

BAY OF BENGAL



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A PUBLICATION OF THE
BAY OF BENGAL PROGRAMME

BOBP SUPPORTED AQUACULTURE PROJECT IN THAILAND: EXPERTS REVIEW PROGRESS

The two-year-old BOBP-supported aquaculture demonstration project in Phang Nga bay, Thailand, was reviewed by fisheries officials of seven countries at a consultation held in Phang Nga a few weeks ago.

The project covers half a dozen villages scattered in Phang Nga bay, about 100 kilometres from Phuket. The villages are located in mangrove and mudflat areas, populated by subsistence fisherfolk, most of them accessible only by boat. The houses of the residents generally stand on stilts erected in the tidal zone.

Begun in March 1979, the project seeks to convey three messages: that aquaculture can improve the earnings and living standards of the Phang Nga bay residents; that self-help can stimulate community development; and that the village women can expand their incomes by acquiring skills in handicraft-making and fish processing. (For details of the project, and progress made during the past years, see boxes on pages 2 and 3).

External funds to support the project are provided by BOBP through FAO/UNDP South China Sea Programme

Construction of cages for fin fish culture at Ko Pan Yi, one of the villages covered by the Phang Nga aquaculture demonstration project.



which implements the project in collaboration with the Government of Thailand. The Thai national government provides full-time professional and supporting staff, including a team leader, a marine biologist and technicians; the Phang Nga provincial government also contributes substantially to the project, through matching funds for certain activities and full finance for certain follow-up activities.

The 25 participants at the consultation included representatives from BOBP member-countries, plus Indonesia and Philippines, besides BOBP, SCSP and project staff.

The consultation was held at the Phang Nga resort hotel. Addressing the participants, the chief guest at the opening ceremony—Mr. Suib Rodprasert, Governor of Phang Nga province—said: "In the fisheries sector, and particularly in the Phang Nga area, we find evidence of declining resources and must therefore resort to various forms of aquaculture ... It is necessary not only to apply what we have learned in our fishery research centres, but also to transfer this knowledge to the rural population ... It is a slow process, but major breakthroughs do not happen overnight."

Mr. Umpol Pongsuwana, director of Thailand's brackishwater division, said: "In implementing this project we have encountered numerous problems and in most cases have solved them by trial and error. While we have had some successes, we believe that there is much more for us to do to make life better for our fishermen."

After the opening ceremony, consultation participants drove by car and launch to Sam Chong village and observed the training activity there for women on making better shrimp paste.



Oyster is cultured in cages at Ko Pan Yi and Ko Mak Noi villages. The cages are submerged at high tide, exposed during low tide.

In the afternoon, participants acquainted themselves with community development activities in Ko Khiarn and Bang Pat villages — a joint effort of the people, the project and the Phang Nga provincial government. These concerned mainly arrangements for organizing and storing fresh water supplies. At Ko Khiam there was a 25 cubic meter storage tank along with a well, a windmill pump, and pipes to the water's

edge for collection by boat. At Bang Pat, there was a 500-cubic meter reinforced concrete fresh water tank to catch and store rainwater during the wet season.

At both villages, the facilities initiated and completed by the project were turned over to. Governor Suib Rodprasert. The Governor in turn handed the facilities back to the village leaders. The ceremonies thus marked

the successful execution of the community development component of the project.

In between the field visits, participants discussed the project's three components, with Mr. Kachomsak Wetchagrun of the Department of Fisheries serving as moderator.

Aquafarming: —

Phang Nga project personnel outlined the progress of aquafarming with the aid of sketches, charts and graphs. Mr. Boon Boonruang, project team leader, gave details about cage construction, the growth rates of cultured fish species and oyster spawning. By demonstrating improved methods of aquafarming, the project sought to catalyze follow-up action. The setting up of a small cockle plot in Ban Ko Mai Pai was cited as an example. The results led to a 1.8 million baht grant from the Phang Nga provincial government for follow-up action.

Participants evinced keen interest in the aquaculture component. They learnt that the initial cost of fish cages was about 19,000 baht but the cost had been brought down by using polyfoam floats discarded by tin mines in the area instead of plastic containers.

The cost could be reduced a further 25% by using locally available material

Phang Nga Project : Women's Activities

To help increase the incomes of women in the Phang Nga project area, training courses have been held in handicrafts, mainly for younger women, and in processing (improving quality of shrimp paste, making fish products such as fish sausages and shrimp biscuits)—mainly for older women.

Training courses in handicrafts In November-December 1979, an expert from the Philippines, Ms. Crissanta Sallador, held two courses in Bangkok

9th Phang Nga to train local women in the design and manufacture of various types of handicrafts, such as macrame. Every participant was aided by Ms. Sallador in making the item of her choice. In Bangkok, the participants completed 15 articles—including 18 different types of plant hangers, four handbags, of different shapes and sizes, three lamp shades and four wall decorations—in two weeks.

In Phang Nga, 28 women primarily from three of the project villages, learnt the basics of knotting and weaving and made 64 articles, including plant hangers, handbags, caps, wall decorations, belts, baskets, slippers and lamp shades.

Products made at the courses were later exhibited at a Red Cross Fair.

Said Ms. Sallador "This training course has illustrated the keen interest of many young

women in the villages to learn something productive during their spare time."

Handicraft study tour of the Philippines : In June-July 1980, two groups of women from the Phang Nga area were exposed to Filipino handicrafts during a two-week study tour. They visited marketing, training, design and production centres, both private and government; observed the production of many handicraft items such as macrame, woodwork, shellcraft, embroidery, fibre craft, ceramics, bamboo and jewellery; and discussed handicrafts with designers, producers and retailers. A number of handicraft samples were picked up from the tour to be used as models in Phang Nga. These included lamp shades, palm-leaf baskets, shell necklaces and handbags.

The study tour gave the participants many ideas on expanding the handicrafts in the Phang Nga area for the tourist market. It is believed that handicrafts of various types are very appropriate for manufacture in Phang Nga because raw material is locally available.

* *Training courses on fish processing* : In April 1980, training courses on post-harvest fisheries technology were held separately in the villages of Ko Mai Pai and Ko Pan Yi. Twenty women attended each course. At Ko Pan Yi, participants used equipment provided by the project—food grinders, mixers, slicers, ovens, utensils—to make fish sausages and shrimp biscuits. Instruction was also provided on the drying of ground-up fish.

At Ko Mai Pai, participants were trained in making shrimp biscuits and crackers, fish sausages and dried ground-up fish. Raw material for these products included small shrimp, mackerel, barracuda, and trash fish.

A handicrafts training course for women in progress at Phang Nga.



PHANG NGA PROJECT: PROGRESS OF AQUAFARMING AND COMMUNITY DEVELOPMENT

AQUAFARMING

Villages covered : Ban Ko Mai Pai, Ban Ko Mak Noi, Ban Ko Pan Yi, Ban Ko Khiam

- * Cockle culture in enclosures at Ban Ko Mai Pai started June 1979, harvested March 1980, Grant of US \$ 90,000 from Phang Nga provincial government for expansion of cockle culture.
- * Demonstration of mussel culture at Ban Ko Mak Noi : A development fund of US \$ 20,000 from Phang Nga provincial government for building up brood stock in the project area.
- * Demonstration of oyster culture at Ban Ko Mak Noi and Ban Ko Pan Yi started July and October 1979. Target not attained because of small length of species. Bigger-size species now being cultured.
- * Demonstration of fin-fish cage culture started April 1979 at Ban Ko Khiam and in October 1979 at Ban Ko Pan Yi. Initial results not satisfactory because of inadequate participation by target groups. Later results better after improved participation. Some privately owned fish cages have also been set up.
- * *Group training on aquafarming* : a) Six-day observation tour in February 1980 for 28 fishermen and nine fisheries officials. Tour covered fin-fish cage culture and mollusc culture in Satul province; and Songkhla, Surat Thani and Chumphon provinces along the coast of the Gulf of Thailand.
- * Two-day training course on sea-bass fry nursery held in June 1980 at Ban Ko Pan Yi for 34 trainees (fisherfolk, technicians and officials).
- * 20-day tour of fish-cage culture and mollusc culture sites in Japan, Hong Kong, Singapore and Malaysia for project team leader and project technicians.
- 20-day observation tour of aquaculture practices in Japan, Hong Kong, Singapore and Malaysia for two project fisheries biologists in June 1980.

COMMUNITY DEVELOPMENT

Villages covered : Ko Khiam, Ban Ko Mai Pai, Bang Pat

- * Service boat for supply of fresh water to all villages.
- Repair of public walkway—Ban Ko Mai Pai.
- Construction of 500 cu. metre reinforced concrete freshwater tank—Bang Pat.
- * Construction of 20-cubic metre freshwater storage tank complete with well, wind-mill pump, small jetty and outlet pipes—Ko Khiam.

Under planning:

- * Construction of small experimental solar stills for fresh water in Bang Pat, Ban Ko Pan Yi, Sam Chong.
- Construction of improved jetty and walkway—Bang Pat and Sam Chong villages.

Some other points made at the discussion on aquafarming:

- It is essential to gain the confidence of fishermen by demonstrating tangible benefits from innovations.
- A problem in operating the fish cages was that in a group of six fishermen, one or two people did most of the work. This problem was solved by turning over the cage operations to an individual or a small family.
- Is cage culture economically viable? Preliminary indications are positive, but more time is needed for detailed cost benefit analysis. Suggestion: Instead of waiting for two or three years to harvest two or three kilogrammes of seabass, fishermen can harvest them in six months when they weigh about 600 grammes (valued in the Phuket area at 40-50 baht per kilogramme). Supply of seed fry Initially seabass fry for the project's experiments were provided by brackishwater fisheries stations in southern Thailand. Subsequently, villagers learnt to collect seabass and grouper fry from natural sources in the bay. If cage culture develops on a large scale, it will be

necessary to establish hatcheries to supply fry. Such hatcheries will have to be managed by government or an institution—hatchery technology cannot be passed on effectively to the villagers.

- If fish cage culture develops in a big way in the area, marketing the harvest is a potential problem. The fisheries department may have to assist in bringing producers and buyers together.
- The difficulties of breeding marine species were outlined by Mr. Pinit Kungvankij, Chief, Satul Fisheries Station. He felt that Phang Nga was not suitable for a hatchery and that Phuket should continue to supply fry. He pointed out that induced or natural spawning in laboratories is more difficult for marine species than for freshwater species. Mr. Pinit responded at length to questions on hatchery techniques.

Women:

The Phang Nga project's activities concerning women are detailed in the box on page 2.

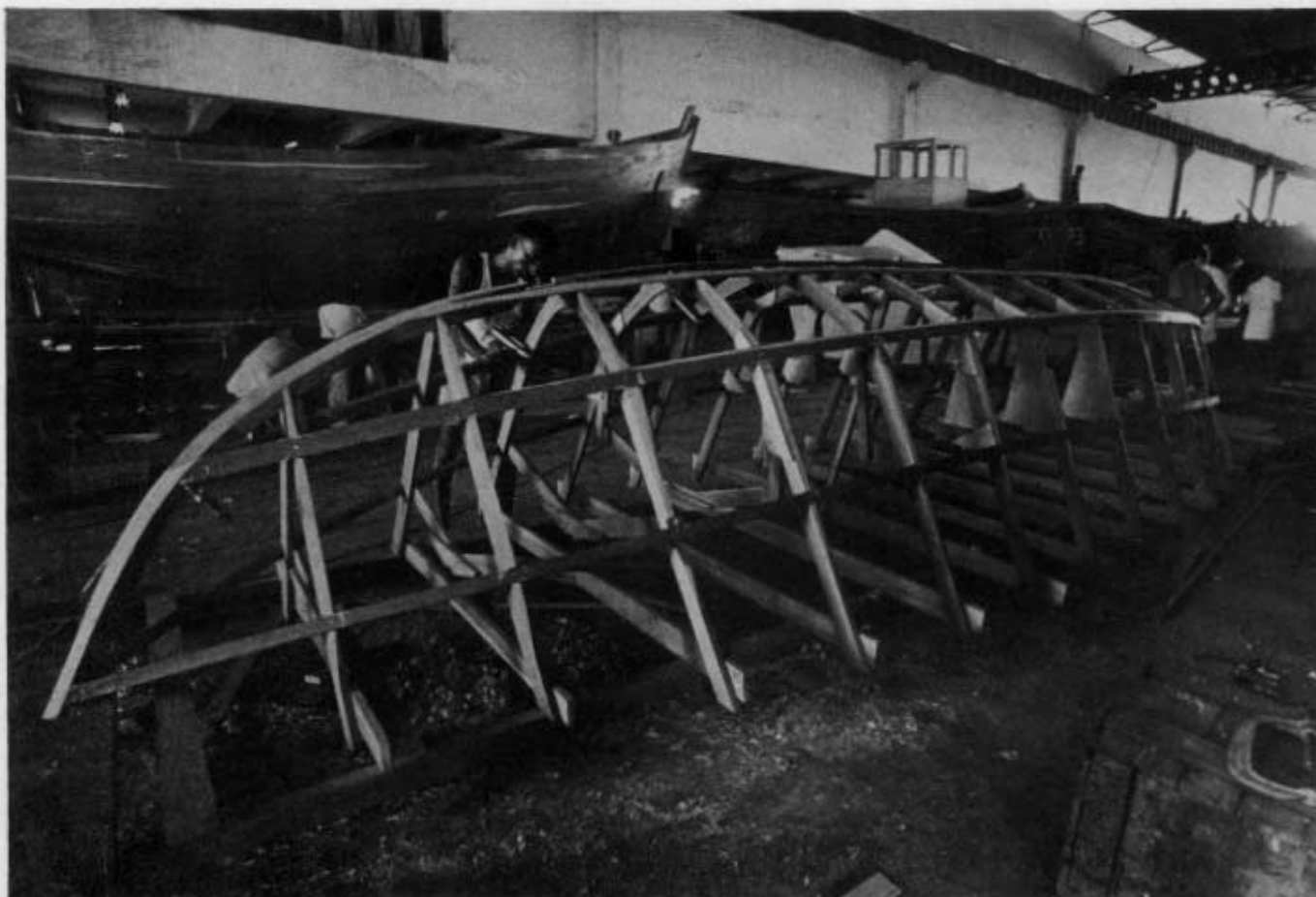
During the discussion on the women's component, the moderator pointed out that in the area of handicrafts, training had been limited to cotton-twine macrame, and leaf and palm frond weaving. The training had been provided at two levels teachers were trained in Bangkok and groups of young women in the local villages. The fisheries department worked closely with the department of local production in the organization of the training courses.

The improved shrimp paste which the Phang Nga women are being trained to make costs more than the traditional paste but fetches 2½ times its price and is therefore remunerative. The Phang Nga provincial government is expected to provide working capital for expanding production of high-quality shrimp paste.

Community Development:

The moderator described the project's activities on this front. He said that a socio-economic survey of the project area, prior to its launching, had pinpointed the need to tackle community development problems, the most

(Continued on page 21)



glimpses into BOBP projects



Boathuilding in Royapuram

1. Carpenter attaches chine batten to frame of IND 17, gillnetter for Kerala being built by BOBP.
2. Fishing craft experts A. Overa (centre) and O. Gulbrandsen (left) oversee construction.
3. Portable circular saw acquired by BOBP being used by workman.

Boatbuilding in Royapuram

The BOBP has embarked on a crash boatbuilding project to help develop small-scale fisheries in India and Sri Lanka. Nearly a dozen experimental boats are being built at the Royapuram boatyard of the Tamil Nadu Fisheries Development Corporation, following an agreement signed in January between BOBP and the Corporation. These include one boat for Sri Lanka, eight for Tamil Nadu and Andhra Pradesh, two for Kerala. Some 25 of the yard's workmen are engaged in constructing these boats.

Boatbuilding began about two months ago, under the supervision of BOBP fisheries engineer Arild Overa. "Our area of operation is very wide," says Overa, "and we are devising different types of boats to suit varying local conditions and fishing methods."

"The Royapuram boatyard has turned out to be excellent for our needs," says Overa. "I am very pleased with the performance of the yard and the support for the project provided by the management"

BOBP's *modus operandi* is to provide the boatyard with a design, build a prototype for short-term trials, modify the prototype if necessary after the trials, and build two or three of the modified prototypes for long-term fishing trials in selected areas. These trials will determine the viability of the boats and BOBP's recommendations on them.

BOBP has acquired several modern hand tools for the Royapuram yard to speed up the construction. These include drills, jigjaws, planers, routers, sanders and grinders, plus equipment for aluminium boatbuilding. These tools and any other equipment the BOBP acquires will be transferred to the Royapuram boatyard at the end of the project. The yard's carpenters have been quick to learn the use of the tools; their enthusiasm is manifest.

Details of BOBP's experimental boats

One prototype for Sri Lanka, SRL 11, has been completed. This is a beachable boat meant to serve as an alternative to the harbour-based 28-foot boats now popular in that country. Two more, probably of the same type, will be built for experimental pair trawling and purse seining—operations in Tamil Nadu.

These prototypes will be of plywood, and will be equipped with a 13 H.P.

Deutz aircooled engine. A modern Marconi rig with main sail, jib and genoa will also be tested on the prototype. The SRL-11 type is well suited to fibre-glass construction, which is a popular boat building method in Sri Lanka.

- Three beachlanding, motorized craft will be built for the Tamil Nadu coast, similar to the IND-11 type that was successfully surf-tested at Ennore last year. These three boats will undergo intensive fishing trials at various locations. The boats are based on the kattumaram principle—they are self-draining, with buoyancy provided by polystyrene 'logs' (see *Bay of Bengal News*, January 1981).

- A new surf-crossing, beachlanding sailboat, IND-15, is being developed for the East Coast—a possible alternative to the kattumaram.

- Two earlier prototypes for the East Coast tested last year will be modified. These are a decked planked boat (IND-10) and a twin-hull boat, (IND-14). The IND-14 will be tested with different sail-rigs. "The concept for IND-14," says Overa, "is that if the sail experiment succeeds, it will be mainly used as a sailboat; its outboard engine will be used mainly to get the boat across the surf. That way, operational costs will be kept down."

- The two prototype gillnetters for Kerala are a 25-footer for sailing and rowing, IND-17, and a 28-footer with sails and a 5 H.P. diesel engine, IND-18. Both are built of plywood and were designed by Norwegian naval architect Oyvind Gulbrandsen, under a consultancy for a UNDP-funded project for fishing craft development in Kerala. Gulbrandsen visited Kerala

last year, surveyed its coastline, and studied the state's requirements for new craft in the light of its fisheries policy.

Technical and surf trials for SRL 10, IND 17 and 18 began late May off Royapuram. They are being supervised by an array of experts: Gulbrandsen from Norway, surf specialist Geoff Gowing from Australia, and BOBP staffers Arild Overa and R Ravikumar. Two fishermen from Sri Lanka will take part in the trials. A Sri Lankan official, Mr. A. Patrick, recently spent three weeks in Madras observing boat construction and engine installation at Royapuram.

Mr. Lars Engvall, director of BOBP, says: "The Royapuram boatbuilding project is in consonance with our policy of establishing close cooperation with national institutions."

New York Times on BOBP

The *New York Times* featured the work of the Bay of Bengal Programme in its issue of January 22, 1981. Spread across five columns, the story, headed "Innovative fishermen in India trying motorboats," introduced BOBP's beachcraft development project to its readers. The story was researched by *New York Times* correspondent K. Kasturi Rangan some months ago. He went round Nethuppam village at Ennore near Madras, rode the IND 11 beachcraft prototype operated by fisherman Jayapalan and interviewed BOBP director Lars Engvall.

Kasturi Rangan liked what he saw. *New York Times* editors liked what he sent. Result: A good story (photograph below).



Orissa Extension Officers in Sri Lanka

Fifteen young marine extension officers from Orissa recently received orientation in artisanal fisheries in Sri Lanka. They took part in fishing operations off Negombo and received theoretical and practical instruction in engines and gear.

Funded by BOBP and accepted by Sri Lanka in the spirit of TCDC (technical cooperation among developing countries), the course was meant to upgrade the technical capability of Orissa's extension service in marine fisheries.

Six of the Orissa officers were in Sri Lanka during November-December 1980, nine during March-April 1981. Arrangements for their stay and their training were made by the Youth Fisheries Training Project (YFTP), Negombo, an independent agency run by Fr. Alexis Benedict, an energetic priest-cum-fisherman. The YFTP was started 10 years ago to introduce educated but unemployed youth in Sri Lanka to fisheries. It has so far trained some 125 youth of whom 80 are engaged in fisheries. It owns four mechanized boats which the project uses for its training activities.

Detailing the instruction provided to the Orissans, Fr. Benedict said they went out for 10 days with 28-footers that deployed bottom longlines and for 10 days with motorized 18-footers using gillnets. They were engaged in canoe trawling operations for a week. They

received five days of gear training and five days of engine training. There was also classroom instruction and discussion.

Talking to *Bay of Bengal News* in Negombo, the second batch of Orissa officers said that each of them accompanied a crew of four during fishing operations. The 28-foot boats that used bottom-set longlines often recorded good catches, the daily average catch being about 70 kg; the species caught included rock fish, seer, tuna and red-snapper. The gillnets in the 18-foot boats caught an average of 20kg fish per day. The canoe-trawling operations for prawns were economic, the average daily haul ranged from 10 to 20 kg.

Talking about the differences in working conditions and fishing methods between Orissa and Sri Lanka, the visiting officers said that lagoons were not as common in the Orissa coast as they were in Sri Lanka; hence Orissa needed beach-landing boats. The fishing methods used in Orissa were confined to gillnetting and trawling; in Sri Lanka bottom longlines seemed common.

Did the Orissans have any problems communicating with the fishermen? "We used sign language," said one of the officers, "but some of the fishermen did speak a little English."

The only eventful episode during the Orissans' tour occurred on a cyclone-hit day when their boats were a kilometre from the shore. "But there was no danger, there were more than 150

canoes around and help would have been available, if needed," said Prasanta Mohanty, one of the officers. Another member from the visiting team, Satish Ranjan Das, said in reply to a question that the officers were quite confident of handling fishing operations by themselves. "Ask Fr. Benedict to give us a boat."

The Orissa officers, most of whom are under 25, took part last year in a NORAD-assisted socio-economic survey of selected fishing villages in Balasore district. Prior to the Sri Lanka tour, the Orissa officers put in some 60 seagoing days with Orissa department boats. On their return to Orissa they will be assigned to do extension work in specific areas in each of the four coastal districts.

Stock Assessment Training

The BOBP has joined hands with three other institutions—Asian Development Bank (ADB), South China Sea Programme (SCSP), and South East Fisheries Development Centre (SEAFDEC)—to fund and sponsor two regional training courses—one on stock assessment, another on fisheries statistics. The courses will be held in September-October in Thailand.

A six-member steering committee met in Bangkok early March to discuss the content and organization of the courses and the level of participation and training.

The courses will upgrade the competence of local fisheries personnel in assessing their fishery resources, and in setting up adequate systems for data collection. At present, the lack of data hampers rational exploitation and management of the fisheries. The declaration of the EEZ by several developing countries—which gives them both greater opportunities for tapping resources and responsibility for conserving resources further offshore—makes the need for data even more urgent.

Participants in the courses will be nominated by governments of ADB member countries. For the course on stock assessment, participants should be fishery biologists with some background in statistics or mathematics. For the fisheries statistics course, participants should be statisticians with experience in the design and execution of data collection programmes.

An Orissa extension officer goes out fishing in Negombo, Sri Lanka.



A Letter from the Publisher

Bombay attracts tourists round the year but a few weeks ago it played host to an offbeat group of non-tourists, half a dozen fishermen from Bangladesh. Bipin Das, Binode Baran Das, Manoranjan Das, Clarence Dias, Noor Ahmed and Noor Ahmed (the last two are brothers) came on a mission that was again offbeat: to study Maharashtra's *do!* net fishery and observe the worthy men and women who engage in it.

The *do!* is a fixed bagnet into which fish are enticed by tide and current. The visitors from Bangladesh are seasoned users of fixed bagnets made of nylon twine which they call *behundi*. They spent three hectic weeks watching Bassein and Versova fishermen rig, set and harvest their *do!* nets which are made of cheaper polyethylene twine and set more flexibly than the *behundi*.

G. Pajot, BOBP's fishing gear technologist, mooted the idea of the Bangladesh fishermen's visit, and the BOBP funded and organised it in cooperation with Maharashtra's directorate of fisheries. As Pajot points out, the Noor Ahmed brothers of Moiscal village near Cox's Bazar—fine fishermen both—were initially quite sceptical about the possibilities of improving their fixed bagnets, but pictures of fixed bagnet operations off Bombay, which Pajot showed them, aroused their interest.

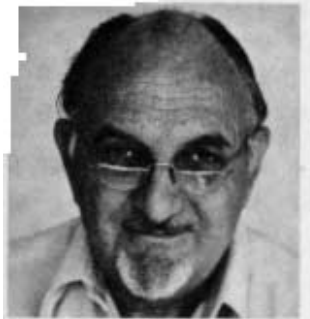
Today the Noor Ahmeds are enthusiastic about applying what they saw in Bassein and Versova in their own fishery. Whether it will work and significantly reduce the costs of their operations is something which only actual fishing back home can reveal. But a new idea has taken root.

The mechanism by which this new idea was transplanted is known as TCDC (technical cooperation among developing countries). BOBP has a particular interest in TCDC: we commissioned a study on TCDC possibilities in fisheries, and a report on the subject will be published shortly. And recently we helped organize several other TCDC activities as well, particularly in the area of aquaculture. To illustrate: An Indonesian mission visited Andhra Pradesh in March to assess the possibilities for brackishwater fisheries development; two aquaculturists from Tamil Nadu worked with their counterparts in Sri Lanka to design a pilot project in shrimp culture; and half a dozen Malaysian officers began a two-week aquaculture study tour of Indonesia and Thailand in April.

It is our hope that TCDC will eventually be a vigorous and ongoing process in every area of fisheries in the Bay of Bengal region.

A word about our newsletter, *Bay of Bengal News*. While it will naturally discuss BOBP projects, it will also seek to promote wider knowledge about the fisheries of member-countries themselves, and greater cooperation between them. Toward this end, the current issue carries a special section on Bangladesh—reports on its small-scale fishing communities, on BOBP's experiments with fishing gear, on government plans. And the photographs by Harry Miller go beyond the drab facts to convey something of the agony and the ecstasy of the life of the small fisherman.

A fastidious photographer Miller (right) was dismayed to find that the Bangla—"desh fishing season had almost ended just before his visit (in April). Miller had perforce to train his wide angle and tele lenses mainly on the fishermen—rather than on actual fishing operations. But the results were pleasing. My own favourite is the picture of two Cox's Bazar fishermen, heads bent, hands busy, totally absorbed in their work of mending nets in the soft glow of twilight.



The lead story of this issue describes the Phang Nga aquaculture demonstration project, whose success in integrating aquafarming with community development and women's activities merits careful study. On the second half of the issue is a weighty piece: B T Antony Raja examines the resources in the shelf area of the Bay of Bengal region, summarizing his own BOBP paper on the subject. (That in turn was inspired by a consultation on stock assessment conducted last June in Chittagong). Raja's article should interest fisheries scientists, planners and administrators in the region. And on the back page, John Kurien attacks the many myths that surround the small-scale fisherman.

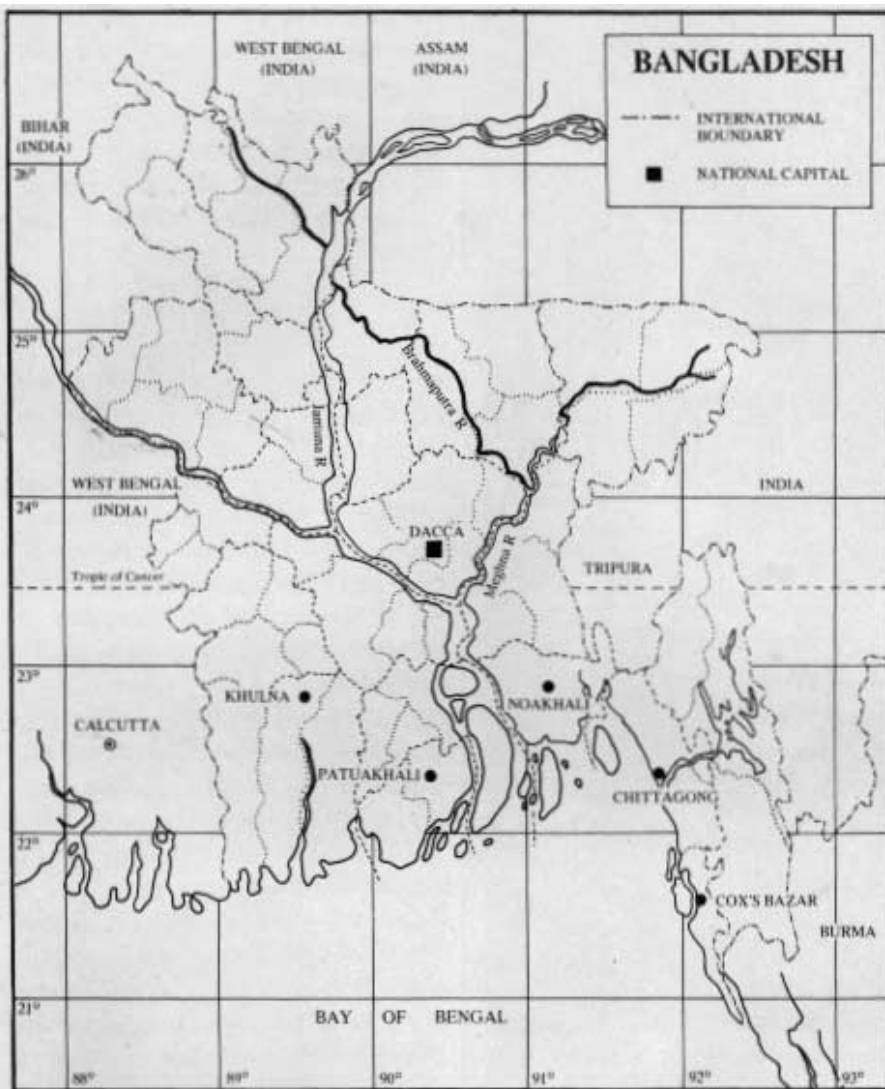
In sum, we have tried to offer varied fare in this issue. A journal like *Bay of Bengal News* should, we think, inform the expert, involve and educate the layman and facilitate communication between the two. If you feel strongly about anything in this issue, please write and tell us.

SMALL-SCALE FISHERIES OF BANGLADESH

A Reporter's Diary

Small-scale fisheries account for 95% of the total fish catch in Bangladesh. Reporter S R Madhu and photographer Harry Miller visited Bangladesh some weeks ago and made a quick tour of fishing communities of Chittagong and Cox's Bazar, where most of the fisherfolk operate. What they saw and heard is described here in words and pictures. On later pages we present a summary of BOBP projects in fishing gear, government plans for fisheries development, and photo-images of Bangladesh fisheries.





Bangladeshis take as avidly to fish as fish takes to water. The aroma of fish seduces you, whether you dine under chandeliers at Dacca's Intercontinental, squat on the floor in a mud hut in Bhola, or share a cane bench with a middle class householder in Chittagong.

Fish thrive in water, and water is something Sonar Bangla (Golden Bengal) has in abundance. The water is everywhere, landlubbers can't escape it. The entire country is criss-crossed with rivers (Padma, Brahmaputra, Meghna, etc) rivulets, estuaries, lakes, ponds, canals. And the Bay of Bengal, of course, laps the shores of five southern districts—Chittagong, Noakhali, Barisal, Patuakhali and Khulna.

The waters supply food, facilitate irrigation and make cheap mass transport possible—*sampan* and other ferry boats are numerous. Take a cruise from

Dacca to Bansal : craft of many hues, sizes and shapes mingle pell-mell in an orgy of colour and movement. But in summer, when the skies roar in fearful wrath, the waters ravage the countryside, leaving trails of ruin and devastation.

The capriciousness of the waters has a direct effect on fisheries. Fishermen take to the sea when it is kind—October to March. During this period, fisherfolk migrate along the coast from Chittagong, where many of them live, to rich fishing grounds such as Dubla Char and Kalidaha. When the sea gets rough, the fisherfolk turn to lake and river fishing. "In Bangladesh," says an official, "the seagoing fishermen are also riverine fishermen. Small-scale operations predominate in the sea and in the rivers."

The "small" sector is indeed a big one in Bangladesh. It makes up 95% of all fish caught. Some statistics: the total fish production is 635,000 tonne, valued at \$370 million. Of this the sea provides 100,000 tonne, inland waters the rest. Some 800,000 people depend directly



Three types of traditional fishing craft are used in Bangladesh—*balams*, exclusively in marine waters, and *dinghies* and *chandis*, in brackish waters.

The *balam* is a dug-out hull with a slightly raised bow and stern. There are large *balams*, 15-20 m long with a crew of 20 to 30; and medium sized *balams* 10-15 m long, with a crew of 10 to 13. These boats are used by Chittagong fishermen and operated in the open sea off Cox's Bazar and Dubla island, generally with gillnets and *behundi* (setbag) nets.

The *dinghi* is a plank-built and shallow boat about 7 metres long, with a pointed bow and stern. The deck is made up of detachable half-split bamboo. It is propelled by long oars, or by a thin cloth or a plastic sail mounted on a bamboo mast. It is operated throughout the coastal area, by two or three persons, who use either gillnets or *fundas* (staked gillnets).

The *chandi* is also a plank-built boat, about 15 metres long. Part of the vessel is decked with planks, the rest may be decked with split bamboo. Common in Barisal and Patuakhali district, the *chandi* generally uses gillnets.

The most common gears used in Bangladesh coastal fisheries are setbag nets (behundi), staked gillnets (funda) and driftnets. Setbag nets yield more than 40% of the total marine catch, while driftnets, large and small, account for approximately 30%.

The *behundi* net is a fixed bag net with a 15 to 30 metre circular mouth. The net tapers from the mouth and ends in a bag 25 to 30 metres away, and is fixed by tying the two ends of the mouth to wooden poles driven into the bottom of the seabed. Fish comes in with the current, enters the mouth and ends up in the bag. The *behundi* net has a life-span of about five years; it is used in Chittagong district and at Dubla.

The *funda* net is 55 metres long and three to four metres deep with 4" meshes. It is a stake net used at Kalidaha in the open sea from November through March. It has an average life-span of about five years.

1. Left: Chittagong canoe fisherman hauls in his stake-net (*funda*).

Picture by Cedric Day



2. Chittagong fisherman stacks net on shore after fishing operations.

or indirectly on fisheries. 70% of the catch comes from Chittagong district in the east, 13% from Patuakhali, almost in the middle of the Bangladesh coastline. Foreign countries bought \$ 40 million worth of Bangladesh fish—mainly shrimp—in 1979-80.

The boats and nets used by Bangladesh fishermen are described on page 9 (see box). Hilsa, jewfish, pomfret, Bombay duck and Indian salmon are the most important marine species. These are harvested at four main landing terminals—two at Cox's Bazar, one each at Khulna and Chittagong.

At the Chittagong fish harbour, large passenger and cargo ships vie for attention with *balams* of all sizes returning with catch, and ferry boats. Trucks unload ice while push carts wend their way along crowded streets to the fish market.

The Chittagong fish market is an open-air affair with neither roof nor floor. The fish are piled high in two rows of push carts facing each other. One wades through thick slush to reach the carts.

A modem market for Chittagong is an obvious need.

The landing centre at Cox's Bazar is better organized. There's a market adjoining it—a large open-air concrete hall, with fresh catch heaped (at landing time every morning) in neat piles. Rickshaws bearing ice arrive every few minutes; the iced fish will journey soon after to Chittagong and other centres. (Icing is common for coveted varieties of fish such as hilsa, prawn and salmon). At the beach, *balams* keep sailing in with their catch. Middlemen ascend the craft even before they have landed: deals are struck and cash changes hands. By selling at sea, the fishermen have escaped the market duty, while the middlemen have bought cheap.

"Nearly 150 fishermen land their fish here every day," says Mr. Rahul Amin Chowdhury, manager of the market, owned by the Bangladesh Fisheries Development Corporation (BFDC). "But many fishermen stay at sea for a whole week and proceed to Chittagong where they get better prices."

He adds: "The BFDC has sold mechanised boats to a number of fishermen on an instalment basis. But the instalments are slow in coming; if we apply pressure on them they stop landing here." Sometimes the BFDC gets tough, gives chase to fleeing boats and seizes them.

The BFDC, headquartered in Chittagong, was set up in 1964. Its present functions include surveying marine fish resources, building new harbours, use of trawlers to boost catch, mechanisation of country craft, preservation and marketing of fish, setting up net factories. In March, the BFDC launched a campaign—"Sea Fish Sale Fortnight"—to popularize the merits of seafish in the capital, Dacca, and in other parts of northern Bangladesh where people prefer freshwater fish.

The BFDC operates fish processing facilities at Cox's Bazar and Chittagong. There are freezing plants at Chittagong and Khulna run by BFDC, the BJMSS (an apex cooperative of fishermen), and private enterprises.

Talking to fishermen, we learn that they are generally Hindus. There are three kinds of fishermen. Some own boats, some hire boats, most fishermen (more than 60% of them) merely work for a wage. The wage-earners are of several types. Some fishermen get a wage contract for the five-month marine season (perhaps 1,000 takas a month plus board); some get separate contracts (from the same owner or different owners) for marine and river fishing. There are also fishermen-cum-boat owners who jointly hire a mechanised carrier boat; this tows the boats to the sea off Dubla Char and brings back fresh fish to Chittagong.

Most fishermen lead austere lives. Some of them live in the boats they worked in—a coarse tarpauline top curtaining the stove that cooks their food—and bathe whenever they can, using the nearest community tap. Those who have a shelter of their own often live in huts of thatched bamboo without water or electricity. Some own radios—which, besides the inevitable pack of cards, a swill from the bottle and the occasional movie, constitute their sole entertainment.

One of the main problems of Bangladesh fishermen is the short duration of the marine fishing season; they need to



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3. Cycle rickshaws of Chittagong and Cox's Bazar serve as colourful ice-carriers. This one, brought to the Cox's Bazar landing centre, will take back preserved hilsa to neighbouring towns.
4. Cox's Bazar fisherman Minal Kumar, who fishes with bottom longlines.
5. Hail Hankar, 27, another Cox's Bazar fisherman. His 33-ft country craft is towed 60 miles out to sea by a mechanised carrier.
6. The Chittagong fish market and organized market is being planned.
7. Stakenet (funda) fisherman in the Dacca area. Photograph by Cedric Day, FAO Rome photo library.



Women from Kalidaha fishing community near Chittagong. They take active part in post-harvest operations.

maximise their earnings during this period. To do so they need better craft and gear, improved facilities to preserve and process fish and loans and credit facilities. Developments in this direction: The Bangladesh government (through BFDC) is distributing mechanised craft, built at a DANIDA-supported yard in Chittagong, to fishermen. The BOBP is conducting experiments on improving traditional gears. More ice plants and freezing plants are being set up. Some 170 branches of the Bangladesh Krishi Bank will help develop fisheries through loans to fishermen for the purchase of boats, engines, nets and other equipment, besides loans to boatyards, net-making factories, ice plants and fish freezing plants. (Government plans and foreign support to fisheries development are outlined on page 17).

We accost Hari Hankar, 27, a fisherman from Cox's Bazar, who owns a 33-ft *borkhi nauka* country craft. He goes 60 miles out to sea during the fishing season—his boat is towed by a mechanized carrier—and lays his bottom lines, with 500 to 1,000 hooks per line. This year his daily catch was about 60 to 70 pieces of jewfish and catfish. Most of the catch was sold to M A Matin and Company, a Cox's Bazar firm that

exports dehydrated fish to Hong Kong. "Our earnings per day amount to 200 to 300 taka" says Hail. "I pay each of my crew 3,000 to 4,000 taka per season (September to March) in addition to board."

During the off-season, Hankar retains his crew and turns to fishing in the river nearby for small shrimp. The entire crew is paid 2,000 to 3,000 taka for fifteen days.

Hankar is married but has no children. At present his wife is at home and he lives in the boat with the crew. He seems quite content with life—his one ambition is to acquire a motorized boat.

Short and stocky Minal Kumar Jaladas, 25, is another fisherman operating in Cox's Bazar with bottomset longlines. He earns a wage of 5,000 takas for five months during the busy marine season, catching jewfish, catfish, threadfin and small shark.

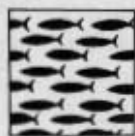
Minal Kumar has been fishing from the age of 13. He was a riverine fisherman, and he has been fishing in the Bay of Bengal ever since he came to Cox's Bazar five years ago. He says that sea fishing is hazardous but brings in more money than fishing in rivers. On one occasion three years ago his boat capsized in a cyclone but he was rescued.

The turbulence of the sea is something Bangladesh fishermen learn to anticipate. "From the way the wind blows, the colour of the sky and the pace of the current, they know that the sea is going to be rough," says a fish exporter. "These fishermen have a built-in sensitivity to radical changes in atmospheric pressure ... they sense danger."

Minal Kumar and Hari Hankar are two of the fishermen we met, and on later pages we describe more encounters. As for the women in small-scale fishing communities, they are quite shy and taciturn with strangers; but they are far from passive in their approach to work. Besides running their households, they take active part in net-making, fish drying, shrimp processing or aquaculture. More than half of the fish drying activity—large quantities of fish and small prawns are sun-dried—is undertaken by women.

While the quality of life of the fishermen we spoke to isn't high, they are far from being destitute. So long as they go out to sea—on their or someone else's boats—they are assured of food. "A good fisherman," asserts G. Pajot, BOBP's fishing gear expert, "never need be hungry

Fact Sheet of Bangladesh Fisheries



Fish production

—marine	:	100,000 t (1978)
—inland	:	540,000 t (1978)
Potential annual yield	:	350—400,000 t (marine fisheries) 0—200 m depth

Source

FAO Yearbook of
Fishery Statistics 1978



Craft

—balams)	
—chandis)	45,199 both marine
—dinghies)	(1974-75) and riverine
—motorized	:	1,030
boats	:	(1976-77)
—trawlers	:	26
	:	(1976-77)

Status and Potential of
Bangladesh Fisheries by
M Karim 1978

Statistical Yearbook of
Bangladesh, 1979



Gear

—gillnets	:	4,878
	:	(1967-68)
—seine-nets	:	2,601
	:	(1967-68)
—setbag nets	:	2,601
	:	(1967-68)
—castnets	:	4,906
	:	(1967-68)
—longlines	:	2,215
	:	(1967-68)
—miscel- laneous	:	3,947
	:	(1967-68)
	:	22,905
—Total no. of : gear	:	758,497 (1974-75)

Statistical Cell, Bangladesh
Fisheries Development
Corporation, 1972

Status and Potential of
Bangladesh Fisheries by
M Karim 1978



Infrastructure

—harbours/ landing centres	:	8 (1978)
—ice plants	:	36 (1978)
—cold storage plants	:	16 (1978)
—freezers	:	9 (1978)

Status and Potential of
Bangladesh Fisheries by
M. Karim, 1978



Number of fishermen with dependents

Inland	:	618,000 (1976-77)
Marine	:	206,000 (1976-77)
Total	:	824,000 (1976-77)

Statistical Yearbook of
Bangladesh, 1979.



Commercially important marine fish species

Jewfish, Indian salmon, hilsa,
pomfret, penaeid shrimp, cat-
fish, eel, red snapper,
grunters, Bombay duck



Exports and Imports

Imports	:	2 million taka 1976-77
Exports	:	597 million taka 1979-80

Statistical Yearbook of
Bangladesh, 1979

DRIFTNETS, TRAWLS, SET BAG NETS

A Look at BOBP Experiments With Fishing Gear And the Fishermen Using It

In Bangladesh, the BOBP has been working on improvements to three kinds of gear—driftnets, high-opening bottom trawls and setbag nets. Experiments on longlines are to begin later. The goals are to either lower the costs of the gear or raise catches and incomes from them.

Large-mesh driftnets: Nets of thinner twine (27 ply) cost 40% less and catch more fish than nets of thicker twine (45 ply). These are the findings from BOBP experiments in Bangladesh in 1979-80. These findings have been confirmed by three Chittagong boats that used BOBP-supplied thinner nets along with traditional thick-twine nets, in 1980-81 fishing operations. The fishermen using these boats want to buy the thin-twine nets at cost from BOBP.

To enlarge the scope of these "demonstration trials," the BOBP plans to hold a consultation in July. Manufacturers and importers of fishing gear will attend the consultation, besides fisheries officials, extension officers and fishermen who have used the nets. It is hoped that the consultation will discuss the merits of thinner versus thicker twine in detail, so that a better understanding of large-mesh driftnet fishery results. The BOBP will later offer 100 thin-twine nets at cost to five fishermen. (At present, according to fishermen themselves, several hundred boats seasonally operate off Chittagong using large-mesh driftnets).

The BOBP is also conducting a comparative study of the efficacies of different mesh sizes of driftnets. The study has revealed that driftnets of larger mesh size (180 mm) catch more of good-quality high-priced fish species than driftnets of smaller mesh sizes such as 100 mm, 125 mm, and 150 mm.

High-opening bottom trawls: The BOBP has used the high-opening bottom trawl, which is towed by one or two boats,

with success in Tamil Nadu. (See *Bay of Bengal News*, January 1981). The trawl can be used by shrimp trawlers to catch food in the non-shrimp season.

Units of the high-opening bottom trawl were constructed and rigged in Madras for use in Bangladesh. Here the main objects are to increase production and to diversify fishing methods for small motosed craft.

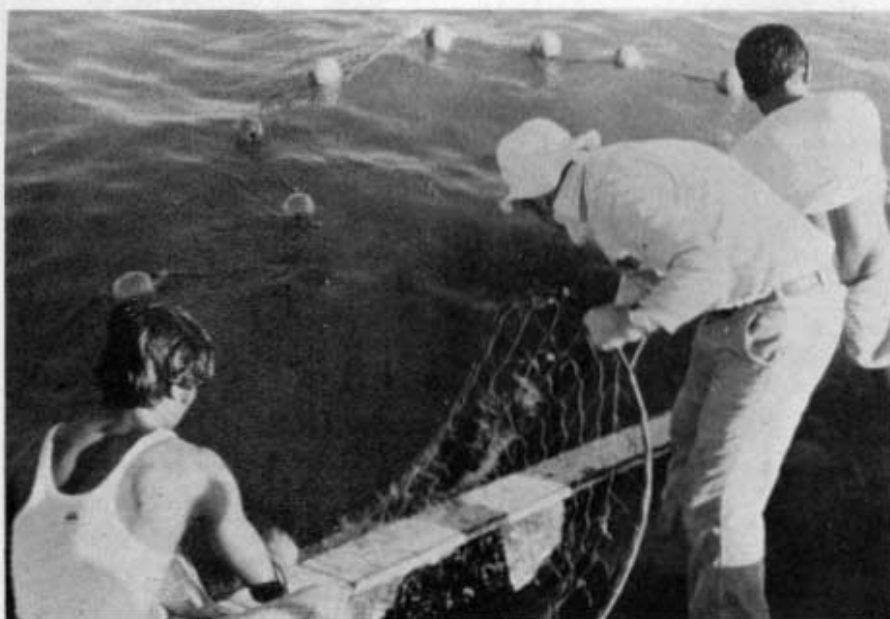
Experiments were held during a six-month period (October 1980 to March 1981) in Cox's Bazar and Chittagong with John Crockett, a Scottish master fisherman, serving as consultant. It is believed that more trials are needed to yield definite conclusions: a detailed report is under preparation. However, work has been initiated on the hand-braiding, assembling and rigging of improved high-opening bottom trawls.

Details: Under an agreement between BOBP and the Swedish Free Mission (which runs a fisheries project in Bhola near Chittagong), boats and crew were provided by the SFM (two 38-ft boats

fitted with 33 H.P. Volvo and Yanmar inboard engines), and gear by BOBP. The experiments began in October off Cox's Bazar, but were suspended in December as the boats leaked badly and the engines were run down. Resumed in January off Chittagong, the experiments terminated in March since the crew apprehended a cyclone.

Two-boat trawling experiments were also conducted off Chittagong in co-operation with another agency, the Kalidaha Fishing Project. These began 12 December and concluded 25 February. More high-value quality fish were caught during these trials than in the earlier trials.

Talking to *Bay of Bengal News* in March about the difference in operating conditions between the waters in Tamil Nadu and in Bangladesh, consultant Crockett said, "The tide here is very strong—unbelievable. You are dealing with turbidity all the time."



Above: Master fisherman John Crockett and crew of a 32-ft boat try out high-opening bottom trawls off Chittagong. Top: BOBP fishing gear expert G. Pajot examines a setbag net with Bangladesh fishing technologist T K Das.

Crockett said the data from the trials needed careful study. He offered one practical observation: "I think we have found that we can tow a larger trawl net than anticipated."

Behundi (sethag nets): Behundi or set-bag nets constitute an important traditional fishery of Bangladesh, accounting for about 30 per cent of the total fish catch. The nets are made of nylon, and BOBP believes that the cost of fishing gear can be reduced by replacing the nylon with polyethylene.

Experiments on the comparative merits of nylon and polyethylene twine in setbag nets were carried out between July and October 1980 in cooperation with the Kalidaha Fishing Project (funded by CARITAS). BOBP provided the polyethylene twine and bore the cost of rigging two behundi nets; CARITAS supplied a boat and crew to use these nets. In October these nets were transferred to private fishermen who are still using them.

Bipin Chandra Das, 51, of Ban Mohara village in Chittagong district, has been fishing for several weeks using both polyethylene twine and the traditional nylon. He finds the polyethylene



Chittagong fisherman Bipin Chandra Das, who has been trying out BOBP-supplied setbag nets of polyethylene twine, at his village home.

cheaper than the nylon, though somewhat less durable.

Bipin has two sons and three daughters, all of whom (barring the eldest daughter who is married) live together in Bipin's mud house. He is the sole earning member of the family: he owns three country craft, two of which are leased to others. He and some other fishermen

also hire a fish carrier to facilitate operations off Dubla Char in winter. The carrier brings fresh fish to the Chittagong landing centre.

Bipin was one half a dozen Bangladesh fishermen who made a study tour of set bag net fisheries in Maharashtra in April (Story on page 16).

Profile of a fisherman-entrepreneur

One of the fishermen cooperating with BOBP on the use of thin-twine nets was interviewed at length. He is Abdul Salam Chowdhury, 49, of Patargota village in Chittagong district. Salam is more than a good fisherman—he is an entrepreneur by his own right, with a brisk business and a yen for adventure. Thirty four people work for him in five mechanized boats owned by him, the biggest of which is a 52-ft long, 110 h.p. engine trawler. Gunny bags bulging with nets are piled high in his godown (a hut of thatched bamboo). Outside the godown, masses of white nylon twine owned by Salam's outfit mingle with yellow, green and red ropes hung out to dry between bamboo poles. Troops of net-riggers work in the shade of a white tarpaulin cloth.

Salam was born in Chittagong. As a boy of 15 he strayed into Burma without



a passport and worked as an apprentice in the Rangoon boatyard. Two years later he returned to what was then East Pakistan and completed school.

In 1960, Salam started working with a society now known as the BJMSS, which pioneered the mechanization of sailboats in Bangladesh. He was fortunate to receive training from a succession of experts, mainly Japanese, who came to Chittagong. Between 1966 and 1974 he built scores of boats for BJMSS. The experience he acquired

then stood him in good stead subsequently.

Salam says that the use of gear varies with the season. From October to March he uses large-mesh gillnets of thick twine—45 to 60 ply. The rest of the year he deploys hilsa gillnets. He was given 10 thin-twine nets by BOBP for demonstration trials. He says the thinnest twine net is cheaper and catches more fish of a better species than the thicker-twine nets. He is buying these from BOBP; in fact he would like more of them. He also believes that the colour of the twine—light green—has some significance, since it blends with the sea water and entangles unwary fish. Bangladesh presently imports twine from Korea and Japan.

What are his problems? Salam says that catches in the Bay of Bengal are dwindling; the costs of fuel and ice are mounting. When the catch at a particular time happens to be good, the price falls to uneconomic levels; further, skilled labour is scarce and expensive, since many fishermen are opting to buy their own boats with help from Bangladesh Fisheries Development Corporation.

Bangladesh Fishermen Study Bombay Nets

Half a dozen Bangladesh fishermen on a BOBP-funded study tour visited Versova and Bassein villages near Bombay in April. They studied the construction, rigging and use of setbag nets there, took part in fishing operations, and discussed what they had observed and learned at a two-day session in Madras.

The tour, a good example of TCDC (technical cooperation among developing countries) followed from BOBP fishing gear expert G. Pajot's study of setbag net fisheries in Bangladesh, which is based on nylon twine. He thought that Bangladesh fishermen could profit from exposure to similar fisheries in Maharashtra, which is based almost entirely on polyethylene twine and nets of different design.

Four Bangladesh fishermen who were already trying out BOBP-supplied gear were selected for the tour. Two of them were from Kalurghat village in Chittagong, two others from Fazilkharat and Miriam Ashram near Chittagong. It was believed that two more should be selected from Moiscal village near Cox's Bazar, a leading fishing centre. When Pajot first visited Moiscal, the fishermen there seemed reserved, and sceptical about polyethylene. They warmed up after a couple of visits. Two brothers—both named Nur Ahmed—were picked for the Maharashtra tour from Moiscal. They later turned out to be the most energetic members of the team, besides being the best fishermen.

Maharashtra's fisheries directorate—Mr. S S Naik, director, and Mr. G C Dhapse, assistant director, responded positively to BOBP's request for a tour of setbag net fisheries by Bangladesh fishermen. Pajot discussed arrangements for the tour with Mr. Dhapse during preparatory trips to Bombay.

The Bangladesh team arrived in Bombay on April 7. The fishermen were accompanied by BOBP's local counterparts in Bangladesh, Mr. T K Das and Mr. Mohammed Shahidullah, and Mr. Abul Kashem, BOBP's project officer for Bangladesh. Toward the end of the Bombay stint, the team was joined by Mr. A H A Jalil, Assistant Director of Fisheries, Bangladesh, who acquainted himself with the outcome of the tour.

The tour began with a talk on setbag net fishery by Mr. Raje of the Central Institute of Fisheries Education (CIFE), Versova. Later the participants made a thorough study of a typical Maharashtra setbag net (known as a dole net)—the types and sizes of twine, the sizes of mesh, the nature of rigging. The visiting fishermen then joined their Bombay counterparts in daily fishing trips off Versova, and later switched to Bassein, where they took part in a three-day fishing trip. The Bombay tour climaxed with trips to the CIFE, the Bombay fishing harbour, the Taraporewala aquarium and fish processing and preservation centres.

Soon after, the fishermen met Pajot in Madras to review the tour and its meaning for Bangladesh fisheries. A consensus emerged as follows:

- The study tour was most useful, being fully practical.
- The Versova nets are very effective in capturing quality fish. Their rigging enables quick and easy operation. Nets can be set at the desired depth.
- Ideal fishing materials do not exist; the "best" material is often what is inexpensive and locally available—not what is technically excellent. Price is

all-important for setbag net fishery where nets account for a major portion of the investment of fishing equipment. Hence polyethylene twine in the form of twisted wire is technically and economically advantageous when compared with other netting yarn such as nylon multifilament. The relative cheapness of polyethylene is the main reason for its widespread use for setbag nets in Maharashtra.

- The setbag net is a stationary fishing gear. Since it stands for a long time immediately under or partly above the water surface, the colour of the twine should resist the effect of sun's rays. Blue isn't the best colour for such gear.

- Yarn sizes ranging from 1.00 to 1.50 are appropriate for the construction of setbag nets. The use of thinner yarn will substantially reduce the initial cost of the fishing gear.
 - Polyethylene netting material absorbs less sediment than nylon material does from turbid sea water and is therefore easier to clean.
 - Local availability of twine is a big advantage—it reduces the expense and hassles of import. Polyethylene twine can be manufactured locally—processing techniques involved are simple and inexpensive.
 - Because of low specific gravity, PE monofilament tends to float. Its
- (Continued page 21)

Bangladesh fishermen meet with their counterparts in Bombay.



THREE MILLION TONNES OF FISH PER ANNUM BY 1985

Bangladesh's Second Five Year Plan envisages an ambitious increase in fish production—from 650,000 tonne to three million tonne. The jump in inland fisheries is from 550,000 to 2.6 million tonne, and in marine fisheries from 100,000 to 400,000 tonne. To implement this ambitious plan, an aggressive programme has been formulated.

* *marine fisheries* the government plans to acquire and license more trawlers, and distribute mechanized boats to small fisherman. At present there are about 20 trawlers and 1,400 motorized boats in Bangladesh. By 1985 the trawler force and the fleet of motorized boats will expand manyfold.

To stimulate the *small sector*, the BFDC is distributing mechanized boats, marine diesel engines, floats and nylon twine to fishermen.

Under another scheme for the fishermen, a solo-economic survey conducted at places where the BFDC has workshops and landing centres identified the very poor fishermen; they have been encouraged to buy boats with bank loans.

- An integrated marine fisheries development programme will be undertaken. It will cover all aspects of fisheries, ranging from exploration to processing.

- A band of the coastal sector will be reserved exclusively for small-scale fisheries operations—either with small motorised boats or with sail boats.

- A fish harbour and jetties with ancillary facilities such as fish markets, ice plants and navigational aids are planned to be set up at important points along the coast.

In *inland fisheries* the main goals are to raise production to 2.6 million tonne, push exports of fish fourfold, create 0.3 million additional jobs and vastly expand the practice of fish farming and aquaculture.

"Culturable" water areas include 1.5 million acres of mangrove and tidal flats, 1.8 million ponds, 40,000 acres of

oxbow lakes and 7 million acres of paddy field that get inundated in the monsoon. "The total area of water with excellent fishery potential is very great," says Dr. Aftabuzzaman, Minister of State for Fisheries.

Culture Fisheries: Highlights

Some highlights in the area of "culture" fisheries, according to Dr. Aftabuzzaman in recent article:

All ponds, tanks and baors will be brought under intensive fish culture. 34 per cent of the ponds are totally derelict today; commercial banks will aid private enterprise in excavating and desilting them to culture carp.

—Plans have been chalked out to produce 2,000 million fish fry and fingerlings by 1984 to stock the ponds and tanks. The government has banned fishing in some breeding grounds; it is also modernising fish seed farms and setting up a few large hatcheries.

* *major brackishwater aquaculture* projects are being taken up in Khulna and in the Chakoria-Sunderbans areas which have plenty of mangrove vegetation, ideal for shrimp. The government is leasing out land to private parties so that they can erect dykes to trap post-larvae and juvenile shrimp and rear them.

In the area of *resource surveys* the most important step has been the acquisition of a modern research vessel, *Anusandhani*. It is to explore and research the territorial waters of Bangladesh.

External Assistance: Marine Sector

Several multilateral, bilateral, and government agencies are assisting fisheries development in Bangladesh. The list below is indicative, not exhaustive.

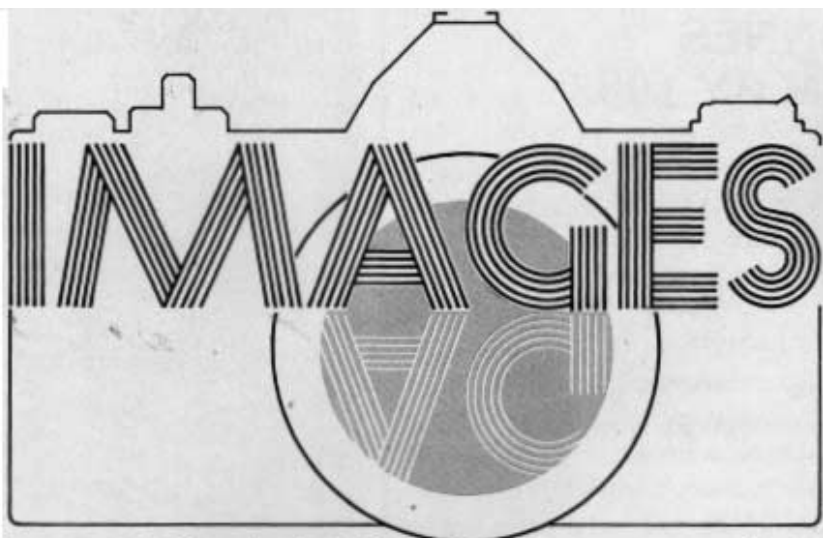
- ADB, IDA and DANIDA are helping finance the fisheries component of the Integrated Rural Development Project.
- A FAO/UNDP project assists the Bangladesh government in coordi-



Modern research vessel Anusandhani, a grant to Bangladesh from Japan, surveys the territorial waters.

nating the activities of agencies concerned with fisheries and in formulating fishery development policies and programmes.

- A FAO/UNDP project assists the Bangladesh government in establishing a system for survey of fishery resources.
- The FAO/SIDA Bay of Bengal Programme assists small-scale fisheries by developing and demonstrating new technologies and techniques in the areas of craft, gear, aquaculture and women's participation.
- DANIDA finances the building and mechanization of boats through a project based in Chittagong. Boats built here are distributed to fishermen by the Bangladesh Fisheries Development Corporation under various incentive schemes.
- DANIDA is also helping to establish landing centres for fishing boats, with facilities for ice-plants and cold storage at Pathargata and Khepupara in the district of Patuakhali.
- *Anusandhani*, an exploratory fishing and research vessel, is a grant from Japan.
- Japan has also supplied 560 marine diesel engines and fishing gear to Bangladesh for distribution to fishermen under subsidies.



Images of Bangladesh fisheries—its many moods, faces and facets—caught by a probing and perceptive camera.



1. A smallfisherman in Chittagong.
2. Fish basket being camed from boat to landing centre.
3. A turtle fisherman in Dacca (picture by Cedric Day, FAQ Rome photo library.)
4. Carpenter at wor*. Boathuilding yard operated with DANIDA assistance in Chittagong.





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5. *Busy at twilight, two Chittagong fishermen mend nets.*
6. *A senior citizen (mother of active fisherman) from Kalidaha fishing community near Chittagong.*
7. *Preserved fish journeying from landing centre to market in Chittagong.*
8. *Dehydrated fish from Bangladesh that will be exported to Hong Kong.*

Photographs: Harry Miller

Aquaculture Project in Thailand

(continued from page 3)

pressing being the supply of drinking water.

Mr. Akradet Artachinda, engineering consultant, described the project's work on setting up freshwater facilities. He said that many problems were encountered in the construction of a large water tank in Bang Pat. Transporting the materials by small local boats was very difficult, particularly during the south-west monsoon season. Though originally conceived as a self-help project, with voluntary labour provided by a number of villagers, the tank had to be completed by hiring four labourers. It was suggested that a small charge be levied on the users of water from the Ko Khiam storage tank to offset future costs.

Plans to construct small family-sized solar stills for fresh water were described. Inexpensive to build, these stills can be easily operated by a family to meet its needs of drinking water. The project plans to train local teachers and students on constructing and operating the stills.

Some suggestions on the women's component: (a) Shellcraft should be included in the women's component since it is already an industry in Phuket and technology can be easily imported. (b) The handicrafts produced in the Phang Nga area are aimed primarily at tourists. More effort should be expended on handicrafts for the local market.

In response to a query on how the project could cover more villages, Mr. Kachornasak said that each village

must be considered' on its own merits. All villages do not necessarily have the same problems and the same conditions for practising aquafarming. An effective extension service would be the best way to spread these techniques to other villages. It was revealed that Thailand's department of fisheries plans to establish a marine extension service through a UNDP-supported project expected to start this year. The project should conduct, when appropriate, studies on the economic viability of each major aquafarming activity. On the basis of these studies it should formulate proposals for bank loans or other credit programmes.

Interviewed on her return from Phang Nga, Mrs. Freda Chandrasekharan, Assistant Director of Fisheries, Tamil Nadu, described the consultation as very useful. She and other participants met and spoke with fishermen in the project's villages and acquainted themselves with the project's three components. "It is too early to assess the impact of these activities on the living standards in Phang Nga, but it is evident that they are well received by the fisherfolk.

"I was particularly impressed by the Phang Nga project's work on increasing women's participation in development. The integrated approach of the project to the development of the fishing community, with active participation by the fisherfolk, is an excellent one."

Mussel soat is being transported to Ban-Mak Noi island for culture.



A Bangladesh fisherman goes out fishing with dol nets off Bassein, a Bombay fisherman by his side.

Bangladesh Fishermen Study Bombay Nets

(Continued from page 16)

buoyancy may allow reduced flotation and *vice versa*, requiring more ballast in fishing depth adjustment.

- The use of large-mesh netting in the construction of the front part of the setbag net is appropriate. It reduces cost and resistance to the flow of current, thereby easing gear handling.

On the basis of these observations, participants agreed that:

- BOBP should pursue the introduction of polyethylene in Bangladesh setbag net fishery through practical demonstrations to traditional fishermen.
- The rigging and operation of the orthodox setbag nets ought to be improved.
- Comparative fishing trials of orthodox Bangladesh setbag nets and Maharashtra type nets should be conducted during the next fishing season in Bangladesh.
- The volume of setbag net fishery in Bangladesh should be determined and the yearly demand for polyethylene yarn estimated.

Interviewed on his impressions of the Bombay tour, Noor Ahmed Saudagar, 40, of Moiscal, said he was quite impressed with dole fishery off Versova and Bassein. It was relatively cheap, the shooting technique was easier, the fishing operation more comfortable than in Bangladesh.

FISHERIES RESOURCES IN THE BAY OF BENGAL

What do we know about them ?

by B.T. Antony Raja

The Bay of Bengal including the Malacca straits occupies an area of about 2.8 million square kilometres. The shelf area is about 19% of its total surface area. Fishing activity is very much within this area: average production here is about 1.5 million tonne, the record being 1.7 million tonne.

Let's compare production figures for different ocean regions. According to a rough estimate, the production is about 4 tonne per square kilometre of the shelf area in the Atlantic region, about three tonne in the Pacific and slightly over one tonne in the Indian Ocean.

Production from the Bay of Bengal shelf region—3.2 tonne per square kilometre—is reasonably good, considering the low output from the Indian Ocean area and the fact that the most productive Bay of Bengal areas are yet to be exploited optimally.

Of the average annual production of 1.52 million tonne from the Bay of Bengal, the country-wise figures are 91,000 tonne in Bangladesh, 128,000 tonne in Sri Lanka, 246,000 tonne in Thailand, 308,000 tonne in Malaysia, 361,000 tonne in Burma and 387,000 tonne in India. About 60% of the shelf area is currently under exploitation and the average yield from the exploited area is about 4 tonne per square kilometre. Higher than this rate is obtained from Sri Lanka, Thailand, Malaysia and lower than this from Bangladesh and Burma; India's figures represent the average. On the other hand, the rate of tertiary production per unit area is highest off Bangladesh waters; slightly more than half of this rate is obtained towards its west and about one-third on its eastern side.

On the western seaboard of the Bay of Bengal, the yield per kilometre of coastline increases from south to north, but on the eastern side it increases from north to south. On the other hand, a different picture is obtained as far as the returns per square kilometre of exploited area are concerned; it decreases from south to north for the western Bay of Bengal countries but increases from north to south on the opposite side. The highly rewarded fishermen are those in Thailand, each of whom harvests about 22 tonne per year; the returns for their counterparts in the other countries are very low, between two and six tonne.

Annual Fish Production

The average annual fish production on the western side of the Bay of Bengal is about 129 tonne per kilometre of coastline, 4.2 tonne per square kilometre of exploited area and 1.7 tonne per active fisherman. On the eastern side, the respective figures are 206 tonne, 4.6 tonne and 6.1 tonne. It is felt that the fish production on the western side of the Bay of Bengal can be considerably increased. The most significant increase may have to come from India and Bangladesh; the quantum of increase may be a little less from the other two countries, Sri Lanka and Burma. The situation in Malaysia is one of almost maximum exploitation; and in Thailand some marginal additional yield can be had mostly from coastal tunas, squids and cuttle fishes. In so far as small-scale fisheries are concerned, the prospects are by far most promising in Burma followed by India, Bangladesh and Sri Lanka.

There is a general similarity in the identity of important exploited stocks in the Bay of Bengal waters, both in the

pelagic and demersal groups. Among pelagic resources, the clupeoids, scrobroids and carangids are the dominant groups in all countries. The demersal resources are more varied than the pelagic. The sharks and rays, snappers, groupers, croakers and prawns and to some extent catfishes are important in all the countries. The importance of other groups such as leiognathids, pomfrets, threadfin breams, grunts and threadfins is confined to certain sub-regional pockets.

Barring certain exceptions, it appears that interest in stock assessment studies is low in the Bay of Bengal region. Reasons? Lack of data, lack of expertise, doubts about the usefulness of such studies, doubts about the enforceability of solutions arising from such studies, etc. Subject, of course, to national priorities, this situation has to change. The national governments ought to have before them a number of options before evolving a national policy for small-scale fisheries development. Scientists have got to be inducted for stock assessment studies: they have a vital and dynamic role to play in helping the national governments to identify the different options.

It is also seen that stock assessment studies in the region employing statistical models are limited to the application of logistic models. No attempt has been made to employ the analytical model in order to obtain long-term estimates, mainly because of the incompleteness of biological studies.

In multi-species fisheries, such as those obtained in the Bay of Bengal region, the problems are many, requiring multi-disciplinary approaches. The basic requirement is the collection of good,

accurate data of the right kind in as comprehensive a manner as possible.

In order to understand the biological interactions in the multispecies system, studies could be initiated of the historical records of the fisheries in relation to the oceanographic properties of the environment and the biology of important constituents of commercial catches. There are at least two areas in the region—Gulf of Mannar and the Wadge Bank—where a fund of data is available from different methods of resources evaluation. A critical comparative study of all the information/data, keeping in view the present exploited situation, species composition of the catches, the trophic levels they belong to and the changes, if any, in the composition of present day catches as compared to those of earlier years, would certainly be a very rewarding exercise. This study could possibly indicate to what extent

the stock estimates obtained by various methods are reasonable and whether any rough conversion factor could be employed to make these estimates mutually comparable.

It is interesting to note from records of tertiary production that the conventional estimation—that one-third to one-half of tertiary production can be considered as potential yield—does not hold good in some areas. In these areas, the estimated maximum sustainable yield of the stocks based on catch and effort data is nearly 100% of the tertiary production or even more.

A rough estimate of the potential sustainable yield in the shelf waters in the Bay of Bengal countries indicates a figure of about 275,000 tonne for Sri Lanka, 319,000 tonne for Malaysia, 325,000 tonne for Bangladesh, 825,000 tonne for Burma and one million tonne for India, an addition of

about one million tonne over the past best figures for the region. These estimates would certainly include stocks which would not provide economic returns in the context of present market trends and the present knowledge of harvesting technology. The total fish population may also contain certain stocks the removal of which may upset the ecological balance and affect the economic yields of other exploited stocks. There may also be surplus stocks of the exploited species in the total potential yield, the increased harvesting of which may pose problems for the traditional sector.

Careful consideration of these factors is essential before any steps are taken to introduce new methods to augment production. Once new methods are introduced it will be necessary to carefully monitor development.

PROFILE

B.T. ANTONY RAJA



By common consent, the 1980 consultation in Chittagong on stock assessment in small-scale fisheries was a very useful exercise.

The BOBP's consultant for the project was B.T. Antony Raja, deputy commissioner for fisheries, Government of India. Dr. Raja spent about two weeks at BOBP before the consultation, editing papers prepared in advance by member countries. He also prepared a short summary paper on stock assessment in the region, and compiled a list of annotations—points to be considered by participants at the various sessions. The annotations proved to be a great help in focussing the discussion at the consultation.

Soon after the BOBP team returned to Madras after the consultation, Dr. Raja

got to work on the report of the consultation. His approach, decided in consultation with BOBP, was to prepare subject summaries on various aspects of fish stock assessment. The summaries were based on the views of participants, papers submitted to the consultation, and other published data. The result: two useful papers.

Commenting on the Chittagong consultation, Dr. Raja says "It gave me practical insights into organizational set-ups, methodologies adopted and the nature of studies undertaken on stock assessment. The consultation also helped better understanding of problems—both in studying stock assessment and in managing stocks."

"The participants were sometimes forthright, sometimes hesitant. They were forthright when they were confident that their data collection system was adequate. They were hesitant when they believed that the system was imperfect. It took a great deal of probing to elicit the required information."

The status of stock assessment in the region varies from inadequacy to near adequacy—with some shades in between, Dr. Raja says. The level of exploitation of the stocks also varies correspondingly—low to near optimum, and even over-exploitation. On the one hand there is a lot of understanding on the need for stock assessment; on the

other, a sense of alarm, arising from a feeling of helplessness about the inevitability of over-exploitation.

Dr. Raja says the task ahead is gigantic: to understand the Bay of Bengal region's multi-species fishery in the tropical eco-system in its totality. Countries which have yet to begin exploiting their resources have time in their favour. They should avoid the mistakes of other countries which did not institute management measures in time.

Born in Kuala Lumpur, Dr. Antony Raja took a master's degree in zoology from Madras University.

For his first major job with the CMFRI (Central Marine Fisheries Research Institute), Dr. Raja helped collect field data on the marine fish landings of Tirunelveli coast. During the next 4-6 years, he worked on solving biological problems of sardines. He has contributed a number of papers on the Indian oil sardine, some of which helped to resolve conflicting views on the growth and reproduction of oil sardines.

For his doctorate, Dr. Raja worked at the University of Tokyo on the biometry and systematics of Indo-Pacific sardines.

In 1974 Dr. Raja joined the Ministry of Agriculture. He is currently Deputy Commissioner (Fisheries Development), and helps to frame and implement programmes to develop the deep-sea fishing industry.

MYTHS ABOUT SMALL-SCALE FISHERMEN

by John Kurien



Small-scale fishermen are ignorant, unscientific, conservative, pessimistic and slow to learn.

This is one of those myths that pass into folklore as a result of value judgements made by armchair observers. There is as much truth in these assumptions as there was in the belief rampant in Kerala, India, during the 19th century, that European men wore pants and never sat on the floor because they had tails!

How do myths arise? When the perspectives and “world views” of the observer and his subject are totally different. Myths are quick to spread and intensify when they promote the interests of the stronger groups in society. So also the myths about small-scale fishermen. They are created and propagated by all except the fishermen themselves.

Traditional small-scale fishermen of South-East Asian countries represent these working masses of this region who are closest to Nature. Nature, in the form of a mighty, moody, capricious ocean—now rough, now calm; sometimes bountiful, sometimes barren—conditions their psyche and influences their whole “world view”. Their hot temper, which flares up and cools down in a trice; their overt generosity and carefreeness; their nomadic instinct; their disregard for the morrow and their proneness to superstition—all these underscore their closeness to and intimate dependence on Nature. It is this nexus between man and nature that governs the evolution of their techniques of fishing, their comprehensive and intricate grasp of the totality of their eco-system.

Big words? Let me cite a few examples that prove my point and blast the many myths about the lowly fishermen.

• Poonthura is a small, densely populated fishing village in the south-western state of Kerala, India. Shark fishing is a speciality of some of the catamaran fishermen there. During the calm season (November-March) they set out for the fishing grounds so as to reach it before dusk. On reaching the appropriate depth—between 30 to 40 fathoms—they take in multidimensional sights of landmarks and of emerging stars, drop a long heavily weighted bottom set gillnet without any markers or buoys and return ashore. After two or three days—a period that varies depending on the current and the shark catches made by other groups—they go back to the exact spot, drop a line with a hook attachment and fish out their own net, with sharks and rays entangled in it, often in less than half an hour! Such skill defies verbalisation in the form of any theory on the science and practice of fishing.

Small-scale fishermen “unscientific?”

• For hook fishing, small-scale fishermen rely largely on the availability of live bait—worms, small fish or crustacea. Over the years, bait has become a scarce commodity and hence costly too. Necessity leads to innovation—no international expert is around. The community’s traditional R & D—the wealth of knowledge arising from their assimilation of the nuances of their eco-system—is put to work. Result: a minor technological revolution: the use of the twinkling weft yam of nylon on their aluminium

hooks. The fish are fooled and now the use of minium is widespread.

Smallscale fishermen “uninnovative?”
“Slow to learn?”

• The capitalist ethic glorifies the conquest of Nature by man. Small-scale fishermen glorify and worship Nature as Mother, “Mother Sea” or Kadamma is the provider. Her gifts you reap; her anger you accept; her barrenness you never reproach. This relationship with Nature is manifest in their technology—low productivity fishing gear, minimum damage to the ecology. As pointed out earlier, it is equally apparent in their psyche.

I remember a memorable expression of this faith in the ocean. One evening, squatting back to the sea on a palm-fringed beach, I was trying to impress a group of fishermen about the need to save for the uncertain tomorrow. They listened carefully, but when I stopped one of them pointed over my shoulder to the sea and queried: “You mean that will dry up tomorrow?”

Small-scale fishermen “pessimistic?”

No, friends. Rather than indulge in rash and superior generalisations about small-scale fishermen, let us understand them, respect their knowledge, and probe their motivations. The reality and the myth are worlds apart.

John Kurien has worked for several years with small-scale fishermen in Kerala. He is a researcher at the Centre for Development Studies, Trivandrum.
