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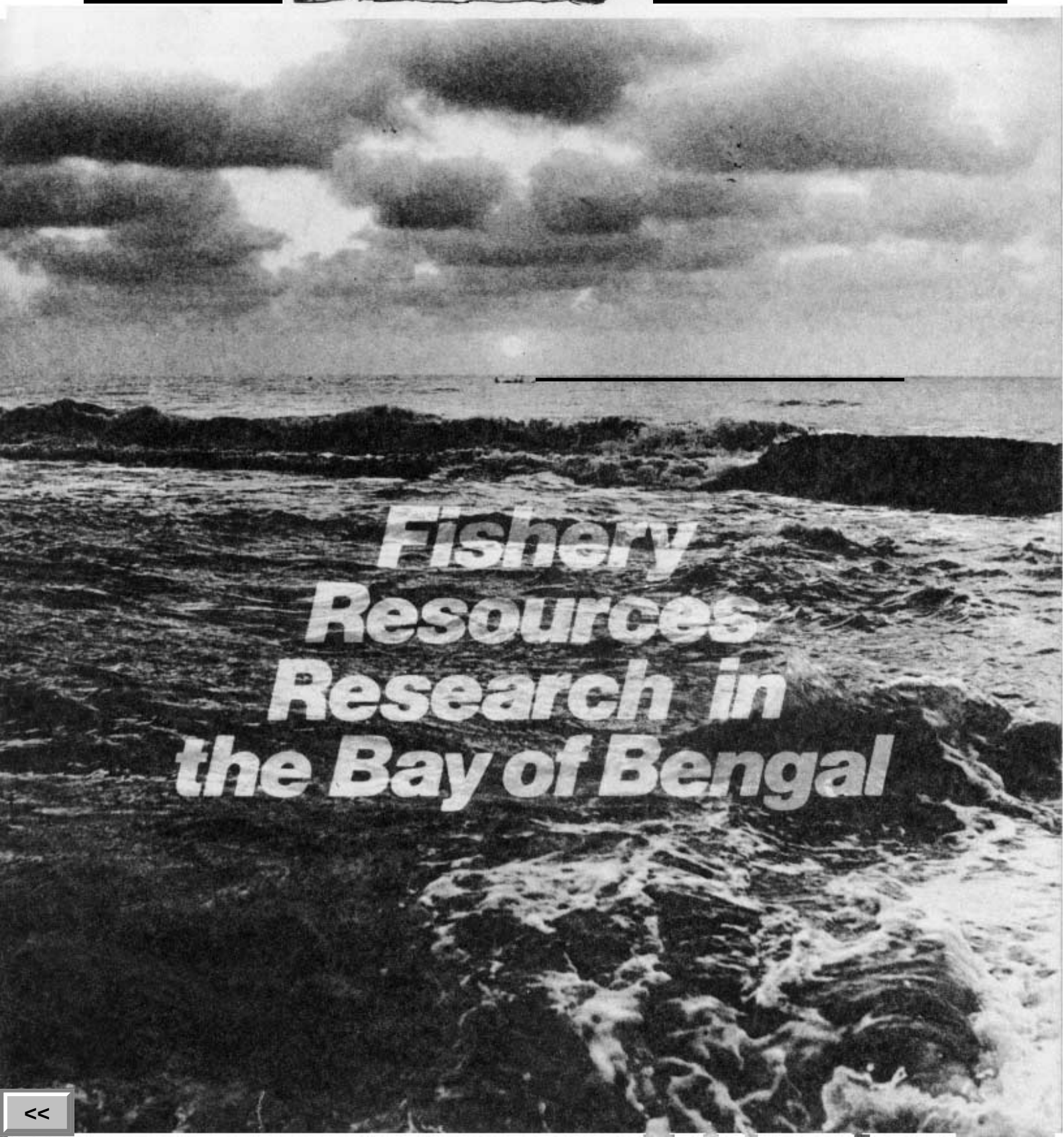

Fishery Resources Research in the Bay of Bengal

Fishery Resources Research in the Bay of Bengal

by Siebren C. Venema

Research on fishery resources is critical for planned development. The author identifies nine key areas for fishery resource research in the Bay of Bengal region, spells out the current status in each, and outlines possibilities for future action and development. Later issues of Bay of Bengal News *will present data in tabular form, country by country, on existing research facilities, statistical systems and resource surveys.*

The BOBP's project "Marine fishery resources management in the Bay of Bengal" aims at improving the practice of fishery resources assessment among member countries; exchange of data; and standardised approaches for collective analyses and interpretation of results by scientists of member-countries.

This paper, prepared for the project, attempts to outline key areas for development, summarise recent trends in these areas and suggest corrective action.

1 Key Areas for Fishery Resources Research

Research on marine resources involves a variety of activities including

1. Description (inventory) of existing fisheries
2. Resources surveys
3. Fishery statistics
4. Sampling of commercially rmportant species
5. Environmental studies
6. Fishing gear studies and developlopment
7. Stock assessment along with management and development advice.
8. Detailed biological studies, experiments, etc.
9. Economic analyses.

These key areas, whose relative importance may vary depending on the development of the fisheries, are not always covered by a single institute. In particular, 3, 5, 6, 8 and 9 are often covered by specialized laboratories or institutions.

In fishery biology, including stock assessment, scientific methods are used to obtain inputs for commercial purposes. The scientists work for the fisheries, but reciprocally fisheries should also work for the scientists in order to provide them with correct inputs for research. Where information

and data are lacking, developers and managers have to follow their intuition, which in some cases may not lead to the right approach. In particular, marine fisheries suffer from overly optimistic expectations, based on extrapolation of near - shore conditions to large offshore areas and on the lack of economic evaluations. No forester would extrapolate forest densities over a large area without forests, since he can easily see what he is doing. Yet this is what happens in fisheries, because the resources situation cannot easily be observed, certainly not by a casual visitor.

Fisheries science is based on sampling the resources and the environment with many different methods. Several mathematical and statistical techniques have been developed over the years to enable a correct interpretation of the data, in order to assess what happens in the depths of the sea. Although scientists cannot actually see the resources, they can try to understand what takes place by a direct confrontation with catches at sea, by studying bottom samples and by watching echo sounders. This, combined with a thorough analysis of data provided by a commercial fishery, will give the scientists an idea of the resources situation.

1.1 *Key 4 area 1: Description of existing fisheries.* The people who know the situation at sea best are the fishermen, and except in cases where no fisheries exist, information obtained from them forms one of the principal key areas for fisheries research. The fisheries in the Bay of Bengal area are little known. Whatever information exists on fishermen, their gear, vessels, fishing grounds, seasonality of fishing, species caught, etc., remains in *partial reports or has not been assembled.* It will be a gigantic, but necessary, task to collect, compile and publish this information. Once done it will prove to be an invaluable tool for management and development.

1.2 *Key Area 2: Resources surveys.* There are many kinds of resources surveys, e.g., surveys aimed at obtaining an estimate of the standing stocks, experimental fishing or monitoring surveys. In the Bay of Bengal, the overall survey activity has been very low, with the exception of Thailand, where regular monitoring surveys on demersal fish resources were introduced many years ago. Elsewhere surveys intensity has been very restricted or only recently improved, e.g., with the R/V DR. FRIDTJOF NANSEN. The east coast of India, for example, has never been surveyed seasonally by acoustic methods, and despite the presence of a large fleet of survey vessels, bottom trawl surveys have been restricted. Similarly the central part of the Bay of Bengal (Andaman and Nicobar islands and north Sumatra) has received very little attention.

(Continued on page 4)

A Letter from the Publisher

ANATOMY OF A SUCCESS — BOBP'S AQUACULTURE PROJECT IN THAILAND

Seabass — *Plakapong* in Thai, *Bekti* in Bengali, *Lates Calcarifer* in Latin — is one of the most popular fishes in the Bay of Bengal region. Seabass and grouper are today being reared in scores of cages in small remote villages along the west coast of Thailand, following a BOBP demonstration project in Phang Nga. (See Bay *of* Bengal News, December 1982 and September 1983). Production has reached about 500 tonne per year at a farm gate value of US $2 million. In terms of visible impact it is BOBP's most successful project.

Our role — to test a new technology and demonstrate it — has been amply performed, and

BOBP's support to this project is now being terminated. The final report of the work, including an assessment of the impact it has generated, is under preparation and might be featured in a later issue of *Bay of Bengal News.*

Meanwhile, let us look at why this project succeeded so well. Technology-related factors are :

— *Price* of *fish* : there is a high and steady demand for seabass and grouper (mainly from Malaysia), generating a high price (US $ 4 per kg)

— Availability *of* fingerlings from hatcheries (seabass) and from the wild (grouper) caught by traps.

— Availability *of cheap feed* (US $ 0.2 per kg), consisting of trash fish from trawlers and push netters.

— *Protected space* to locate the cages near the village houses.

— *Low investment costs*

— *A technology suitable* as a supplementary occupation for families of fisherfolk.

Other factors crucial for the project's success include :

— Participatory approach : Continuous close cooperation over long periods between the target groups and the scientists and extension staff — at culture sites, in the laboratories, on study tours.

— Demonstration of the technology for adequate duration (several years).

— *Long-term* engagement of a competent and dedicated staff.

— Operational flexibility concerning expenditure or administrative arrangements for plan implementation, particularly for trouble-shooting.

It may not be possible to replicate this project everywhere. But most of the lessons learned can in principle be applied wherever new technology has to be introduced — in aquaculture or any other fisheries discipline.

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BAY OF BENGAL NEWS

BAY OF BENGAL NEWS is a quarterly publication of the Bay of Bengal Programme (BOBP).

The BOBP is a regional fisheries programme executed by the Food and Agriculture Organisation of the United Nations (FAO) and funded by the Swedish International Development Authority (SIDA) and the United Nations Development Programme (UNDP). It covers countries bordering the Bay of Bengal.

The BOBP's main aims are to develop, demonstrate and promote appropriate technologies and methodologies to improve the conditions of small-scale fisherfolk, and to assess and monitor fishery resources.

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Fishery resources research in the Bay of Bengal

(Continued from page 2)

1.3 Key Area 3 : Fishery statistics. Accurate fishery statistics are extremely useful, if not essential, to many. The biologist, the economist and the marketing man need different, but accurate and up-to-date statistics.

The precision and time frame may differ between users. For example, export figures of shrimp should be very detailed for marketing and tax purposes; information on landings of valuable species should be provided without delay for marketing; the stock assessment specialist usually can afford some delay, but he should be able to lay his hands on some basic catch and effort data in combination with overall landings by species of a given stock. This is not easy. It requires a well planned system, a lot of training and large investments In personnel and some in data processing equipment.

The statistical system that was introduced in Indonesia in 1975/76 is probably the only system applied in the area that provides the necessary elements in published form for stock assessment. Definition of gear, species groups, etc , standardization of procedures and an intensive training programme have laid the basis for a very useful system. Of course such a system does not guarantee accuracy, particularly as long as processing is done by hand, involving a lot of transcriptions and additions, nor are the data immediately accessible outside the place of collection. Nevertheless, the Indonesian and the Indian statistics systems can form the basis for a regional approach that will allow the summing up by species, areas and gear, type of important species in the area, in particular those that migrate between EEZs. Several countries in the area have plans to improve their statistics (Bangladesh, Burma). It is hoped that in the future, regional aspects will be taken into account.

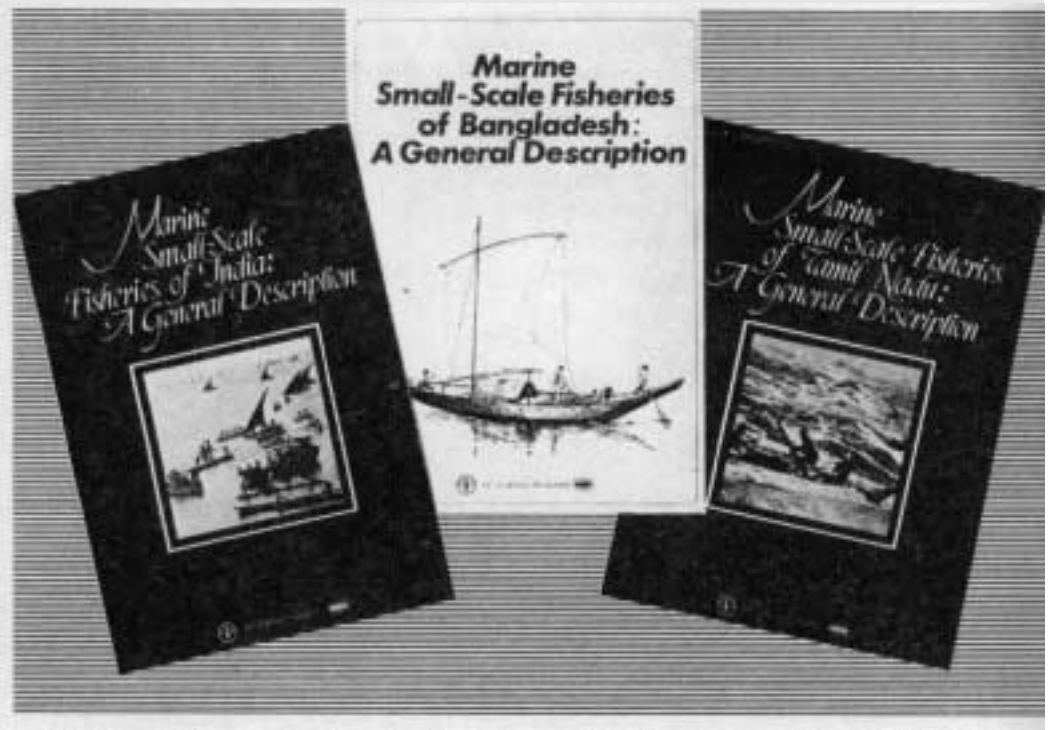
1.4 Key Area 4 : *Sampling of commercially important* species. The best and least expensive way of obtaining large samples from the populations in the sea is to sample the landings of commercial fishermen, in particular catches made with less selective gear, e.g., shrimp trawls, purse seines, beach seines. The complexity of tropical fisheries, in particular the shrimp trawl fishery, and the multitude of gear and landing sites, have discouraged many fishery research institutes from getting engaged in large scale sampling programmes.

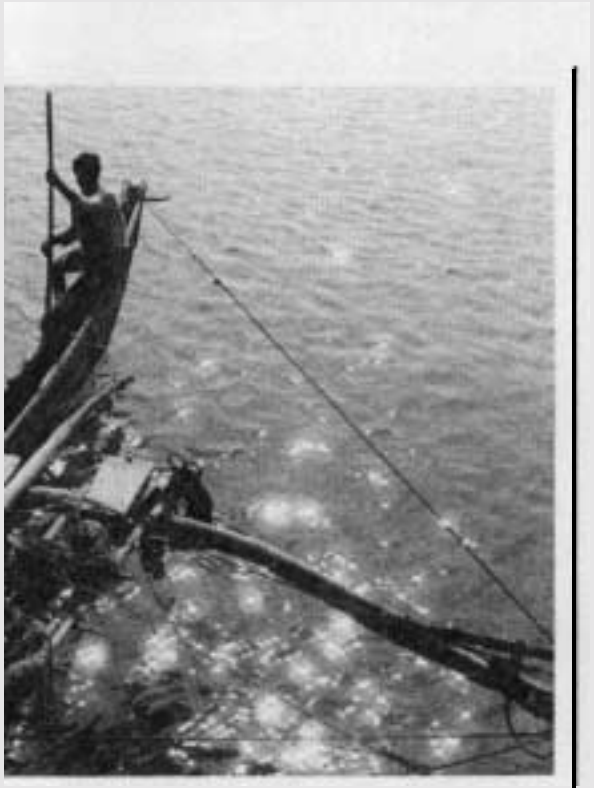
Methods applied in temperate waters for stock assessment based on "year-classes" were not considered useful in the tropics, so why bother and spend a lot of time and money on sampling? However, over the last five to ten years, methods have been developed that allow detailed analyses on the basis of length measurements. New age-reading techniques, counting daily rings in the earbones of fish (totoliths) have also been developed, and both methods have helped better understanding on the length and age structure and, therefore, the growth and mortality, of tropical populations.

Sampling of important commercial species is, therefore, an extremely useful tool for stock assessment also in the tropics, and every effort should be made to set up a coordinated sampling system. Where large samples already exist, efforts should be made to analyse them with the help of the new methods, Elsewhere sampling should be implemented on species selected on the basis of national and regional criteria – e.g., top priority could be given to easily recognizable and valuable species like the white or silver pomfret and to migrating species like Rastrelliger Kanagurta. The selection of priority species is a task for scientists;

on the other hand, the assistance of administrators is needed to provide the means for such programmes and to convince fishermen and fish buyers that sampling is needed and that they should permit it.

1.5 Key Area 5 : *Environmental studies.* Although oceanographic equipment ranks high on the purchase list of most new fisheries institutes, the proper collection and use of environmental data often leaves much to be desired. Knowledge of environmental conditions is extremely important in estuarine areas, such as the northern part of the Bay of Bengal. Species are bound to certain limits of salinity, turbidity and oxygen, and their area of distribution





is, therefore, determined by the environment. Intensive and correct measurement of the environment is of great importance to fishery scientists. However, specialists (oceanographers, etc.) may be needed for the execution of the necessary sampling and analysis. Such cooperation might connect what is often a pure academic oceanographic survey to an applied science.

Above : "Gear research *should* progress hand in hand *with resource studies . . . "* (traditional *craft* and gear *from Sri* Lanka). Below: Publications brought *out by* BOBP which describe *the* current status of marine small-scale *fisheries in* India Tamil Nadu, Andhra Pradesh, Orissa), Bangladesh and Sri Lanka,

Other environmental parameters, for example the depth of the thermocline, can be of direct practical value for the fishermen, in particular for tuna fisheries. The importance of pollution studies for fisheries depends on local conditions.

1.6 Key Area 6 : Fishing *gear* studies and development. The main task of a gear research group is to improve the performance of the local fishermen. However, if a stock is already fully exploited and the fishermen do not have alternative employment, the introduction of improved gear can be counter-productive, especially if costs are increased. Improved methods can exploit stocks different from the traditional gears. For example, the high-opening fish trawls off Tamil Nadu yielded unexpected catches of white pomfret. Gear research should therefore progress hand-in-hand with resource studies. Resource scientists need good contact with gear scientists (or at least practical fishermen) in order to interpret the results of catches taken by research vessels, or the commercial fishery. In either case the results will be highly selective, depending on the type of gear used. Fishing gear studies, selectivity and behaviour studies form part of the terrain of fishery scientists and should not therefore be neglected by research institutes.

1.7 Key Area 7 : *Stock* assessment and management/development *advice.* From the point of view of the administrator or manager and the development organization, stock assessment forms the key to management and investment. Since stock assessment advice is often sought when stocks are declining, it has become almost a synonym for restriction and implementation of laws and regulations. If stock assessment is available at an early stage of fishery development, it may be useful in the adoption of measures that could prevent over-investment. Proper stock assessment based on data provided by the fisheries has been limited in the Bay of Bengal. So far most assessments have been made on the basis of comparison with other areas, overall production figures derived from measurements of primary production, shelf area, etc. Such methods lead to a wide range of estimates, useful for a first approach, but not good enough to determine the limits to be set to development. Despite the weaknesses in the existing statistical and other data, it seems that more could be done with these data to make assessments along traditional lines. Even with limited data, if collected properly, reasonable assessments can be made. There must be a large quantity of data in the Bay of Bengal area that would allow preliminary analyses. One of the reasons that such analyses have not been done is perhaps a lack of understanding and exchange of views between managers and scientists. Should the manager request certain assessments or data sets, the scientists may be able to fulfill the request without special efforts, provided a certain basis of data collection exists. The interaction between scientists and users of their products is discussed below.

1.8 Key *Area* 8 : Detailed biological studies, experiments. *etc.* A profound knowledge of the biology, autecology, behaviour and environmental require ments of commercial and related non-commercial species is of great value to a fisheries biologist. Long term academic type studies are required to obtain this knowledge.

Although the fishery biologist can signal the needs for such in-depth studies, he/she is usually not in a position to carry them out, because of other obligations described above. Therefore, these studies have to be done by full-time research workers, and/or students working in cooperation with fishery biologists. In several countries in the Bay of Bengal area, biologists concentrate more on such academic

studies, so stock assessment 'gets neglected. This is because promotion in rank is often related to the number of academic papers produced. Therefore, production of a number of small papers on, for example, a new species or an abnormality, gets priority over the production of an analysis of commercial fisheries, which may be published anonymously or only as a stencilled report. Yet the latter would be of more importance to the fishery industry as a whole and to managers in particular. There should be a balance between different kinds of research, which will be beneficial to all.

1.9 Key Area 9 : Economic Analysis. An analysis of the economic aspects of a fishery is vitally important for decision-making on investment and management. Data collection comprises costs of operation, prices and investment costs. The fishery scientists may be able to assist the economist in providing data on catch rates, catch composition and operational practices.

BOBP has conducted *several studies with fishing gear, one of the key areas of fishery* resource research in *the* Bay *of* Bengal. Above : *High-opening* bottom trawl trials in Rameswaram, Tarnil Nadu, India.

2. Recent developments and suggestions for action required.

2.1 Key Area 7 : Description *of existing fisheries.*

Recent developments : The Bay of Bengal Programme has updated five "general description" documents – relating to the marine small-scale fisheries'of India (the States of Andhra Pradesh, Orissa and Tamil Nadu), Sri Lanka and Bangladesh.

Action suggested : An outline for detailed descriptions by small areas (e.g. an area covered by a particular statistical unit) should be developed during 1985. The description should include a chart showing the fishing grounds by type of fishery. Also recent fisheries-oriented publications should be researched and pertinent material used in support of the outlines.

2.2 Key Area 2 : Resources surveys. Although not a heavily surveyed area, the amount of survey work undertaken in the past and present has been large enough to generate a wealth of data. Although surveys may be used to identify new resources, the chances of finding such resources are, however, very small if indeed they exist. More important are surveys as a means of resources monitoring independent of data collected from the fisheries.

Recent developments : A systematic bottom-trawl survey was completed in 1983, covering the entire coast of Burma, thus yielding valuable information on the fishery resources on the eastern part of the area. A survey programme has started in Bangladesh, while an acoustic survey with a new research vessel was planned in India for 1985. Monitoring and other surveys are on in Thailand and Malaysia. The Fishery Survey of India, formerly Exploratory Fisheries Project (EFP), has recently changed its area of operation to deeper waters. The surveys executed for many years in the shallow waters by EFP constitute a monitoring survey and the data should be valuable for stock assessment purposes.

Action *suggested* : Ongoing surveys should be carried out regularly in a manner which is statistically acceptable and should include strict guidelines for intensive biological sampling. Efforts should be made to process the large amount of data available, preferably by means of computer programmes that may need to be developed for this purpose, Equipment and expertise for such an exercise is available in the region. Areas not sufficiently covered should be surveyed with suitable gear, including droplines, longlines, gillnets, squid jigging and dipnets.

2.3 Key Area 3 : *fishery* statistics. About 60 per cent of the total landings reported from the area do not have the data at the species or species group level, even in cases where such data have been collected, and of the overall figures those obtained in some countries are less reliable.

Recent developments : Several years of effort will hopefully lead to the publication of a statistical yearbook in Bangladesh towards the end of 1986. Improvements are still needed in the coverage of shrimp farm production and marine artisanal fisheries. A preliminary report for 1984-1985 is in preparation.

Plans to improve the fisheries statistics of Burma are still being discussed, whereas the statistical system in the Maldives has been much improved and India is due for its five-yearly full census of fisheries in 1985. Statistical officers in the northern provinces of Sumatra have received further training through the Bay of Bengal Programme (BOBP).

Good statistics by species and gear, including effort data, are being collected in several countries and it should not be difficult to establish a base for meaningful regional reports. Also in the area, the Indo-Pacific Tuna Development and Management Programme (IPTP) is collecting statistics for tuna.

Action suggested : A regional working group of specialists would be required to prepare a format for regional statistics. Additionally, attempts should be made to retrieve statistical data, in particular of valuable resources such as shrimp, and use these for stock assessment. This may be a tedious process requiring the guidance of experts, in several areas, e.g., Pakistan and Gulf countries, where it has led to useful results.

2.4 Key Area 4 : Sampling of commercially important species. The development of stock assessment techniques based on data obtained from length samples collected on a regular basis, or

from resources surveys, has stimulated activities of fishery biologists in all tropical areas. Much depends however, on the quality of the samples and the selectivity of the fishing gear employed. Where the gear is not very selective (trawl) the opportunity to collect data may be better but the large number of species often discourages scientists.

Recent developments : The working group meeting on mackerels (Rastrelliger and Decapterus sp.) in the Malacca Straits and the training course in computers organised by the BOBP have already produced results, which could be more useful when they can be compared with those obtained on the same species in the area and under different conditions. Exchange of biological information on the same species, .but not necessarily of the same stock, is particularly stimulating for fishery research workers. This may be done through the lengthy process of publishing papers '– with little opportunity of exchange, criticism and learning – or better, through data processing and analysis by a national or international group of specialists working on that species. Such working groups form the backbone of stock assessment in the North Atlantic area and also in FAO regional bodies such as CECAF.

Action suggested : Information on existing sampling programmes, species, etc. should be collected and exchanged. Names of specialists working with the data should be exchanged and working groups could be encouraged. On-the-job training and advice could be provided by experienced staff from FAO or programme activities of organizations such as Southeast Asian Fisheries Development Center (SEAFDEC) or International Center for Living Aquatic Resources Management (ICLARM). Results of this work could then be circulated in a preliminary form.

2.5 Key Area 5 : Environmental *studies.*

Recent developments : Survey data from Burma and Bangladesh have indicated that oxygen may seasonally form a limiting factor for the distribution at greater depths. of demersal species. As a consequence of this, there is often a mixing of all size groups rather than a positive correlation between depth and size. In particular the northern area with its strong flux of fresh water may need intensive study.

Action suggested : The best way of obtaining reliable oceanographic data is to seek the cooperation of specialists in this field and under their guidance, sample such data during resource surveys.

2.6 Key Area 6 : fishing gear studies and developments.

Recent developments : Tests with longljnes, high opening bottom trawls, large and small mesh driftnets and two boat trawling have been carried out as described in various papers by the Bay of Bengal Programme (BOBP).

Action suggested : Although there has been some biological work done in connection with gear introduction, further and continuous work may be needed and sampling programmes may have to be set up. Ekploration for catching cephalopods with unconventional fishing gear should also be tried.

"Improved methods can exploit stocks different from those caught by traditional gears. For example, the high-opening fish trawls off Tamil Nadu yielded unexpected catches of white pomfret."

2.7 Key *Area 7* : Stock assessment and management/development advice. All the work conducted in the key areas mentioned above, should eventually lead to some conclusions about the status of the stocks and subsequent advice about their management or development.

Recent developments : A review of the results of stock assessment work carried out in the Bay of Bengal is presented in BOBP/WP/36 (under print). .

Action suggested : Analysis of good existing data sets might lead fairly quickly to a reasonable assessment. Most useful might be a concentration of research effort on shrimp, the most valuable and therefore the most threatened resource. Assessment of resources that can also be distinguished in the landings, and, for example, stock assessment of Rastrelliger, may be repeated and improved with detailed data becoming available through sampling schemes.

Good interaction between stock assessment specialists, managers and fishermen would be required for effective management of the resources. Organizing workshops may further serve this purpose; the publication of information at a generally understandable level, as in newsletters, would also be a useful approach.

2.8 Key Area 8 : Detailed biological studies, experiments, etc.

Recent developments : No specific development can be mentioned.

Action suggested : A bibliographic compilation of biological work on fish resources would be a useful document for reference and exchange of information. Necessary biological work of a more academic nature should be defined and handed out to universities, for example to students working on fisheries as a study subject.

2.9 Key Area 9 : Economic analyses.

Recent developments : No specific development can be mentioned.

Action *suggested* : Economists should be encouraged to become involved in fisheries research, and to start collecting and analyzing data on particular fisheries.

About the Author :

Mr Siebren C Venema is an expert on fishery *resources on the staff of the FAO* headquarters *in Rome.*

What is the best feed for shrimp under culture?

Several questions concerning the effect of feed on shrimp growth were examined during a recent study at BOBP's pen culture project at Killai in Tamil Nadu, reported on these pages.

The National Swedish Board of Fisheries and the BOBP have jointly studied various possible feed formulations for shrimp at the BOBPs pen culture project in Killai, Tamil Nadu. The Board's Laura E Piriz recently spent four months at Killai studying various potential shrimp feeds.

Shrimps are omnivorous and a feed based predominantly on animal protein is considered the best. for shrimp culture. However, what is the best is not necessarily the cheapest or the most appropriate for a specific location. Since feed constitutes a major item of expenditure at Killai, developing a low-cost but effective diet is desirable. Several questions need to be addressed, however, and answers to these might lead to optimal feed costs. Among these are :

- Can culture be profitable without resort to supplementary feed?
- Can vegetable protein be a substitute when animal protein is not available, e.g., during the rainy season?
- Can locally available plant material, e.g., mangrove leaves, be used to formulate a vegetable feed?
- Can the rate at which animal protein feeds are given to the shrimp be reduced?

Laura Piriz and BOBP professional staff set out to find answers to these questions. They stocked three 0.2 ha shrimp pens, each with 8000 shrimps. During the grow-out phase, shrimp in one pen (Pen 1) were left to fend for themselves, and In the other two pens, the following feed combinations were tried out – one in each pen. In Pen 2, the feed comprised squid offal and/& trksh fish - 60%; rice bran - 25% and tapioca (binder) - 15%. In Pen 3, the composition was groundnut oilcake - 25%; rice bran - 50%; tapioca (binder) - 25%.

Feed preparation at Killai – as seen by Swedish artist Signar *Bengtson*

Table 1

Stocking and harvest data: Pens 1, 2 and 3

	Initial average weight (g)	Final average weight (g)	Weight gain %	Stocked No.	Harvested No.	Survival %
Pen 1 (no feeding)	2.78	5.96	53	8000	971	12
Pen 2 (animal protein)	2.78	9.03	225	8000	3083	39
Pen 3 (vegetable protein)	2.78	7.99	184	8000	2427	30

Table 2

Price of feed used in a vegetable and animal feed mixture of one kg.

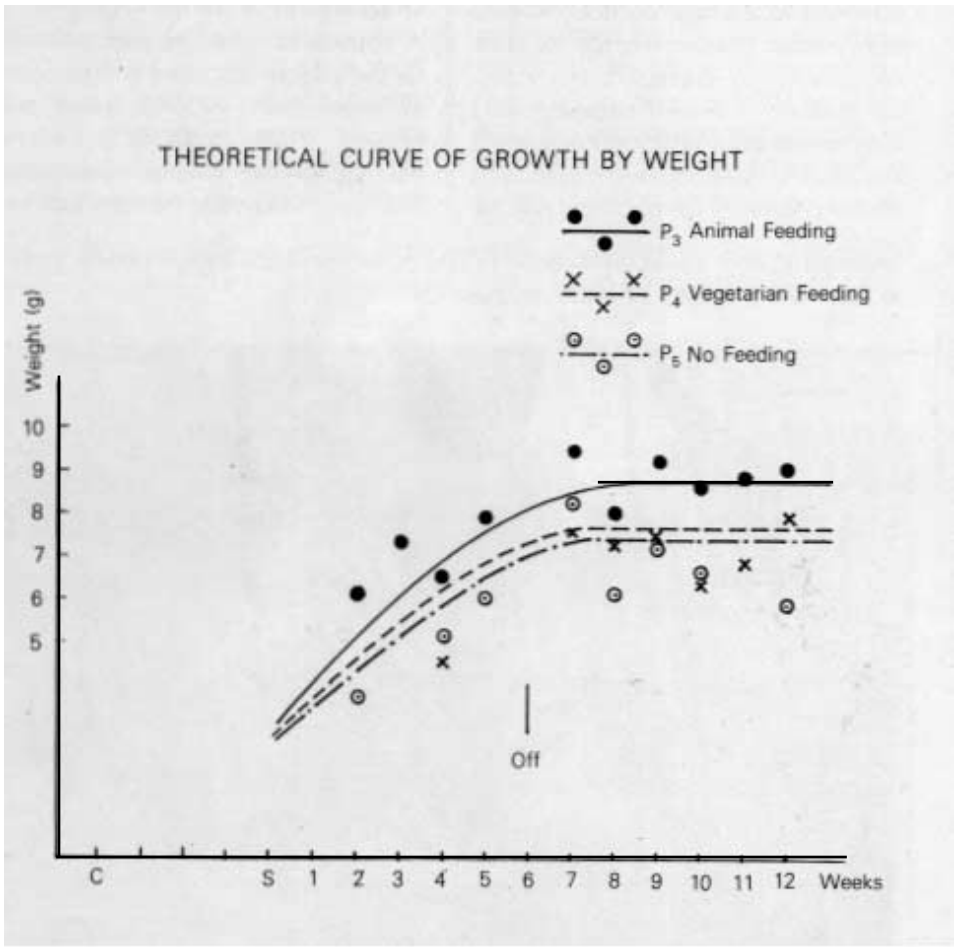
	Animal feed mixture	Vegetable feed mixture
Squid/fish (Rs)	0.6 - 0.9	—
Rice bran	0.14	0.28
Groundnut oil cake	—	0.55
Tapioca	0.29	0.49
Total (Rs/kg)	1.03 - 1.33	1.32

In contrast to earlier experiments, the present experiment was primarily concerned with feed economics, and consequently, good feed components which were expensive were discarded – e.g., *maida* as binder. Also, the feed rate was reduced from an initial 10% of shrimp body weight to 8% and then 6%, each reduction being effected after a 25-day feeding schedule with the quantity preceding it. The shrimp were let to starve every fifth day of each schedule.

The shrimp seemingly adapted to thu schedule satisfactorily. But heavy rains during Deepavali (October-November 1984) led to a sharp drop in water salinity in the pens. This, coupled with the low feed rate, hit the cultured shrimp. The outcome, from a commercial viewpoint, was disappointing. Nonetheless, the results were scientifically valuable.

- As expected, the starving experiment (Pen 1) gave the poorest results, with the shrimp being of a very poor quality and fetching a low price.
- Though the vegetarian feed was more expensive than animal protein-based feed, it was not as effective as the latter.
- Earlier studies with mangrove foliage as feed supplements seemed to have yielded reasonably promising results. But no attempt was made under the project to study the subject, as extensive exploitation of this resource might lead to ecological disturbances. Since the feeds developed in this experiment might be promoted through extension, disturbing the eco-system was a very real danger.
- A 6% feed rate is probably not enough for the shrimp to reach a marketable size in 80 days. This, however, cannot be stated categorically because the precipitous drop in salinity also affected the algrowth of shrimp in the Killai experiments.

During the experiments, efforts were made to manufacture dry feed pellets during periods when the landings of squid and trash fish were high. This proved to be a viable option. The preparation of dry pellets may be farmed out to the Veddar community, which occupies the lowest rung of the socio-economic ladder at Killai.



Assistingfis Andhra BOBPbegi

by Diana

Fellowing its activities for fisherwomen in Lanka, BOSP has taken up work with fish economic study of four fishing villages in proposal to improve the access of fisherworn as their prime need. This article describes

Awareness of the important role women play – not merely in maintaining the family, but also in providing financially for it – is growing everywhere.

Women's participation is quite crucial for the success of many development programmes, a fact ignored by many projects in the past. In fact what's needed is development programmes drawn up specifically for women. Income earned by women is more likely – than that earned by men – to be spent on food and other basic needs. It is higher incomes for women, rather than higher household income per se that will improve the economic status of families.

The BOBP has carried out extension activities for fisherwomen in Tamil Nadu, India, as also in Sri Lanka and Bangladesh. What can be done in Andhra Pradesh? In April 1984, discussions began between BOBP and the Department of Fisheries of that state. BOBP suggested as a first step a study on the living conditions of small-scale fishing communities. This would perhaps lead to recommendations for pilot activities.

It was agreed that the study would be confined to a single district. Officials from three coastal districts – East Godavari, Visakhapatnam and Srikakulam – helped organize field trips, meetings and discussions to select the district. (Meetings were held with district collectors, development officers and officials from the department of women and child welfare).

Cooperation received from all the districts was excellent. Visakhapatnam district was chosen for the study because :

- pilot activities for women here would not clash with or duplicate ongoing programmes for women – which in this district are confined to women from urban areas.
- a number of fishing villages are easy of access, facilitating both the study and any ensuing pilot activities.
- a research institute is available to conduct the study. (INCOR – Institute for Coastal and Offshore Research – showed keen interest.)

The next step was to select particular villages for the study. In close cooperation with fisheries officers from Visakhapatnam, a number of fishing villages were again visited. The following were finally selected :

- Bheemunipatnam (three fishing hamlets here)
- Mangamaripeta (two fishing hamlets here)
- Chokkavanipalem and
- Peda lalaripeta

Organization of the survey

A household schedule was prepared for the villages, discussed with research assistants from INCOR, tested and revised. Next, INCOR organized training for five female investigators who would interview the fisherwomen.

investigators from a local organisation helped *BOBP conduct* a socioeconomic survey in four fishing villages of Visakhapatnam district.

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Tamil Nadu, /ndia, in Bangladesh and in Sri rwomen *in* Andhra Pradesh. After a socio- Visakhapatnam district, BOBP formulated a to bank loans — which they have described the study and the proposal.

On an average, 10 per cent of the households in a village were visited; in smaller villages the percentage was higher, to improve the accuracy of the information.

Some salient facts from the survey : Of the sample population, around 80% depend mainly on fishing for their income; nearly half of these 80% don't have any assets; weekly income is around Rs. 120 but shows great variations. More than three fourths of the households are in debt. In two out of three households women undertake income-earning activities, the majority of them (70%) in fish marketing. Fish marketing is by far the most profitable income earning activity for fisherwomen, yielding them an average of Rs. 40 to 60 per week. (Neither coir-making nor small business provides this kind of return). On an average, marketing is undertaken for 7-10 hours a day and 5-7 days a week. Formerly, women in the fish -trade confined themselves to marketing the family catch. Nowadays the business has become far more monetized : auctioning and group purchases are the main means through which the women obtain their merchandise.

Pilot activities : Possible pilot activities for the women were discussed in detail during group discussions with women held as a part of the survey. Activities suggested varied from improved fish curing to women's involvement in seed collection for aquaculture, to organized fish transport, and institutional credit to increase the women's working capital for fish marketing.

What was the reaction to the proposed activities?

Most women were not much interested in organized fish transport because of the dispersed locations of market places and probably because of fear of an increase in competition. Improved fish curing didn't elicit much interest, as spoilage of fish is only slight, and aqwaculture is not yet important enough in the coastal areas of Andhra Pradesh to stimulate fry/seed collection as a profitable income earning activity for fisherwomen.

However, all women were very eager to obtain bank loans but didn't know how to go about getting them.

Banks and Fisherfolk

Several banks have been involved with credit for fisherfolk. However, they have confined their loans to fishermen — for the purchase of boats/kattumarams/nets.

Only a few banks have experimented with small-scale loans to fisherwomen to step up fish marketing or set up petty shops. By far the majority of the women have been deprived of any form of institutional credit; they depend on family, friends or moneylenders.

As for repayments of loans by fisherfolk, the experience so far has been that fisherfolk repay loans regularly as long as field staff of the banks visit the

Selling fish gives fisherwomen in Visakhapatnam an average income of Rs. 40 to *Rs. 60* per week. They work five to seven days a week, seven to ten *hours a* day.

villages and collect repayments. Once the banks withdraw their field staff, repayment rates decline sharply. The workload entailed by small-scale loans for small-scale fisherfolk and the decline in repayment rates has discouraged banks from being active in this area.

The BOBP study has thus revealed that the prime interest of fisherwomen is better access to institutional credit. Interestingly enough, earlier BOBP studies in Tamil Nadu and Orissa in India as also in Bangladesh, yielded a similar finding – that fisherwomen there were very interested in better credit facilities. In response to their stated need, BOBP helped organize some pilot credit schemes for them.

* In Chingleput district, Tamil Nadu, "link workers" from half a dozen villages trained by BOBP have helped fisherwomen apply for and secure individual loans.
* In Adirampattinam, Tamil Nadu, group loans have been organized for both fisherwomen and fishermen.
* In Orissa, an extensive credit scheme is in progress under which loans worth Rs. 7.5 million are being disbursed by several banks to 2,000 fisherfolk households.
* In Bangladesh, credit has been made available to groups of fishermen for a variety of activities.

On the basis of previous experiences, the BOBP tried to come forward with a proposal. Its main characteristics :

– It would make bank loans economically feasible by stipulating higher repayment rates than usual and by reducing the banks' workload in disbursing small-scale loans;
– It would help the Fisheries Department aim at a large number of fisherwomen despite a sparse budget and a limited staff;
– And most importantly, the proposal would not only aim at better economic conditions for women by helping them obtain small-scale loans; it would give the fisherwomen full responsibility for making the proposal work. This would increase their self esteem and perhaps their lifestyle as well.

These conditions may seem over-ambitious for a single extension proposal. However, it was found that experiments of the Grameen Bank, Bangladesh with group-based savings

and credit for the poor covered such conditions rather well. The Grameen Bank Project (GBP) was initiated in 1976 by Dr. M. Yunus, Professor of Economics at the Chittagong University, Bangladesh. It aims at extending banking facilities to the poor, men and women, to change the vicious circle of 'low income, low savings, low investment, low income' into an expanding system of 'low income, credit, investment, more income, more credit, more investment, more income'. Starting with two branches, the GBP has expanded to an independent bank with 157 branches in five districts serving around 130,000 borrowers of whom 60% are women. The formation of small savings and loan groups, of about five persons per group, is crucial to the success of Grameen Bank operations. Bank workers pay field visits to the villages and assist the groups with loan applications and repayments. Formally, every loanee is alone responsible for his or her loan, but intra-group pressures on the loanees have stimulated repayment. Even after 10 years of operation, the Grameen Bank has managed to secure a repayment rate of over 99%. The group loans encourage collective activities such as the purchase of tubewells and rice mills – something beyond the ken of individuals.

A similar project and set-up could be organized in Andhra Pradesh in cooperation with the Department of Fisheries. Extension officers will assist fisherwomen in group formation, loan applications and repayment. Bank officers would have to accompany the extension officers once in a while to explain banking procedures and undertake formal action concerning individual-cum-group loans. Once the loan groups have been established and a certain group 'spirit' has been sparked, the groups can undertake more activities, either to improve incomes or to better social conditions – health care, nutrition, sanitation, housing, education. In all this, the extension officers have a very important role to play – to facilitate and stimulate group activities. In case the activities cover areas other than fisheries, contacts should be established with the government departments concerned.

The proposal

Thus a year after BOBP's entry, a proposal for pilot fisherwomen extension activities in Andhra Pradesh has finally been prepared. After a lot of field work and study, the tangible result is a proposal on paper. What remains to be done to convert concepts and plans to practice?

* The Department of Fisheries should free two extension officers to carry out the proposed activities.
* Banks have to be encouraged to institute new loan procedures by which they can increase their repayment rates and fisherwomen can enlarge their economic base for income-earning activities.
* The fisherwomen showed keen interest in group loans. Some enterprising women were willing to shoulder the responsibility of group leadership. Their willingness to cooperate has to be further stimulated and they have to be helped in the group-forming process.
* The BOBP will continue to assist in executing the proposal. It is ready to fund on-the-job training and transport facilities for extension officers. Workshops can be organized with bank personnel and fisheries officers to explain the Grameen Bank approach and to adapt it locally.

Everyone involved – not the least, the fisherwomen themselves – are eager to see extension activities begin.

Abstracts of BOBP Publications

Abstracted here are BOBP's publications out in recent months.

BOBP/WP/33 : Factors that influence the Role and Status of Fisherwomen : Karuna Anbarasan, Madras, India, April 1985.

This report is based on a year's study of three fishing villages of Chengalpattu district, Tamil Nadu, conducted between February 1983 and January 1984. It profiles the villages and analyses the various factors that influence the role and status of fisherwomen there. It also includes three case studies which describe the lifestyle, the work and the family and social status of three fisherwomen.

BOBP/WP/34 : Pilot Survey of Set Bagnet fishery of Bangladesh, by Abul Kashem and Anwar Ikbal. Madras, India, August, 1985.

This paper describes the conduct and the findings of a pilot survey of the set bagnet fishery of Bangladesh, which is believed to account for at least one third of the total catch from marine small-scale fisheries. The survey was planned by the BOBP's project officer in Bangladesh and executed by the staff of the Marine Fisheries Department, Chittagong, with the department's statistics officer as the team leader. Between January and June 1983, when the survey was conducted, a total of 172 fishermen and bahardars all along the coast and at Dubla Char, Sonar Char and Sonadia Island, were interviewed.

BOBPIWPI35 : *Pen Culture of* Shrimp in *the* Backwaters, of *Killai, Tamil* Nadu : M. Karim and S. Victor Chandra Bose-Madras, India, May 1985.

This paper describes the results of a 21-month experiment on pen culture of shrimp and finfish in the backwaters of Killai in South Arcot district, Tamil Nadu, India. It concludes that shrimp pen culture is technically feasible and that Penaeus indicus is the most promising of culture species. The experiment was carried out in collaboration with the Department of Fisheries, Tamil Nadu.

BOBP/WP/40 : Promotion *of* Bottom Set Longlining in Sri Lanka, by K T Weerasooriya, S S C Pieris and M Fonseka. Madras, India, August 1985.

This document is the third report of bottom set longlining trials conducted by BOBP in cooperation with the Ministry of Fisheries, Sri Lanka. (Earlier reports were published as BOBP/WP/6 and BOBP/WP/16.) It summarizes the results of trials conducted between 1981 and 1983, and also discusses biological information obtained from the trials during the period 1979-82.

The report concludes that bottom longlining might be a viable alternative fishery for Sri Lanka's standard 28-footers and also for 18 ft GRP boats, during the lean season for driftnet fisheries. This conclusion is based on trials conducted in Negombo, 1981/82 and Puduwakattuwa, Dehiwala, Panadura and Ratmalana, 1982/83.

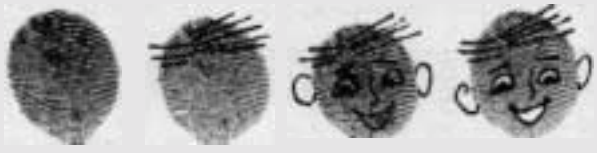
BOBP/MAG/1 : Towards Shared Learning : Non-forma/ Adult Education for Marine Fisherfolk. 'Trainers' Manual. Madras, India, June 1985.

This 172-page volume is part of BOBP's NFAE (non-formal adult 'education) package for the benefit of Tamil Nadu marine fisherfolk. The manual will serve as a practical guide for trainers – the trainers of "animators" (teachers) in NFAE centres of the state's fishing villages. The manual describes the approach, beliefs, and assumptions behind participatory training – which is what NFAE is all about. It details the qualities an animator is expected to possess, the responsibilities he will handle, his attitudes. It includes a 12-day model training programme for animators, with notes and suggestions for the trainers and exercises for the animators.

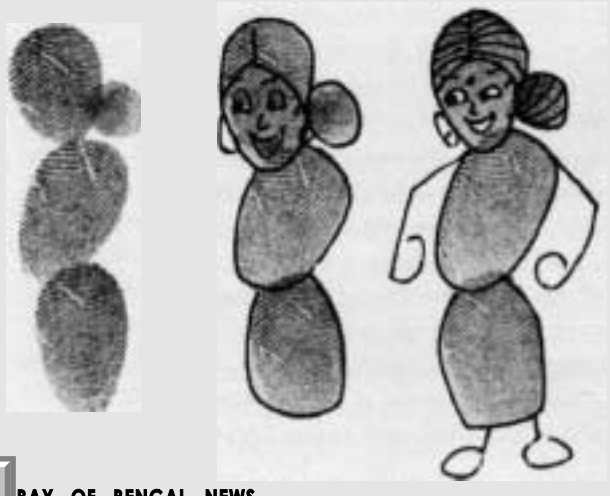
BOBP/MAG/2 : Towards Shared Learning : Non-forma/ Adult Education *for* Marine Fisherfolk. Animators' Guide. Madras, India, June 1985.

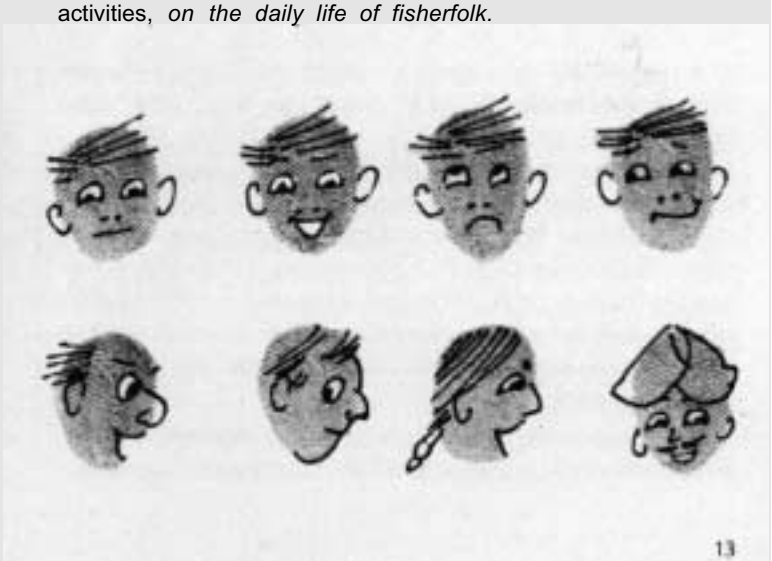
This is another publication in BOBP's NFAE package for marine fisherfolk, for use by animators. The chapter "Guide to make your own sketches" at the end of the book should prove popular with animators and with other readers as well.

The Animator's Guide covers eight major subject areas – community, occupation, health and nutrition, social problems, leadership, income and saving, cooperation and education. In each of these areas, problems relevant to the fisherfolk, who constitute the learners, are highlighted and approaches to analysing them outlined.



The Animators' Guide, part of BOBP's non-forma/ education package, contains a do-it-yourself guide for sketch-making. It illustrates the step-by-step process *for* sketches (left) and contains interesting sketches on facial expressions (below), on fishing activities, *on the daily life of fisherfolk.*





"SMALL-SCALE FISHERFOLK COM

Discussions on for new

The small-scale fisheries project of the Bay of Bengal Programme, funded by SIDA,concludes its second phase in 1986.

During the past year, member-countries of the Bay of Bengal Committee (BOBC) have expressed keen interest in a continuation of BOBP's small-scale fisheries work beyond 1986. The project's eighth Advisory Committee, which met January 1984 in Dhaka, Bangladesh urged early formulation of proposals for a successor project. The subject has since been actively pursued by member-countries with FAO and donor agencies.

– A two-member consultative mission fielded by FAO visited member-countries mid-1984 to consult them about their needs and priorities. A report of the mission was made available to a working group which met in Bangkok, September 4 - 7, 1984. This group discussed and outlined the essential features of a BOBP beyond 1986.

– The working group's report was discussed at the third session of the Bay of Bengal Committee (BOBC) which met in Bangkok late February 1985 and a "plan of operations" or project proposal document was thereafter drafted. The document discusses the Bay of Bengal region as a "natural management area", and salient features of fisheries in countries of the region. It analyses the BOPP's work and the impact achieved by several of its activities; it also mentions the merits of regional and sub-regional cooperation

Pic : E. Amalore

MUNITIES IN THE BAY OF BENGAL" project from 1987

– Potential donors (SIDA, NORADand DANIDA)to a future BOBP discussed the document at a meeting in Gothenburg, Sweden, in July 1985. An appraisal mission from the three agencies is scheduled to meet in Madras in September, then tour member-countries to study and assess the project proposal. It is hoped that donors and member-countries will reach early agreement on the successor project.

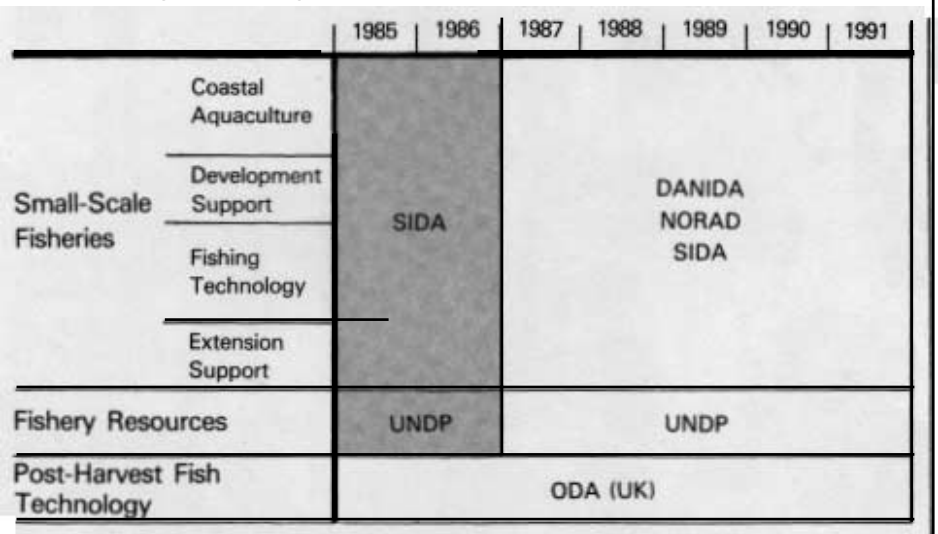
Phe Successor Project

"Small-Scale Fisherfolk Communities in the Bay of Bengal" is the proposed title of the successor to the present SIDA-funded project of BOBP. It will run from 1987 through 1991. Seven member countries – Bangladesh, India, Indonesia, Malavsia, Maldives, Sri Lanka, Thailand – will make yearly contributions to the project to help defray local costs.

The main goal of the new project, like the present one, will be : socio-economic betterment of small-scale fisherfolk. Immediate goals : development and demonstration of methodologies and technologies through pilot activities to investigate problems and opportunities

The project's role will be catalytic and consultative – it will supplement and support national development effort. It will utilize existing national and regional institutions to implement activities: provide-on-the-job training; spur cooperation among participating countries; and act as a clearing house of information through its Information Service.

Proposed Support Programme of the Bay of Bengal Committee, 1987-1991



The project staff will include specialists in aquaculture, fishing technology, naval architecture, extension, sociology, socio-economics and information.

Criteria for pilot activities will be relevance of potential results to objectives; apparent technical economic and social feasibility; time frame for achieving tangible results; regional relevance; and government priorities and support.

Some examples of proposed pilot activities follow:

Coastal aquaculture

The project will tackle major techno-economic problems inhibiting development of coastal aquaculture relating to seed, feed, engineering and disease such as:

- Investigations of wild seed potential and improvement of. collection, handling and transport of seed.
- Demonstration and training in hatchery techniques for shrimps and finfish.
- Experiments and demonstration of alternative nursery practises.
- Identification of suitable feed compositions for different cultures by utilizing locally available resources.
- Determination of suitable configuration and engineering details of ponds for shrimp and fish culture.
- Identification of diseases and methods of treatment.

Fisheries development support

Major areas of work cover preparation of development projects and programmes, including mobilization of funds and provision of planning support for follow-up projects in the wake of successful BOBP pilot activities; analysis of alternative policy options; and in-service training.

The project will undertake pre-feasibility studies; in-depth studies of basic issues (such as possible conflicts between small-scale and industrial fisheries, or employment and income-earning opportunities in fishing communities); design of monitoring and evaluation systems for development schemes; and provision of legal advisory services.

Fishing technology

The project will take up activities relating to small-scale capture fisheries – fishing methods, gear, equipment, aids; design, construction and propulsion of craft; and facilities for their landing and berthing.

Specifically:

- Improvement of existing fishing units through motorization of country craft, diversification of fishing methods (design and rigging) and modification of gears.
- Improvement of fishing methods with emphasis on energy-saving stationary gear such as set bagnets; traps, trammel nets and gillnets, particularly for shrimp; longlines and traps; driftnets, particularly for tuna.
- Development of alternative craft such as beachlanding craft and small-purpose fishing boats with low operational costs and extended range of operation.
- Introduction of low-cost equipment and gear – such as haulers, winches, netting materials and accessories.
- Introduction of energy-saving measures such as fish aggregating devices, sails for propulsion and propulsion systems.

Extension support for betterment of fishing communities

An important strategy in this area is to help improve the access of fisherfolk communities to institutional credit and to social and infrastructure facilities provided by governments. Methodologies will be introduced for the purpose. Training packages – curricula, materials and techniques – will be developed to help train extension personnel at various levels including bank personnel who may deal with fisherfolk; village link workers; the fisherfolk themselves (through non-formal adult education) and also the trainers. Appropriate low-cost training aids will be developed as well.

Extension support will be offered for the introduction of new or improved project technologies in coastal aquaculture, fishing craft, fishing gear and methods.

Another proposed pilot activity is development of a socio-economic information system that will prove valuable for fisheries extension personnel. The system will cover a techno-demographic census, a catch and effort study, a costs and earnings study, a socio-economic/ethnographic study. These will help in the planning, monitoring and evaluation of extension work.

Components of the BOBC

The SIDA-funded small-scale fisheries project is one of the components of the BOBP. Another component is the UNDP-funded project on marine fishery resources management, which also terminates in 1986. A successor to the latter project will carry forward the useful work done so far in developing techniques and training personnel for better resource assessment; and in promoting regional cooperation on joint assessment of stocks.

A project on post-harvest fish technology in the Bay of Bengal region has been sanctioned by the UK's Overseas Development Authority. One hopes that this project too, which will function as an appendix to the BOBP and in cooperation with it, will materialize soon.

The three new projects, when operational, will function under the umbrella of the Indian Ocean Fishery Commission's Bay of Bengal Committee.

BOBP Conducts Shrimp Culture Training Courses in Three Countries

Four training courses in pond culture and pen culture of shrimp within five weeks in three countries — that sums up the BOBP's aquaculture work schedule during June-July.

The courses were held in Polekurru, Andhra Pradesh, from June 17 to 24, and July 22 to 27; in Satkhira, Bangladesh from July 20 to 23; and in Pitipana, Sri Lanka (on pen culture) from July 27 to 29. In all 43 trainees attended the courses.

The BOBP-assisted pond culture projects in Polekurru and Satkhira are now three years old. Ponds have been constructed and culture trials carried out during dry and wet seasons, low and high salinity periods (0-45 ppt), cool and hot months (22-44°C), and low and high mean tide periods — whether or not feed was available from the local market; whether or not prawn seeds were available in creeks, rivers or estuaries.

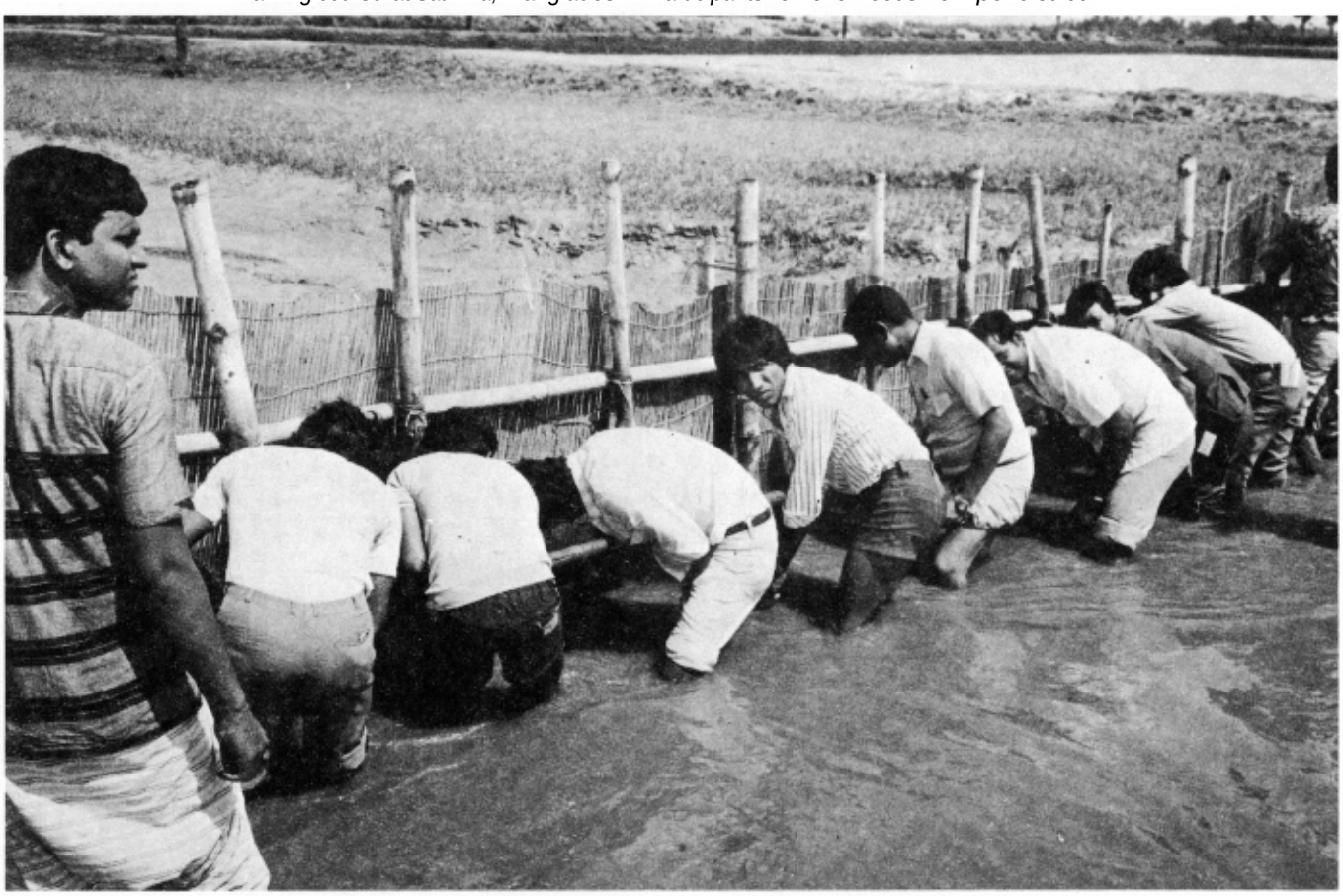
In Bangladesh, shrimp culture can be carried out from December till August. At other times, fresh water inflow is so high that the salinity of the water in the pond complex becomes zero, rendering shrimp culture impractical. In Polekurru, the rainy season starts a bit later, but one is able to keep up pond salinity to a reasonable level by putting off exchange of water until the salinity level in the creek starts to rise again. In Satkhira as in Polekurru, it was found that enough shrimp can be collected throughout the year to stock the ponds. This disproved the theory that shrimp seeds are available only during peak seasons. Feed, however, causes more concern. Daily supply of fresh trash fish, clam or squid is not possible. Reason : Polekurru is close to the Kakinada harbour and boats do not go out to fish when the sea is rough or when festivals are on. Satkhira, on the other hand is 100 km from the sea, so animal protein in the form of snails, prawn heads, animal viscera and fish meal has to be bought.

These factors, and the interest expressed by the respective governments, led to BOBP training courses in pond culture of penaeid shrimp. The courses covered subjects like pond engineering, water management, fertilization, feeding, harvesting, marketing and general management. The faculty consisted of Mr. T. Radhakrishnamurthy, team leader, and Mr. J.A.J. Janssen, BOBP aquaculturist, at Polekurru; and Dr. M. Karim (of the Bangladesh Planning Commission), Mr. P.B.G. Funegaard (BOBP aquaculturist), and Mr. R. Karim (project team leader) at Satkhira.

In the course was opened by the Minister of Agriculture, Fisheries, Forestry and Livestock, Major General M A Murim. In Andhra Pradesh, the Director of Fisheries, Mr J M Girglani, sent his representative, Mr B R V Chulapathi. On both occasions the view was expressed that training of a good number of fisheries officers was necessary to expand shrimp culture. Not only because of shrimp's export potential (in Bangladesh shrimp is the

(Continued on page 20)

Training course at Satkhira, Bangladesh: Participants remove weeds from pond screen.



LINKING EDUCATION WITH DEVELOPMENT

Reproduced here is the gist of a scintillating address by Dr A K Jalaluddin, Joint Director of the NCERT (National Council of Educational Research and Training), New Delhi, at a recent workshop in Madras on non-formal education for marine fisherfolk. He said that education will become truly participatory — and catalyze and stimulate development as well — if government and funding agencies encourage a network of small grassroots agencies active in different areas.

When assessing the results of educational and developmental programmes, educators have till now looked at development from their own standpoint. This leads to the question: What will be the linkage between education and development if development is considered from the standpoint of those who design, fund and implement development programmes?

To identify the educational needs of any set of people, it is essential that their experiences be understood. This is in turn, necessitates an understanding of the exploitative and hierarchical nature of existing social relations in so far as they impinge on education and development. These relations clarify why the poor remain poor. It, therefore, becomes essential that the social position and status of those who plan and deliver development programmes be understood: these may crucially influence the programmes.

The essential task is to bring up development programmes in which the intended beneficiaries are so deeply involved that they formulate, implement and evaluate the programmes, without at the same time radically changing the political and social structure. Is this possible? My experience is that this is indeed possible provided that we are courageous, frank honest and sincere.

To articulate such a strategy, it is essential to find out how, at the local level, the existing power structure can be weakened by an enlightened global, macro-level policy.

Almost all development programmes have an element of patronage built into them. The prospective beneficiaries have to compete among themselves for the intended benefits as resources are generally scarce. This competition rarely ever leads to real development. It is essential, therefore, to. think of an educational programme that strikes at the root of this patron-client relationship and upholds the right to development and education. An administrator who does not respect this right — and the need of the common man to learn and upgrade his own position — is not being true to his profession. Fortunately, today the government encourages discussion on these issues at various levels.

Once it is agreed that participation is of the essence and that non-formal education can be effective within the existing social structure, the question arises: what is needed to implement an educational programme based on the participatory approach? It is now possible for a governmental agency to say: "We like the idea of non-formal education and the participatory approach to development. Here is the money; you deliver the goods". Is it then possible for us to deliver the goods? In many cases we find that we are not sufficiently prepared to act as development workers or educational workers. In the face of these practical problems, the importance of human resource development as a concomitant to physical resource development was first discerned in the 1970s. But even if these two inputs — money and human resources — are provided, a third dimension is still found to be lacking. This dimension relates to organization — of people, of the providers of education and development programmes, of people who generate new ideas about education and development.

Now the question arises: can a department or a directorate, which is hierarchical in character, be such an organisation even when it has the complete BOBP package at its disposal? The simple answer is, "no". Would funding agencies constitute such an organization? They may be in a position to oversee non-formal adult education programmes and ensure that the funds allocated for this purpose are properly utilised; but for actual implementatiQn, it would be in their interest to encourage and facilitate the formation of micro-level agencies under an interfacing policy.

Interfacing of organizations

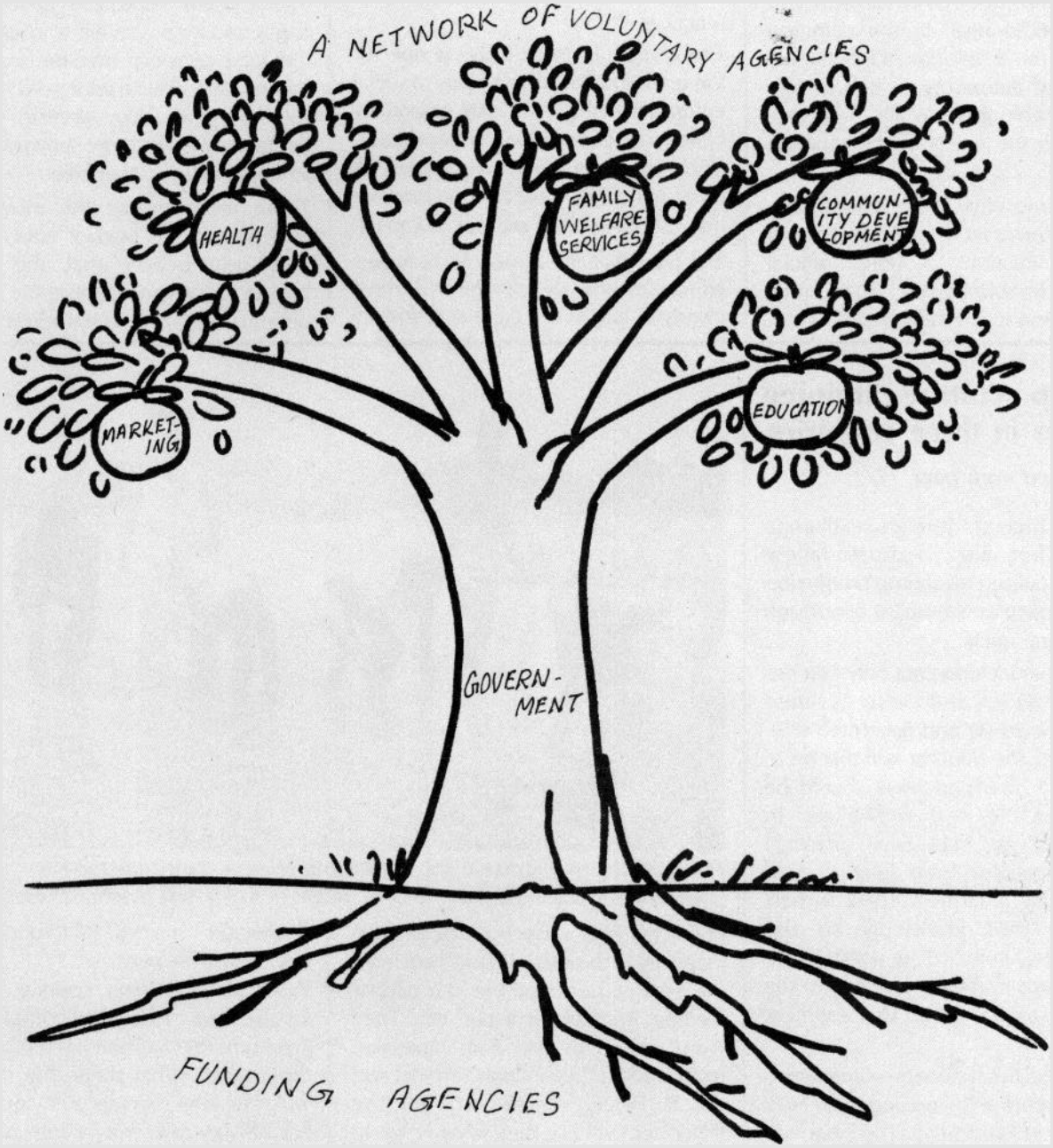
What do we mean by interfacing of organizations? The hierarchical nature of governmental organization implies that a government department will not be able to run a genuinely participatory programme. Government functionaries at the field level are not usually able to function in a participatory manner because they have to respond to the needs of the higher levels of their organisation rather than to the needs of the people. The implementation of a participatory programme demands a flexible open-ended system which cannot, by its very nature, be a massive organisation with elaborate rules of conduct and procedures. The way around this particular block is to network small local initiatives, which are essentially participatory, through organisational interfacing.

Small voluntary organizations in India are doing good work, with voluntary workers sacrificing a great deal in order to be with the people in the villages. The issue is to protect, preserve and replicate these initiatives. Can we overcome the problems involved in transplanting a successful non-formal education programme from one locale to another? In this context, networking of experiences becomes a crucial determinant of success. Government and funding agencies should, in their own interest, be able to encourage a macro-level organizational structure

that would protect and promote grassroot agencies and groups. Small groups of rural workers may come together on the basis of a common interest in protecting their own efforts in education and development. A consortium of such groups may be recognised by the government as an intermediary between government programmes and target groups. A consensus among several small units has to be evolved, based on the acceptance of a common approach to development and the understanding that no ready-made solution exists to solve all problems. We will have to work with the people, learn from their experiences and change our strategies and approaches on the basis of these experiences.

In this way a linkage can be brought about between several small organizations engaged in different activities relating to education, cooperative development, marketing of local produce, health care, family welfare services, etc. This network can integrate and coordinate all these different activities and provide technical information, assistance and guidance. The linkage between education and development should be that the same group either engages in or is linked with all the different activities that form the rubric of educational and developmental activities; only then can it provide a good non-formal education developmental programme.

Finally, I would like to elaborate on the meaning of education and on how non-formal education and development can be conceived of in a composite conceptual framework. The formal educational structure adopts the top-down approach that eventually leads to mentally dependent childrem or adults who are used to, and expect to be guided and directed by, someone else. The young development functionary, who is product of the formal education system, expects someone higher up in the hierarchy to tell him what to do. He lacks a sense of autonomy and is, by and large, a



*A I*network of small voluntary grassroots agencies should be encouraged by both government and funding agencies, says the aut *hor.* Such a network can help set up a good non-forma/ education prograrnme based on people's participation.

"yes man". This weakness in the education system is responsible for a dependency syndrome at all levels of development – the family, the community and the polity. This syndrome makes people passive when they should actually be demanding and articulating change . . . . We have to be insistent about, and be prepared to sacrifice for, change. Development policies, unfortunately, do not accommodate such an enlightened approach to problem-solving. In the interests of democratizing and encouraging structural change in society at an acceptable speed, it is essential that we overcome this dependency syndrome. We need a new kind of education which would provide a tremendous boost to the development process and which would instil in the common man and the development functionary. a sense of autonomy, which in turn would enable them to act in accordance with the needs of the situation they face.

What is innovative in this kind of non-formal. education is the creation of learning situations. A senior official might tell his subordinate : "You know the situation in the field best and are, therefore, in the best position to make a decision". This creates in the subordinate an urge to look for the right questions and find answers to them. In a similar way, each situation, each experience, can be used to create learning situations which would lead to independent thinking and a sharpening of critical faculties, in addition to collective action, reflection and self-criticism. Societal development should be seen in the context of this kind of individual development which would bring about autonomy, critical thinking and awareness of one's role in the community and society at large. This education should also make-a person aware of the manipulative practices prevalent in society and instill in him a sense of abhorrence to such practices.

The climate in India today is ripe for the promotion of certain kinds of social entrepreneurship which are essentially linked to the individual. Entrepreneurship cannot be collective; it takes its roots in the individual but can blossom into collective effort with social impact.

It is here that the basic link between education and development is most clearly visible in the context of India's present stage of economic and social development.

By working with the people and instilling in them an awareness of social forces and realities, the social entrepreneur may articulate the need for a new kind of education, a new kind of development. Very often, money is diverted from primary to secondary and higher education. This is largely responsible for the under-development of the fundamental area of education. It is now possible to create a social demand for primary education and literacy by linking them to social entrepreneurship and marketing. The present approach of supply management may thus be replaced by the practice of demand management. And the government might find it convenient to respond to this kind of social demand from the traditionally downtrodden sections of society rather than accede to the demands of the more powerful and affluent sections of society.

These are some of the new ideas emerging in the field of education. I personally believe that the BOBP project in non-formal education has the potential to give shape to these ideas.

Shrimp culture training courses in three countries

(Continued from page 17)

second highest foreign exchange earner) but also because fallow farmland utilized for shrimp production could expand employment opportunities in rural areas.

The trainees included not only fisheries officers (25), but also private entrepreneurs (4) and fishermen **(15).** In Satkhira, the Minister said that more farmers (3 took part now) should be trained in the new technology. In Polekurru, an intensively practical eight-day course from June 17 was attended by 10 farmers. These farmers will put their knowledge to use immediately in their **1** ha ponds in the 16 ha farm complex funded by the DRDA (District Rural Development Agency),.

In Sri Lanka five fishermen were trained in pen culture at the request of an M.P. (Member of Parliament). The fishermen observed for the first time aquaculture practices like collection of shrimp juveniles with push or hand nets from the estuary, nursing these in a happa, feeding, erection of a pen etc. They were guided by Mr. Samaranayake, team leader of the Pitipana project and Mr. B. Perera, officer-in-charge. The fishermen will use their knowledge to produce either penaeid shrimp or freshwater shrimp (Macrobrachium rosenbergii) in pens.

Hand-picking of shrimp harvest. Participants at work during the training course on pond culture of shrimp organized by BOBP at Polekurru, Andhra Pradesh.

With these training courses, BOBP involvement in the pond complexes in Polekurru and Satkhira has more or less terminated. What shape the projects will now take is yet to be determined. But it is very clear that shrimp culture in the region is here to stay. **J.A.J.**

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