance Board (AIB), the former responsible for enrolment of members and collection of contributions and the latter attending to the financial management of the Scheme. Collection of contributions will be done primarily through the Fisheries Co-operative Societies.

President Ranasinghe Premadasa of Sri Lanka (below, right) presents pension documents to a woman member at the inauguration of the Sri Lanka Pension and Social Security Benefit Scheme for Fisherfolk.

HINDU

Are they oceans or dumping grounds?

A heavily polluted Bay

The heavy concentration of population and the high level of industrial activity in the coastal districts of Tamil Nadu have badly polluted the entire coastal stretch of the Bay of Bengal.

P. SUNDERARAJAN writes.

ENVIRONMENT

Two articles in THE HINDU of Sunday, May 5, drew attention to pollution in the Bay of Bengal as well as elsewhere.

How badly is the Bay polluted?

The Bay of Bengal, like most other seas in the world, is being increasingly polluted. To discover what effect this pollution has on the fisheries of the Bay is a new project of the Bay of Bengal Programme.

The expected outcome is a better understanding of the nature and quantities of pollutants in the Bay of Bengal region and the effect they may have on the fisheries. This is an essential step towards formulating concrete measures to combat and alleviate pollution in the Bay.

To help with this step, Staffan Holmgren of Sweden has joined the BOBP staff as adviser on environmental matters. He says:

"The sea is gradually being polluted all over the world and many coastal areas are being seriously damaged by effluents from industries and cities and by nutrients and pesticides from agriculture and forestry. International shipping is also contributing to marine pollution. So are spills from oil and gas extraction. The Bay of Bengal is, unfortunately, no exception in this respect. But information on the present levels of pollution in the Bay is scanty, diffuse and hard to come by, scattered among a large number of departments, institutions and agencies."

To collate this information and assess the effects of pollution on fisheries will be the task of this SIDA-supported project. The project has been endorsed by BOBP's Advisory Committee, but member countries will decide the extent of participation and the operational arrangement that they want.

Holmgren, who started work on this project in April 1991, will be visiting member countries to discuss with the concerned government authorities in each the marine pollution situation. He will also seek the cooperation of research institutions organisations and universities involved in investigating such pollution. The work will focus on pollution directly relating to fisheries.

To achieve the goals in seven countries in two years, the project will have to rely heavily on the close cooperation of the concerned national institutions. They will have to identify problem areas and process and analyze all the relevant data that is available. The main role of the project itself is to *stimulate and facilitate with technical and financial support.*

Based on the results of the project's activities, a regional workshop is planned for Septembçr 1992 to discuss the findings. It should result in conclusions about the level of pollution in the Bay of Bengal and its impact on the fisheries. The workshop will, it is expected, be in a position to recommend necessary follow-up action and suggest suitable remedial measures to reduce harmful effects on fisheries. All relevant results of the activities and workshop will be documented and published.

BOBP has used wall-writing to try and prevent pollution in the Bay. This picture is from Vishakhapatnam harbour.

Some guidelines to ensure healthier oyster farming

Three years of trials with oyster culture in Malaysia, by the Fisheries Research Institute, Penang, and the Bay of Bengal Programme, have revealed some potential for oyster production.

To consider what the future course of action should be, the Department of Fisheries in Malaysia with support from BOBP and IDRC, organized a seminar in Kuala Lumpur from 26 to 28 February, 1991.

Fortysix participants, among them oyster farmers, a trader, biologists, extension and development officers and fisheries administrators discussed the FRI-BOBP experience since 1987 with seed sources, collection methods and grow-out systems and their learning from market studies of consumption centres, price structure and potential customers. Related experiences from elsewhere were also discussed and the seminar benefited from presentations by experts from Malaysia, Thailand and IDRC.

It was felt at the end of the seminar that full implementation of its recommendations would provide a healthy environment for oyster farming to develop within the artisanal fisherfolk community. The recommendations included the following

RESOURCES

- An inventory of natural stocks should be made to pinpoint potential culture areas, which could then be studiedin more detail to assess their potential for culture.
- Detailed monitoring should be carried out of landings of oysters from wild harvest and culture to determine the sources, and species, of oysters being produced.

RESEARCH

- Research should be intensified, particularly regarding water quality with respect to pathogenic bacteria, heavy metals and biotoxins such as PsP.
- Natural spatfall must be continuously monitored to define its abundance and seasonality.
- As culture develops, its impact on the carrying capacity of the environment should also be carefully monitored so as not to exceed it.
- Long-term research must focus on hatchery seed production on a commercial basis.

CULTURE SYSTEMS

- Transfer of foreign culture technology can be a stimulus to development and should be encouraged.
- The economic and technical potential of alternative culture systems should also be examined so that the most appropriate technology is promoted. Alternative species and culture systems can be assessed through pilot field trials.
- The technology of seed production from both natural sources and hatcheries needs to be developed.

QUALITY CONTROL

- Oyster culture cannot develop without a guarantee to the consumer of the product's wholesomeness. Only the introduction of depuration and proper monitoring can assure a quality product, but the economics of depuration need to be carefully evaluated.
- Improved methods of handling and examination should be introduced in post-harvest activities to ensure better fresh and processed products.

MARKETING

- A demand for oysters and oyster products should be stimulated through an active promotiOnal programme directed at both local and export markets.
- A variety of oyster products, from half shell to canned and cocktail oysters, could be promoted.

HUMAN RESOURCES

- Oyster farming has a human side. A long-term plan of action for this is necessary. Training and information programmes should encompass administrators, farm **managers, extension workers,** social scientists and legal personnel, as well as the farmers.

EXTENSION

- If extension efforts are to be successful, potential farmers must be carefully selected on the basis of their interests, qualifications and entrepreneurial abilities.
- Lead farms must be incorporated into the development process to serve as training and demonstration centres and to develop culture methods.
- Extension officers will need good technical support to give them the credibility they need to communicate effectively with farmers.
- Close liaison between research and extension people will help improve the research necessary on the managerial and extension aspects.

***REGULATORY** MEASURES*

- Any new industry needs a conducive regulatory framework within which it can develop. After identifying the competent authority, the following might be considered for promulgation
  - (a) Specific areas for oyster culture, with their usage defined.
  - (b) Specific areas for oyster spat collection, with their usage defined.
  - (c) Regulations governing the introduction of exotic species into Malaysia from outside.
  - (d) Regulations governing movement of seed and stock within Malaysia.
  - (e) Water quality standards for shellfish growing areas with powers for enforcement.
  - (f) Quality standards for finished products, fresh or processed, with the necessary post-harvest procedures.
  - (g) Aquaculture licensing mechanisms for participants.
  - (h) Leasing mechanisms for space allocation with water column rights, including conditions of tenure, such as fees, reporting requirements, operational standards and obligations upon termination.

Indonesian fisherfolk team together to supplement incomes

While a Bay of Bengal Programme extension subproject has been successful in getting small-scale fisherfolk in Langkhat, North Sumatera, Indonesia, to take collective action to help improve their lot, the that the participants founded have had some difficulty in identifying worthwhile activities that would substantially raise their incomes. The isolated nature of the communities, the strong cornpetition for the natural resources etc, limit their opportunities and make it difficult for them to identify new income earning activities.

Nevertheless, by the end of 1990, four of the six groups had taken up some activity or the other, such as setting up a retail shop for the sale of fishing gear and agriculture equipment, raising goats and calves or chickens, producing shrimp paste and cultivating different kinds of vegetables. Due to the paucity of funds the groups were able to raise, they had to limit the scale of the activities they entered into to such small ventures. Nevertheless, enter into them in the right spirit they did.

In Pulau Kampai, some of the women on a study tour had found women in one vifiage raising goats, and decided to follow suit. The men's group here, which had been running a small kiosk to sell goods for fishery and farming (see *Bay of Bengal News No. 37),* got down to expanding its business. A women's group in Pulau Sembilan agreed on raising ducks as there was a good market for eggs. The men's group here planned to change its fishing gear and try out mackerel gillnets. And in Pangkalan Siata, the women's group began rearing a calf which they hoped to sell at a profit in a year. While the men, who catch shrimp, planned to enhance their incomes by making shrimp paste.

A review of this subproject in January 1991, by a consultant, M. B. Sirait, University of North Sumatera, and a BOBP staff member, Hanne Kristensen, Sociologist, found that even for these activities the savings funds of the groups were not sufficient. The groups need access to considerably larger amounts of money to make the kind of investment that would ensure higher incomes. Local financing through the traditional supplier of credit, the *Toke* (a fish buyer-cum-trader), is, contrary to the prior assumptions of the project, not considered feasible by the fisherfolk themselves because the interest rates on long-term loans are too high and the *Toke* usually only engages in activities connected with the fish trade.

When the project was conceived in 1987 for the three villages, it was planned to provide institutional credit to the fisherfolk. However, when a survey showed that there was no real need for such credit, as it was already available through the *tokes,* even though at a price, it was decided to concentrate on mobilizing and training the fisherfolk in making better use of existing resources and in selecting and managing alternative aétivities or enterprises, emphasizing, the while, collective action on self-help basis.

Between the end of 1988 and the end of 1989, two consultants from a Jakarta-based NGO, Bina Swadaya, successfully started six groups, three men's and three women's, in the villages. To form the groups, they took the villagers through a range of 'reflection sessions' which enabled the participants themselves to identify their main problems and needs and got them to discuss possible solutions for these. This spadework resulted in the groups starting to save regularly and pooling their savings in group funds, for use on a group basis in income-generating activities. At the same time, Bina Swadaya also trained, at the field level, the involved extension staff from Provincial Fisheries Services and from the Extension Department.

Most of the groups meet on a regular basis and have continued their savings practices. Though their earnings from their investments are, at the moment, modest, the group members stress that their funds are nevertheless very useful as a ready pool from which members could draw loans and to make necessary household purchases, for social welfare obligations in times of emergency, such as illness etc. — for which it is otherwise difficult, or very expensive, to get a loan.

It is significant that the group funds have, in most cases, steadily grown by being recycled among the group members — a fact that shows that they are highly appreciated and that the members are able to administer them.

Today, though progress has been rather slow, and with the main objec-

Fattening the cow

Some groups function better than others. In the Langkat experience, it was observed that the better trained during the initial motivation sessions and those who received more attention from the extension staff, functioned better. However, regardless of their training, the women's groups in general have proved more cohesive, enthusiastic and inventive than the men's.

In Pangkalan Siata, the women's group has had 52 members right from its establishment in March 1989. Its members meet once a month for discussions, to pay in the Rs. 1,000 each member saves a month, and to plan group activities etc. The level of attendance is suprisingly high : only very few who have pressing reasons for absence, such as illness etc., fail to turn up. "This is," in the words of one of the group leaders, "because We feel these meetings have many ads antages and enable us to share our experience and discuss our problems."

This group utilizes its funds to give short-term loans to its members at 10 per cent interest. The interest was used to purchase a calf, which the group expects to sell, after a year, for about Rs.70,000 and earn a substantial profit. This enterprise has proven so viable that the group plans to buy more calves.

tives still to be achieved, the experience, in general, shows several positive, albeit intangible and unzneasurable, elements. These include awareness building, developing the ability to utilize one's own resources, etc. This, in the long run, may have a beneficial impact on the economy of the fisherfolk who are enthusiastic about the scheme continuing.

The formation of these groups has, thus, enabled fisherfolk to make more effective use of financial inputs. The subproject, which has enabled them create an institutional body *within* the community, has made it possible for them to receive and utilize funds on terms and conditions set up by the fisheffolk themselves. In the long run, the establishment of such group funds and each group's ability to set up feasible small enterprises could well provide an alternative to collateral for the banks, by convincing those institutions that small-scale fisherfolk enterprises can be worthy of credit. Simultaneously, it will show the fisherfolk that theythemselves, by collective savings, can mobilize resources to make them less dependent on outside funding for expansion of their enterprises.

To continue and speed up this positive process, the review team has recommended that the project give the groups financial support in the form of small loans (of about Rp 2 mill = US $ 1,000 per group), to enable them to raise the necessary seed capital for specific plans. It must, however, be accepted that even if the fisherfolk succeed in these small enterprises, it will take time before any measurable impact appears. The main advantage in the method used, therefore, lies not in financial results but in getting the fisherfolk conscious of getting together to help themselves.

Motorization scheme needs easier credit

Motorizing traditional ***chandi*** boats is now being seen as one of the avenues for Development of Bangladesh's marine/estuarine fisheries. But its success can be ensured only with better facilities for institutional credit for fisherfolk. Such credit would have to be made available more speedily on easier terms than at present.

Some time ago, the Bangladesh government's emphasis was on large-scale mechanised fisheries to increase the catch. But now greater emphasis is being given to the development of small-scale fisheries. The majority of coastal fisherfolk communities, who comprise the small-scale component of the national fisheries, use small, traditional non-motorized boats, mainly the *chandi* boats. Their incomes and living standards are conspicuously low. River erosion adds to their misery, constantly forcing them to shift their homes.

Traditional *chandi* boats are propelled by oars and sails. Their range of operation is limited and catches modest. To improve this situation, the Bay of Bengal Programme launched a pilot project to motorize traditional *chandi* boats. Low horse-power *(10.5)* long-tail outboard engines were fitted to *chandi* boats. Trials conducted with these boats showed that both landings and earnings could be doubled. These boats lessened the physical strain on the fishermen, increased their mobility and made life less hazardous during rough weather, especially during cyclonic conditions, a constant threat in the Bay of Bengal region.

The success of the first motorized boats aroused much interest and enthusiasm among ***chandi*** boat operators. But their poverty gave them little chance to benefit from this success.

The Ministry of Fisheries and Livestock now stepped in and urged that a subproject be undertaken by the BOBP to motorize a large number of *chandi* boats. The subproject then got underway with the intention of motorizing seventy *chandi* boats — twenty through BOBP funds and fifty through DANIDA bilateral assistance. These boats were intended to benefit 700 small-scale fishermen in the Daulatkhan and Charfesson *upazilias* of Bhola District. Under this scheme, crew members were also to be trained in the maintenance and repair of engines and BOBP was to provide regular engine service for a two-year-period.

In 1988, twenty *chandi* units were motorized in two batches, ten at a time. The owners of four boats in the first batch and six in the second batch repaid their instalments within the specified period. Niiie owners took 4-7 months more time than scheduled. Only one owner could not repay in full — and that too because the unit's engine and nets were stolen. The overall payment position was, thus very close to 100%.

During the field investigations for the selection of beneficiaries for the other fifty units it was found that the fisherfolk faced great difficulties because of the extremely unfavourable credit terms laid down by fish traders/money lenders. On the average, about Tk.12,000 and Tk.20,000 are needed by each non-motorized and motorized boat respectively before the start of the fishing season (April) for repairs to boat and nets, a few pieces of new net as replacement and repayment! adjustment of balance loans from the previous fishing season. But the *"dadandars"* (fish traders/money lenders), offer prices for the catch that are 10 per cent lower than market prices, resulting in losses ranging from Tk.6,000 to 17,000 for the season for each *chandi* unit.

To seek credit elsewhere is futile; institutional credit is almost non-existent for the fisherfolk community, most of whose members have few fixed assets. Existing credit procedures are also complex and lengthy. Thus, there have been second thoughts about motorizing their *chand.i* boats.

If the fisherfolk community in the small-scale fisheries is to benefit from this project, there must be easier institutional credit to make motorization possible. Only then will their incomes increase and their socio-economic conditions improve.

NEW BOBP PUBLICATIONS

The following reports, working papers and miscellaneous publications have been published by the Bay of Bengal Programme since October 1990. For more information and lists of all publications, contact the BOBP Information Service, Post Bag 1054, Madras 600 018; India.

BOBP/REP/45 — *Seminar on Gracilaria Production and Utilization in the Bay of Bengal Region* summarizes the proceedings of an international seminar held in Songkhla, Thailand, in October 1989. The seminar reviewed the current status of knowledge on Gracilaria world-wide and indicated future work directions. The report also indudes 24 papers presented by participants from various countries.

BOBP/REP/46 — *Exploratory Fishing for Large Pelagic Species in the Maldives* discusses the 'findings of exploratory surveys of tuna fishing in the Maldives. Despite limited fishing operations, some useful information was obtained on pelagic fish stocks (tuna and sharks) and on the feasibility of operating multi-day gilinets-cum-longline on offshore fishing trips.

BOBP/REP/47 — *Exploratory for Large Pelagic Species in Sri Lanka* discusses the fmdings of a project which, during 1987-88, sought to obtain information on surface and deep-swimming tuna in Sri Lanka and on the technical feasibility of exploiting them using small-to-medium size craft. Improvements necessary in craft are identified, efficiency of gear used is reported on and the need for greater attention being paid to tuna bait is pointed out.

BOBP/REP/48 — *Report of the 15th Advisory Committee Meeting* includes the recommendations of the 15th meeting of the Advisory Committee of the Bay of Bengal Programme for Fisheries Development (BOBP), held in January 1991 in Colombo, Sri Lanka. It also contains the annual reports (or status reports) of the projects in the Programme, describing the work on, and achievements of, each during 1990. It assesses their progress and indicates the workplans for 1991.

BOBP/WP/63 — *Shrimp Seed Collectors of Bangladesh* is based on a socio-economic study of the tens of thousands of shrimp fry collectors — men, women and children — in the coastal areas of Bangladesh. The study was undertaken in 1987 by a voluntary agency, UBINIG (Policy Research for Development Alternatives), to obtain information and discover strategies to improve the lot of those who make a living collecting shrimp fry — yet remain poor and under-privileged despite contributing much to the foreign exchange earnings of the country.

BOBP/WP/64 — *Reef Fishery Survey in the Maldives* describes the exploratory fishing trials carried out for over a year (1986-87) in the reefs of North Male Atoll in the Maldives to assess the potential for reef fish in the country and study the possibilities of developing a viable reef fish fishery. It includes preliminary information on various reef fish species, their abundance and rates of exploitation, and the relative efficiency of various fishing gear needed to tap this resource.

BOBP/WP/65 — *Seaweed* (Gracilaria Edulis) *Farming in Vedalai and Chinnapalim, India* describes trials with seaweed carried out between 1987 and 1990 in the open sea off two coastal villages in Tamil Nadu. The purpose of the trials was to discover whether the collectors of wild seaweed in the area could augment their income by cultivating seaweed and, thereby, also possibly preserve their natural resource, which is believed to be diminishing through over-exploitation.

BOBP/WP/66 — *Improving Marketing Conditions for Women fish Vendors in Besant Nagar* discusses and describes how the need felt for a fish market by the fisherfolk who lived and worked on the shore by Besant Nagar, Madras, was translated into reality in August 1990, when a fish market run exclusively by women fish vendors was opened in this suburb. It also narrates the role of various organizations in setting up the market and their perceptions of the process by which it became a reality.

BOBP/WP/67 — *Design and Trial of Ice Boxes for Use on fishing Boats in Kakinada, India* describes the development of an ice box for use on board traditional fishing boats and the trials conducted during 1988 and 1989. The project, which studied the technical and fmancial viability of these boxes, indicated that when ice was used for preserving high value fish (particularly seerfish), it could increase incomes by about 20¾ and enable a boat-owner to pay for a box within one to three years.

BOBP/WP/69 — *Agar and Alginate Production from Seaweed in India* surveys the Indian seaweed industry and its principal products, agar and sodium alginate. Although small by world standards, Indian production of agar and alginates is important in providing income opportunities to many fishing communities, particularly the women, who harvest the seaweed from coastal waters. Technical and economic aspects of seaweed collection and processing, and the markets for products, are examined in the paper. The trials BOBP undertook to cultivate seaweed and use it as raw material for village-scale agar production are also briefly described.

BOBP/WP/76 — *FLcberfolk Needs Analysis in the Maldives* summarizes and analyzes the information collected from fisherfolk communities in the Meemu, Vaavu and Faafu Atolls of the Maldives as part of an exercise to develop a fisheries extension service, to build rapport with the fisherfolk and to get a working understanding of their socio-economic status, the dynamics of their communities and their needs and concerns.

BOBP/INF/11 — *Marine Small-Scale Fisheries of West Bengal: An Introduction* makes a brief, factual presentation of data and baseline information on the main features of these fisheries in West Bengal, India. It could serve as an introduction to the subject leading to deeper studies, as a source of general information, or as a background for use in discussions on planning and programming of developmental assistance.

BAY OF BENGAL NEWS

Bay of Bengal News is a quarterly publication of the Bay of Bengal Programme (BOBP), a regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka, Thailand. The Programme plays a catalytic and consultative role : it develops, demonstrates and promotes new techniques, technologies or ideas to help improve the conditions of small-scale fisherfolk communities in member-countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, by member-governments in the Bay of Bengal region, and also by UNFPA (United Nations Population Fund), AGFUND (Arab Gulf Fund for United Nations Development Organizations) and UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

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