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New BOBP activities

BOBP begins the second year of its second phase (1987-1991) with many interesting new activities, a sampling of which is described on these pages.

Radio programmes for Sri Lankan fisherfolk

Sri Lankan fisher-folk are avid radio listeners. It is said that the recent stop page of a regular late- night radio music programme in Sri Lanka provoked a blizzard of protests from fisher-folk.

If all goes well, the fisherfolk are in for a regular radio treat from October 16, World Food Day. Under a BOBP-supported project in cooperation with the Ministry of Fisheries and the SLBC (Sri Lanka Broadcasting Corporation), two 1 S-minute programmes prepared for fisherfolk will be broadcast each day on the Sinhala commercial, to be extended later to Tamil. Each programme will be a package of news, education and entertainment. Possible subjects : weather forecasts, fish prices, interviews with fisher-folk (since fisher-folk, like most others, learn best from their neighbours), talks by leaders, officials and experts aimed at fisherfolk. Since

fisher-folk will listen directly to their leaders over the radio, possible distortions in passing on information through a hierarchy will be avoided. An effort will be made to make radio an effective tool for rescue and crisis management when cyclones or other diasters occur or when fishermen are lost at sea.

BOBP consultants experienced in rural broadcasting will help in the planning of radio programmes and in training Minfish and SLBC. staff. The latter are presently busy conducting audience profile studies of fisherfolk communities. Sample programmes will be produced and field-tested before the actual programme goes on the air.

Says BOBP extension training officer Rathindra Nath Roy, "SLBC has an excellent record in community programming. The radio in Sri Lanka holds its own despite the onslaught of television. The programmes for fisherfolk will further strengthen the radio here as a tool of rural communication."

World Food Day this year focuses on "Role of Youth". The radio-programme-for-fisherfolk project launched in Sri Lanka is of particular value to young fishermen who seek to be better informed and better equipped than their ancestors in an environment that's more complex than theirs.

Assisting fisherfolk through NGOs in India

Some NGOs (non-government organizations) build and enjoy an excellent rapport with local communities. Their skills and contacts are ideal for grassroots-level rural development work. With fisheries departments being perennially short of manpower and funds, NGOs can help amplify extension services to fisherfolk to improve their living standards. This is the rationale behind BOBP's effort to assist fisherfolk through NGOs, An inventory of fishery-related NGOs along the east coast was undertaken last year. Six of them (three each from Andhra Pradesh and Tamil Nadu) discussed future cooperation with BOBP at a meeting February last.

The main needs of the NGOs are for information and training in brackish-water aquaculture, fishing craft, fishing gear and post- harvest technology; and for assistance in areas like credit mechanisms and non-formal education for fisherfolk. Further studies are planned to identify, design and test little pilot projects through NGOs to help fisherfolk. BOBP will also act as a catalyst in encouraging NGO-to-NGO contact in health, nutrition, diaster preparedness and the like.

Expanding and amplifying development programming through NGOs is in accordance with the government's own thinking, as stated in the Seventh Plan Document. In fact, it is hoped that three-way cooperation – among government, BOBP and NGOs – will emerge along India's east coast.

NGOs in India would like to assist fisherfolk in areas like fishing technology (below) and non-formal education (above).

Strengthening extension services to fisherfolk communities in Bangladesh

This sub-project intends to strengthen and amplify extension effort to fisherfolk communities of Bangladesh through training of government and NGO staff; technology transfer; and support to pilot extension schemes.

At present, government extension staff are few and overburdened with work. They lack transport facilities to reach remote fisherfolk communities, and the equipment, teaching aids and skills needed for extension and knowledge transfer. They also tend to focus on tishing rather on fisherfolk communities — with whom they spend too little time for any rapport to build up.

The sub-project will be carried out in two coastal districts over a period of four years in three phases. In the first phase, extensionstaff will be trained in socio-economics and technology, followed by field exercises in participatory research among fisherfolk communities, so that the training is put to use. During the second phase, needs and options will be identified through a participatory approach, and community action will be planned for selected options. During the third phase, selected extension schemes with fisherfolk communities will be implemented.

Till now, BOBP activities in Bangladesh seemed to focus on technology (fishing gear, fishing craft, aquaculture) as a result of perceived needs in technology. In the post-1986 phase, the emphasis will be on fisher-folk communities.

Oyster culture in Malaysia

Malaysian fisheries staff examine *oyster shell* cultch.

Will oyster farms one day dot the coastal waters of Malaysia, as they do certain areas in Thailand? It is this vision of the future that has spurred the Malaysian Department of Fisheries to undertake a four-year project with BOBP financial and technical support.

Dr. Ong Kah Sin, Director of the Fisheries Research Institute, Penang, and his staff of biologists are now working on a viable technology for small-scale family-based oyster farming. Mr. Ng Fong Oon, Project Manager at FRI, says the first thing to be done is to locate a reliable and consistent source of baby oysters or "spat" which will supply farmers with growing stock. The spat search will occupy the remainder of this year and become an ongoing activity. Zukifli Mahmood, Roslan Shamsuddin, Ahmad Ali and Hasbullah Zakaria, young fisheries biologists, have been posted to four field locations — Langkawi Island, Pangkor Island and Pulau Kambing (Goat Island) in Trengannu — for spat search.

It is hoped that at least one major spat source will be located. Pulau Kambing is on the east coast of peninsular

(Continued on page 23)

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No easy solutions for set bagnet fisherfolk

Based on a study by Safique Islam, Ishaque Bhuiyan, Anwar Iqbal, S.M. Shamsul Huda, Abdur Razzak and *Kamal Sen Cupta, under the guidance of BOBP.*

Is the set bagnet, which so many small-scale fishermen of Bangladesh use, . destructive to the fishery resource? Does saving the resource mean destroying the livelihood of the fishermen? This article ponders these agonizing questions.

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What can be done about a fishery – which not only contributes a sizable portion of the country's catch but also offers livelihood to a large fisher-folk population – if it is considered to be harmful to the fishery resource and to other fisheries? In attempting to address this question, the Bangladesh Government had asked the BOBP to look into the set bagnet fishery and suggest options.

Of the annual marine fish production in Bangladesh, estimated to be 220,320 t in 1985/86,48,021 t or 21.8% was contributed by the set bagnet fishery. Some 15,000 units of this gear provided a major proportion of the livelihood of a large number of fisher-folk. The government is concerned about reports it has received of the harmful effects of this fishery on other fisheries.

To better understand the problem and its dimensions and to design a deeper and more rigorous study, the BOBP in October-November 1987 conducted a preliminary study of the biological and socio-economic aspects of the estuarine and marine set bagnet fishery. The study was carried out by Mr. Safique Islam, Mr. Ishaque Bhuyan and Mr. Anwal Iqbal of the Directorate of Fisheries, Bangladesh, and Mr. Kamal Sen Gupta, a socio-economist from CODEC, an NGO. They were assisted by two fishery inspectors from Chittagong, Mr. S. M. Shamsul Huda and Mr. Abdur Razzak. The study looked at the set bagnet fishery in Khipupara, Teknaf, Kumira, Chakoria and Sonadia, which reasonably represent the fishery as it is practised in estuarine and marine zones.

First let us consider the biological findings of the study. Because of the numerous rivers and rivulets opening into the sea and the quantum of outflow, practically the entire coastal belt of Bangladesh is estuarine, and a very large number of set bagnets is operated in the estuarine environment. This fishery is conducted round the year. The marine set bagnet fishery is concentrated off Kubla, Sonachar and Sonadia islands and only during the dry and fair weather season (October-February). A detailed description of this fishery, the gear characteristics and the results of BOBP efforts to improve the gear have been reported in BOBP/WP/34 and BOBP/REP/34.

The mesh size of the cod end being very small – 4.2 mm to 13 mm – the set bagnet catches all sizes and species of fish, including juveniles of shrimp. In fact, the behundi jal, as it is locally known, functions like a sampling gear for most of the commercial organisms in the fishing ground. About 100 finfish and shrimp species were identified from the catches of set bagnets. Eight of the penaeid shrimp species are also captured by trawls and five spices by trammel nets. Of the finfish species caught by set bagnets, about 34 species also enter the gillnet fishery, 24 the trawl fishery and 12 the trammel net fishery. Thus many finfish and shrimp species are common in the catches of set bagnets and other fishing gears.

The catch rates of estuarine set bagnets are very low (3-19 kg/haul) – less than those for trammel nets (24 kg/set) or gillnets (16-38 kg/set). The catch rates of estuarine set bagnets are also lower than these of marine set bagnets (46 kg/haul).

In spite of the low catch rates, the number of set bagnets – estuarine and marine – has increased, from 4,808 in 1967/68 to 15,696 units in 1984/85.

The most common ("modal") sizes of the shrimp and finfish caught by estuarine set bagnets were about 30% of the maximum size attainable by the respective species. As a result, 30%-90% of the panaeid shrimps and finfish were found to be immature, depending on the species and location. In other words, had these fish and shrimps not been caught by the behundi jals they would have matured and in time been recruited by the other fisheries. And this is the crux of the problem. However, the set bagnets cannot be solely blamed for exploiting juvenile shrimps and finfish, thus reducing the possible catch of other fishing gears such as trammel nets and trawls. Thousands of shrimp seed collectors are active in Bangladesh, and it is estimated that they collect about 450 million seeds of P. monodon for sale to shrimp culturists. In the process, billions of shrimp seed – other than P. monodon varieties – and finfish juveniles are removed from the estuarine environment.

The figure on page 7 shows how various fishing gears exploit shrimp and finfish species at different stages of their life cycle. It also shows the possible interaction between the set bagnet fishery and other fisheries and the probable impact of set bagnets on the exploited resources.

One cannot indict an entire fishery on the basis of a small sample, and the findings clearly indicate the need for a more detailed investigation of biological aspects of the set bagnet fishery over at least a year in representative locations, to determine seasonal variations (in catch and species composition) and to quantify the abundance of juveniles and adults in the various interactive fisheries. This more detailed

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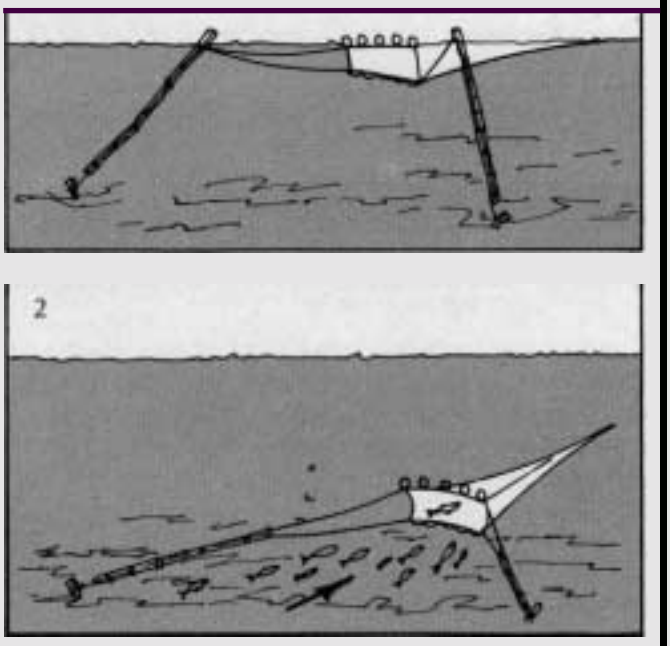
How the set bagnet is operated

The behundi or set bagnet is a fixed tapering net, resembling a trawl net, set in a current by attaching it to holdfasts. It has a rectangular mouth opening, and is made up of four panels; the side panels are extended into wings which, it is believed, increase the effective fishing width by herding fish into the mouth opening.

The sketches at right help illustrate the working principle of the set bagnet.

1. During the inter-tidal period, the net is set in the current by attaching it to "holdfasts" (wooden stakes). The net floats on the water surface.
2. When 'the current gets strong, the net sinks and stretches. Fish drift in with the current.

   During a.subsequent inter-tidal period, the net comes up to the surface. It is emptied of catch, then set in the opposite direction. When the current gains strength again, the net once more sinks and stretches, this time in the opposite direction.



study will also identify feasible and practical management measures. For example, a better understanding of the gear may suggest modifications to reduce damage without reducing the fishermen's income.

Having looked at the problem from the biological angle it is necessary to consider the fisherfolk aspects, since any changes in the gear or even the resource management approaches intended will ultimately be successful only if the people concerned put it into practice.

There seem to be essentially two types of set bagnet fisherfolk: those who use this gear all the year around and little else, and depend on it for their livelihood (this type accounts for most of the estuarine fishery and even some of the small set bagnets at sea); and those who use the gear for a season and migrate to coastal and island locations during the lean seasons. (This type accounts for most of the set bagnet fisherfolk out at sea, who mostly use the large size nets).

The seasonal set bagnet fishery is well organized, involves large investments and support and service setups. The fisherfolk involved in th'is type of fishery are usually paid on a salary and expenses mode and seem to be relatively-better off than their colleagues who use set bagnets the year around in the estuarine zones.

The socio-economic picture of the estuarine set bagnet fishetfolk communities is grim. Most of the villages are in remote locations and undeveloped in infrastructure facilities which most agrarian communities take for granted. Access roads often do not exist; the communities rarely have school, health care or banking facilities; ice for all practical purposes is unavailable. The quality of housing is poor, sanitation and hygiene levels are low, and most fisherfolk do not have assets like radio sets, bicycles or household goods which are indicative of some development.

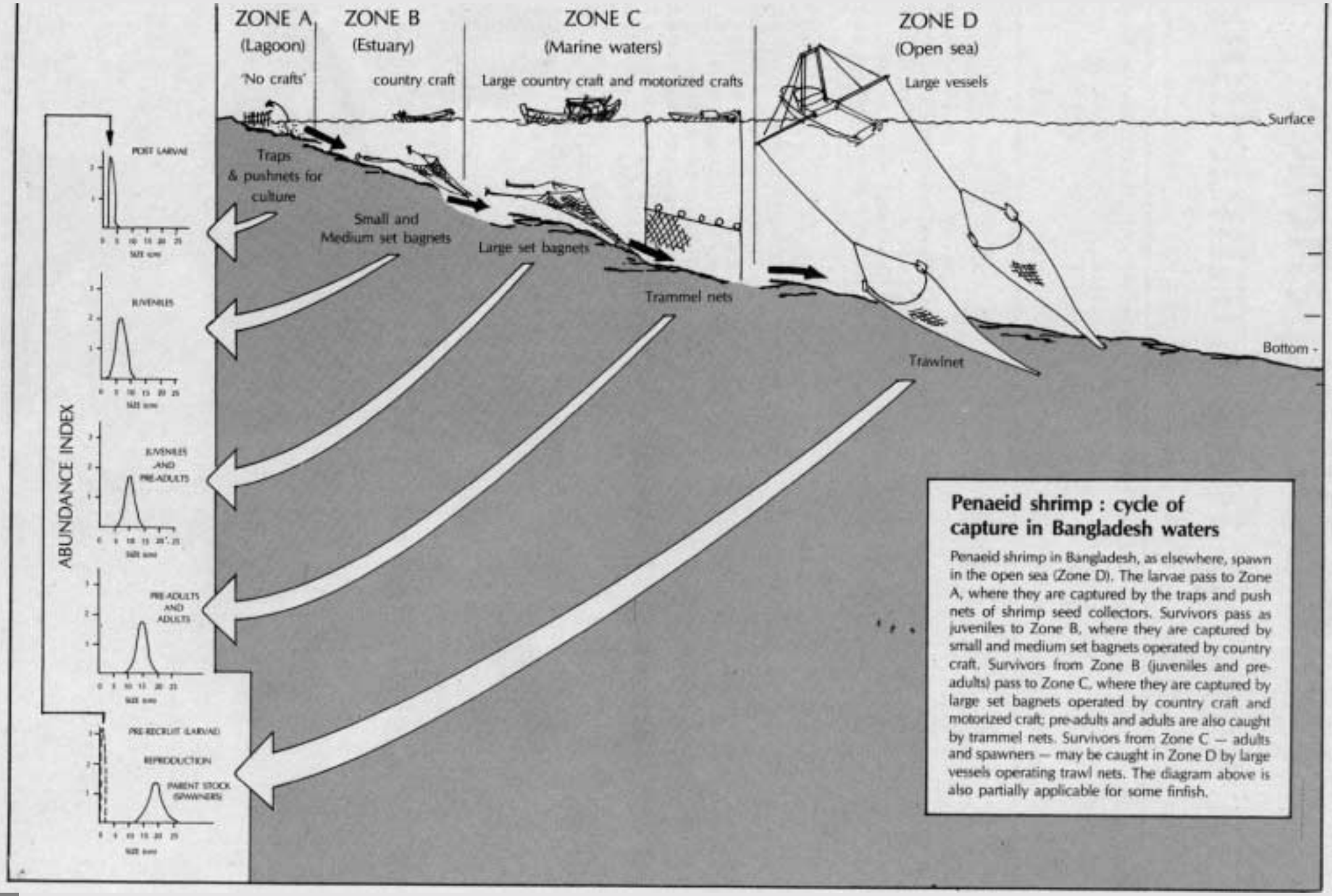
Compounding this situation is the fact that not only are their catches low but the small sizes of fish and shrimp get them lower prices, The remoteness of their location makes them dependent on several tiers of middlemen, who while they help in marketing their catch and providing them much-needed credit, also exploit them.

Credit sources available to these fisher-folk were found to be restricted to personal loans, and loans from fish traders and marketing agents.

But the real problem seems to be a seeming lack of alternatives. If set bagnets get them low catches and poor prices why have they not tried alternative gears? The people lack credit to experiment, but they also seem convinced that there are very few other fish resources available and accessible to them even if they did have the credit! Why don't they abandon fishing and seek alternate sources of income? Remoteness, lack of education and information, lack of land, lack of credit and poor organization add up to a grim scenario of poor alternative opportunities.

Given this kind of situation, our study indicates the need to look at and work with these communities not only to better understand them but to identify mechanisms and approaches by which they can be helped to organize themselves towards development. Simultaneously, there is a need to look closer at the available resources and to do opportunity searches to identify alternative options of development in fisheries and non-fisheries sectors.

Helping people in such resource-poor opportunity-poor situations is never easy, but that is the challenge we face in doing something to help the set bagnet fishery of Bangladesh. We hope that the more detailed biological and socio-economic studies planned will help in developing options for these needy fisher-folk while providing resource-conserving methods of practising a fishery that they have engaged. in for generations.



Penaeid shrimp : cycle of capture in Bangladesh waters

Penaeid shrimp in Bangladesh, as elsewhere, spawn in the open sea (Zone D). The larvae pass to Zone A, where they are captured by the traps and push nets of shrimp seed collectors. Survivors pass as juveniles to Zone B, where they are captured by small and medium set bagnets operated by country craft. Survivors from Zone B (juveniles and pre-adults) pass to Zone C, where they are captured by large set bagnets operated by country craft and motorized craft; pre-adults and adults are also caught by trammel nets. Survivors from Zone C — adults and spawners — may be caught in Zone D by large vessels operating trawl nets. The diagram above is also partially applicable for some finfish.

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The BOBP experience in shrimp feed formulation

by Charles Angell

Feed is of paramount importance in shrimp culture. In some countries of the Bay of Bengal region, readymade shrimp feed is not available; local manufacture in small quantities is not an easy task. The feed problems BOBP has faced in its shrimp culture projects — and the lessons learned — are discussed on these pages by BOBP's senior aquaculturist.

Coastal aquaculture has been an integral component of BOBP's work since its inception. The explosive growth of interest in shrimp culture inevitably generated requests from participating countries for assistance in this exciting industry.

The BOBP's work in shrimp culture has included projects in Bangladesh (Satkhira), India (Polekurru and Killai), Malaysia (Ban Merbok) and Sri Lanka (Chilaw). With the exception of Killai and Chilaw, all of these activities involved some aspect of pond culture. Killai and Chilaw have been unique attempts to develop a pen culture technology for prawn farming.

All of these activities had one thing in common — they were semi-intensive and intensive management systems in which feed was a required input of paramount importance. However, BOBP by its very nature tries to introduce applied technologies in aquaculture through practical pilot activities, limiting the scope for experimental feeding trials. Shrimp culture in Bangladesh, India, Sri Lanka and Malaysia was a new activity and represented a relatively small industry when the programme started. Consequently, there has not been the concurrent development of a shrimp feed manufacturing capability adequate for the industry's requirements. In its earlier projects, BOBP was forced to formulate feeds on an ad hoc basis using locally available ingredients and manufacturing machinery. It "quickly became apparent that local manufacture of shrimp feed in relatively small quantities was not an easy task.

What do shrimp require in an artificial diet?

A detailed discussion of prawn nutrition is not appropriate for this article, but some of the basic nutritional requirements of prawns are reviewed, so that the reader understands better the problems facing the prawn farmer and

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feed manufacturer in their attempts to develop an economical artificial food.

The nutritional requirements of penaeid shrimp are not as well known as those of the most popular cultured finfish, such as trout. Considerable work has been done in Japan with the kuruma prawn, Penaeus *japonicus,* and most of the results can be applied to diet formulations for other species.

In the case of the tiger prawn, P. monodon, we are dealing with a carnivorous beast which requires a relatively high protein content in its diet. A good prawn feed will have a crude protein content between 35 and 40%; closer to 40% if the prawn are small. The ten essential amino acids common to higher animals have also been found to be required in prawn diets.

A very important finding affecting diet formulation is the requirement for sterols and certain highly unsaturated fatty acids. Prawn growth and survival are poor if the diet does not meet these requirements. Among the sterols, cholestorol is of particular importance. Unsaturated fatty acids of the Omega-3 type, particularly 18, 20 and 22 chain UFA's, must be supplied by the diet, since they cannot be synthesized by the prawn. A good artificial diet must also provide an adequate level of phospholipid.

Prawns find their food through their keen sense of smell. The faster the animal can locate its feed, the more efficiently the feed will be utilized. "Attractants" are an increasingly important part of prawn nutrition research. A powerful attractant, glycine betaine, has been found in squid and shrimp flesh. At present, attractants form part of the raw ingredients of the diet, but they can be added as specific chemical substances in the future.

Prawns nibble their food, rather than swallow particles whole as fish do. If a feed pellet is not compact and stable during the feeding process, it literally flies apart, its component particles quickly settle to the bottom and become unavailable to the prawn. Water stability is increased by gelatinizing starch in the diet during processing and the addition of a binder. Starch gelatinization is accomplished by heating the moist feed or steam injection. Binders are substances which promote water stability. They are chosen on the basis of their binding ability and cost. Adequate compaction during pelletizing enhances water stability.

The BOBP experience *with* shrimp *feed.* Above : *At* Killai, Tamil *Nadu.* Making a simple pelleted ration, *which will later be sun-dried. Facing page : At Polekurru,* Andhra Pradesh. *Using* locally available raw materials to fabricate *a wet feed.*

Some possible raw material sources and their dietary inputs are summarized in Table I.

Raw materials for shrimp feed posed serious problems – as to availability and quality – in BOBP's shrimp culture demonstration project at Satkhira in Bangladesh. The main protein source of shrimp feed is fish meal, which is generally of low quality and uncertain of supply in the country. While the protein requirement for *Penaeus monodon* is between 35 and 40%, it was possible to produce a pellet containing only 26% protein and with a high fiber content. Indeed, it will be difficult to produce a quality shrimp pellet in Bangladesh using indigenous raw materials. Fortunately, the shrimp culture industry in that country utilizes extensive culture technology – which relies on enhanced natural productivity rather than on intensive use of artificial feeds.

Manufactured shrimp feed was not readily available in Malaysia when BOBP began a demonstration and training program at Ban Merbok. Trash fish, rice bran and fresh whole fish formed the basis for freshly prepared pellets. Minced fresh fish was also fed directly on some occasions. The proportion of wet fresh fish to wet pellets varied according to the age of the prawns. Dry pellets were not used in the trials. Today, imported shrimp feed can be 'readily purchased in the country, and there is enough animal feed manufacturing capacity to meet the shrimp industry's needs.

BOBP's assistance to shrimp farming technology development in India was concentrated at Polekurru and Killai. Polekurru, Andhra Pradesh, was an attempt to develop economical pond

A modem small-scale shrimp *feed* mill in Surat Thani, Thailand.

designs, but included feed formulation as an important component. Again, due to the non-availability of manufactured feed, ad **hoc** confection of a practical diet had to take advantage of locally obtained raw materials including trash fish, rice bran, groundnut oil cake, tapioca and broken rice. Feed was. given wet, and feed conversion ratios averaged 4.4 to **9.1.** The minced feed was. simply hand-pressed into balls which were placed on clay plates in the experimental ponds.

Raw materials availability was also a serious constraint at Killai. Agricultural by-products were fairly easily obtained from the surrounding area, but, typically, protein sources were the problem. The first nine culture trials in pens of varying size involved *Penaeus indicus.* Trash fish and squid offal were secured from a nearby fishing port and incorporated into a pelleted ration which was sundried. Wet feed using similar components was also given. The only mechanical equipment used in feed preparation was a mincer. Pellets were spread on the ground for sun-drying. Feed costs amounted from **17%** to 79% of gross costs. The local cost was Rs 2.5 ($0.19) per kg and the conversion ratio was about 7 : 1 for dry pellets and 11 :1 for the wet version.

The nine trials with P. *indicus* at Killai ended in 1986 and while yields were good, up to 380 kg per crop per ha in 60 days, profitability remained elusive due to the small size of the shrimp at harvest and the fact that only 2 crops per year were possible using natural fry sources. Consequently, BOBP decided to try the tiger prawn, P. monodon, with hatchery-bred seed obtained from a local private hatchery. Realizing that a good feed would be essential to success, we tried to design the best formulation possible for use in pen culture trials both in Sri Lanka and India. We found that almost all ingredients, barring a few vitamins and an antioxidant, can be had in India. But again, quality and reliable supply were problems, particularly with respect to fish meal. Therefore, we had to buy our fish meal from manufacturers in Gujarat, where a sub stantial by-catch fishery exists.

BOBP also set up a small-scale feed production plant including a hammer mill, blender and pelletizer. The raw materials costs for the feed came to about Rs. 6.4/kg ($0.49) excluding transport costs. Unfortunately, two attempts to rear P. monodon at Killai failed completely, so we have no data on conversion ratios.

BOBP has been much luckier with pen culture trials at Chilaw, Sri Lanka. Feed production has been in collaboration with a Colombo feed mill, but using the same specifications as were employed at Killai. Shrimp fry are obtained from local private hatcheries. The ready availability of these two crucial inputs has contributed a great deal to the success of the project. The best trial resulted in a feed conversion ratio of 2.4:1 and a productivity of 720 kg/ha with an average size of 26 g and a maximum grow-out from PL20 of about 150 days. These trials are continuing. It has to be emphasized that all major components of the Sri Lanka-produced pellet are imported. Its cost is SL Rs 22.50/kg. ($0.75).

Feeds for nursery rearing

Most of these growout trials were preceded by nursery rearing of both hatchery and wild post-larvae and juveniles. Pen culture technology employs nursery happas for juvenile rearing, so in several cases we were able to get 'some good data on survival, but records of total food consumption were not kept. Early nursery feeding is difficult because of the small size of post. larvae. Food particles must be small enough that the post-larvae can easily grasp them and the particles must be very stable and as nutritionally complete as possible. Postlarvae and early juveniles also require a diet high in protein. Shrimp feed manufacturers in Japan, Taiwan and the United States are producing water-stable feeds for post-larvae and juveniles, but these are not available in our region, nor do any of the national feed mills have the capability to produce them.

Egg custard, adequately screened to a small size, is an excellent starter feed

which can be given the first week or so until ,PL's have grown enough to take larger particles. Crumbles made from the Sri Lanka pellet proved to be ideal for rearing from this point to stocking. The crumbles were carefully prepared to avoid excessive powdering. Minced clam, oyster and mussel meat were also used. P.monodon was seen taking egg custard in preference to clam meat in Sri Lanka nursery happas. Eggs may be costly, but if feeding their custard is limited to PL's the amount required is small. We gradually wean the early juveniles from the egg custard to other feeds in our Sri Lanka nursery operation, rather than make an abrupt transition. Survival data varies considerably between the Chilaw and Killai projects of BOBP. The first nursery trial at Chilaw yielded 47% from PL20 to stocking size, while the second attempt was a very pleasant surprise : 90% survival after a total rearing time of two months (including some prawns removed earlier for stocking after reaching 2 g).

At Killai, recovery of P. indicus after 50 to 55 days of nursery rearing wild juveniles to 2 g, varied from 35 to 57%. Boiled, chopped clam meat and squid offal was used as the feed. Trials with P. monodon gave only 28 to 33% survival in 42 days of nursery rearing.

Some of the practical diet formulations used in these trials are summarized in Table 2. More than one formulation was tried at Ban Merbok and Satkhira, depending on the availability of raw materials and the age of prawns.

We have concluded that good results can only be obtained with high quality feed and that it is well nigh impossible for the small farmer to manufacture his own. Large farms may be able to, but future improvements in the productivity of the shrimp culture' industry in countries bordering the Bay of Bengal will depend on the development of national and regional feed manufacturing capabilities.

Table 1

Shrimp feed raw material sources and their corresponding dietary inputs

Source	Protein	Lipid	Carbohydrate	Phospholipid	Sterol.	UFA	Binder	Attractant
Fish meal	x	x						
Squid meal	x				x			x
Shrimphead meal	x		x				x	
Ground nut oil cake	x		x					
Sesame oil cake	x		x					
Cottonseed oil cake	x		x					
Rice bran, de-oiled	x		x					
Wheat flour			x				x	
Tapioca meal			x				x	
Lecithin				x				
Carboxymethylcellulose							x	
Brewers yeast	x							
Fish and vegetable oils		x				x		

Table 2

Practical diet formulations used during various BOBP shrimp culture trials, by ingredient and project location

Ingredient	Percentage composition				
	Ban Merbok	Polekurru	Satkhira	Killai	Chilaw
Trash fish and clam' meat		60	60		
Animal viscera				40	
Rice bran, groundnut oil cake and broken rice (Polekurru only)	40 (20)	30	20 (35)		10
Tapioca, maida, and/or wheat flour		10	20 (25)	10	10
Whole fish	(50)*				
Squid offal/trash fish				50	
Minced fish	60 (30)*				
Fish meal			40		26
Shrimphead meal					10
Squid meal					10
Soybean meal					20
Fish oil					3
Lecithin					1
Vitamin mix					< 1
Mineral mix					< 1
CMC or CMS for binder					1
Antioxidant (BHT)					15

* Also used at Killai for P. monodon

() More than one formulation was tried

Remote sensing in fisheries development

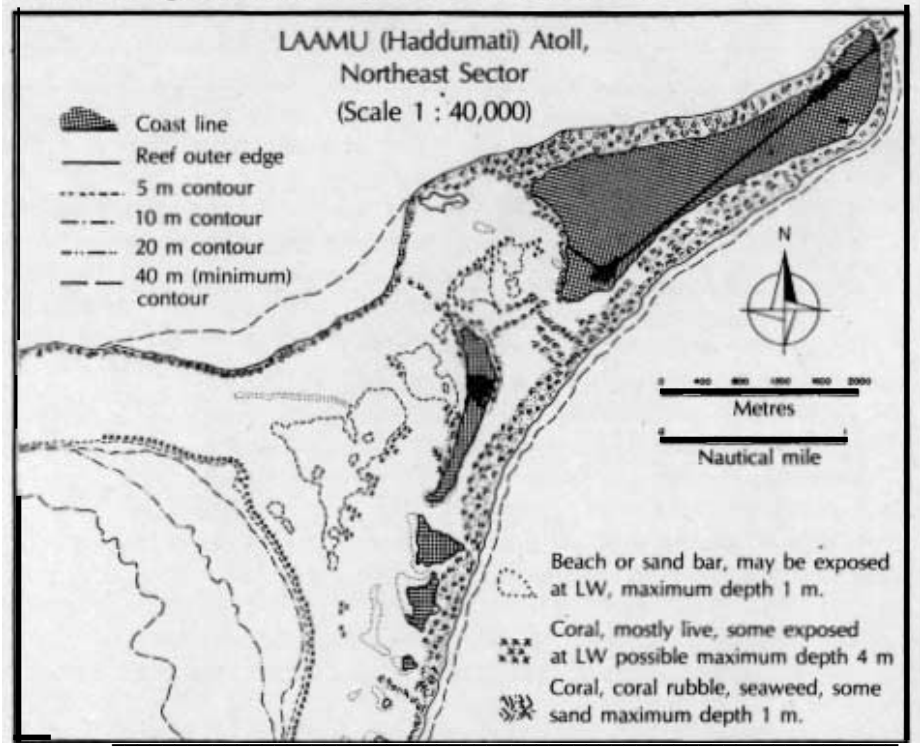
by Martin Van der Knaap

Remote sensing is the technique of gathering data — usually photographic or emanations across the electromagnetic spectrum — through airborne or satellite borne instruments. In recent times, satellites have become perhaps the most widely used and cost-effective means of gathering remote sensed data.

Three types of satellites are employed in remote sensing. These are: polar-orbit environmental satellites (examples: TIROS-N, NOAA-8), geostationary observational satellites (example Meteosat) and earth resources satellites (example: Landsat, Soyuz/Salyut). The first two types can typically cover the same ground area several times a day and provide images with a resolution of 1.1 to 5 km, i.e., they can distinguish between objects separated by 1.1 to 5 km. These satellites are usually able to provide maps on a scale of 1 2,000,000 to 1: 5,000,000. The main applications of these two satellite types include: monitoring weather patterns, cloud types and their coverage, precipitation (rainfall), sea surface temperature determination etc. They have also been used experimentally to study distribution of sea surface temperatures.

Earth resources satellites, such as Landsat and SPOT, provide higher resolution than the other two types. For instance, Landsat has a resolution of 80 metres (with its multispectral scanner) and 30 m (through its Thematic Mapper). SPOT's resolutions are 20 m (multispectral scanner) and 10 m (panochromatic). Landsat can cover the same ground area once in 16 days and SPOT once in 26 days (the orbit of the satellite can be changed to cover the same area once in five days if required).

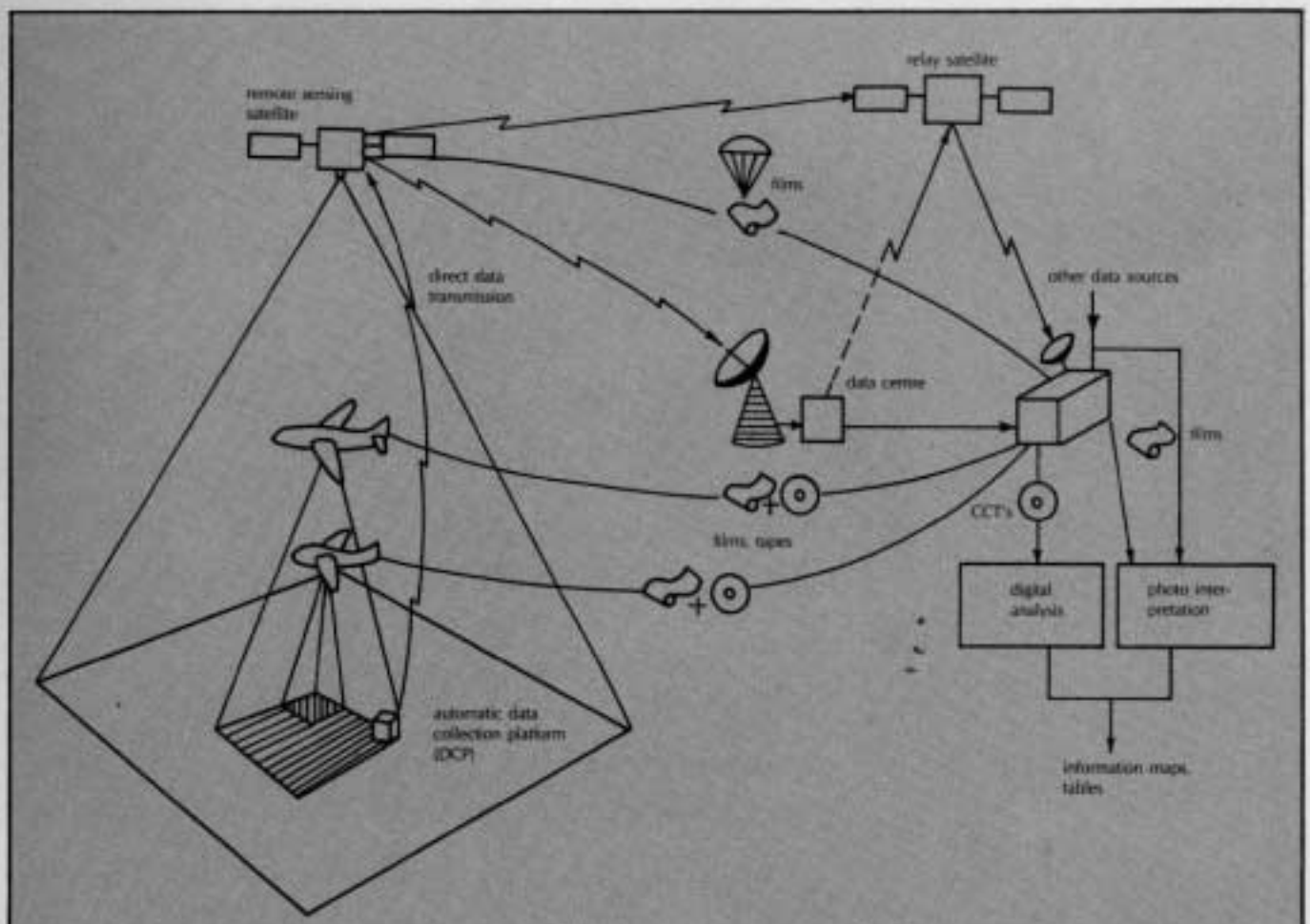
This fishery chart from Laamu atoll (below) in the Maldives was made possible from remote sensing data. Source : FAO project TCP/MDV/4505.



In September 1986, remote sensing imagery was used in a FAO/TCP project to study the land surface of the Laamu atoll in the Republic of Maldives. When the satellite imagery was analysed at the FAO Remote Sensing Centre, however, it was found that the satellite imagery could provide valuable fisheries-related data as well. FAO's Fisheries Department became interested in this application of remote sensing and participated in a ground survey during June/July 1987.

A significant finding from this study relates to the possibility of distinguishing several features of the marine environment in the Maldives through satellite images. Normally, different features sensed by a remote sensing instrument are given different colours in the final imagery. When the ground survey was used in the the analysis of the satellite images of the marine environment around the Maldivian waters, it found that about eight different bathymetric (depth) classes, ranging from zero to 50 m depth, could be distinguished in the imagery. Similarly, dense coral formations in shallow waters could be easily distinguished from similar formations in deeper waters. Further, a shallow coral-covered bottom (depth zero to 2 m) could be clearly distinguished from a shallow sand-covered bottom or a seagrass-covered bottom.

Application of remote sensing for fishery development is a developing science and experience from case studies such as tuna on the west coast of the USA, shrimp culture site identi-



How information is obtained through remote sensing

Remote sensing aircraft or satellites convert the data they receive directly from earth — or from data collection platforms on earth — to either photographs or coded images on computer tape. The aircraft bring back the photographs and tapes to remote sensing data centres on earth for analysis. As for the satellites, they transmit information to receiving stations on earth for analysis and interpretation. If the remote sensing satellite is unfavourably placed vis-a-vis the ground station, it sends the data to a relay satellite that's better placed, whence the data is transmitted to earth. The analysis by data centres yields information about the nature and characteristics of the earth's surface, about natural and artificial vegetation, about the bathymetry (depth contours) and bottom characteristics of aquatic media.

fication in New Caledonia and coral reef studies on the Great Barrier Reef have shown encouraging results.

Remote sensing may help reef fish research in the Maldives

In the Maldives, BOBP has initiated a Reef Fish Research and Resources Survey with funding from the UNDP. Under this project, potential for reef fish fishery in the Kaafu atoll is to be studied. Several gear types will be employed over a period of one year to determine the abundance of commercially important reef fish species in various biotopes. Supplementary remote sensing studies may contribute valuable information on biotopes, their total surface areas and bottom configuration of that Atoll. If satellite imagery is obtained for the entire country, the results may be extrapolated to the other atolls and thus the coverage would be on a national scale as well. Further, bathymetric data obtained through satellite imagery could be an important resource for navigational purposes.

Remote sensing has other applications in fishery. Aquaculture has been identified as an important activity in raising the incomes of marine fisher-folk. One problem in extending aquaculture to coastal regions is the lack of information on locations suitable for aquaculture. This lacuna can probably be filled through extensive field surveys, but a quicker method would be remote sensing which can provide data on mangrove covered areas, characteristics of shoreline areas, surfaces of water bodies, seaweed concentration, presence of tide-influenced estuaries or lakes, etc.

These are just examples of the use of remote sensing in fisheries development. A complete listing of possibilities would be quite voluminous. The idea in this short note has been only to sketch the outlines of some possible applications of remote sensing in the Bay of Bengal region. The author is grateful to Mr. Dominique Lantieri (remote sensing consultant) and Mr. Stephen Drew (FAO fishery officer) for their comments.

Further information on the topic can be obtained from : FAO, 1985 Report of the ninth international training course on applications of remote sensing to aquaculture and inland fisheries. Rome, 10-28 September, 1984.

Fish landings at

Maldives- wh
the sea is the main

Text and photographs by Peyton Johnso

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Perhaps in no other sovereign state is fishing so important to the national economy as it is to the Republic of Maldives, a slender string of about 1,200 islands and coral atolls stretching some 800 kilometers north to south and 133 km at the widest point, east to west, across the southern face of the Indian Ocean.

Last year, 45 per cent of the Maldivian work force was employed in the fishing industry. Moreover, fish and fisheries products supply the rapidly growing population of approximately 180,000 citizens with literally all of their home-grown high quality protein, vital to the national diet. Without fish, mostly tuna, which is eaten daily, Maldivian health and nutrition, which still leaves much to be desired, would be calamatious, especially for the children who make up an increasing percentage of the population every year.

Fisheries exports also provide the island republic with the second largest slice, after tourism, of its inadequate annual foreign exchange earnings. It could hardly be otherwise. All the 202 inhabited Maldivian islands are by definition surrounded by salt water and the sea comprises 99 per cent of the entire national territory.

Though the total land area of the Republic is just 300 square kilometers, the Maldives has one of the world's largest Exclusive Economic Zones, or EEZ's.

Dr. Maumoon Abdul Gayoom, the scholarly and astute President of the Republic, says that the Maldives "always has, does, and always will" look to the sea for its principal sustenance.

In 1985, the Maldivian fish catch was 43,700 tons. Marine exports easily accounted for the lion's share of Maldivian exports - worth 110 million Rufiyaa, or $15.7 million at 1985 prices and exchange rates — followed by wearing apparel and clothing accessories at a meagre 2.5 million Rufiyaa, or $357,000.

Tourism, which has a bearing on everything in the Maldives, including the present and future of the fishing industry, in 1986 brought in 87.4 million Rufiyaa, or $12.5 million. There are 56 tourist resorts on as many islands in the Maldives with a total occupancy capacity of 5,400 beds.

BOBP IN THE MALDIVES

The Matha Hari – *tuna resource survey vessel used by BOBP in the Maldives.*

Once extremely poor by anyone's standards, the Maldives over the past half dozen years has been able to maintain a healthy average annual economic growth rate of about 10 per cent. Or slightly better, thanks to the tourism and fisheries sectors. The decline in fisheries export earnings of the early 1980s was arrested with good catches for the years 1984, 85, 86.

Many Maldivians believe that the collapse of world tuna prices in the early 1980s may in fact have been a blessing in disguise, as it has forced the nation to begin the long over-due diversification of fisheries practices and policies. Over the past few years, despite the loss of its Sri Lankan market for "Maldive Fish", a smoked, dried or salted tuna product that was once the Maldives' only fisheries export, Maldivian fisheries exports have realised higher annual earnings than in the "good old days" before 1982 when the bottom fell out of the world tuna market. Tuna, skipjack and yellow fin primarily, and small tuna and tuna-like species continued to dominate the Maldivian fishing industry and will no doubt continue to do so many years to come.

The past decade has witnessed a major transformation of the Maldives fisheries sector. It has become increasingly productive through major investment in motorization, catch collection and fuel distribution, and diversification of processing methods.

Though based on a "free enterprise" economy, the Maldivian fishing industry is managed locally rather than through foreign participation, assuring that all profits remain within the country and are available for financing further fisheries developement.

The three-year Maldives Development Plan for 1985-87 aimed at expansion of the canning industry, a wider and much more energetic exploitation of the vast EEZ and continued investment to upgrade and diversify the fishing industry.

Maldivian fishing grounds can be classified into four main groups :

Reef *waters* These include the outer slopes of the country's almost endless reefs and inter-island channels, plus the reef areas and inner slopes of the atolls.

Inter - atoll basins These comprise the waters between atolls, 19 of which are considered major and are reflected in BOBP's work in the Maldives, has covered stock assessment, exploratory surveys, research, training and extension.

Maldives was a member of BOBP's UNDP-assisted project on "Marine Fishery Resources Management in the Bay of Bengal" (1983-1986). Under the project, fishery resources of the Maldives were reviewed (findings set out in BOBP/WP/36 and BOBP/WP/53); a working group investigated tuna resources of the Maldives and Sri Lanka (BOBP/WP/30 and BOBP/REP/41); and training courses were held for national biologists on the use of micro-computers for compiling, processing, analysing and assessing resources data.

In 1987, two specific projects on fishery resources were launched in the Maldives, with BOBP providing technical assistance on. behalf of FAO. The first investigates the abundance of tuna' in the offshore waters of Maldives and their capture by small-to-medium size craft. MATA-HARI, an experimental vessel built in the Maldives, is used for these surveys. The second is a two-year UNDP-funded pilot project on reef fish research. This project seeks to determine the abundance of reef fish stocks and the most suitable fishing gear to tap them. FARUMAS, a research vessel, was built and deployed for this purpose (see page 19 of this issue).

During 198384, a one-year FAO/TCP project on training and extension was carried out by BOBP for fisheries officials (with the help of FAO consultants). The project was meant to up grade national capability and improve the system of statistics collection and tuna resources assessment. Consequent to this project, a marine fishery research section was set up in the Ministry of Fisheries.

In the area of extension, the following activities have been suggested

- Improved salt drying techniques;
- New smoking techniques;
- Training in engine repair and maintenance;
- Making local and Japanese hooks for pole-and-line fishing;
- Use of beach hauling devices;
- FADs for tuna;
- Socio-economic studies;
- Expanding the coverage of the Bank of Maldives.

In 1988 BOBP will take up one of these activities – the use of beach-hauling devices for motorized dhonis – for trials and demonstration.

Maldives has played host to some important BOBP meetings including the 10th Meeting of the Advisory Committee and the Fourth Session of the Bay of Bengal Committee, both held in Male, 1987.

the Republic's division into as many administrative districts.

Near shore waters These cover all fishing grounds lying within 25 nautical miles of the various coasts. Traditionally these have been the waters most fished, but as yet only the sea's surface layer has been exploited.

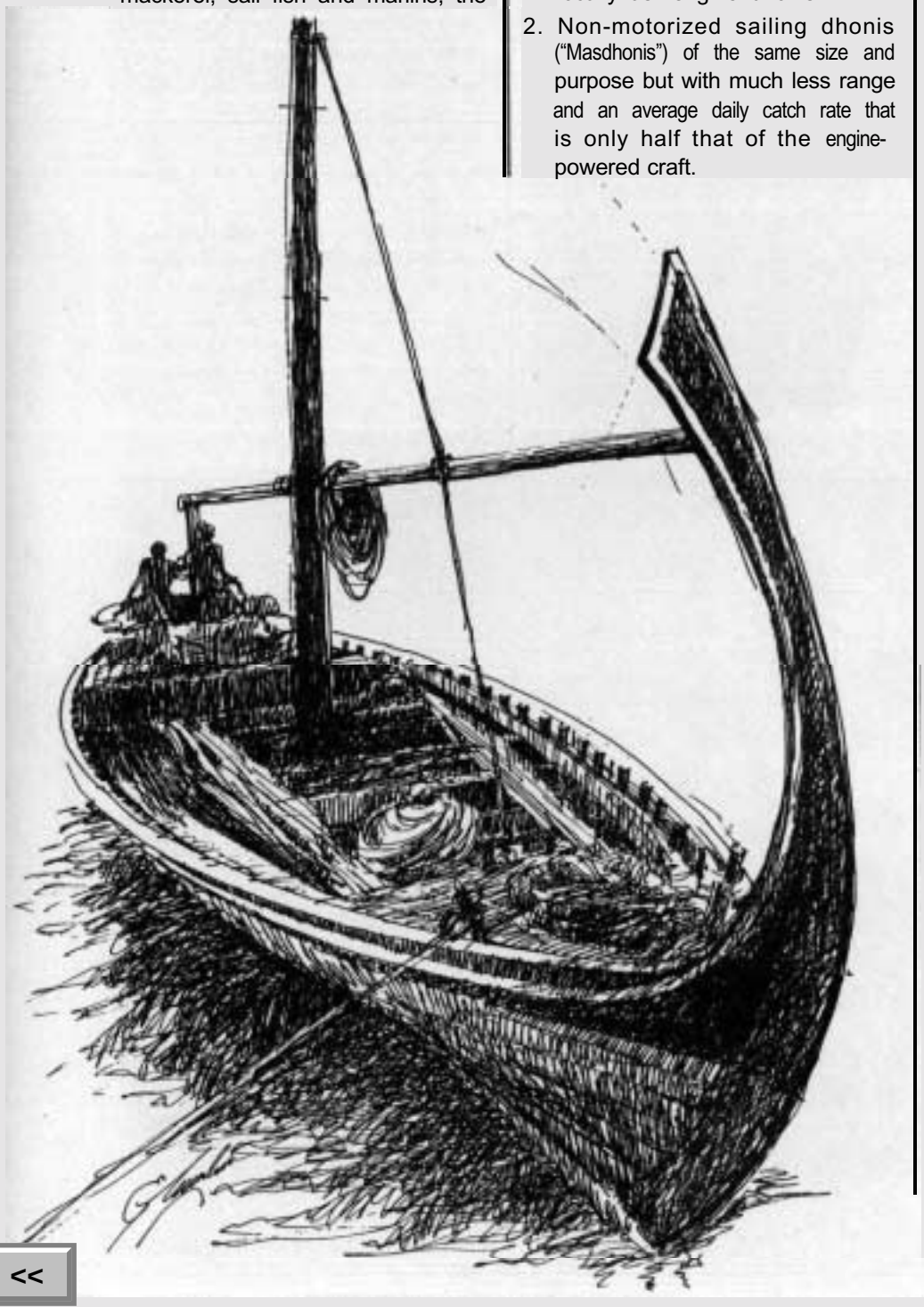
Oceanic waters These include all the "offshore" fishing grounds beyond the reach of traditional Maldivian fishing vessels.

There are still no reliable estimates as to fishing potential of these four areas, but catch data indicate that the reef waters are mainly fished for serranids, lutjanids, bait fish for the tuna pole and line fishery, lobsters and shark. The inter-atoll waters are fished for frigate, mackerel, sail fish and marlins; the near-shore waters for skipjack and other tunas and tuna-like species.

For many centuries all Maldivian traditional fishing craft were made of coconut wood timber, now in short supply and increasingly replaced by expensive imported timber. Traditional Maldivian craft, however, known as "dhonis" are solidly built and have proved quite seaworthy and are used year round in all but the roughest weather.

The Maldivian fishing fleet in 1986 totalled 5,274 vessels, divided into four main categories :

1. Motorized traditional craft of 10 to 15 metres for pole and line fishing, mostly for tuna, powered by a 22-30 hp inboard engine. These are used for 12-hour day trips and are known locally as "engine dhonis".
2. Non-motorized sailing dhonis ("Masdhonis") of the same size and purpose but with much less range and an average daily catch rate that is only half that of the engine-powered craft.
3. Non-motorized traditional craft of 8 to 10 metres used for trolling in reef and inter-atoll waters and for gillnetting sharks. These are known in the national language, Dhivehi, as "Vadhu dhoni", or troll boats.
4. Row boats of two to five metres used almost exclusively within reef waters. These are four to eight hour handline boats for fishing horse mackerel, sail fish and dog tuna during the northeast monsoon.



The composition of the Maldivian fishing fleet in 1986 was 3,021 troll boats, 1,296 motorized pole and line craft, 651 sailing pole and line boats, and 306 row boats. The motorized boats are in every case at least twice as efficient as the non-motorized craft and the government's fisheries development strategy depends in large measure on the ability to introduce new engine-powered craft and to motorize existing traditional boats.

Motorization of Maldivian traditional craft began in 1974 with an FAO fisheries technical assistance project funded by the UNDP. Since then there have many FAO and other internationally assisted fisheries development projects in the Maldives. Several are still in operation and a couple more are in "the pipeline."

Sagaciously, for a nation that must ever look to the sea, the government has incorporated fisheries considerations into both its educational and tourism strategies. Thus the Department of Tourism is beginning to crack the whip over the tourist resorts. Those without incineration and compacting facilities to dispose of plastic bags, tin cans, and other sea-polluting rubbish, will be closed unless they acquire such and soon.

This measure will be of direct protective benefit to the nation's natural ecology and environment, present and future. It will also be in the immediate and long-term interest of the Maldives' fisherfolk.

The government has a similarly long-term view of how important it is that the nation's youth understand how much the Maldives must depend on its fisheries. The government is integrating subjects like fisheries science and sea environment into the secondary school syllabus – whether the schools are in capital Male or in the atolls and remote islands.

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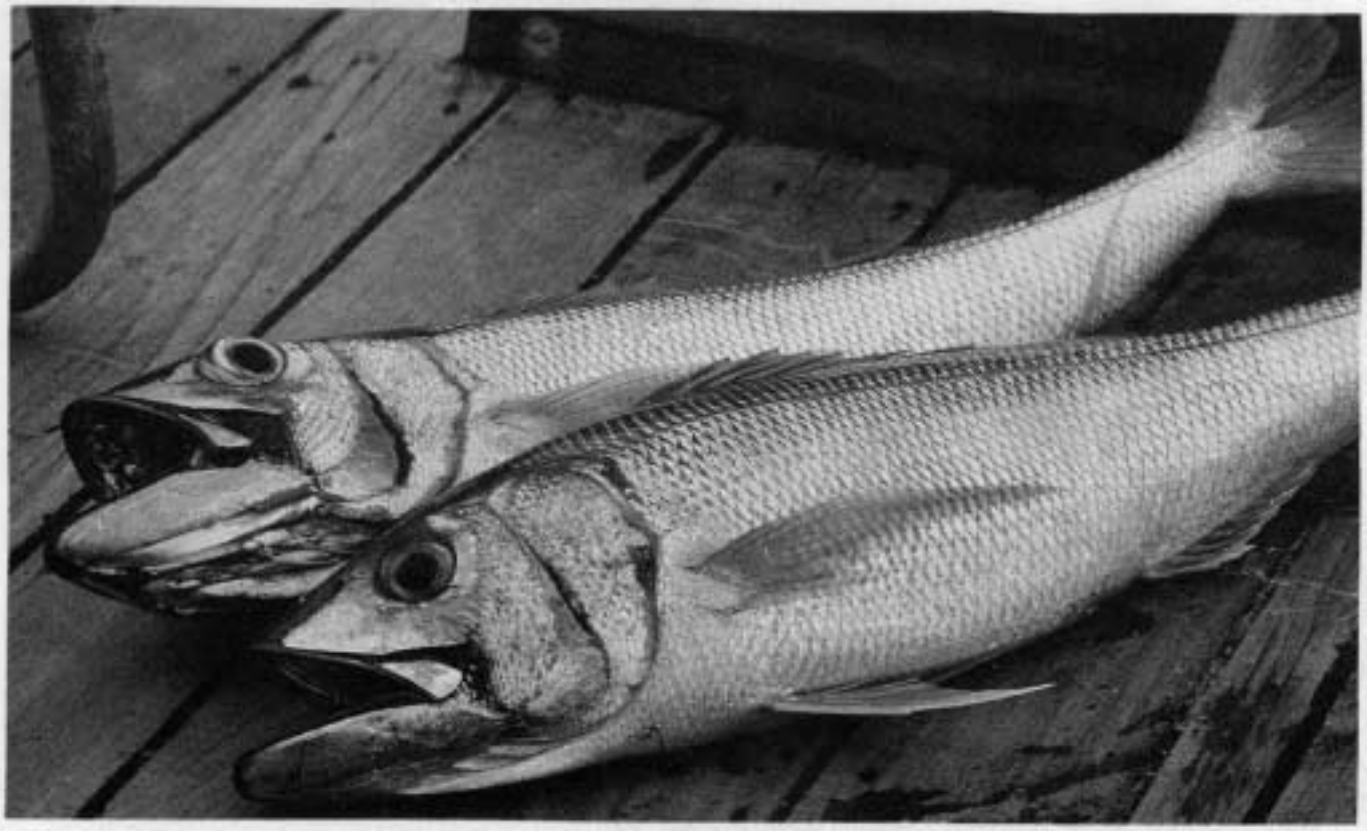
glimpses into BQBP Projects

Tapping the reef fish resource in the Maldives

As mentioned in Bay *of Bengal News,* March 1987, a two-year $ 190,000 UNDP-funded project was launched in August 1986 to study the abundance of the reef fish resource in the Maldives and to examine the suitability of various fishing gears to tap this resource. For this purpose, a second-generation dhoni was constructed by the Maldivian Government boatyard at Alifushi, and modified by BOBP to meet the needs of reef fish research. Echosounders, radio equipment, and a pot-hauler were installed. The vessel became operational early September 1987. Fish traps, set longlines, hand-lines and trolling lines were fabricated.

For practical reasons, North Male atoll was chosen for a thorough survey. During September and October 1987, the crew and three national scientists from the Maldives acquainted themselves with the various fishing gears and survey methods necessary for collecting required data; the actual survey started by the end of October. Three transects were established in the atoll for exploratory fishing : they cover several different ecological conditions — island reefs, ring reefs, atoll-rim reefs and channels. Fishing operations are also conducted occasionally in the adjacent Ari atoll, in order to note any differences in species and distribution density.

Exploratory *fishing* trials for reef fish. in the Maldives. Capture of reef fish by traps (above), *and by hook and line (below).*



Fishing gears are operated at different depths, times of the day and seasons, using different types of bait; catch rates are determined in each case. The fish caught are also investigated for length, weight, sex, gonad maturity, stomach content and parasite presence. Otoliths (ear bones of fish) taken from fish samples will be examined for age determination during a later phase of the project.

Initial experiments with fish traps indicated that traps should be baited and that a soaking time of at least 4 or 5 days was necessary to obtain sizeable catches. Quite a few traps have been lost for various reasons inherent to this type of fishing.

The set longlines and handlines tend to catch adult-size fish; traps catch large as well as small fish. Commercially valuable species caught by these methods include two-spotted and humpback red snappers, green jobfish, groupers, longface and spotcheek emperors.

A relatively small mesh size has been chosen for the survey work with traps; but larger meshes are also being tried out, to study small fish species and juveniles of larger species escaping from the traps.

More detailed findings and conclusions will be possible after further surveys by the research vessel during different seasons, throughout 1988. M.V.K.

Exploratory tuna survey in Sri Lanka

A BOBP-NARA exploratory fishery survey for tuna began in Sri Lanka early 1987, as mentioned in the March 1987 Bay of Bengal News. The survey will give an idea of the abundance of tuna in Sri Lanka's offshore waters and help to determine the type of fishing craft and gear that can tap this resource. Some 35,000 tonnes of tuna are presently produced by Sri Lanka's coastal fishery (extending up to 25 miles from the coast) and the adjacent offshore fishery.

A 10.4 m combination boat (gillnet/longliner) provided by the Ministry of Fisheries is being used for the survey. It is manned by a crew of five, is fitted with a 56 hp Yanmar diesel engine, has a fish hold capacity of 6.5 tonnes, is equipped with a satellite navigator and an electronic log. Fishering gear: drift gillnets, longlines and troll lines. The boat operates mainly from Negombo and Galle, and occasionally from Colombo.

A total of 37 fishing trips was undertaken during 1987, resulting in 161 sea days and 118 fishing days. Operations were confined mainly to the range between 50 to 100 miles from the shore, in the south, south-west, west and north-west coasts of the country.

Preliminary analysis by a NARA team shows a total landed catch of 22,469 kg. Average: 608 kg/trip, 190.6 kg/fishing day and 139.7 kg/sea day. Gillnets accounted for 80 per cent of the catch, longlines for 19 per cent and troll lines for 11 per cent. The species caught by gillnets were mainly tuna 68% (skipjack 38%, yellowfin 11 %), shark 13% and billfish 13%. 90 per cent of the catch of longlines consisted of shark.

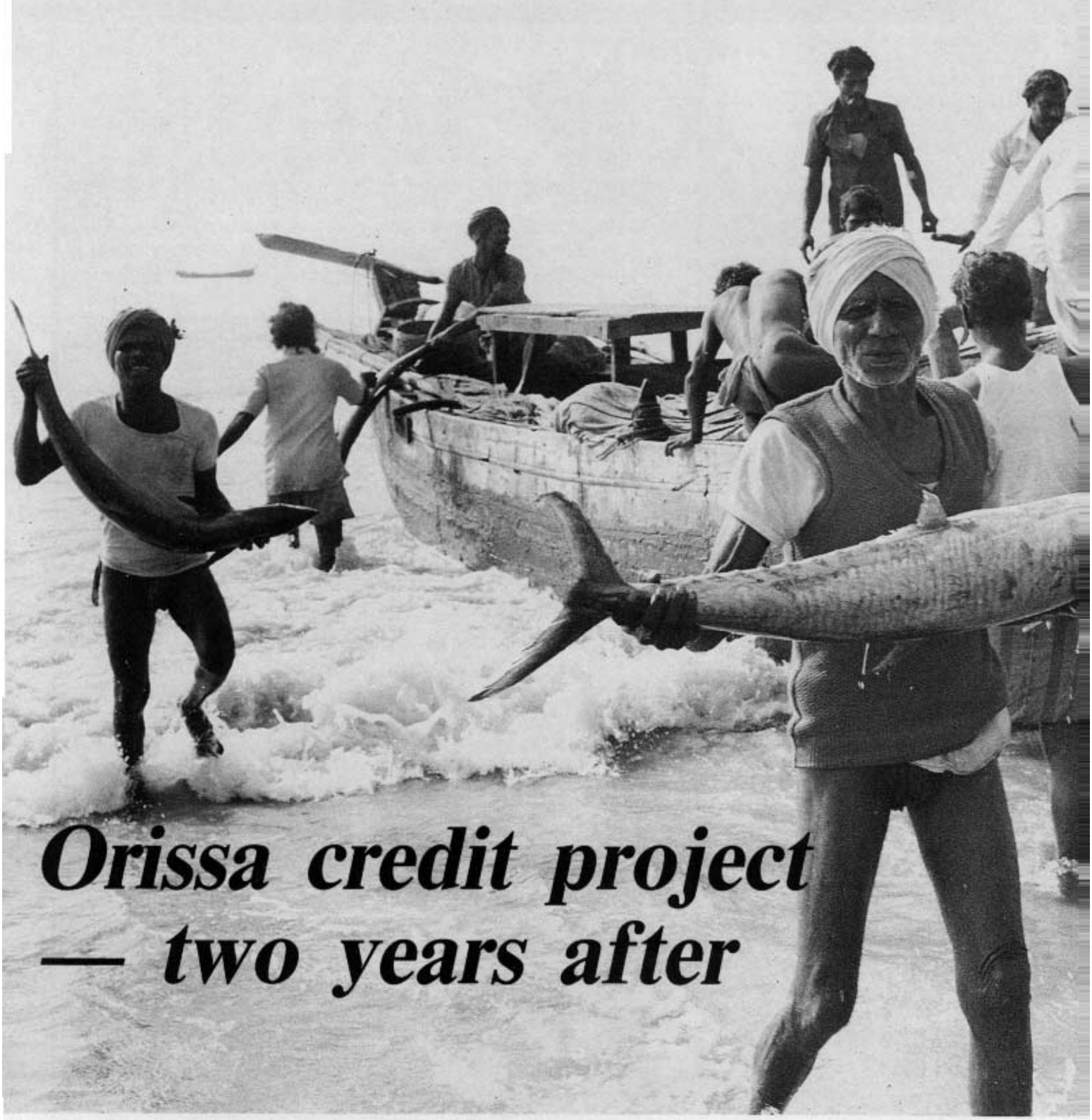
The total number of fishing days achieved till February end (118) is low. Unfavourable weather, repairs to engine and the satellite navigation unit, festivals, and curfews on account of civil disturbances, were some reasons for &n-fishing days.

Biological and technological data, and data on costs and earnings, are being collected and analyzed. Information is also being secured from visual observations of surface schools, birds etc.

The survey will continue till the end of 1988. Besides the exploratory survey data, NARA's ongoing sampling programme on the existing coastal and offshore tuna fishery should also help provide a better understanding of the tuna resources in the exploited and explored areas within the EEZ of Sri Lanka. L.J.

BOBP Advisory Committee Meeting — field trip to Chilka lake

Delegates to BOBP's 12th Advisory Committee Meeting (12-15 January 1988, Bhubaneswar, Orissa, India) talk to sellers and buyers of shrimp seed at Chilka lake. Other field trips were made to the fish landing centre in Puri and to some of the non-formal education centres for fisherfolk children set up in Orissa under a BOBP-initiated scheme. The meeting reviewed the progress of BOBP during 1987 and endorsed the workplan for 1988 including the new activities (See pages I-3 and page 23 of this issue).



Orissa credit project — two years after

by B.T. Antony Raja and N. Luginbuhl

BOBP support to the well-documented Orissa credit project for fisherfolk ended two years ago. A recent appraisal shows that the project's performance — in disbursement of loans and their recovery — has since declined. The authors suggest measures to restore the project to its original level of achievement.

Some years ago Orissa embarked on a new experience in bank lending for artisanal marine fisherfolk through a BOBP-supported credit scheme (*Bay of Bengal News,* March 1984). It was new in the sense that there was no element of subsidy in the credit project for acquiring fishing requisites or for conducting fishing business and that it did away with multiple window clearance. The principal aims were two : to examine whether direct and enduring links could be established between banks (who were not enthusiastic to accept the fisherfolk as

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creditworthy and regular clients) and the fisherfolk (who considered the banks a cumbersome institution as compared to the informal credit facility available at their occupational spots from money lenders and others); and whether bank credit to the fisherfolk can be viable and recoverable.

As of April 1986, when BOBP's active involvement of four years came to a close, it was gratifying to find that the project had successfully demonstrated that non-subsidized lending to artisanal marine fisher-folk can help banks and fisherfolk alike, and that the recovery rate could be as high as 95%. (BOBPI REP/32 describes and analyzes the project in detail).

The main reasons. for the project's resounding success :

- Loan availability at short notice at the right time;
- Careful selection of beneficiaries;
- Close monitoring of disbursements and repayments;
- Regular meetings/seminars between the bank officials and fisher officers, and regular joint visits by them to the villages to ensure timely repayments;
- No external interference or influence;
- Establishment of a sound procedure for acquisition of physical assets and their employment for the required purpose.

Did the success continue to be sustained? Did the scheme generate any multiplier effect – more banks, more loan amounts, more areas, more clients and for more needs? Have further steps been taken to instil a regular saving habit among the target group? Can the scheme be replicated elsewhere?

An appraisal survey was conducted recently nearly two years after BOBP's direct role in the credit scheme ended. Findings? The success is not uniformly sustained; there are clear indications of some decline in the recovery rates; some specific pockets/places are playing truant; there is no multiplying effect; a regular savings habit is not manifest, except in some stray cases; the credit scheme is replicable, provided the lessons learnt so far are incorporated in schemes elsewhere.

The following statistics are self explanatory.

	No. of beneficiaries (approx.)	Amount disbursed (Rs. millions)	Recovery rate (%)
As of April '86	2150	6.2	97
As of December '87	2320	8.0	72

The "culprit" district responsible for the reduced recovery is Cuttack (34%), for, in the other three districts of Balasore, Puri and Ganjam the recovery rates are around 80%. Again, it is only one village in Paradeep (Sandkhud) which has largely affected the performance of the entire district of Cuttack. Reasons? There are many : some important ones are :

- Inadequate supervision by both bank and fisheries officials; absence of joint effort by both;
- Groupism within the community, one set of wilful defaulters having a bad influence on the others;
- Lack of interest on the part of village leaders in exerting pressure on the fisherfolk to effect repayment (sometimes even discouraging the loanees from repaying for fear that the pressurized group might shift allegiance to the other party/ parties);
- Interference by middlemen/village leaders who promoted the interests of some applicants with bank officials, bypassing fisheries officials;
- Change in the methodology of disbursement of loans, such as direct crediting of loan amount into the loanee's account instead of payment by banker's cheque to the supplier of requisites;
- Production of fake receipts for acquisition of assets;
- Clandestine disposal of the requisites and
- Poor physical verification of the acquired assets.

What about the other districts? Why has the recovery rate'declined? In a nutshell, three broad areas could be identified – managerial, institutional and attitudinal,

Major managerial factors are as follows:

- Infrequent meetings/seminars of bank and fisheries officials;
- Transfer of either bank or fisheries officials or both, resulting in severance of links built up earlier between the two;
- Absence of field officials of banks for long periods or insufficient time at their disposal to pay attention to the fisheries sector;
- Waning interest among fishery extension officials who have been loaded with additional work;

– Selection of remote villages hazardous of access;
– Ineffective joint monitoring as a result of all these factors.

Institutional factors are listed below :

– Multiplicity of state-sponsored loan-cum-subsidy schemes such as ERRP (Economic Rehabilitation of Rural Poor), IRDP (Integrated Rural Development Programme), ATMF (Assistance to Traditional Marine Fishermen), BLRP (Bonded Labour Rehabilitation Programme), SCCFC (Scheduled Castes/ Tribes Cooperative Financial Corporation), NCDC (National Cooperative Development Corporation) etc. – Under these schemes, the subsidy amount ranges from 25% to 100% of the cost of requisites;

– Prolonged gestation period for processing of applications under the BOBP scheme because of priority given by banks to the state-sponsored subsidy scheme, thus killing one of the major attractive features of the BOBP scheme;

– Attenuation of physical and financial targets of the BOBP scheme negotiated between the Directorate of Fisheries and NABARD (National Bank for Agriculture & Rural Development) because of the pressure of various other schemes.

– Anxiety to meet the physical target at least half way, totally ignoring the financial allocation. (This resulted in disbursement of only Rs. 2.3 million for 1986-88 against the sanctioned amount of Rs. 7.5 million by NABARD – National Bank for Agriculture and Rural Development).

– Slackness in scrutiny of application and selection of beneficiaries.

As regards the attitude of beneficiaries : in spite of a general decline in catches and revenue, it was conceded that the loanees have the capacity to repay – it is their willingness or otherwise that decides the rate of recovery. Failure to repay can be due to many reasons – wilful, having no regard for personal obligation; induced, because of disinformation that it is a non-recoverable loan, and because of the bad examples set by other defaulters; non-intentional, because of lack of reminders/pressure from the agencies concerned.

Thus, it will seem that the cardinal factors which contributed to the thumping success of the scheme when BOBP was involved, suffered to some extent or the other, when BOBP's direct role ended, leading to a general slackening in the progress of the scheme. However, the number of villages so affected may be only around 25% of the total number of villages catered to.

An upbeat feature of the credit scheme is that wherever repayment is exceptionally good, banks are willing to finance fishermen directly without recourse to NABARD refinance. Such a welcome spin-off has clearly demonstrated the economic viability of bank loans to small-scale fishermen, without their having to depend on money lenders/village leaders.

Another effect of the credit scheme is that the interest rate of informal loans has fallen appreciably.

Once in about six months a review seminar is held between the officials of the banks and the officials of Directorate of Fisheries. Such seminars should not be rushed through, as it happened in Feb. 1988. They should be used to analyse variations in recovery rates, achievements in the physical targets and financial assistance, and take remedial action

For enduring success . . .

If the scheme is to be a lasting success, the following steps should be taken :

– state-level review seminars could be held even once a year, but the performance should be watched closely at the district level every six months;
– there should be frequent meetings among officials and more joint visits tc the villages;
– recovery camps (like loan festivals) should be organized, especially during the peak fishing season and on weekly/monthly fishing holidays observed by the fishermen;
– applications should be scrutinized more carefully and quickly;
– there should be no slackness or deviation in the methodology of disbursement of loans; it is absolutely essential to ensure that there is no room for misuse of the facility, supply of inferior quality of materials and clandestine disposal of the fishing requisities;
– village leaders, middlemen or outsiders should not be allowed to influence or interfere with the scheme;

– the loan ceiling without collateral' security should be raised in line with the crop loan (which is being raised to Rs. 7500);
– in villages where bankability has been proved, loans may be advanced for non-productive purposes and for labour payments;
– extension activities should be strengthened to motivate and educate fishermen about savings and accounts and about the differences between this scheme and subsidy-cum-loan schemes;
– bank branches which cannot spare time for field visits by officers should not take up the scheme;
– physical and financial targets should be fixed more realistically, in keeping with past performance;
– a pragmatic well-thought out action plan has to be evolved to integrate various subsidy schemes and this non-subsidy; credit scheme so that the latter does not suffer because of the former;
– in view of escalation, the capital cost of fishing assets should be revised;
– to improve the position of chronically defaulting villages, all the bank officials and fisher officials (including the concerned Asst. Director of Fisheries) should visit the villages in groups, once a month on the fishing holiday; the cooperation of the village headman should be sought.

Strong action should be announced under the Orissa Marine Fisheries Regulation Act, if fishing crafts obtained on loan are not registered. The villagers could be told that government welfare measures may be withdrawn from the villages, and that because of a few defaulters, many others may have to suffer.

New BOBP Activities

(Continued from page 3)

Malaysia, outside the BOBP's operational area. However, one of the most desirable species of farmable oyster, Crassostrea belcheri, is found there in abundance. It will be possible to transport spat over to the west coast without too much difficulty.

A variety of substrates is being tested for the setting of oyster larvae. "Cultch" materials include old oyster shell, discarded motorcycle tyres, cement-coated Netlon tubes and polypropyelene net panels. The latter were shown to be effective cultch for the Malaysian flat oyster, Oyster folium, in the course of earlier field studies.

Once spat sources are located, a variety of growout techniques can be tested, depending on species and market conditions.

The four field biologists will keep in close contact with villagers living near the spat collection sites, some of which could become growout areas as well. In fact, spat collection could eventually develop into a business in its own right, as it has done in Thailand.

BOBP recently contracted an oyster marketing study by INFOFISH, headquartered in Kulala Lumpur. The study highlighted the growing upscale markets for oysters in Singapore and urban centres in Malaysia.

Bettering the lot of kattumaram fisherfolk in India's east coast

The BOBP has begun a one-year study of the kattumaram fishery in India. A comprehensive sampling programme in two east coast states — Andhra Pradesh and Tamil Nadu -will be the main feature of the study. A main sampling centre and a secondary sampling centre are to be identified in each state, with three field officers executing the sampling programme at each main centre. The officers will be trained by BOBP before being deployed. Under the sampling programme, data relating to various aspects of the kattumaram fishery — resources, socio-economics, technology — will be collected and analysed, in cooperation with the governments concerned.

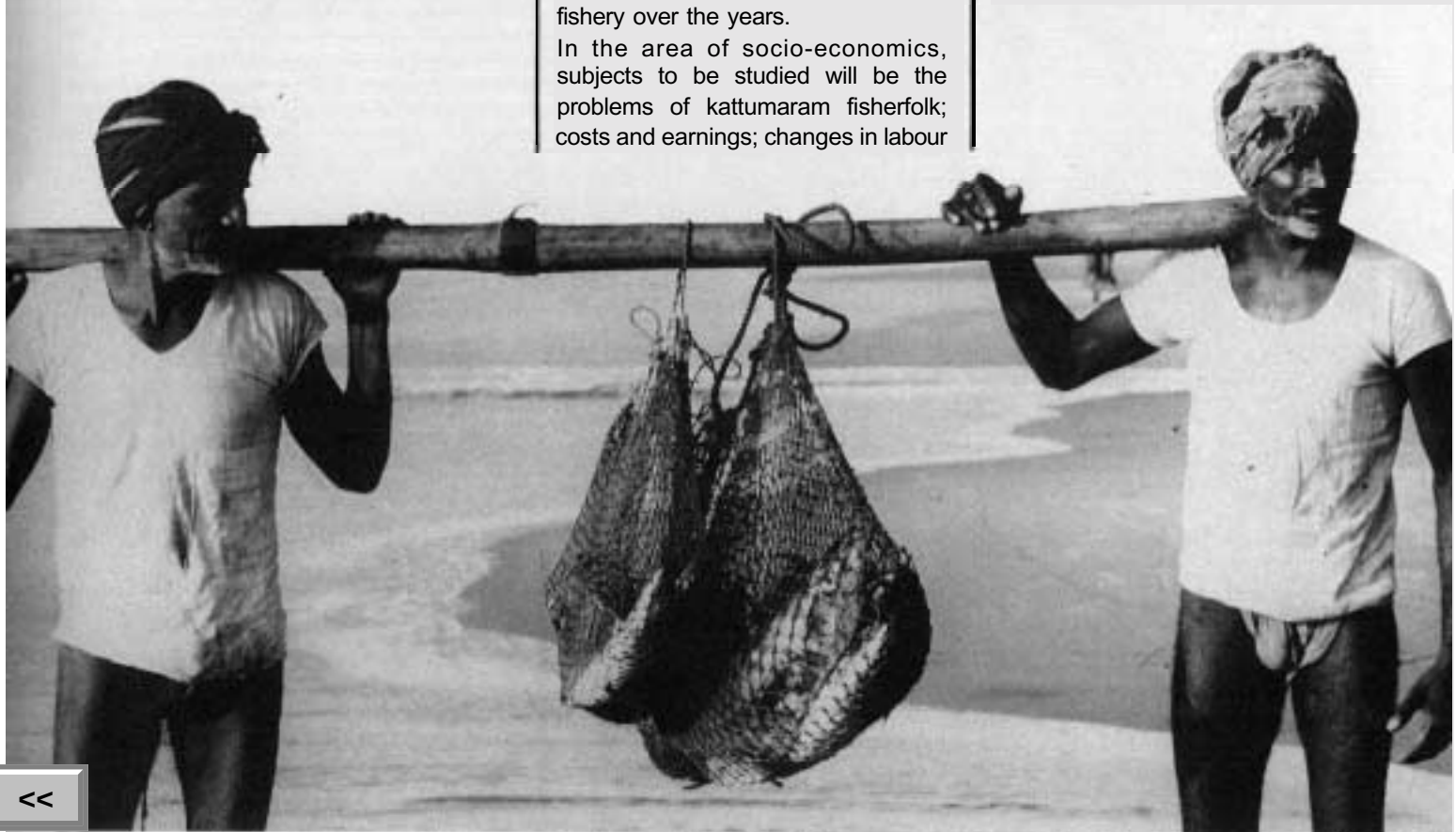
In the area of resources, data will be collected on the species composition of kattumarams and other fishing crafi, shared species, the seasonality of the fisheries, recent trends in production and catch rates. How kattumarams can tap resources that are accessible but not being utilized at present, will also be studied.

In the area of technology, subjects studied will be the fishing gears of kattumarams and other craft; quantity of gear units used; why kattumaram fishermen prefer the gears they choose; and changes in fishing gear and operational methods of the kattumaram fishery over the years.

In the area of socio-economics, subjects to be studied will be the problems of kattumaram fisherfolk; costs and earnings; changes in labour organization; comparative living standards of kattumaram and other fisherfolk. Marketing constraints faced by kattumaram fishermen will be studied by the BOBP's ODA project through its own field officers.

On behalf of the BOBP, a biologist, a fishing technologist and a socio-economist will travel periodically to- the sampling centres to monitor the programme and analyse results. It is hoped that on the basis of data generated by the one-year study, recommendations can be made on improving the socio-economic conditions of kattumaram fisherfol k.

During past BOBP work on kattumanams (reported on in BOBP/WP/1, BOBP/WP/2 and BOBP/REP/17) the view was expressed that technological improvement to the kattumarams was very difficult, it being a near-perfect traditional craft, thanks to centuries of evolution. The Government of India, however, suggested that BOBP continue its investigations on kattumarams in view of their important role in small-scale fisheries. The one-year study has been taken up in response to this suggestion. "The emphasis in this study is on the kattumaram fisherfolk community and the fishery as a whole, rather than on the craft as such" says BOBP Director Lars Engvall.



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Helping a community discover itself : BOBP's work in Besant Nagar, Madras

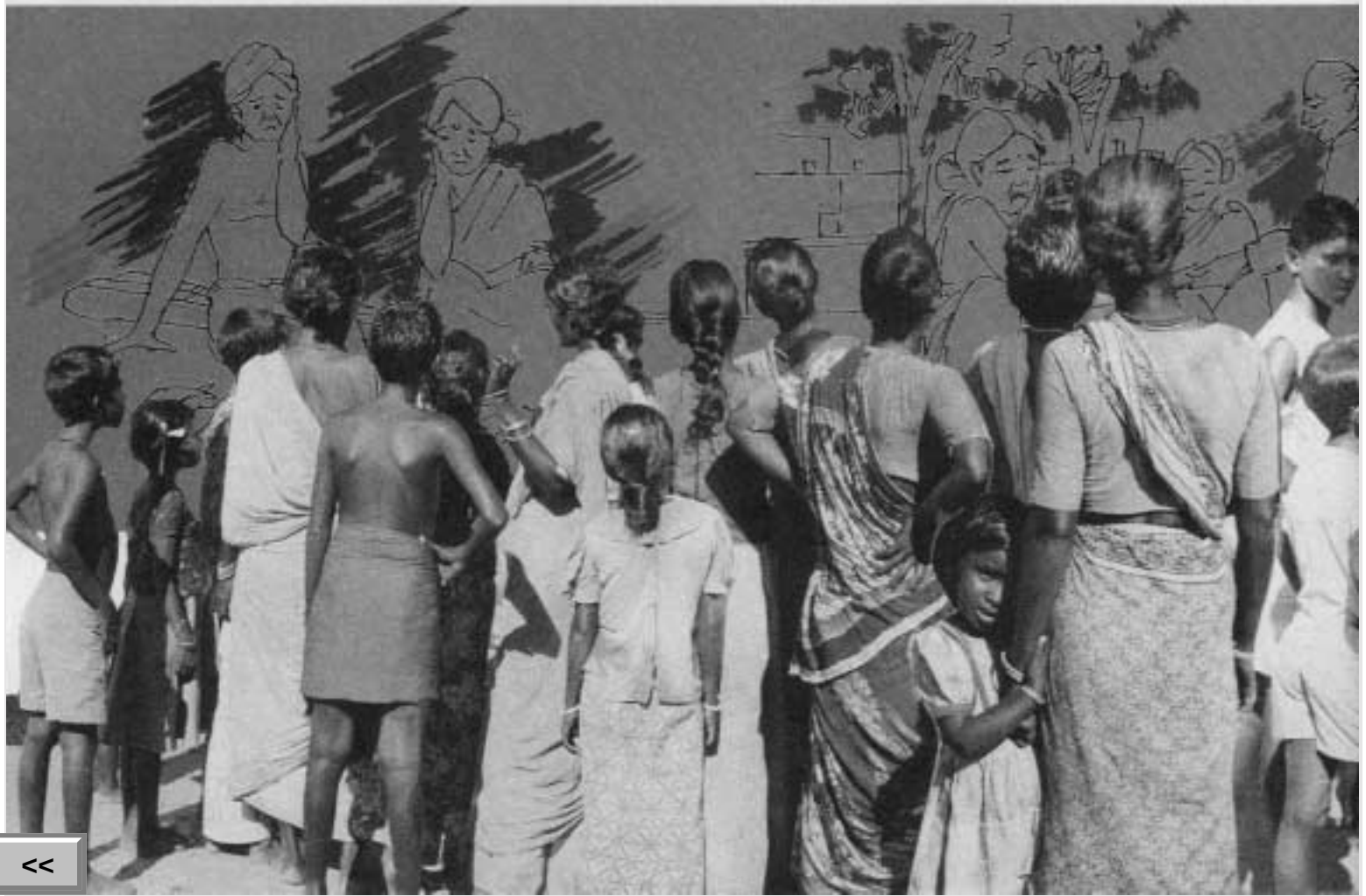
by A. Alexander and P. Townsley

Many maladies afflict the small-scale *fisherfolk of* Orur and Olcottkuppam in Besant Nagar, Madras, as detailed by the *authors.* BOBP is *encouraging* self-examination and *self-help among these* communities through a series of small initiatives — such as a poster exhibition (below).

In April 1987, BOBP's beachlanding craft, the IND-20, commenced technical trials from Elliot's Beach on the seafront of the Besant Nagar area of southern Madras. Crews for the trials were hired from the twin villages of Orur and Olcot Kuppam from whose beachfront the craft were operating. Subsequently, representatives of the communities approached BOBP with a request for a donation to the temple fund. It was agreed that 10% of the catches obtained during the BLC (beachcraft) trials should be donated to the communities. However, the villagers also gave BOBP a list of problems and needs which went far beyond anything which could be resolved by donations of this sort. BOBP offered to at least help the communities think through and analyse their difficulties. A community development worker started to work in the villages in August, 1987, holding discussions, organizing youth groups, and undertaking a village survey. The depth of the crisis facing the kattumaram fisherfolk of Orur and Olcot gradually became clear and their need for guidance in adapting to the environmental and social changes around them became apparent.

Until about 15 years ago, Orur and Olcot Kuppam were one village, called Orur ("Kuppam" is Tamil for a fishing village). Like hundreds of other fishing communities on the coast of Tamil Nadu, it was made up of one caste, the Pattinavar fishermen, and was relatively isolated from the life of the nearby city of Madras and the surrounding hinterland. The rapid expansion of the urban agglomeration southwards during the seventies radically changed the environment surrounding the fisherfolk. Besant Nagar and adjoining areas were swiftly developed into middle-class residential districts. At sea, the equally

"Aren't these about us?" Besant Nagar fisherfolk discuss the posters on their life and work put by ***by*** *BOBP.*



rapid expansion of nechanized fisheries, particularly trawling, was bringing the resources exploited by kattumaram fishermen under acute pressure. Given the proximity of Madras harbour to the village, the traditional fishing grounds of Orur were particularly susceptible to the inroads of larger, more efficient craft.

Around the same time, the community was seriously divided by a dispute which, originally only a family affair, eventually resulted in the community being split into the two villages of Orur and Olcot. Each village now functions independently, with its own panchayat', and the only institution which still unites the two villages is the temple committee which organises religious functions. and festivals.

It may be this history of factionalism and division which has resulted in the current sense in these villages that there is no single group or institution which represents the fisherfolk in any effective way. This, in itself, could be the reason why the voice of these fisherfolk has never been heard in any forum where their problems and expressed needs could be acted upon. The resulting neglect is evident, with both villages suffering from poor housing as well as a lack of sanitation and drinking water facilities. improved housing and communal latrines have been provided by the corporation in the past but their effect on fisherfolk's lives was minimal. The houses built for them were taken over by outsiders; at present not one is inhabited by a fisher-folk family. The latrines were never provided with adequate water supply, and fell into disuse as they became positive health hazards and people returned to using the beach or the nearby woods, as they always had done before.

This situation has made the fisher-folk acutely aware of their state of neglect and powerlessness. As one village leader says : "The Corporation doesn't care about the Kuppam". Given that full water, sanitation, and garbage collection facilities are provided for the surrounding residential districts up to within a few metres of Orur Kuppam, but nothing is provided for the fishing communities, this feeling may be justified. A unified village leadership would be able to push for the rectification of such problems, but such a leadership simply does not exist. Partly because of continuing division within the community, and partly because people seem to be too occupied simply with keeping their heads above water to focus on larger issues.

The drastic fall in catches of kattumaram fishermen in the area has made fishing an extremely marginal occupation in Orur and Olcot Kuppam. Fisherfolk identify several causes. First and foremost, overfishing by mechanized trawlers in inshore waters, where they are often to be seen fishing within a few hundred metres of the shore, in spite of the 3 km limit legally imposed on such craft. Local fisher-folk also admit that there are simply too many traditional fishermen as well, and that, in the shrimp season, the over- crowding on fishing grounds has become ridiculous. Pollution from rivers, local industries, and ships using Madras harbour are also felt to be having a negative effect on resources. Just as serious in the long run, fisherfolk state that long-term changes in weather patterns and currents have made it increasingly difficult to predict fish movements and availability. Fishermen quote the example of their boat seine nets (thuri) which have been underutilised for the last four years due to the complete failure of successive ribbon fish seasons for which these nets are primarily used.

The uncertainty and the pitiful size of fishermen's catches leads to a poor and irregular income which, in turn, makes it difficult to replace aging or damaged craft and gear. This in turn affects fishing performance, creating a situation which becomes increasingly difficult to escape. The low catches and poor gear may go some way to explaining the generally poor standards of fishing practice seen in the villages. On the other hand it may be that no amount of hard work or improved fishing techniques would make kattumaram fishing pay in Orur and Olcot Kuppam.

The low returns from fishing have significant effects on the whole community; Credit is scarcely available from any source, let alone from institutions such as banks. Even money lenders seem to regard the fisher-folk communities as a bad risk. The two cooperative societies set up in the villages have long ceased to operate as channels for credit due to the appalling repayment rates from fisher-folk on earlier credit schemes. The only real source of funds for productive investment is through chit funds organised by the villagers themselves.

The fisherwomen who depend on a steady supply of fish for marketing are obviously affected by the irregularity of catches. Use of the main Saidapet fish market is justified only when large, high-value species are caught. Otherwise, the fish sellers from the two villages are forced to sell on local roadsides with no infrastructure to ensure hygienic conditions. This reflects on the prices obtained.

Given this combination of circumstances, where low and unstable catches mean inability to reinvest to improve fishing capability, which in turn means that credit channels and marketing facilities are effectively closed to the fisherfolk, it is not surprising that many fisher-folk regard a change of job as the best solution to their problems, The proximity of the city of Madras should offer opportunities for those who wish to find work in other sectors. Yet here again, the fisherfolk appear to be caught in a trap. The education at their disposal is deemed not relevant to fisher-folk. Thus many children drop out of school early in order to learn fishing and start working. Later, when they want to try to get jobs outside, they find that poor qualifications and lack of

schooling leave them with very few alternatives. The result is a large number of dissatisfied young fisher-folk such as Thesappan, who says : "I only go fishing because I have no other means of livelihood". Alcoholism and drug-taking, which eat up a good proportion of fisherfolk's meagre incomes, are perhaps symptoms of their frustration.

The problems of kattumaram fisher-folk are by no means unfamiliar to BOBP, although the problems encountered in Orur and Olcot Kuppam may be accentuated by their proximity to a major urban centre. Improvements in the kattumaram as a craft have been studied in the past but, in terms of cost and accessibility for users, it appears to be as near an optimal solution as possible at present. The scope for improving fishing performance in general may be severely limited by the state of fisheries resources in the inshore areas currently accessible to kattumaram fisher-folk. BOBP's beachcraft programme has been active in demonstrating the existence of untapped fisheries further offshore such as tuna and shark, and there may be potential here. However, if further research and trials proved the viability of such fisheries, kattumaram fishermen would certainly have to overcome basic problems of mobility, size of craft and adoption of new gear in order to diversify into these new fisheries. Their willingness to try out technical solutions has been demonstrated. When the IND-20's landings of flying fish during late 1987 generated considerable enthusiasm, the fishermen of Orur and Olcot were quick to modify existing gillnets to enable them to take advantage of the new flying fish season.

In such a case, BOBP has helped identify potential, and its fishing technologists can also indicate improvements in efficiency to make the fishery viable for kattumarams. However, this remains a highly seasonal and as yet unproven activity. Clearly, while the search for technical solutions continues, opportunities outside fisheries must not be overlooked.

The first essential step must be to try overcome the state of demoralisation of local fisherfolk and encourage them to think through their problems and see that solutions are possible. While they undoubtedly face considerable barriers of marginalization and disadvantage, a rational assessment of the range of options open to them should reveal practical ways of improving their situation.

BOBP's community development worker has begun by holding extended discussions with a full range of members of the community, to identify problems, understand their causes and encourage people to think about possible solutions. Simultaneously he has initiated community-based activities such as a sports club and a general village clean-up, all in response to needs identified by villagers. During the course of organising such activities, other possibilities — such as improving the marketing conditions for fisherwomen involved in fish-vending or setting up a fried fish stall on the nearby beach — have been aired. BOBP can help by directing those interested towards existing organizations and institutions which can assist fisherfolk in realising such ideas. Guidance can also be given in preparing sound business plans for requesting bank loans and carrying out simple market surveys to assess the potential for new marketing practices and possible customer response.

A small poster exhibition which was held to review the results of the community development worker's survey and present its findings to the community helped to generate more discussion and focus villagers' ideas. Response to the posters prepared by BOBP's information service during pre-testing of some of the exhibits ranged from total lack of interest ("Go away. We're playing a game" from a group of chokkatan players) to an enthusiastic discussion on the significance of the sketches and the issues they raised. This range of responses clearly indicates the range of possibilities present in Orur and Olcot. BOBP is taking the first steps in trying to build the confidence of the community to take a more active role in shaping the future of fisherfolk in Orur and Olcot.

Kattumaram fishermen of Besant Nagar (facing page and below) — problems mount, catches decline.

LETTER FROM THE PUBLISHER

SAFETY AT SEA

Many fisherfolk of Beruwela and Galle and a couple of other fishing centres in the south western parts of Sri Lanka will long remember the third week of December 1987, just before Christmas. Some of them will never forget that week and what followed.

On 14 December, a fleet of 28-footers, 32-footers and Abu Dhabi boats (34-footers) including the two BOBP prototypes SRL-15 and SRL-34, set out on their driftnetting and longlining fishing trips for tuna and shark. Some of these boats usually confine themselves to overnight trips, but increasingly (as discussed in the Letter from the Publisher, December 1987 Bay of Bengal News) they stay out up to 4-5 days. They may operate as far as 120 n miles from the coast.

Towards the following weekend, when all the boats should have been back on the shore, some 25 boats were still to return. Those that had returned had to brave strong currents that had carried them long distances away from the coast.

SRL-34

The missing boats returned one by one. SRL-34, which had demonstrated an outstanding economic performance over the past six months, did not return, however.

And nothing was heard about it – until 55 days later on 10 February, when we received a message in Colombo that the crew of four had been rescued at the Mentawai Islands in the Indian Ocean off Sumatra in Indonesia!

The crew is back in Beruwela, but the fate of the boat is still unknown at the time of writing. We hope to provide more details of the 55-day drift-in-mid-sea ordeal and the drama of rescue in a future issue of Bay of Bengal News.

We also hope to discuss and elucidate the subject of safety at sea in all its aspects; problems fishermen face, the type and frequency of incidents, existing facilities for rescue, need for preventive measures on shore and at sea, bearing in mind the economic constraints of the small-scale fisheries sector. The SRL-34 incident has dramatized the hazards of fishing, particularly in offshore areas. It has also triggered a study in Sri Lanka of problems and remedial measures.

Incidents of fishermen and boats lost at sea are in no way new, nor are they confined to Sri Lanka. Not long ago one read in Indian newspapers about a bamboo raft that had drifted from Burma and landed south of Madras with a couple of Burmese fishermen on board. Likewise, Indian fishermen have ended up in Burma and Bangladesh. And there are of course all those that never turned up anywhere.

In examining the subject of safety at sea, we will take up Sri Lanka as a case-study. It seems obvious even at the outset that international co-operation is essential to make search and rescue operations effective and to reduce costs. To make our coverage in Bay of Bengal News as comprehensive as possible, we invite readers to participate – with real-life anecdotes and stories, comments and suggestions.

LARS 0. ENGVALL

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 bordering the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka, Thailand. The BOBP's main project is "Small-scale fisherfolk communities in the Bay of Bengal" (GCP/RAS/118/MUL). Executed by the FAO (Food and Agriculture Organization of the United Nations) and funded by Denmark and Sweden, the project develops techniques, technologies and methodologies through pilot activities to improve the conditions of small-scale fisherfolk in the seven member-countries. The project began in 1987 for a duration of five years. It succeeds an earlier BOBP project, "Development of small-scale fisheries in the Bay of Bengal", which terminated 1986. A five-year post-harvest fisheries project, executed and funded by ODA (U.K.), is also part of the BOBP.

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