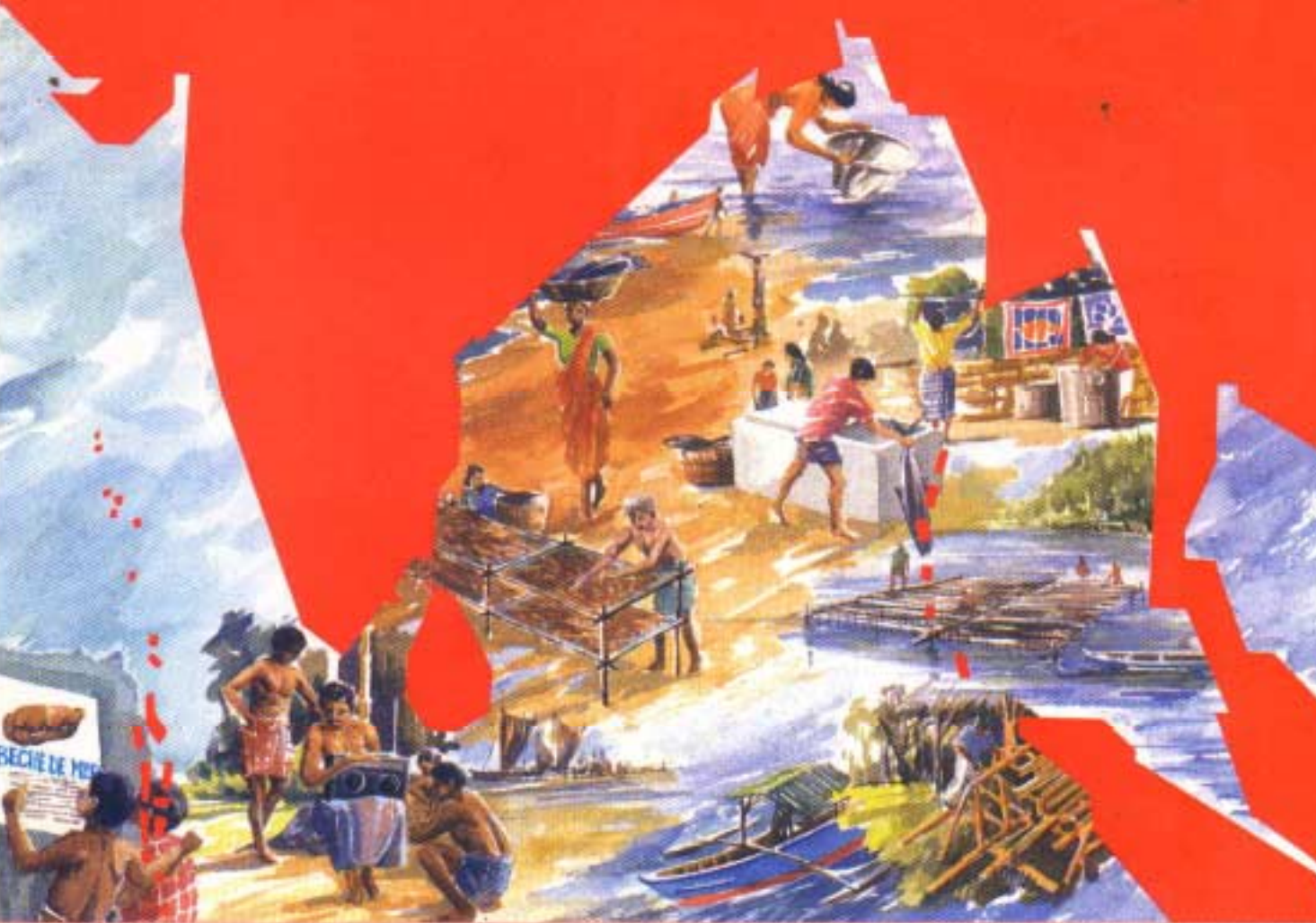


BOBP/REP/58



Report of the Seventeenth Meeting of the Advisory Committee



BOBP

For Fisheries Development

BAY OF BENGAL PROGRAMME

**REPORT OF THE SEVENTEENTH MEETING
OF THE ADVISORY COMMITTEE**

April 6-8, 1993
Dhaka, Bangladesh

This document records the recommendations of the 17th meeting of the Advisory Committee of the Bay of Bengal Programme for Fisheries Development (BOBP), held 6-8 April 1993, in Dhaka, Bangladesh.

The document contains the annual reports (or status reports) of the projects in the Programme. These reports briefly recapitulate the objectives and status of the activities, describe the work and achievements during 1992, assess the progress and indicate the work plan for 1993. The reports were prepared at the end of 1992 and presented to the 17th meeting of the Advisory Committee.

The Advisory Committee is composed of member countries, agencies funding BOBP projects, and the FAO. The Committee meets once a year in member-countries on a rotational basis.

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

June 1993

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REPORT OF THE SEVENTEENTH MEETING OF THE ADVISORY COMMITTEE OF THE BAY OF BENGAL PROGRAMME FOR FISHERIES DEVELOPMENT

OPENING OF THE MEETING

1. The Advisory Committee of the Bay of Bengal Programme for Fisheries Development (BOBP) held its Seventeenth Meeting from 6 to 8 April 1993 at the Hotel Sonargaon, Dhaka, Bangladesh. A list of participants is given in Appendix A.
2. The Meeting was formally inaugurated, together with the Eighth Session of the IOFC Committee for the Development and Management of Fisheries in the Bay of Bengal, on 3 April 1993 by the Honourable Abdullah-Al-Noman, Minister of Fisheries & Livestock and Environment and Forests, Bangladesh.
3. The working session of the meeting was opened on 6 April 1993 by the outgoing Chairman from Thailand, Mr Udom Bhatia, Director, Phuket Marine Biological Centre, Phuket.

ELECTION OF CHAIRMAN

4. The Advisory Committee unanimously elected Mr Ataur Rahman, Director of Fisheries, Bangladesh, as its Chairman to hold office until the beginning of its Eighteenth Meeting.

ADOPTION OF THE AGENDA

5. The Advisory Committee adopted the agenda shown in Appendix B. The documents placed before the Committee are listed in Appendix C.

SMALL-SCALE FISHERFOLK COMMUNITIES (DANIDA/SIDA/AGFUND/Member Governments)

6. With reference to the 'comic book', *Our Fish - Our Wealth*, published by BOBP it was suggested that more such extension materials should be prepared on different aspects of fisheries.
7. In view of the constraints with regard to the marketing of oyster and the supply of oyster spat in Malaysia, further marketing promotion and development of hatchery technology and nursery rearing are needed.
8. Despite the negative results of seaweed (*Gracilaria*) culture in India and Sri Lanka experienced by BOBP and other organizations elsewhere, it was suggested that renewed efforts should be made, since such culture appears to be a suitable economic activity in some coastal communities. There is need to undertake trials at many different locations so as to ascertain the favourable combination of environmental variables.
9. With special reference to the Extension subproject in Indonesia there is a need to review the relations between private sector entrepreneurs and small-scale fisherfolk in order to explore possibilities of cooperation between them.
10. High priority should be given to the ongoing work on the establishment of freshwater prawn hatcheries with the private sector in Bangladesh.
11. Detailed comments on the draft terminal report should be obtained by the Secretariat from all countries and agencies concerned before its finalization towards the end of 1993. The report should include an appendix giving details of national and regional organizations that have participated in the work.

12. Since there is evidence that BOBP's work has had a stimulating effect on small-scale fisheries development efforts outside the region, these aspects should be covered in the terminal report.

13. In view of the felt impact of the many seminars, consultations and training courses conducted by the Project, it should be elaborated on, in the terminal report, and quantified where possible.

14. The work programme of the Project for 1993, as proposed in consultation with the individual member countries, should be implemented. This would also include a few months of work in 1994 to finalize and issue remaining reports, working papers and manuals.

15. Subject to the formal concurrence of the donor agencies, surplus funds should be utilized to support the subgroup under the Bay of Bengal Committee, recommended in its eighth session, preceding the Advisory Committee Meeting, to prepare proposals for continued regional cooperation within the framework of Agenda 21 of UNCED. When undertaking the task, the subgroup should take into account the experiences from BOBP and other research and development programmes in the region.

Learning.5

16. There is a need for flexibility in implementation of projects to enable necessary modifications in objectives and approach along the way. Statements of objectives should be kept general in order to enable adaptation and allow the projects to evolve in response to needs. This is because of the complexity of small-scale fisheries and fisherfolk problems and the fact that the situations relating to resources and socioeconomics tend to change (often rapidly).

17. Betterment of people should be the primary guiding principle in the identification of problem areas, and technology development, where relevant and appropriate, should give direction to development efforts.

18. Project objectives should be determined on the basis of the problems at the ground level and not be dictated by particular development ideologies and fashions.

19. While it is necessary to focus clearly on the development of the target group, in BOBP's case small-scale fisherfolk, it must be noted that there are several ways to reach and benefit them, including benefiting others (sometimes more entrepreneurial groups), which indirectly helps the target group.

20. Integrated development in fishing communities, which often includes nonfishery aspects, is important and desirable. However, given restricted mandates of fishery agencies and limitations of manpower and capacity, this should be achieved by catalytic action in cooperation with other agencies or through subcontracting such efforts to the private sector, NGOs and other government agencies.

21. Considering the multiparty nature of resource management, it would be impractical to deal with particular target groups only and there is a need to work with all the stakeholders.

22. Management of fisheries often requires limited access or production and cannot be implemented without a parallel and complementary development which increases earnings and makes the necessary cut-backs socially and economically viable.

23. Most small-scale fisheries development projects are of too short a duration, and provision must be made for flexible time frames to overcome the obstacles and delays caused by various factors.

24. Considering the very limited access to institutional credit of small-scale fisherfolk, the possibilities to make use of traditional credit delivery systems should be explored.

25. While NGOs can be effective extension agents, only a few of them work with fisherfolk. Therefore, selection of an NGO should be done with due consideration to its motivation and capacity. Whether government extension services, NGOs or private individuals, they should be employed where capacity can be matched to the clients' needs.
26. Effective extension depends upon full participation of the client group, and increased effort is therefore required to understand the economic and social structure of the recipients.
27. Considering that extension programmes are often constrained by inappropriate inputs in technology and communication, increased attention needs to be given to matching technology and delivery systems to the client.
28. Recognizing that effective communication between the extension agent and the client is a key element, agents should be recruited from the client community whenever possible.
29. In view of the growing interest of well educated entrepreneurs in aquaculture, technology should be extended to this group through the use of successful aquaculturists and/or highly qualified specialists.
30. Limited availability of qualified agents constrains extension in many countries. The contact farmer/fisherman method may be used when the technology to be extended has been proven economically viable.
31. BOBP could also look into the problem of design and operation of small fishery harbours and fish landing centres since these form an important infrastructure for small-scale fisherfolk.

POST-HARVEST FISHERIES (ODA)

32. With regard to the recognized problem of seasonal spoilage of *hilsa* in Bangladesh during periods of glut, it was suggested that work should be carried out to address this issue, especially targeting improvements at the fishing community level through effective preservation and better marketing of fish.
33. In view of the heavy losses of fish through by-catch discards from the shrimp fishery in Bangladesh waters, BOBP was requested to undertake a prefeasibility study to assess the potential for collection at sea by artisanal fishermen.
34. The use of pesticides to control insect infestation is a major threat to public health in the region and, especially, in Bangladesh. Priority should be placed on assistance to provide effective, appropriate and alternative means of control.
35. The issue of potentially noxious chemical substances derived indirectly from the environment or added directly to fish products from marine capture fisheries and aquaculture requires early attention.
36. Training and advice for member countries in quality control techniques, with respect to the recent requirements of importing countries, was suggested. Malaysia's primary concern was related to improving the quality of products, such as shellfish, marketed internally.
37. The Integrated Fisheries Project in Cochin/Vishakhapatnam, India, may be a useful host organization for further work by BOBP on value-addition to traditional and nontraditional products.
38. The project should continue and expand its work on internal marketing of fishery products and on artisanal processing of fish, with particular emphasis on the role of women.

BIOECONOMICS OF SMALL-SCALE FISHERIES (UNDP)

39. The 7th Session of the SCORRAD to be held in Bangkok, 29 Nov - 1 Dec 1993, will discuss the application of bioeconomic models in fisheries. Experiences of selected case studies of the bioeconomics project should be presented at that meeting by national staff concerned.
40. In view of the problems arising in small-scale fisheries and fisheries management, there is need for integration of socioeconomics and extension with traditional fisheries research.
41. There is need for coordination between the different national agencies for effective implementation of the Project.
42. Regulation of small-scale fishing effort is difficult without provisions of incentives or alternative income earning opportunities, for which credit is often required. Management authorities should therefore evaluate existing incentive schemes and seek cooperation with the credit institutions for this purpose.
43. There is need for further assistance to implement follow-up actions arising out of the recommendations of the study on the 'Bioeconomics of Set Bagnet Fisheries' in Bangladesh.
44. The data requirements for biosocioeconomic assessment should be integrated into the respective national fisheries statistical systems.
45. The issues and constraints experienced in executing biosocioeconomic assessments, varying from one country to another, should be addressed in detail, on a country by country basis, before the end of the Project.

ASSESSMENT OF POLLUTION HAZARDS (SWEDMAR)

46. Programmes to monitor the effects of pollution and general environmental degradation on fish and fisheries should be established in vulnerable areas. Simple and cost effective methods and measures, such as bioindicators, should be used.
47. Criteria for water quality standards for aquatic life need to be established. Standards from cold and temperate regions may not be applicable and new research for tropical areas is required.
48. In addition to monitoring and research, comprehensive, fisheries-oriented environmental action plans are needed in the context of other similar efforts.
49. As in fisheries management, a dialogue between fisherfolk and institutions/authorities is required for environmental issues.

CLEANER FISHERY HARBOURS (IMO)

50. Preparation for a new project in the Maldives should be undertaken in 1993.
51. Note should be taken of the possibility of obtaining advice/assistance from IMO with regard to oil pollution prevention preparedness and response and rehabilitation of mangrove sites.
52. Note should also be taken of the availability of the International Oil Pollution Compensation Fund from which damages can be claimed by members of the Fund.
53. There is need for assistance in determining the impacts on fisheries and environment of oil spill disasters, with particular reference to the Malacca Straits.

NEW PROJECT PROPOSALS

54. The Committee noted with great appreciation the firm indications of forthcoming support to BOBP from Japan and Denmark, but continued efforts should be made to enlist support from other sources to widen the donor base.

55. In the absence of UNDP from the meeting, FAO was urged to obtain confirmation from UNDP about their interest in supporting the Programme.

56. Of the two project proposals, priority should be given to 'Coastal Fisheries Management' but continued efforts should be made to enlist additional support for 'Sustainable Brackishwater Culture Development'.

57. Details of the Coastal Fisheries Management project should be elaborated by BOBP in consultation with the member countries.

OTHER MATTERS

58. Note should be taken of the possibility of obtaining training assistance from SEAFDEC for fisheries personnel from South Asian countries.

NEXT MEETING

59. In response to the kind offer of the Government of the Maldives to host the 18th Advisory Committee meeting, it should be held in the Maldives in early 1994.

ADOPTION OF THE REPORT

60. The report was adopted on 8 April 1993.

Appendix A

LIST OF PARTICIPANTS

MEMBERS

Bangladesh

Rahman, A K Ataur	Director, Department of Fisheries, Dhaka.
Amin, Md Ruhul	Deputy Secretary, Ministry of Fisheries and Livestock, Dhaka.
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Appendix B

AGENDA

1. Opening of the meeting
2. Election of Chairman
3. Adoption of the agenda
4. Small-scale Fisherfolk Communities (**DANIDA/SIDA/AGFUND/Member Governments**)
5. Post-harvest Fisheries (**ODA**)
6. Bioeconomics of Small-scale Fisheries (**UNDP**)
7. Assessment of Pollution Hazards (**SWEDMAR**)
8. Cleaner Fishery Harbours (**IMO**)
9. New project proposals
10. Other matters
11. Next meeting.
12. Adoption of the report

Appendix C

LIST OF DOCUMENTS

1. Agenda
 2. List of documents
 3. List of participants
 4. Annual Report 1992 – Small-scale Fisherfolk Communities (GCP/RAS/118/MUL, GCP/RAS/117/MUL, GCP/RAS/126/AGF)
 5. Draft Terminal Report – Small-scale Fisherfolk Communities in the Bay of Bengal (GCP/RAS/118/MUL)
 6. Annual Report 1992 – Post-harvest Fisheries (ODA)
 7. Annual Report 1992 – Bioeconomics of Small-scale Fisheries (RAS/91/006)
 8. Annual Report 1992 – Cleaner Fishery Harbours (IMO)
 9. Annual Report 1992 – National Projects Implemented through BOBP
 10. Project proposal – Coastal Fisheries Management
 11. Project proposal – Sustainable Development of Brackishwater Culture
- IOFC : DM/BB/93/3 : The Bay of Bengal Programme (BOBP) 1991-92
- IOFC : DM/BB/93 : Report of the Assessment of Environmental Hazards in Fisheries of the Bay of Bengal

Appendix D

SMALL-SCALE FISHERFOLK COMMUNITIES IN THE BAY OF BENGAL

(GCP/RAS/118/MUL, GCP/RAS/117/MUL, GCP/RAS/126/AGF)

Annual Report - 1992

INTRODUCTION

This report deals mainly with the progress of work during 1992 and the proposed targets for 1993 of BOBP's 'mother' project, 'Small-scale Fisherfolk Communities in the Bay of Bengal,' GCP/RAS/118/MUL, funded by DANIDA and SIDA. But it also covers the projects GCP/RAS/117/MUL and GCP/RAS/126/AGF, which constitute funding support to the 'mother' project for the Information Service, funded by the participating governments, and for training activities, funded by AGFUND (Arab Gulf Fund for United Nations Organizations).

GCP/RAS/118/MUL and GCP/RAS/126/AGF have supported work in the disciplines of Extension, Brackishwater Culture, Fishing Technology and Development Support while GCP/RAS/117/MUL has provided services for all disciplines of BOBP.

The report contains a narrative summary for each discipline, which highlights the year's work, problems, issues and future plans. The subprojects under each discipline are then discussed in a table format that gives information about objectives, targets, achievements, status and future plans.

While the subprojects and activities belong to particular disciplines from a managerial and administrative point of view, nearly all of them are of a multidisciplinary nature of varying degrees. Subprojects under the technical disciplines have, for instance, had significant inputs from Development Support and vice versa. Therefore, the report gives an accurate picture of the project as a whole but not necessarily for each discipline.

EXTENSION

In three countries, Indonesia, Shri Lanka and Thailand, extension projects came to an end and the thrust of the work was to consolidate, learn from the process and to report. The year's extension given to BOBP gave breathing space in Bangladesh and in the Maldives to work towards targets, as in these countries the start-ups had been delayed, partly due to procedural problems.

In the Maldives, going clockwise around the region, a fisherfolk workshop, held at the end of 1991, gave the Ministry clear focus for the project. From wondering how to work on issues outside one's mandate, the Ministry could now work on enabling reef resources management, an idea whose time had come even in terms of government policy. The project focussed on building awareness through development of extension materials for fisherfolk and for children, the future fisherfolk, and through promoting the consultative process.

In Shri Lanka, BOBP support to the increasingly popular fisherfolk radio programme came to an end and the responsibility of the effort was taken over by the Ministry, which has a budget for the programme to ensure sustainability. The manpower, their capacity to produce attractive, informative programmes, the equipment to do so and the participation of the fisherfolk and their enthusiasm exist. However, keeping the programme on track, answering the needs of fisherfolk, sustaining participation and building a managerial environment to hold and sustain the creativity of the radio staff are the challenges the Ministry will face. Only time, and commitment to what has been learnt, will show success in this pioneering effort which has turned out to be an example for the region. Bangladesh has started up a fisheries radio programme, and Thailand and the Maldives are working towards expanding and improving their fisheries radio programmes.

In Bangladesh, the main activity of extension development was completed. It can be said with some confidence that field staff at the *thana* and district level, given training, motivation, some financial support to create revolving credit funds and a conducive managerial environment, can do excellent

work in addressing fisherfolk needs. The effort turned out to be low in cost and used almost exclusively in-country resources, which means replicability is within the realm of possibility. A detailed manual to enable replication has been produced. The challenge for the government is to come to grips with generating organizational change, which will be absolutely necessary to create an environment to get the best from their staff. The women's activity which had a late start, when the UNFPA main phase was cancelled, will continue in 1993.

The extension subproject in Thailand came to an end late in the year and the learnings extracted from the process have been thought-provoking not only in terms of specific approaches and methods of extension but of larger questions as to what constitutes extension and what kind of manpower, organization and communication is needed to do justice to the task. The DOF held workshops for district level staff to share the learnings with them and to help them think through the issue. A book of guidelines is under development to assist the process and give direction to future efforts. The DOF feels the effort has, overall, been a useful learning experience and has called for a senior and policy level staff workshop in 1993 to discuss the learnings in the context of their policy and plan.

That group mobilization, building managerial capacity for enterprise development and credit supply can be a path towards income generation and social development has been confirmed in Indonesia in the extension subproject in North Sumatera. It is still too early to talk about long-term impact and sustainability but an impact assessment planned for 1993 may give more answers. The question at the completion of the project this year was: Is the fishery agency willing to build up staff expertise and allow them to commit the long intensive interaction necessary with fisherfolk to help them better manage their enterprises and benefit from them? With a positive answer, the learning from the project, the few trained staff and the manual can be put to use to build on the effort.

At a more general level, some issues and concerns have come into focus. The crisis in resource availability, diminishing incomes and poor access to social services will require fisherfolk to understand their situation, think through their problems, come up with solutions and organize themselves to do something about it. Extension will increasingly mean awareness building, mobilizing, helping consultative processes to happen, mediating negotiations and coming up with new ideas and technologies that enable people to experiment, see successes and, therefore, to move on and change. All this would require rethinking and reorganizing fishery agencies to address these new challenges.

The focus of 1993 will be on completion of the subprojects in Bangladesh and Maldives and on consolidation and dissemination of the learnings to give direction to future efforts.

Subproject : Extension, General (EXT/GEN)

Targets 1992

Assessment of merits and possibilities of fisheries agencies subcontracting extension components.

Distribution of 'comic book' (*Our Fish - Our Wealth*) and appraisal of its usefulness in development communication.

Achievements

The subject was discussed in an internal BOBP workshop. A report highlighting the types of activities that lend themselves to subcontracting, organizational and administrative factors to facilitate subcontracting and the justification to do so appeared in Issue No. 48 of the Bay of Bengal News.

The Tamil and Telugu versions of the comic book were widely distributed in four districts of Tamil Nadu and two districts of Andhra Pradesh, aimed at fisherfolk, adult education centres and primary schools catering to fisherfolk. The evaluation based on written feedback and intensive semistructured interviews of a stratified subsample showed enthusiastic support; fisherfolk enjoyed the book and retained the contents. They also wanted more such comic books and suggested subjects of future issues. The evaluation specified the strong and weak points of the book which will help in improving future such efforts.

Development of extension worker's handbook on management of fisherfolk enterprises.	A management consulting company, working closely with Extension staff, undertook the task. A first draft of the handbook was discussed at a workshop and the recommendations and changes are being incorporated into a second draft.
Development of guidelines for fisheries extension work.	Guidelines prepared for Shri Lanka were modified to meet the needs of extension workers of the region. The document is being edited prior to printing early in 1993 (BOBP/MAG/9).
Training of fisheries staff in radio programme development and production in Thailand.	The DOF felt that, given the delays in funding for their radio programme, it would be more useful to plan the programme strategy, staffing and training for it. A one-week consultancy input (M. Pickstock, UK) was organized. The recommendations, briefly, are to start daily broadcasts by mid-'93, using the Agricultural Extension Department's radio station, to build up better understanding of the audience, train staff and generate a strategy over time to go into full-scale programming by early 1995 using three radio stations.
Unscheduled	<ul style="list-style-type: none"> — Support was given to the DANIDA - assisted project Nonformal Adult Education for Fisherfolk in Tamil Nadu in selecting a facilitating team, organizing a review of the project and on-line process consulting. — Two studies were undertaken to better understand the problems faced by the women running the Besant Nagar Fish Market in Madras and to identify future action in discussion with the Corporation of Madras and Department of Fisheries. See Bay of Bengal News No 48. — Extension staff participated in the FAO- Government of Japan International Expert Consultation on Development of Community Based Coastal Fishery Management Systems for Asia and the Pacific held in Kobe, Japan.

Targets 1993

- * Completion of manuals on Rapid Rural Appraisal, and Enterprise Management.
- * Finalisation and distribution of 'comic book' II, on resources management.

Subproject : Fisheries Extension Services, Maldives (EXT/FES/MDV)

OBJECTIVES	Establishment of a fisheries extension unit and training its staff. The target groups of the subproject are fisherfolk communities in Meemu, Vaavu and Faafu atolls. A country-wide expansion in due course is envisaged.
STATUS 1991	The Ministry of Fisheries and Agriculture (MOFA) established an extension unit in 1989 and allocated four staff to the subproject. Training in extension methodology, on-line and in other countries of the region, was given to the staff. Initially, selected fisherfolk were given training in various technical subjects and a BOBP-designed boat-hauling device was demonstrated.

A rapid appraisal of all 19 inhabited islands in the target area clearly showed that the priority problem areas do not fall within the mandate of MOFA. In discussing the appraisal in all the 19 islands, the consensus of the fisherfolk was that the project should focus on management of marine resources on reefs, the problems relating to reef openings, harbour silting and erosion, rat and bat infestation and improved access to health care and education. During 1991, training and activities in these four priority areas were undertaken with the cooperation of the Atolls Administration and other ministries. Rather than evolve a new cadre of link workers, as had been planned originally, work was done through Island Development (men's and women's) Committees. It showed that much can be achieved by building up the managerial and problem-solving capacities of these committees. A fisherfolk workshop at the end of 1991 suggested that the project focus during the rest of the time on development of extension materials for management of marine reef resources.

Targets 1992

Support to selected Island Development Committees in :

- reef resource management
- eradication of rat and bat infestation

Development and dissemination of extension materials relating to management of beche de mer, giant clams and other reef fisheries

Development of teaching materials on fisheries management for schoolchildren

Unscheduled

Achievements

Discussion and training sessions to build awareness were undertaken in the islands of Vaavu and Meemu atolls on coral reefs, sustainable management of reef resources, and, in particular, on beche de mer, giant clam and bait fish. The activity was helped by radio programmes from the Voice of Maldives and extension materials developed by the Marine Research Section (MRS). (*See Buy of Bengal News No. 46*)

Rat eradication campaigns were held by the Island Development Women's Committees with support from BOBP. The competitions not only brought in large numbers of dead rats (2,746) but also raised quite some enthusiasm for collective work amongst the women. Bat nets were distributed to all the target islands to be deployed and maintained by the Women's Committees.

To assist the discussions and training activities, the MRS staff participating in the subproject developed and distributed three extension pamphlets and posters relating to beche de mer, giant clams and bait fish. Some posters were also developed on health and population education issues and used during discussions with the women's groups.

An effort has been initiated to evolve a practical workbook for Atoll and Island Development Committees and fisherfolk groups to better understand their reefs and the impacts various actions have on them, learn how to collect information and undertake basic assessments, and suggest how such information could be used to make local decisions for sustainable reef resource management.

A first colouring-cum-activity book on reefs has been developed and a first draft is being circulated for comments. Once printed in 1993, it will be widely distributed to island primary schools.

In cooperation with the Voice of Maldives, five five-minute programmes were produced on subjects relating to reef resource management and broadcast before the field visits to build the foundation for discussions. Audio tapes of the broadcasts were also carried along and left with the Island Development Committees for subsequent discussion.

Assessment

With the fisherfolk workshop in December 1991 showing the way, the subproject focussed on enabling and promoting reef resource management. This tighter focus on subjects which fall within the mandate of MOFA helped. The staff of MOFA and MRS have built up a rapport with the target communities and this will help in discussions and consultations which may lead to management actions. The capacity of the staff to develop extension materials, assist in radio programme production and in mediating discussions has been improved and strengthened. However, logistics and manpower shortages will continue to affect the amount of effort achieved. While the fisherfolk are enthusiastic and want to work towards management, the subproject has had problems of getting things done due to a lack of managerial direction and commitment in MOFA. With the end of the project a year away, the question is not whether good work can be done to benefit fisherfolk but whether MOFA will be able to gear itself managerially to sustain the effort.

Targets 1993

- * Completion of the colouring-cum-activity book.
- * Development of handbook to enable understanding and management of reefs at atoll/island levels.
- * Study tour for three MOFA and Atolls Administration staff to the Philippines to study community based fisheries management approaches.
- * Training of Voice of Maldives and MOFA staff in the use of radio broadcasts in fisheries extension and development.
- * Reporting.

Subproject : Fisherfolk Radio, Shri Lanka (EXT/RDO/SRL)

OBJECTIVES	Introduction of a radio programme as a communication and extension tool to help fisherfolk in their development. It is hoped that the radio programme, through participative programming, will give fisherfolk a voice.
STATUS 1991	<p>The radio programme introduced by the subproject had been on the air, uninterrupted for three years, since 2.1.89. The broadcasts, on the Sinhala Commercial Service of the Shri Lanka Broadcasting Corporation (SLBC), are five minutes daily and 1.5 minutes on Sundays. The Government of Shri Lanka had committed itself to taking over the programme in 1992.</p> <p>The introduction was preceded by audience profile studies of fisherfolk, programme strategy development, acquisition of equipment, training of Radio Programme Unit (RPU) staff in broadcasting, field recording, interviewing, story writing etc, and the establishment of a Steering Committee to guide the RPU and protect it from external pressures.</p> <p>Based on audience response and an evaluation during the course of the subproject, RPU staff were given supplementary training and the Programme was improved to make it more participatory.</p> <p>A regional workshop held in Colombo 1991, to discuss the role of radio in fisheries extension and development, stimulated Bangladesh, Maldives and Thailand to expand their use of fisherfolk radio programmes.</p>

Targets 1992

Installation of new equipment for the RPU.

Training of RPU staff in use of new equipment.

Reporting.

Achievements

The studio was completely refurbished to enable mixing and editing of field recordings, recording interviews and generally produce a higher quality of programmes for broadcast.

Done, first by engineers of SLBC and then by a radio consultant (Pickstock), who focussed his training on the use of the new equipment in programme production.

Done (BOBP/REP/53).

The project was handed over to the Ministry of Fisheries and Aquatic Resources (MFAR) at the end of March '92.

Assessment

The feedback from fisherfolk indicates that more and more fisherfolk listen to the radio programme regularly and enjoy it. A commercial radio programme aimed at fisherfolk insisting on the slot immediately following the ministry programme is a clear, albeit indirect, indication of audience support.

The RPU is capable of good programming and Pickstock, the evaluator/trainer, went so far as to say that he believed that they were as good as, if not better than, their SLBC counterparts, at least in field recording and developmental radio programmes. The Government is committed to continuing the programme. With everything going so positively it would be a shame if the radio programme were allowed to suffer for the lack of a management environment to encourage creativity, insist on fisherfolk participation and to gear the programme exclusively to address the needs of the fisherfolk. This is the challenge MFAR has and it is hoped they will take the right direction. Sri Lanka's success in radio for fisherfolk may provide inspiration and direction to other countries of the region.

Subproject : Fisheries Extension Development, Bangladesh (EXT/FED/BGD)

OBJECTIVES

Demonstration of extension support to fisherfolk communities through training, technology transfer and support of pilot extension schemes.

The immediate targets are the fisherfolk communities of the Patuakhali and Borguna Districts of Bangladesh. The subproject hopes to demonstrate that a trained cadre of Department of Fisheries (DOF) extension and NGO staff, functioning in a participative manner, with some logistic and project financing support, can address the needs and problems of fisherfolk communities.

STATUS 1991

The subproject began in July 1989. DOF staff from all thanas in the two target districts and staff from two NGOs received training in rapid rural appraisals, participatory needs analysis, and planning and project management in four separate sessions interspersed with 8-10 weeks of field work where they put their learning to test. The participating staff were also trained in group mobilization and management as well as savings and credit management.

Out of the training and field work emerged 36 project ideas based on the priority needs of the community, 18 of which were accepted for funding and implementation. The projects implemented by the fisherfolk men's and women's groups undertook savings mobilization, revolving fund management and pilot activities in

finfish hatcheries/nurseries, culture of tilapia, carp and prawn, poultry rearing, homestead forestry, credit schemes for boat/net repair and fish trading, salting of *hilsa*, health and population education. Twelve of the pilot projects needed credit, and a revolving fund, based partially on the fisherfolk's savings, was established. Tk 232,665 (about US \$ 6,000) was disbursed. The activities at the end of the year were on schedule with ten of the projects working above plan expectations.

With the cancellation of the main phase of the UNFPA project, women's activities were incorporated into the subproject. With the help of two coordinators, 15 women's groups were mobilized in ten villages to undertake activities such as savings, to identify income-generating enterprises and to receive training in group management, women's issues, health and population issues.

The enthusiasm, participation and the quality of work of the DOF staff have been of a high level. However, there is need for constant supervision and support, which have been made available through quarterly review workshops and through placing a full-time trainer and two coordinators in the field.

Targets 1992

Printing of manual.

Consolidation of revolving funds and handover.

Training and support to women's groups in income-generation and health and population education.

Organization of National Fisheries Extension Consultation in cooperation with DOF and DANIDA.

Achievements

The manual to enable the learning and replication of the effort was printed in Bangla and the DOF has arranged for its distribution to all its district and *thana* level staff. The demand for the manual (BOBP/MAG/8 from the NGO sector is very encouraging.

The 18 pilot activities continued to function well, with 12 of them showing exceptional performance. All 18 activities were terminated in September 1992. However, the groups continue to function under the DOF staff and some hope to continue their enterprises. The credit repayment was a remarkable 100 per cent in all the activities. Upon termination, the groups were ranked on the basis of simultaneous evaluations by the staff and the fisherfolk. The groups were rewarded for their performance by inputs of set multiples of their savings.

The 15 women's groups functioned well. Their savings are on schedule and some of the groups have even increased their savings commitments. The group supervisors, young women from the villages, received training in group formation and management, nutrition, health, family planning, women's rights and savings and credit management, and they, in turn, have trained the women with help from the coordinators and other resource persons. 170 women took up enterprises, primarily paddy husking and small trading, with credit support of Tk 170,000. The enterprises are functioning well and repayments are on schedule. The performance of the group supervisors has been particularly impressive.

The consultation was held in Mymensingh in April, and gave the participants an opportunity to think through the role of extension in the context of the National Fisheries Plan, its approaches and methods and the organizational changes necessary to facilitate extension. The meeting brought together 65 participants from all agencies concerned with fisheries development and from all the levels within the agencies. (See Bay of Bengal News No. 46.)

Promotion of national follow-up project identified in 1991.

The DOF is keen to expand and replicate the subproject all along the coast. DANIDA expressed interest, but later felt that it would rather focus on inland fisheries extension. A UNDP programming mission has incorporated the proposal as part of its recommendation.

Assessment

With all but the women's activities completed, it can be said with confidence that, with motivation, good training and a conducive management environment, the district and thana staff of the DOF can rise to the occasion and do an excellent job in developing and managing participatory activities for fisherfolk. Some concerns remain. The technical knowledge and capability of the staff is low and is further aggravated by nonexistent backstopping. The culture of management is not conducive to committed and motivated staff performance.

The personal links and working relations the staff have developed with fisherfolk can provide a solid foundation for future work. The fisherfolk groups seem cohesive and most are continuing and even taking up new enterprises and using their savings to work towards self-reliance. However, credit remains a problem, with savings supported by revolving funds as the only visible and viable option.

The women's activity shows promise. In particular, the confidence, capacity and commitment of the village supervisors needs mention. The DOF staff, almost all male, will have difficulty working with women due to social constraints and the DOF needs to seriously consider adding women staff to address their needs.

Targets 1993

- * Consolidation of women's group activities through training and on-line support
- Reporting

Subproject : Extension Services for Small-Scale Fisheries in Ranong, Thailand (EXT/ESR/THA)

OBJECTIVES

Development and testing of a model for an improved extension service to enable integrated fisherfolk development in the coastal provinces of Thailand.

STATUS 1991

After initial surveys in all coastal villages of the Ranong Province in 1987 and specific studies on costs and earnings and problem areas, a variety of subproject activities have been undertaken that can be classified into : adapting, demonstrating and extending fisheries technologies; facilitating credit; income-generating activities for women; enabling fisherfolk access to social services in cooperation with other agencies; and, provision of infrastructure.

Technology extension

- The subproject has overcome the grow-out problem of oyster (*Crassostrea*) by choosing proper sites which are not affected by salinity fluctuations caused by freshwater drainage. Fisherfolk have been trained in spat luring and trials were conducted to determine spatfall location and seasonality. But the number of spat collected will not allow expansion of culture in any significant scale.

- Crab traps were successfully introduced after some initial problems in extension. But the subproject was concerned about the crab resources in the area and was hesitant to promote the technology further. A one-year crab resource study was undertaken to better understand the dynamics of the crab population.
- Other attempts in technology extension i.e. culture of mussel, oyster (*Saccostrea*), shrimp in cages and fattening of crab have all failed for such reasons as lack of seed, marketing problems, high salinity fluctuations etc.

Credit

- Finding no institutional sources of credit (without collateral), the subproject resorted to setting up village-based revolving funds. They functioned well. However, the sustainability of such schemes, without continuous supervision, remains to be ascertained.

Women

- Women in selected fishing communities were provided skill-training, in fish preservation, manufacture of fishery products, sewing and crochet, in order to enable them to enhance their incomes and to reduce household expenditure.

Social services

- Health services and health education was provided, particularly to women and children in remote fishing villages with the cooperation of the Health Department.
- With the cancellation of the main phase of the UNFPA project more women's activities were incorporated into the subproject. Activities included skill training in macrame, hair styling, batik production, running village stores and in book-keeping and accounts.

Infrastructure

- At the request of fisherfolk, the project invested in selected infrastructure inputs in four villages and fisherfolk contributed by providing the labour for construction. The works included access roads, water storage tanks and a rest/guard house at an oyster culture site.

With the end of the subproject nearing, efforts were begun, using consultants, to extract the learning from the project which would guide future attempts to provide integrated development and extension services to coastal communities.

Targets 1992

Finalization of documentation of learning from the project.

Achievements

The Silaprakorn University consultants' study of the learning was supplemented by the project staff's compilation of chronologies and learnings, activity-by-activity. The subproject staff are developing guidelines in Thai for extension in coastal provinces that put together the learnings in one document. DOF intends to distribute the document to fisheries and extension staff in all coastal provinces.

Sharing of learning from project with 150 DOF staff in three four-day workshops.	District level and provincial level extension staff from coastal provinces were brought together in three workshops in Ranong. The meetings were well-attended and the Department of Fisheries (DOF) felt that the exercise had been useful in giving direction to the extension effort.
Training and support to women's groups in income generation.	The activity focussed on batik production, though some good work was done on fish processing, particularly in fish sauce production. In batik production, training was provided to nine women (in a 12-day course) by the Division of Household Industries, Bangkok. The women were able to sell their products at a profit. However, with only a small local market, they had to sell their products in tourist centres, competing with high quality products from elsewhere. To further improve quality, five women were deputed to work and learn during a three-month period in a commercial batik factory. With their skills, they may continue to produce and sell after the end of the subproject.
Phasing out of BOBP support.	The subproject was terminated in September '92. Prior to the termination, several activities were handed over to other cooperating agencies which will continue to support the fisherfolk. The Provincial Fisheries Office is taking over the oyster culture groups and will continue the oyster trials and spat collection efforts. The Provincial Cooperative Office has taken over the support of the Kor Sin Hai Petrol Fund and has registered it as a cooperative. The BAAC (an agricultural bank) is considering taking over the revolving funds of fisherfolk and providing them with credit. The Nonformal Education Centre and the Health Department will continue their cooperative efforts to provide social services.
Reporting	Remaining reports on Oyster Culture and Spat Luring (<i>Bay of Bengal News</i> No. 46) and Mud Crab Resources (<i>Bay of Bengal News</i> No. 49) were completed. The final report of the subproject is under preparation.

Assessment

The extension subproject in Ranong tried to learn by doing extension. While the activity in its entirety may be impossible to replicate, the learnings from it have been valuable and will hopefully give direction to extension efforts in coastal provinces. To briefly highlight the key learnings :

- The readiness of a technology can, and does, affect the success of extension. This seems particularly important in aquaculture technologies, which require developmental work to tune them into local ecosystems. In turn, this raises the questions of technical expertise amongst extension staff to do it, the availability and access to technical backstopping and whether it should, in the first place, form a part of extension. Time and again the resource implications have come up to constrain the extension of technologies and more training is necessary in order to equip extension staff in dealing with resource assessments and in communicating and enabling resource management amongst fisherfolk.
- Income-generating activities of a nonfishery nature, particularly by women, are possible to extend, but while creating some income at a household level, they often do not generate incomes as expected because of difficulties faced in marketing the small quantities produced in often distant and competitive markets.
- The learning of strategies and methods aside, an important question that will have to be considered, given the present small staff and narrow expertise profile of provincial fishery offices, is the organizational and skill requirements to replicate activities successfully in other provinces.

The three workshops to share the Learnings with DOF district and province level extension staff proved useful as it gave them an opportunity to think through the needs, approaches and organization of extension in the context of the DOF policy on the one hand and the learnings of the project on the other. The DOF decision to produce Guidelines for Extension in Coastal Provinces (in Thai), based on the learnings, is another step to incorporate the learnings into the mainstream.

Targets 1993

- * Workshop to share the learnings from the subproject with senior DOF staff.
- * Extension guidelines (in Thai).
- * Final report

Subproject : Improved Earnings of Small-Scale Fisherfolk, Indonesia (EXT/IEF/INS)

OBJECTIVES

To improve the earnings and socioeconomic status of fisherfolk in coastal communities through improving their managerial capacity by emphasizing group action. The target groups are small-scale fisherfolk in coastal villages of the Langkat District of North Sumatera.

Originally intended to demonstrate an institutional credit system, the subproject changed focus because participatory studies during the preparation showed that an informal credit system already existed and was capable of meeting fisherfolk needs. The focus shifted to improving the managerial capacity of fisherfolk by emphasizing collective action.

STATUS 1991

The subproject started in 1989. The staff of the Provincial Fisheries Services (PFS) and Extension Services were trained by Bina Swadaya, an NGO, and became capable of group formation, group management and assisting groups in selecting enterprises. Methods and training materials were developed as part of this training. Out of eight groups formed, six functioned well. They started to mobilize savings, select enterprises and were actually using their collectivity to address other felt needs.

However, the development of viable economic enterprises by the groups was slow because the intensive pressure on resources made it difficult to come up with sustainable fishery-based enterprises, the fisherfolk themselves lacked knowledge and exposure to new enterprises, the PFS and the cooperating agencies were not sufficiently equipped to feed technical inputs, and, most importantly, despite regular savings, the groups could not muster enough capital in a situation where the informal credit sources did not support nonfishery enterprises. This resulted in the groups losing some of their enthusiasm and motivation.

A review of group formation and performance early in 1991 found the six groups still cohesive, but pointed out that the project would have to provide credit and better technical and managerial support. Feasibility studies were undertaken by the groups of their enterprises, and credit, in the form of grants to be converted into group revolving

funds, was extended. Regular follow-up and technical training from the cooperating agencies were supplemented with study tours to similar successful enterprises in the province. There was a general improvement in performance in the groups, with the women's groups performing better than the men's groups. Two of the men's groups abandoned their fishery-related enterprises and switched to livestock-rearing with much more success.

The encouraging aspect was that the groups, in spite of difficulties and setbacks, remained cohesive and some even increased in size. The savings and repayments were on schedule, and, in a few villages, other groups were established on the basis of the project's example.

Targets 1992

Consolidation of group enterprises and revolving funds and transfer of responsibility.

Printing of training manual.

Reporting

Achievements

All six groups continued to function well and there has been an upward trend in economic performance. The groups have attracted new members and their savings and repayments are on schedule. The livestock-rearing groups faced some disease problems, but with assistance from the Provincial Livestock Service these were overcome. One of the groups, in Pulau Kampai, was selected by the Provincial Government to be honoured for their development work and a special workshop was called to spread the subproject approach to other agencies. The PFS has taken over responsibility of the subproject. The Livestock Service, in particular, is cooperating and providing technical support to the groups. A formal mechanism is being discussed to enable the transfer of the revolving funds to an appropriate authority.

A training manual in Bahasa Indonesia (BOBP/MAG/7), on group formation and management, savings mobilization and enterprise selection, was developed by the NGO Bina Swadaya for the subproject, and has been printed. Directorate General of Fisheries (DGF) plans to distribute it to extension staff in all the provinces of Indonesia.

Delayed, but under way.

Assessment

The subproject has clearly shown that, with training, credit support and follow-up, fisherfolk groups can take up income-generating enterprises, not only to improve their economic status, but also to address other needs as a group. It has also shown that fisheries and extension staff, with training, but, more importantly, through motivation, can do the job, though certain organizational problems exist.

However, the question remains as to the replicability of the methodology, considering the high and intensive staff demands required for motivation campaigns, group formation, savings mobilization, credit support, technical inputs and follow-up inputs that are seen as crucial to success.

Targets 1993

* Impact assessment.

* Final report.

BRACKISHWATER CULTURE

In Bangladesh and India (West Bengal) attempts continued to demonstrate nursery rearing of tiger shrimp in floating cages. While some promise had been indicated by preliminary work, the production during 1992 was severely constrained by a shortage of wild seed of *P.monodon* and no progress was made. But the NGOs assisting in the implementation of the subprojects were active in community development work with the families participating in the rearing trials and with others. Cage nursery rearing trials of freshwater prawn in Bangladesh have also been inconclusive; low water levels in the river hampered production results. As reported last year, it is unlikely that the objectives will be achieved within the life of the project.

Productivity of freshwater prawn fry in the brine-based hatchery in Potiya, Bangladesh, reached commercial levels in some of the trials. The main constraint to full production was a shortage of broodstock in the southeastern area of the country. The hatchery is at present operated by BOBP contract staff and the DOF needs to prepare itself to take it over at the end of the 1993 season, or to privatize it.

Construction of the shrimp hatchery at Digha, West Bengal, has been completed but is not yet operational. It will continue to be nonoperational unless there is a drastic improvement in the DOF management and staff inputs.

Eight Indian (east coast) small-scale entrepreneurs, selected from some 250 applicants, were trained in tiger shrimp hatchery operation during a five-week course in Malaysia. Two of them are in the process of setting up their own small hatcheries. The outcome of the training should be evaluated around the middle of 1993, i.e. one year after the course.

Commercial production of oyster from the subproject in Malaysia has been demonstrated as profitable and suitable for fisherfolk and the objectives of the subproject have been achieved. Marketing success has varied from site to site, but improvements in communication between producers and buyers should alleviate the bottleneck. Spat supply continues to be the number one constraint for increased production. Although spat collection is growing as an economic activity in Kelantan on the east coast, it is doubtful that sufficient quantities can be obtained from this source to support a significant expansion of culture activities. Hatchery production from the Fisheries Research Institute (FRI) has been promising, but development of nursery techniques requires further effort.

During 1993, priority will be given to the establishment of four private freshwater prawn hatcheries in Bangladesh, for which BOBP will contribute imported equipment components, feed for one season and training. The Potiya hatchery will be used for training of private sector operators, who will include two persons from India.

Other activities which will continue till about the middle of the year are the cage nursery rearing trials of tiger shrimp in West Bengal and Bangladesh, and marketing assistance and training of farmers in nursery rearing of spat in the oyster culture subproject in Malaysia.

Subproject : General Services (BWC/GEN)

<i>Targets 1992</i>	<i>Achievements</i>
Publication of the mud crab seminar proceedings.	The proceedings (BOBP/REP/51) and a bibliography (BOBP/INF/13) have been published and distributed. An article on the seminar appeared in <i>Bay of Bengal</i> News No. 45. The proceedings were also covered in the Indian trade press.
Unscheduled.	Two aquaculture scientists, from Malaysia and Thailand, were sponsored to participate in IDRC's Second Mollusc Culture Network Meeting and Workshop on Participatory Research Methods held in Iloilo, the Philippines. BOBP's Aquaculturist and Extension Adviser were invited as resource persons by IDRC.

Targets 1993

- * Summary of BOBP's experience of small-scale sector brackishwater culture development.
- * Study tour for Maldivian officer to observe giant clam culture in Australia.

Subproject : *Shrimp Seed Supply, India (BWC/SSS/IND)*

OBJECTIVES	Introduction of methods and techniques to increase the supply of shrimp seed and the income of seed collectors in West Bengal.
STATUS 1991	<p>Considerable efforts were made in 1988-90 to initiate demonstration of nursery rearing of shrimp fry. A pond complex was constructed in a village, Moynapara, in South 24 Parganas District and villagers were formed in groups and trained in the technology. However, the pond complex and further attempts had to be abandoned because of the land dispute between the Departments of Forestry and Fisheries and interference by vested political interests in the village.</p> <p>Cage nursery rearing of shrimp fry was taken up in Ramnagar, Medinipur District, in 1990, with the assistance of an NGO to mobilize, organize and train the villagers. Trials during the 1990/91 season, involving ten family groups, indicated that such nursery rearing might be feasible.</p> <p>Lurelines were tested in 1991 as a selective method for collection of shrimp fry. The results were good but the response from fry collectors was poor.</p> <p>CIBA undertook a study of the by-catch from shrimp fry collection during a twelve-month period in 1990/91 but the analysis had not been completed.</p> <p>The original plan to construct a tiger shrimp hatchery in Ramnagar, Medinipur, had to be abandoned due to problems with power supply, poor groundwater quality and other uncertainties. Instead, a small-scale modular hatchery was set up in Digha, where basic facilities already existed, and staff were trained. The hatchery was completed in 1991 but was not operational due to minor technical problems and high turnover rate of staff.</p> <p>After a study tour of three high-ranking Indian officials to Thailand and the Philippines, GOI requested BOBP to promote small-scale hatchery development through involvement of the private sector.</p>

Targets 1992

Assessment of the economics of cage nursery culture

Evaluation of market for shrimp juveniles produced by cage nursery culture.

Achievements

The nursery trials were very sporadic, due to unusually low availability of shrimp fry, and were therefore also not viable. The NGO continued the work with the participating fisherfolk groups. This is highlighted in an article in *Bay of Bengal News No. 46*. In the beginning of the 1992/93 season the water depth was not sufficient in the canal where the trials have been carried out. They therefore had to be moved to another village and restarted with new participants.

A review was made of the market chain, price structure and mode of operation of the major fry market in West Bengal. Irregular practices, including adulteration, were observed. The findings are being documented in a working paper. A video film on fry collection and marketing in West Bengal is under preparation.

Assessment of economic and technical feasibility of lurelines.	Not done. The salinity in the canals and coastal area was high and fry were very scarce. Lurelines failed to attract fry under these conditions.
Working paper on by-catch study.	The Central Institute of Brackishwater Aquaculture (CIBA) presented the results of their study to BOBP in the middle of the year. They indicate that the percentage of by-catch varied with the distance of the fishing area from the sea. The ratio of target species to by-catch was 1:1.8 furthest inland and 1: 157 nearest the sea. In addition to commercially exploited nontarget crustacean species, 49 species belonging to 28 families of finfish were caught. The percentage of the total number of organisms entering the estuaries and taken by fry catchers will have to be estimated if the effect of fry catching on the commercial fishery is to be assessed. The report is yet to be finalized.
Hatchery training for private sector small-scale entrepreneurs.	Eight participants, selected from 250 applicants, completed five weeks of training in Malaysia on tiger shrimp hatchery operation (see Bay of Bengal News No. 47). So far, it appears that two trainees have started hatchery construction.
Unscheduled.	SANLAAP, the NGO assisting in cage nursery rearing trials, collaborated with an Orissa-based NGO in the training of fry catchers in Orissa.

Assessment

The cage nursery rearing of shrimp fry is an 'ideal' activity for poor fry collectors through which they could increase their income and improve their conditions and status. The rearing would add value to their product and reduce the dependence on traders. However, there are several issues of concern that may jeopardize the viability of it. The natural conditions vary a lot from one year to another, between extremes of floods, droughts and cyclones, and a small-scale operator cannot cope with these if affected. Another big question is whether the fisherfolk have the organizational and managerial capability, individually or as a group, to operate the rearing activities and, more importantly, handle the marketing. The subproject has shown that cage nursery rearing might be viable, but a series of doubts about it were also generated. Only one season remains for further trials before the end of the subproject and this will not be sufficient to produce any definite answers.

The fry by-catch study provided valuable data on the catch composition and its seasonal variation. More in-depth research is required, though, to assess what damage, if any, fry catching does to fishery resources. The shrimp hatchery in Digha has been equipped with all the necessary facilities and is ready for operation. With some initiative and flexibility from the West Bengal Department of Fisheries' side, it could have been operational some time ago. Unless there is a drastic improvement in the DOF management and staff inputs, the hatchery will continue to be nonoperational.

The experience of the Digha hatchery is another one supporting the view that it is very difficult, to say the least, for fisheries administrations in some countries to operate hatcheries themselves. In view of this, training is being provided to private small-scale entrepreneurs. It is probably a step in the right direction, but it is too early to say if it leads to the desired impact; one of the few selected trainees had already started to build his own hatchery, another has started after the training and a couple of others have advanced plans for it. However, some more time has to lapse before an evaluation can be made.

Targets 1993

- * Completion of technical papers on :
- Shrimp fry by-catch
 - Cage nursery rearing trials
 - Shrimp fry marketing

- * Further trials of cage nursery rearing
- * Training of two entrepreneurs in freshwater prawn hatchery operation
- * Final reports on nursery rearing and hatchery development combined with BWC/SPS/BGD.

Subproject : Shrimp and Prawn Seed, Bangladesh (BWC/SPS/BGD)

OBJECTIVES Introduction of methods and techniques to increase the supply of shrimp/prawn seed and the income of seed collectors.

STATUS 1991 A freshwater prawn hatchery with recirculation of brine-based rearing water and a capacity of four million juveniles per year was constructed in 1990 at the Potiya Fish Seed Production Centre. Five DOF staff were trained in Bangladesh and Thailand, but none was available at the start of the operation and were replaced by BOBP contract staff. The technical feasibility of the hatchery was demonstrated during the 1991 season, but economic viability was not achieved.

Trials to rear freshwater prawn juveniles in cages in a canal near the hatchery were initiated with the assistance of an NGO.

Nursery rearing of tiger shrimp in cages at Mognamapara in Chokaria Sundarbans was taken up in 1990 in cooperation with an NGO. The progress was encouraging, but no conclusive results were obtained before the 1991 cyclone washed away all the cages.

Targets 1992

Achievements

Demonstrate economic feasibility of freshwater prawn hatchery.

With an investment cost of Tk 736,000, operating cost of Tk 350,000, post-larvae (PL) production of 20 PL per litre, price of Tk 350 - 500 per 1000 and three production cycles per season, the return on investment (IRR) ranges from 55 to 93 per cent. PL production in the Potiya demonstration ranged from 16 to 38 PL/litre. Survival from Stage I to PL varied from 21 to 38 per cent. (See Bay of Bengal News No. 48). While commercial levels of productivity were achieved in some of the trials, sustained overall economic viability was not achieved.

Training of government and private sector staff in hatchery technology.

Eight DOF farm managers were trained in five 10-day sessions. Although private sector participants were invited, none attended.

Construction of commercial hatchery.

Instead of constructing one commercial hatchery, the target was modified to provide assistance to private sector entrepreneurs. Four beneficiaries, including one NGO out of 170 applicants, have been selected. BOBP will provide imported equipment, feed for one season and training, while the entrepreneurs will meet all other costs.

Hatchery manual.

A draft has been prepared and it will be published in 1993 (BOBP/MAG/13).

Demonstrate socioeconomic feasibility of cage nursery culture.

Tiger shrimp fry abundance was so low that nursery cages could not be stocked except with a limited amount in February. Further trials will be required to evaluate the economics.

Low water levels severely affected freshwater prawn nursery trials. Only limited stocking was possible.

Assessment

The technology of the brine-based freshwater prawn hatchery has been demonstrated. The production per cycle reached commercial levels of around 17 PL's per litre of rearing water. However, a concern has been the shortage of brood stock at critical points during the season. A wide geographical area needs to be covered to ensure adequate supply to achieve the maximum number of cycles (four). Another concern is the fate of the hatchery when BOBP support is withdrawn in 1993. With the present staffing pattern and the need to adhere to Government procedures, it will not be possible to operate it. It is suggested that consideration be given to privatizing the hatchery.

The response to the advertisement about BOBP assistance to establish private hatcheries was very positive and it is believed that the four selected beneficiaries are capable of constructing and operating hatcheries. This would be a breakthrough for freshwater prawn hatchery development in the country.

Nursery cage culture trials for both tiger shrimp and freshwater prawns were severely affected by climatic factors. It also appears that river levels are again below normal and the same situation may repeat itself during 1993. The trials with freshwater prawn should, therefore, be terminated. The tiger shrimp trials should be given another chance, but, as in West Bengal, sustainable results are not anticipated within the timeframe of the project.

Targets 1993

- * Completion of hatchery manual.
- * Establishment of four private freshwater prawn hatcheries.
- * Training of private sector staff in hatchery technology.
- * Trials of cage nursery rearing of tiger shrimp.
- * Final reports on nursery rearing and hatchery development combined with BWC/SSS/IND.

Subproject : Oyster Culture, Malaysia (BWC/OYS/MAL)

OBJECTIVES	Introduction of small-scale oyster farming as an income generating activity for coastal fisherfolk on the west coast of peninsular Malaysia.
STATUS 1991	<p>The subproject was initiated in 1988 with marketing studies that indicated that the oyster market was undersupplied, with spat collection trials at several locations along the west and east coasts and with experimentation of culture techniques.</p> <p>Culture of flat oyster (<i>O. folium</i>) at Langkawi was demonstrated, but was discontinued because of problems with marketing, management by the fisherfolk and inadequate spat supply.</p> <p>Results of spat (<i>Crassostrea</i>) collection trials had led to the conclusion that commercial culture on the west coast cannot be sustained on the basis of wild spat. On the east coast, however, large quantities of <i>C.iredalei</i> spat are available. They were transplanted to the west coast and successfully reared there. Consequent to the trials in east coast estuaries, both spat collection and culture of oyster had become commercial activities on the initiative of the fisherfolk themselves.</p> <p>A few farms were established on the west coast in Kedah and Perak, which cultured <i>C.iredalai</i> transplanted from the east. 'Half-shell' oysters were sold locally and to restaurants (in Penang). The culture technique employed is based on rafts and longlines.</p>

About 70 potential oyster farmers and fisheries officers have been trained in oyster culture in short training courses of 3 or 4 days.

Depuration units had been introduced to ensure that sanitary standards are met before the oysters are marketed (*Bay of Bengal News No. 45*).

Several promotion campaigns organized by the DOF increased the interest in, and consumption of, oysters (*Bay of Bengal News No. 47*).

Trials to transplant and rear hatchery-produced spat were initiated.

Targets 1992

Extension and credit support to ten new farmers in Telaga Nenas and Kg. Teluk, Perak state.

Evaluation of training courses for fisherfolk and extension staff; conduct additional course.

Publication of extension material.

Economic assessment of culture.

Spat nursery trials.

Achievements

Done. Spat outplanted in February were approaching market size at the end of the year. But poor maintenance and consequent unnecessary mortality was a problem. It also appears that the marketing has to be done more aggressively. There is only one regular trader in the area who offers prices that are not acceptable to the farmers.

Done. Many of the trainees were unable to undertake culture due to lack of access to credit. Courses were most effective with trainees from Kelantan, on the east coast. Oyster culture and spat production are spreading rapidly there without any assistance. Several graduates of the courses have played a key role in the expansion.

A draft extension manual has been prepared and will be published in 1993. An illustrated publication describing the culture of *Crassostrea* oyster was published and distributed.

Done. The internal rate of return (IRR) for half-shell production is 48 - 79 per cent for a family farm with nine longlines and five large rafts at present farm gate prices, depending on whether grow-out takes 12 or 9 months respectively. The culture would experience a drop in the IRR from 48 to 14 per cent (with 12-month grow-out) if spat prices rose from the assumed 10 sen to 30 sen. The economic benefit of oyster culture to society is deemed to exceed the financial benefit, as inputs are often reused from other sectors, rural employment is created, no pollution generated and foreign exchange saved.

One remote setting trial using eyed larvae from the FRI hatchery demonstrated technical feasibility. Eyed larvae were set on plastic film strips for later removal and transfer to nursery trays or bags. Naturally occurring phytoplankton was adequate for good growth.

Assessment

The objectives of the subproject have been achieved, but there are two areas of concern for future expansion.

The demand for half-shell oysters is very strong, but sales have relied too heavily on luxury hotels and a few seafood restaurants. Demand can be increased by developing contacts with the many seafood restaurants, particularly in Malacca. Depuration has proven effective, but some participants need careful supervision, at least at the initial stage.

Spat supply remains the critical constraint on production. Supplies and the number of suppliers have increased, but the production capacity of the Kelantan River Estuary is not sufficient to meet

demand. Spat production from the hatcheries at Science University and FRI is still sporadic and nursery methods for hatchery-produced spat have to be refined. Initial results have been promising and the situation is likely to improve. Hatchery spat production and the growth of the industry are intertwined.

Targets 1993

- * Completion of culture manual.
- * Extension support to participating farmers.
- * Training of farmers in spat nursery rearing.
- * Marketing assistance to farmers in Perak.
- * Final report.

FISHING TECHNOLOGY

Efforts were made during the year to complete the subprojects for the 'introduction of outrigger canoes' in Sri Lanka and Indonesia, the 'development and demonstration of a new liftable propulsion system' for different types and makes of diesel engines for small fishing craft in Sri Lanka and India and to continue the 'demonstration of offshore fishing for large pelagic species' in India. Particular attention has been given to reporting and production of extension material to facilitate sustainability of the subprojects and further introduction of new fishing craft technology.

The results of the subprojects for outrigger canoes in Sri Lanka and Indonesia are positive. Continued introduction of new canoes by small-scale fishermen and entrepreneurs in Indonesia is evidence of the sustainability. However, given the scope of these types of canoes in other areas, there is need for further extension inputs from the national institutions concerned. These inputs could be delivered without the assistance of external agencies or projects. In Sri Lanka, while the subproject has produced technical improvements, the impact is dependent on Government measures with regard to incentives. As long as outboard motors fitted to FRP 18-footers are available with subsidy components, the less fancy canoes with diesel engines or low-powered outboards will not be attractive to the fishermen.

Technical solutions for the motorization of fishing craft for beach-based fisheries have been finalized. A reliable liftable propulsion system, 'BOB Drive', for different makes and types of diesel engines was fully developed and tested as a solution to the long-standing problem of motorization of beach-based craft. Many boatyards, workshops, engine manufacturers involved in the work have already taken over the commercial application and are manufacturing and distributing this new type of propulsion system in many areas of the east coast of India. The introduction of a suitable and reliable fishing craft and propulsion system for beach-based fisheries has come a long way and will ensure the sustainability of the development and introduction of beachlanding craft in India. In Sri Lanka, the application of the BOB Drive has been limited to one make and one type of diesel engine for outrigger canoes. The introduction of the BOB Drive for other craft is still to be done on a scale large enough to ensure the sustainability of this development in Sri Lanka.

The commercially oriented fishing trials for large pelagic species along the Coromandel Coast have been in progress for only a few months. It is therefore too early to draw any conclusions on the viability of small, multiday offshore fishing boats. Commercial fishing operations should be continued till at least one full year is completed. It should be noted, however, that the initial results are below expectations.

The remaining work planned for 1993 is limited to (a) winding up the activities in Indonesia and Sri Lanka, (b) phasing out the commercial offshore fishing trials in Tamil Nadu (they may be continued with other external support), and (c) completion of manuals and reports.

Subproject : General Services (FIT/GEN)

<i>Targets 1992</i>	<i>Achievements</i>
Final reporting on BLC introduction in India.	Done, and the report is being published as BOBP/REP/54. A video film is also in the final production stages and should be ready early 1993.
Report on boat-hauling devices, Maldives.	Done, and published as BOBP/WP/71
Report on fishing trials by BLC in Thirumullaivasal.	Done, and published as BOBP/WP/75
Report on flyingfish fishing trials.	Done, and published as BOBP/WP/84
Report on boat development in Shri Lanka.	Delayed. The outrigger canoe work will be reported on separately, while the small-scale offshore fishing trials will be reported on together with those conducted in India.
Liftable propulsion systems in India and Shri Lanka :	
– Finalization of testing and demonstration.	Done for different makes and types of engines (air-cooled and water-cooled VST, air-cooled Lombardini, air-cooled Yanmar) and different types of fishing craft (outrigger canoe, BLC and plywood canoes).
– Extension materials.	Photo albums of the BOB Drive with different engines were prepared for limited distribution to engine manufacturers and dealers, engineering workshops, boatyards and fisheries extension officers. An article in the <i>Buy of Bengal News</i> No. 47 describes the BOB Drive. Blueprints of the BOB Drive and the new, improved small fishing craft were widely distributed in India and Shri Lanka.
– National seminar.	Field visits by boatyard and workshop personnel, engine manufacturers and fishermen were organized to demonstrate the BOB Drive. These visits proved very useful creating an immediate awareness of the potential of the BOB Drive and facilitating its introduction in new beachlanding craft.
– Reporting.	A manual on the construction of the BOB Drive, for different makes and types of engines to suit different fishing craft, is being prepared (BOBP/MAG/14).
Unscheduled.	At the request of the Fisheries Department of Tamil Nadu, renovation and modification of one BLC (IND-25) was undertaken for installation of the BOB Drive for the air-cooled VST diesel engine. A study of shark drift-longlining on the east coast of India was made. More than 500 small fishing craft were involved. This development is a spin-off of the demonstration of BLCs in Orissa, Andhra Pradesh and Tamil Nadu (see <i>Buy of Bengal News</i> No. 46). The increasing level of exploitation of pelagic shark in Orissa and Andhra Pradesh is, however, of some concern from a fisheries management point of view.

10 per cent more than the wooden craft, due to reduced overheads. The final report is yet to be completed.

Unscheduled.

The recommended modifications in the design of the SRL-19A made by the Naval Architect Consultant, for better ringnet fishing operations and beachlanding, were introduced in the final drawing. The mould of the main hull was modified accordingly.

Assessment

The purpose of the subproject was to develop a suitable design to demonstrate the benefit of fuel efficiency and to demonstrate an alternative to the dugout oru which wastes valuable timber. The outcomes were wooden canoes built of short planks, of relatively low cost, positioned diagonally, and canoes made of FRP. The advantage is that they can be operated by an 8 hp outboard motor at the same speed and with the same manoeuvrability as a traditional oru with a 15 hp outboard motor. The design of the new canoes also enables them to engage in a productive ringnet fishery. An inboard installation of a new liftable diesel propulsion system has been demonstrated; this further reduces the cost of fuel. The objectives of the subproject have, therefore, been fully achieved. Despite these improvements, the impact, other than in the ringnet fishery, is uncertain. The FRP 18-footers (monohull) are becoming increasingly popular along the southern coast. They are being introduced, with subsidized outboard motors, through cooperatives. As long as this continues, and as long as no incentives are provided for fuel saving or penalties for wasting fuel, the new canoes and propulsion system may have a bleak future.

Subproject : Large Pelagic Species, India (FIT/LPS/IND)

OBJECTIVES

Demonstration of fishing for large pelagic species using driftnets and longlines. The intended beneficiaries are fisherfolk who operate BLC and similar, or larger, harbour-based boats. Successful implementation would lead to higher earnings and increased fish production from underexploited resources.

STATUS 1991

The target area was the Coromandel Coast, but it was decided to start in southern Tamil Nadu to benefit from the Shri Lanka experience of this type of fishery.

By the end of 1991, more than one year's fishing had been completed with two 10 m boats (SRL-15) transferred from Shri Lanka. The operational base was Chinnamuttam in southern Tamil Nadu. The crew had been trained to operate safely and reasonably efficiently on their own. The fishery was marginally viable, but depended largely on good seasonal catches of high-priced Seer fish. The catch rates of shark, tuna and billfish were not high enough to make the operation economically viable at the prevailing prices of fish.

It was then decided to move the operation from Chinnamuttam to Madras. It was believed that the large pelagic resources along the Coromandel Coast are less exploited than those in the south and that the fish prices would be higher in an urban area.

Targets 1992

Commercial fishing from Chinnamuttam.

Achievements

Five months of commercial fishing for large pelagic (January - May) were carried out. More emphasis on shark drift-longlining offshore yielded better landings and earnings than in the previous year. The

fishing operations were also carried out further offshore than in the first year. *See Bay of Bengal News No. 45.*

Commercial fishing from Madras.	Only three months of operational data are available. The results so far have not been very promising. In view of the limited period of the fishing trials, an assessment of economic viability could not be made.
Report on trials from Chinnamuttam.	Done, and published as BOBP/WP/81.
Assistance in acquisition of new offshore boats.	Arrangements were made for transfer of the mould of SRL-15 from Colombo to the Andhra Pradesh Fisheries Corporation boatyard in Kakinada.
Training of fishermen/boat operators of Andhra Pradesh and Tamil Nadu.	In-service training on operation of fishing craft and gear was extended to ten private fishermen of Tamil Nadu. As a result four of these fishermen are capable of carrying out offshore fishing operations.
Unscheduled.	Assistance was provided to GOI in preparing a TCP project proposal in support of introduction of small offshore fishing boats on the east coast of India. <i>Ad hoc</i> advice on commercial drift-longlining was given to several private fishing entrepreneurs in Tamil Nadu and Andhra Pradesh.

Assessment

The expected combination of high catch rate and higher price of fish in the metropolitan area has not yet materialized after a few months of operation. The fishermen need to become more experienced. Such commercial trials should have at least one year's duration before any conclusions can be drawn. The BOBP support will be withdrawn in May 1993, but the Government(s) may continue the operation with external assistance from other sources (FAO/TCP).

Targets 1993

- * Commercial fishing with two SRL-15s from Madras till May and disposal of the boats.
- * Analysis of fishing data from SRL-15s.
- * Transfer of SRL-15 mould from Colombo to Kakinada.

Subproject : Outrigger Canoes, Indonesia (FIT/ORC/INS)

OBJECTIVES	Development and demonstration of plank-built outrigger canoes as an alternative to traditional fishing craft, in order to increase incomes of fisherfolk and production of underexploited resources. The target group is the fisherfolk of Nias Island, almost all of whom are small-scale operators employing small, traditional craft of limited capacity and range.
STATUS 1991	Four new 8.6 m outrigger canoes were completed in 1991 and put into commercial fishing operations for demonstration purposes. The design was based on the experience of two earlier prototypes, 8.0 and 9.5 m in length, which had been tested in commercial fishing

for about a year. Those two canoes are still in operation after having been sold to small-scale fishing entrepreneurs. A key factor in the success of the fishing operations was the introduction of insulated boxes for preservation of the fish on ice. All canoes were built by local carpenters (trained under the subproject) to a very high standard of construction.

BOBP collaborated with a local bank, guaranteeing 40 per cent of the loan from the subproject, enabling the bank to issue loans for two canoes at the normal lending rate (26 per cent).

Activities started in Gamo on the northeast coast of Nias Island and, later, extended to Sirombu on the west coast. Besides the BOBP-sponsored canoes, small-scale entrepreneurs had started building similar canoes on their own, indicating that the concept had been accepted.

Targets 1992

Demonstrations of canoes in Sirombu.

Monitoring of fishing operations, savings and loan repayment.

Transfer of outrigger canoes to fisherfolk.

Exposure of new canoes to fisherfolk in other villages.

Construction manual.

Evaluation and reporting.

Achievements

Fishing demonstrations of two outrigger canoes (INS-5) were carried out, till November 1992 with the first canoe and will continue till March 1993 with the second one.

Cost and earnings data were collected by a field officer in Sirombu. In-service training in management of small fishing operations and savings was also provided.

The two fishermen of Gamo to whom the local bank (BPDSU) had provided loans for purchase of diesel engines and accessories for INS-5 have both been behind repayments of instalments by two and three months respectively.

One canoe was sold to a fisherman of Sirombu in November 1992 for Rp. 2,500,000; the actual cost was Rp. 4,500,000. The second one is to be sold in March 1993 after completion of one full year of demonstration.

Twentyone selected fishermen of six fishing villages of Nias Island visited Sirombu for six days and observed the fishing operations of the canoes.

A draft manual on the construction of INS-5 and similar canoes at village level was prepared (BOBP/MAG/12).

The subproject was evaluated in June 1992 by a multidisciplinary team. The technical and economic feasibility of the new canoes has been demonstrated. The construction of this type of canoe has been adopted in selected fishing centres (Bay *of Bengal News No.47*).

Credit is not readily available to small-scale fishermen. The majority of the new canoes are, therefore, likely to be purchased by small-scale entrepreneurs.

The final report is yet to be prepared.

Assessment

The objectives of the subproject, to improve the productivity of the small-scale fishery sector and the earnings of the fisherfolk through the development and introduction of plank-built motorized

canoes, have been achieved in selected fishing centres on the east and west coasts of Nias Island. Given the interest of the private sector in demersal fish for shipment to distant urban markets, the outrigger canoes, with inboard engines, will likely spread further to most important fishing centres of Nias without much external assistance. However, unless a suitable credit scheme is devised, further introduction will primarily be through small-scale entrepreneurs and not directly through the small-scale fishermen.

Targets 1993

* Demonstration of canoe in Nias till end April and disposal of it.

DEVELOPMENT SUPPORT

The principal areas of work have been the follow-up of project proposals in Bangladesh, Sri Lanka and India, organization of a Consultation on the 'Planning of Fishing Craft Introduction', preparation of general descriptions of fisheries, economic analysis of BOBP pilot activities and the implementation of the Fisherfolk Credit Project in Sri Lanka.

The project formulation and promotion efforts resulted in providing a focus to marine fisheries management in Bangladesh and this was given consideration by a UNDP programming mission. The proposal for socioeconomic upliftment of fishing communities was also considered by the mission. Assistance was provided in improving the final version of the Sri Lanka Fisheries Management Project and in clarifying its environmental aspects.

The updating and revision of the 'general descriptions' of fisheries of Bangladesh, Tamil Nadu and Sri Lanka were completed, the major part of the work being done by the fisheries administrations of the countries concerned.

A consultation was held to discuss the 'Planning of Fishing Craft Introduction' with selected experts participating and the presentation of case studies dealing with craft introduction schemes undertaken in the region. It is not clear if the conclusions and recommendations of the consultation will lead to any policy changes. However, the consultation resulted in bringing home to the Governments the need to carefully consider several critical issues prior to introduction of craft.

An important area of work has been the economic analysis of pilot project/activities undertaken by BOBP in fishing technology, and brackishwater culture. Closely connected with such economic analysis was the training of fisheries officials in Sri Lanka and Tamil Nadu in economic and financial analysis. A training manual was also prepared.

The Fisherfolk Credit Project in Sri Lanka launched its loan disbursement phase during the year. Immediately preceding the commencement of loan disbursements, a training programme, targeting field level staff directly involved in loan disbursement and monitoring, was undertaken; in addition, a borrower education programme, with accent on proper utilization of credit and repayment, was also held.

Two national projects in Bangladesh viz. 'Chandi Boat Motorization' and 'Cyclone Rehabilitation' were supervised and monitored during the year.

Subproject : General Services (DEV/GEN)

Targets 1992

Consultation on the Planning of Fishing Craft Introduction.

Achievements

A three-day consultation was held in July in Madras and discussed country-by-country case studies and related topics. It was attended by 33 experts in the technical and administrative aspects of craft introduction.

	<p>A report of the meeting has been distributed to appropriate decision makers and the general findings presented in an article in the <i>Buy of Bengal News No.47</i>.</p>
Follow-up of project proposals.	<p>The two proposals prepared for Bangladesh on 'Marine Fisheries Management' and 'Socioeconomic Development of Coastal Communities' were considered by UNDP's programming mission (TSS-1).</p> <p>The Shri Lanka Fisheries Management Project to be funded by UNDP was further improved and due consideration given to environmental issues. The project was approved and will start in March 1993 (<i>see Bay of Bengal News No.47</i>).</p> <p>The offshore fishing project in Tamil Nadu was superseded by a GOI decision to support the expansion of the small-scale offshore fleet on a nation-wide basis with subsidies channelled through state DOFs. Assistance was given in the preparation of a TCP to facilitate this GOI programme.</p> <p>There was no response from the state government on the Nonformal Education Project in Andhra Pradesh.</p>
General descriptions of fisheries in Shri Lanka, Tamil Nadu, Bangladesh.	<p>Drafts were completed on the revision of these documents. However, since a large number of project reports, working papers and manuals have to be produced before the end of the project, and in view of the uncertainty about the third phase, the printing is being held up.</p>
List of externally-supported projects.	<p>The list has been updated and will be issued in March 1993. See also <i>Bay of Bengal News No.45</i>.</p>
Unscheduled.	<p>Training in financial analysis was given to mid-level officers of the Tamil Nadu DOF (January 1992) and Shri Lanka DFAR (April 1992). Training manuals were prepared for the courses incorporating local case studies.</p>

Subproject : Fisherfolk Credit, Shri Lanka (DEV/FFC/SRL)

OBJECTIVES	<p>Introduction of a nonsubsidized credit scheme under the banks' normal lending programmes for small-scale fisheries, fishery-related and other economic activities in order to increase the income of fisherfolk.</p> <p>The target group of the subproject is small-scale fisherfolk, particularly owner/operators of small craft, labourers and women from the fishing communities in the districts of Puttalam, Galle and Matara who have no, or limited, access to credit.</p>
STATUS 1991	<p>By the end of 1991, all the preliminary work leading to the implementation of the final activity, viz. the disbursement of loans, had been completed. The credit scheme had been finalized and approved by the Central Bank, while the approval of the Boards of the participatory banks was still pending.</p> <p>The preliminaries included (a) studies of socioeconomics of fisherfolk in the subproject area, (b) inventory of existing fisherfolk-oriented credit schemes and their status, (c) cost and earnings of economic</p>

activities of fisherfolk by the bank officers, with 37 small economic activities being identified for bank support in the project area, (d) analysis of training needs of bank branch and HQ staff to improve management and the bank-client relationship, (e) identification of improved strategies for credit marketing, (f) training (at two residential workshops) of bank staff in economic and financial analysis of small-scale enterprises, and (g) formulation of a report, by an interagency committee, which includes a credit scheme, a credit flow strategy, a banking plan and monitoring mechanism.

Targets 1992

Achievements

Monitoring.

The scheme was amended to provide a more active role to the fisheries cooperative societies.

Between June and October, 312 loans were disbursed, totalling Rs. 8,833,800.

Borrower education and savings promotion.

A total of 4160 fisherfolk were given a training orientation. Other than covering the savings aspects in the course of the borrower education programme, there was no separate savings promotion campaign.

National seminar.

The national seminar held in Colombo in January 1993 summarized the experience and achievements of the project. It was attended by high-level officials from the Ministry and the banks.

Reporting.

Done, and published as BOBP/REP/55.

Unscheduled.

Training in scheme implementation was done for 106 bank officers and ministry officials at four courses held in Galle, Matara and Puttalam.

Publicity was given to the credit scheme through the fisherfolk radio programme. A brochure was also prepared in Sinhala, spelling out the features of the scheme.

Assessment

Though the project activities had slowed down quite considerably in the initial period, the pace accelerated during the year. In addition to the wealth of information collected on fisheries credit, the project's most important impact was in the improved working relationship which developed between the bank and fisheries officials through the series of joint surveys, investigations and studies, participation in the training programmes and in the formulation of the credit scheme. Another important feature was that the project activities were collectively planned and executed by a committee representing all participating banks and the Ministry of Fisheries, with the BOBP facilitating and coordinating the work. The disbursement of loans in the first four months was quite satisfactory, considering that the scheme had to compete with several other schemes offering lower rates of interest.

ENVIRONMENT

The environmental work of BOBP is primarily carried out by the SIDA project 'Assessment of Environmental Hazards in Fisheries', executed by SWEDMAR, and the 'Cleaner Fishery Harbours' project sponsored by SIDA through IMO.

Another environmental concern directly related to small-scale fisheries is the capture of dolphins. In the BOBP area, this subject is of particular relevance to Shri Lanka, which has experienced negative publicity for large-scale “killings” of dolphins.

In order to assess the problem, BOBP assisted NARA to conduct a comprehensive study of the landings of dolphins and of associated socioeconomic factors as well as attitudes. The details are given below.

Subproject : Dolphin Catches in Shri Lanka (ENV/DOL/SRL)

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|------------|---|
| OBJECTIVES | <ul style="list-style-type: none"> (a) Estimation of total number of dolphins caught. (b) Assessment of economic importance of dolphin catches to fishermen/fisherfolk and consumers. (c) Assessment of attitudes and perceptions of fisherfolk, traders, consumers and nonconsumers to dolphin. |
|------------|---|

STATUS 1991	<p>A review had been made of earlier studies of dolphin catches in Shri Lanka which revealed that some of the estimates were exaggerated because of shortcomings in the studies on which they were based. After a frame survey on the west and south coasts and past records of dolphin catches on the east coast, 14 sampling stations with 7 base stations were identified for a sampling programme. Forms/questionnaires and dolphin species identification sheets were prepared and several field samplers were engaged and trained. The sampling commenced in September 1991. Activities to meet objectives (b) and (c) had been subcontracted to a marketing research bureau.</p>
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Targets 1992

Achievements

Biological sampling to complete one year cycle.	Sampling was conducted at all the selected stations and a one-year cycle was completed by the end of September.
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Socioeconomic and other sociological surveys.	A preliminary survey, an in-depth survey and quantitative surveys of seasonal changes, during the lean and peak seasons of the fisheries associated with dolphin catching, were conducted.
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Worldwide review of information on dolphin catches.	Relevant information has been compiled and reviewed. Dolphins are caught in large quantities as targeted species and nontargeted accidental catches in fisheries in many parts of the world. Catch from industrial fisheries is generally discarded, while those from small-scale fisheries find various uses. Information on abundance and population dynamics are lacking and fishing mortalities are unknown. Aerial surveys, research vessel surveys and observer programmes on commercial vessels conducted in the eastern tropical Pacific give the general impression that the dolphin stocks interacting with tunas have been more or less stable since 1985.
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Analysis and reporting.	Computerization of data on dolphin catches and analysis were completed. The computerization and analysis of bioeconomic data of the fisheries associated with dolphin catching was delayed. The reporting on the socioeconomic aspects, marketing of dolphin catches and perceptions and attitudes of people was completed.
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The dolphin catch was estimated to be around 5,200 animals per year. Though eight species of dolphins and six species of small whales were

identified in the catches, five species of dolphins accounted for 85 per cent of the total number caught. Most of them (70 per cent) were accidentally entangled in tuna driftnets employed by offshore multiday boats. Harpooning in a few places, particularly in the south, accounted for about 30 per cent of the total number caught. The catch of dolphins was highest in November/December in all areas.

Seventy per cent of the consumers of dolphin meat earn less than Rs. 2,000 per month and are generally labourers, primarily from rural areas. Dolphin meat is cheaper than most fish varieties.

A detailed report is under preparation and will be published in 1993 (BOBP/REP/56).

Assessment

The survey was conducted satisfactorily, except for some difficulties in identifying the species of dolphins caught in Batticaloa (east coast), which was due to the common practice of discarding them at sea, and the difficulty of conducting a proper marketing and socioeconomic survey on the east coast due to the civil disturbances in that area. It is believed that the estimate of 5,200 is an accurate one; the sampling was island-wide; the offshore fleet catching the dolphins is fairly well defined; and the harpooning is limited to very few places. The estimate is only one tenth of the figures most commonly publicized.

Targets 1993

- * Finalization of analysis and reporting.
- * National information seminar.

INFORMATION SERVICE

Four issues of Bay of *Bengal* News, BOBP's newsletter, totalling 128 pages were released during 1992. Colour was introduced in the publication from Issue No. 47, September 1992, and will continue to be used hereafter.

Eighteen reports, working papers, manuals and information documents were brought out during the year (see Table 1). Better use of colour for photographs and charts were made in these publications. New ground was broken in the production of an extension manual in **Indonesian** for extension workers and trainers in Indonesia. This manual was profusely illustrated in colour and was well received in Indonesia.

The production of post-harvest fisheries pamphlets in local languages has continued, i.e. A New and Better Fish Marketing Container (Telugu); Insulated Fish Boxes – Types, Specifications and Usage (Telugu/Tamil/Oriya); Permanent Ice Box – Construction Specifications (Telugu); How to Make High Quality Dried Anchovies (Kannada/Malayalam).

As part of its celebrations on World Food Day, 1992, the Phuket Marine Biological Centre of the Department of Fisheries in Thailand, in cooperation with FAO's Regional Office for Asia and the Pacific and the Bay of Bengal Programme, organized an exhibition on Food and Nutrition at the Phuket Aquarium. The exhibition was ceremonially opened on October 16th and was on display till the first week of December. Sixty mounted photographs and twenty framed sketches, drawings and prints, with suitable captions, were sent by BOBP to the Aquarium for the exhibition. (see *Bay of Bengal News No.48*).

In connection with the 1993 calendar, art competitions were held in schools in fishing villages of all seven countries. Over 1000 entries were received and prizes were awarded to the best three entries

from each country. There were also a few consolation prizes. Two drawings from each country were selected for the 1993 calendar from among the 32 prize winners (see *Bay Of Bengal News No. 48*).

Most of the video effort has gone into editing, supplementary shooting and production of films of material shot earlier. The subjects have been feed for shrimp, anchovy drying, pollution in fishery harbours and beachlanding craft. A film on the freshwater prawn hatchery in Bangladesh was produced under subcontract with SAVE in Bangladesh. Particularly in demand were films on prawn seed, feed and culture. The video unit will be closed down in early 1993 since the documentation of all major BOBP activities has **been** completed.

In 1993 considerable effort is required to complete all the reports and manuals which may be as many as 40. It is planned to continue to issue the *Bay Of Bengal News*. No other significant activities are foreseen.

PROJECT INPUTS AND THEIR UTILIZATION

The budget and estimated expenditures in 1992 for the three projects are as follows (in US \$) :

<i>Project</i>	<i>Budget US \$</i>	<i>Est. Exp. US \$</i>
GCP/RAS/ 118/MUL	1,590,000	1,290,000
GCP/RAS/ 117/MUL	70,000	67,000
GCP/RAS/126/AGF	100,000	100,000
Total	1,760,000	1,457,000

Details are given in Table 2. The actual expenditures under GCP/RAS/118/MUL are higher than indicated in table 2a and would amount to about \$ 1.6 million. The low and negative expenditures under "duty travel" and "gen. op. exp." are results of FAO accounting errors of 1991 which were corrected in 1992. But the net income under "equipment" is real, since items not needed have been sold and hardly any new pieces have been acquired.

The expenditures are about 10 per cent lower than budgeted for, mainly as a result of the Advisory Committee's recommendation in its sixteenth meeting to economize the operation. Subprojects have been phased out, nonessential activities deleted from the plan and no new activities taken up.

The budget for 1993 is based on minimum requirements to complete the remaining work of the project. It is estimated there will be a remaining, unallocated balance of \$ 300,000 which should **be** more than sufficient to continue the project till April 1994 with a skeleton staff and the Information Service, enabling the finalization of all reports and manuals. However, this balance will probably be drastically reduced (50 per cent) as a result of loss on exchange between US dollar and Swedish Krona following the recent devaluation of the latter.

GCP/RAS/117/MUL, the Government cash contributions, has continued to support the Information Officer, supporting staff and consultancy services for preparation of reports (Table 2b). All contributions due for 1992 had not been received by the end of the year. All participating countries have pledged to continue their contribution through 1993.

GCP/RAS/126/AGF, the training support has been completed as planned (Table 2c)

Disciplinewise, Extension accounts for about 26 per cent of the expenditures, Brackishwater Culture and Fishing Technology 21 per cent each, Development Support 17 per cent, Information Service 11 per cent and Environment 2 per cent.

Two professional posts were abolished during the year, i.e. Masterfisherman and Socioeconomist, and one at the end of the year, Development Adviser. The Information Officer's post has, as in

the previous year, been filled by a consultant on a part-time basis. Other consultancy inputs are given in Table 3. In the coming year it is planned to abolish the Fishing Technologist post in June and Extension Adviser in October while the Aquaculturist and Programme Director will remain till the end of the year.

At the end of the year there were only two Associate Professional Officers (APO) in post. Four had left during the year and no new ones had been recruited (Table 3). The Economist is scheduled to leave in May and the Socioeconomist in October 1993.

In connection with the phasing out of activities and departure of professional staff, eight posts of the supporting staff have been abolished. Those remaining in December 1992 are listed in Table 4. The process of trimming the supporting staff will continue in 1993; eight more posts will disappear between April and October. The administrative programme offices in Colombo and Dhaka will be closed.

Under subcontract, the major expenditures were for various fishing boat construction/testing activities in India, Indonesia and Shri Lanka; printing of reports; the fisherfolk radio programme and dolphin study in Shri Lanka; extension work in Bangladesh and Thailand; and cage nursery rearing of shrimp in Bangladesh.

Major expenditures by way of materials were for oyster culture gear and spat in Malaysia, stationery, boatbuilding, information and extension, and for cage nursery rearing of shrimp in Bangladesh and India.

The training activities have been mentioned under the various subprojects described in the previous sections. The details are presented in Table 5. The total training time is much less than in the previous year, but still amounts to nearly 20 man-years. Even this is an underestimate, since a lot of training given by NGOs, e.g. in the shrimp seed nursery activities in Bangladesh and West Bengal, is not recorded as organized courses or workshops.

Table 1
List of BOBP Publications issued in 1992

Reports

BOBP/REP/49	Introduction of New Small Fishing Craft in Kerala, India.
BOBP/REP/50	Report of the Sixteenth Meeting of the Advisory Committee, Phuket, Thailand, 20-23 January 1992.
BOBP/REP/51	Report of the Seminar on the Mud Crab Culture and Trade in the Bay of Bengal Region, November 5-8, Surat Thani, Thailand.
BOBP/REP/52	Feeds for Artisanal Shrimp Culture in India – Their development and evaluation.
BOBP/REP/53	A Radio Programme for Fisherfolk in Shri Lanka.

Working papers

BOBP/WP/71	Manual Boat Hauling Devices in the Maldives.
BOBP/WP/74	A Study of the Performance of Selected Small Fishing Craft on the East Coast of India.
BOBP/WP/75	Fishing Trials with Beachlanding Craft in Thirumullaivasal, Tamil Nadu, India.

BOBP/WP/77	Development of Canoe Fisheries in Sumatera, Indonesia
BOBP/WP/79	Review of the Beche De Mer (Sea Cucumber) Fishery in the Maldives.
BOBP/WP/80	Reef Fish Resources Survey in the Maldives – Phase Two.
BOBP/WP/81	Exploratory Fishing for Large Pelagic Species in South Indian Waters.
BOBP/WP/82	Cleaner Fishery Harbours in the Bay of Bengal.
BOBP/WP/83	Survey of Fish Consumption in Madras.
BOBP/WP/85	The Processing and Marketing of Anchovy in the Kanniyakumari District of South India – Scope for Development.

Manuals

BOBP/MAG/7	Guidelines for Extension Workers in Group Management, Savings Promotion and Selection of Enterprise (<i>in Bahasa Indonesia</i>).
BOBP/MAG/8	Extension Approaches to Coastal Fisherfolk Development in Bangladesh: Guidelines for Trainers and Field Level Fishery Extension Workers (<i>in Bangla</i>).

Information documents

BOBP/INF/ 13	Bibliography on the Mud Crab Culture and Trade in the Bay of Bengal Region.
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Table 2a
GCP/RAS/118/MUL - Budget and Expenditures (in US \$)

<i>Code</i>	<i>Object of Exp.</i>	<i>Total 1987-93</i>	<i>Actual Exp. 1987-91</i>	<i>Estimated Exp. 1992</i>	<i>Budget 1993</i>	<i>Unallocated</i>
10	Personnel	5,079,246	3,804,807	774,439	500,000	
20	Duty travel	1,097,293	985,120	12,173	100,000	
30	Contracts	989,565	739,295	130,270	120,000	
40	Gen. Op. Exp.	469,264	429,933	(669)	40,000	
50	Materials	642,623	494,976	77,647	70,000	
60	Equipment	518,302	516,996	(28,694)	30,000	
80	Training	695,321	428,935	176,386	90,000	
	Subtotal	9,491,614	7,400,062	1,141,552	950,000	
90	Servicing cost	1,233,727	961,825	148,402	123,500	
	Unallocated	314,659				314,659
	GRAND TOTAL	11,040,000	8,361,887	1,289,954	1,073,500	314,659

Table 2b
GCP/RAS/117/MUL - Deposits and Expenditures (in US \$)

<i>Code</i>	<i>Object of Exp.</i>	<i>Deposits 1987-93</i>	<i>Actual Exp. 1987-91</i>	<i>Estimated Exp. 1992</i>	<i>Budget 1993</i>
10	Personnel	398,473	272,899	60,574	65,000
20	Duty travel	4,305	1,778	2,527	
30	Contracts	25,000	—	—	25,000
40	Gen. Op. Exp	30,459	4,306	264	25,889
50	Materials	8,199	26	173	8,000
	Subtotal	466,436	279,009	63,538	123,889
90	Servicing cost	23,321	13,950	3,177	6,194
	GRAND TOTAL	489,757	292,959	66,715	130,083

Table 2c
GCP/RAS/126/AGF - Budget and Expenditures (in US \$)

<i>Code</i>	<i>Object of Exp.</i>	<i>Total Budget 1990-92</i>	<i>Actual Exp. 1990-91</i>	<i>Estimated Exp. 1992</i>
40	Gen. Op. Exp	13,615	9,320	4,295
60	Supplies/Equipment	32,384	8,596	23,788
80	Training	307,778	247,643	60,135
	Subtotal	353,777	265,559	88,218
90	Servicing cost	45,991	34,523	11,468
	GRAND TOTAL	399,768	300,082	99,686

Table 3**Professional Staff - 1992 - (GCP/RAS/118/MUL & GCP/RAS/117/MUL)***INTERNATIONAL OFFICERS*

<i>Post</i>	<i>Name of Incumbent (country)</i>	<i>Date of (month/year)</i>	
		<i>Arr.</i>	<i>Dep.</i>
1. Programme Director	Engvall, L O (Sweden)	01/87	
2. Aquaculturist	Angell, C (USA)	01/87	
3. Development Adviser	Fernando, C (Shri Lanka)	08/90	12/92
4. Masterfisherman	Gallene, J (France)	03/88	04/92
5. Socioeconomist	Kristensen, H (Denmark)	05/91	10/92
6. Fishing Technologist	Pajot, G (France)	01/87	
7. Extension Adviser	Roy, R N (India)	01/88	
8. Small Craft Specialist (Asst. Prof. Officer)	Andersen, M (Denmark)	04/89	10/92
9. Fishing Technologist (Asst. Prof. Officer)	Dahlgren, T (Sweden)	12/91	12/92
10. Socioeconomist (Asst. Prof. Officer)	Haglund - Heelas, (Ms) A M (Sweden)	10/90	
11. Economist (Asst. Prof. Officer)	Hall, R (Sweden)	06/91	
12. Aquaculturist (Asst. Prof. Officer)	Nielsen, H B (Denmark)	10/88	04/92

INTERNATIONAL CONSULTANTS

<i>Post</i>	<i>Name of incumbent (country)</i>	<i>w/m</i>
1. Boat Design, Construction and Evaluation (IND,SRL,BGD)	Gulbrandsen, O (Norway)	2.2
2. Information**	Muthiah, S (India)	6.0
3. Fisherfolk Radio Programme (SRL)	Pickstock, M (U.K.)	0.75
4. Evaluation of Outrigger Canoes (INS/SRL)	Turner, J M M	1.0
5. Reporting	Pietersz, V L C (Shri Lanka)	2.5
6. Consultation on Planning of Fishing Craft Introduction	Joseph, K M (India)	2.0

** Costs covered by GCP/RAS/117/MUL

Table 4**Supporting Staff - (GCP/RAS/118/MUL & GCP/RAS/117/MUL) - end 1992***ADMINISTRATION (Madras)*

Scurville, (Ms) S	Sr. Admin. Assistant
Rajagopal, K	Admin. Assistant (Accounts)
Britto, (Ms) J	Receptionist
Shanmugam, T P	Driver
Sivashanmugam, P M	Driver
Rajendran, S	Driver

*ZNFORMA TION SERVICE (Madras) ***

Joseph, (Ms) C	Documentalist
Amalore, E	Artist/Draughtsman
Jayaraj, S	Artist
David, (Ms) C	Secretary

SECRETARIAL SERVICE (Madras)

Ellis, (Ms) M	Secretary
Jayakumar, (Ms) E	Secretary
Mahalingam, (Ms) V	Secretary
Verghese, (Ms) C	Secretary

NATIONAL OFFICE (Dhaka)

Kashem, A	Programme Officer
Ekram, (Ms) Z	Secretary
Syed, Nural H I	Typist
Kabir, A Q	Driver
Miah, Md. Majnu	Driver

NATIONAL OFFICE (Colombo)

Kelaart, (Ms) C	Admin. Assistant
Premaratne, A D	Driver

** Costs covered by GCP/RAS/117/MUL

Table 5
Training activities 1992 (GCP/RAS/118/MUL and GCP/126/AGF)

S. No.	Title	Duration (Days)	Venue	No. of participants						
				BGD	IND	INS	MAL	MDV	SRL	THA
<i>SEMINARS/CONSULTATIONS/WORKSHOPS</i>										
1.	Consultation on planning of fishing craft introduction – for fisheries administrators, scientists & NGOS.	3	Madras	3	6	2	1	2	2	2
2.	Seminar on set bagnet fisheries in Bangladesh – for fisheries administrators and scientists	4	Cox's Bazar	46		1	1			1
3.	Seminar on fisheries extension – for personnel associated with fisheries development in Bangladesh	3	Mymensingh	65						
4.	Review of pilot project activities – for DOF and NGO staff	2	Patuakhali	25						
5.	Workshops on review, evaluation and future planning of activities – for women's group supervisors	9	Patuakhali	10						
6.	Reef resources management – for island communities and school teachers	7	Meemu/Vaavu					85		
7.	Sharing the learning from extension projects – for extension agents	4	Ranong							150
<i>TRAINING COURSES</i>										
1.	Health education – for fisherwomen	2	Patuakhali	74						
2.	Primary health care & nutrition – for fisherwomen	3	Patuakhali	96						
3.	Group mobilization and development – for women's group supervisors	2	Patuakhali	9						
4.	Women's legal rights – for women's group supervisors	1	Patuakhali	9						
5.	Group credit management – for women's group supervisors	6	Patuakhali	9						
6.	Simple accounting – for women's group supervisors	3	Patuakhali	10						
7.	Social and organizational development – for women's group supervisors	2	Patuakhali	10						
8.	Poultry management and vaccination – for women's group supervisors	2	Patuakhali	10						
9.	Social afforestation and nursery management – for women's group supervisors	2	Patuakhali	10						
10.	Small-scale freshwater shrimp hatchery operation and management – for DOF officers	10	Potiya	8						
11.	Financial analysis of fisheries projects – for fisheries officials	4	Madras							
12.	Assembly of propulsion system for beachlanding craft – for mechanics/engineers from workshops and engine manufacturers	5	Madras		8					
13.	BOB Drive – for personnel of engineering workshops, boatyards and engine manufacturers	2	Madras		12					
14.	Marine shrimp hatchery operation and management – for private entrepreneurs	30	Penang		8					
15.	Oyster farming – for fisherfolk and fishery assistants (extension agents)	4	Kedah				10			

S No.	Title	Duration (Days)	Venue	No. of participants						
				BGD	IND	INS	MAL	MDV	SRL	THA
16.	Extension methodology – for MOFA staff	2	Male					8		
17.	Use of equipment and programme production – for fisheries radio staff.	2	Colombo						5	
18.	Radio programme development and production – for fisheries radio staff	6	Colombo							
19.	Appraisal, approval and documentation of loans – for fisheries and bank officers	6	Marawila & Matara						106	
20.	Borrower education – for fisherfolk	0.5	Shri Lanka						5476	
21.	Financial analysis of fisheries projects – for fisheries officials	4	Colombo						10	
22.	Batik production – for women	21	Bangkok/ Khadjaphai							9
23.	Batik production – for young girls	90	Narathiwat							5
24.	Accounting and management – for petrol shop operator	4	Ranong							1

STUDY TOURS

1.	Briefing on BOBP activities – for NGO staff	2	Madras	6						
2.	Liftable propulsion system in beachlanding craft – for fishermen and fisheries officers	4	Kerala		6					
3.	Outrigger canoes – for fishermen of Teluk Dalam, Nias	5	Srombu							
4.	Participatory research methods for coastal aquaculture development – for fisheries officers	10	Iloilo, Philippines							

Appendix E
POST-HARVEST FISHERIES PROJECT
Annual Report 1992

INTRODUCTION

The Post-Harvest Fisheries Project, although separately funded by the Overseas Development Administration of the United Kingdom (ODA) and managed through the Natural Resources Institute (NRI), UK, is a fully integrated technical unit of the BOBP. The Project commenced in August 1987 and, from September 1989 until April 1992, was in its second phase. Proposals for a five-year third phase have now been approved by the ODA and, pending final approvals by the respective host governments, is programmed to start in March 1993. During the period from May 1992 to February 1993, activities were continued on an interim basis.

Three BOBP member countries are included in this Project: Bangladesh, India and Shri Lanka. The principal objectives of the Project are: **to reduce post-harvest losses and improve the utilization of fish in order to enhance incomes of those involved in fish handling and marketing, and to improve the distribution of high quality fish to the consumer.**

SUMMARY OF MAIN ACTIVITIES

Owing to a degree of uncertainty about the Project's continuation into the third phase, activities undertaken during 1992 were mostly restricted to consolidating those already initiated during the earlier stages of Phase 2 of the Project.

Effort has been concentrated in INDIA where four main activity areas, comprising seven subprojects activities, have been implemented:

Improved utilization of low-value fish has continued to focus upon upgrading the traditional drying and marketing of anchovy in South India in order to optimize incomes. A socioeconomic and technical feasibility study for a village-based anchovy drying operation has been completed (BOBP/WP/85). This was instrumental in attracting credit amounting to Rs 1.2 million from the Indian Bank to the Kanniyakumari District Fishermen's Sangams Federation (KDFSF), an active fishermen's NGO. In spite of difficulties caused by a cyclone, 90 drying racks (2,500m²) have been constructed as part of the trial production unit in three villages in the district. So far, 1.5 t of high quality product has been produced, some of which has been utilized for structured consumer research in Madras, the remainder being destined for export and local market testing.

A promising new subproject initiated towards the end of the year is to assess the potential for small-scale tuna processing in southern India. Market studies have indicated that traditional 'maldivé' (*masmin*) fish is in considerable demand in South India and Shri Lanka. In the latter, traditional processing has declined drastically in the face of increasing demand from the more lucrative fresh tuna market. Tuna is recognized as a large, underutilized resource in India and adding value through village-based processing is seen as an appropriate development objective.

Use of ice has focussed on broadening the awareness, amongst fisherfolk within 'target' villages, of the options open to them in terms of types and costs of ice boxes available as well as practically demonstrating the cost-effectiveness of using ice.

In participation with fishermen from three villages in Andhra Pradesh, over 2,900 fishing hours in non-motorized *navas* were monitored. The net incomes derived by the fishermen using trial ice boxes was then compared to that of a control group. The results clearly show a quality premium payable for high value species combined with a significant reduction in quality loss upon landing. The payback period for the type of boxes used was then shown to be as short as one to two months.

Future inputs will involve further demonstration trials and needs assessments in other villages, initially in both Andhra Pradesh and Tamil Nadu. Target groups will comprise non-motorized *navas*, *vallams* and *kattumarams*.

Besides studying the potential for increasing the use of ice at sea, the Project has continued to look at the options for simple, shore-based storage systems, such as the permanent ice box (PIB) developed in collaboration with KDFSf.

The Project has been providing support to state government schemes and credit institutions aimed at disseminating the use of ice. Through developing closer working relationships with private sector companies, these have gained valuable experience in appropriate methods of extending technical advice on their products to the fishing communities.

Fish marketing activities have continued to focus attention on the problems and needs of itinerant women fish vendors. Whilst continuing to promote the use of the new, low-cost aluminium fish container developed participatively with the women during Phase 2, greater emphasis has been placed on assessing the impact this has had on their incomes and lifestyles. Socioeconomic baseline surveys and monitoring studies have been completed in six marketing women's communities in Tamil Nadu and data is currently being analyzed. Already it is apparent that, to several groups, the container has great utility, whereas, to others, this is more uncertain: other needs, such as credit, prevail. Results from these studies, together with information gathered from a series of needs evaluation workshops, will help guide future inputs aimed at addressing critical problem areas and improving access to markets. These inputs will be implemented primarily through grassroots organizations and NGOs.

The survey of fish consumption in Madras has now been published (BOBP/WP/83). Further structured market research is now being conducted into dry fish and anchovy consumption in Madras and Hyderabad in support of the anchovy drying subproject activity.

In collaboration with the Tamil Nadu Department of Fisheries, a new data base is currently being set up at Project HQ, the objective of which is to collate and report on prices of fish and fish products at key landings and at wholesale and retail points throughout South India. Although this is seen primarily as a monitoring tool for use in project evaluation, it may also serve as a useful information service to the sector in general.

The Project has continued to fund a Marketing Adviser post and two extension officers at KDFSf.

Shark leather processing technology, despite a useful input from an expatriate leather expert early in the year, has failed to gather the momentum expected during the previous year. The prime reason for this has been related to the poor quality of the skins as procured by the artisanal fishery in India. Sharks are captured primarily for their fins, which have tripled in value over the last year, introducing a Klondyke mentality among the many opportunistic producers who have appeared. Ice is never used on the boats and the skin tends to be spoiled prior to landing. Moreover, the dilatory nature of the skinning operation further detracts from obtaining good quality raw material.

Although the technology development in collaboration with the Central Leather Research Institute (CLRI), Madras, has been relatively successful, the volatile nature of this fishery, with fins as the over-riding goal, may hinder the development of this product. However, further efforts will continue to identify reliable sources of skins. One such source may be the Andamans.

The Project's activities in **SHRI LANKA** have centred on an appraisal of the problems of small-scale itinerant traders, recognizing the important role played by them in fish marketing throughout the island.

Bicycle fish vendors operate independently in their hundreds from almost all major landing sites and markets in Shri Lanka. They are an impoverished, and largely disenfranchised, group working under extremely difficult conditions. In collaboration with an NGO,

Development Innovations and Networks (IRED), Colombo, a series of activities aimed at identifying key problems and needs of these traders was implemented. Activities have concentrated in Colombo, but more recently have expanded to cover Kandy markets, and Negombo and Doddanduwa landing sites.

A preliminary but key issue to resolve was that of developing an improved fish-cum-ice cycle carrier at a price potentially attractive to the traders. Several prototype boxes were produced with the help of a private FRP manufacturer and with inputs from Colombo traders. These were then monitored while in daily use by 15 traders over a five-month period and showed, among other advantages, substantial savings in the amounts of ice required for the marketing operation.

The participative nature of this technical development led to the early formation of a group of traders in Colombo who have come to realize the advantages of mutual association. Group formation for training and credit procurement have, and will continue to play, an important role in this activity.

Activities by the Project in **BANGLADESH** during 1992 were, as in previous years, implemented under the BOBP Extension and Set Bagnet projects (EXT/FED/BGD and RES/SBN/BGD).

Fisheries extension development activities centred on completing the screening programme to quantify the usage of DDT in dried fish products used for popular consumption. This had been postponed the previous year due to the severe flood damage to Chittagong's dried fish market. It was clear from the study that many of the samples contained unacceptably high levels of DDT. Over 94 per cent of the samples had residues exceeding the CODEX maximum residue level for produce in international trade, while 8.3 per cent had 100 times these limits. Disturbing anecdotal reports of extensive use of other insecticides, such as BHC, carbaryl and dichlorvos, were also received. Further work will look at the technical and socioeconomic factors related to the adoption of safer alternatives, including traditional insecticides. The use of bacterial insecticides may also be investigated as part of a regional programme in collaboration with NRI.

Further work was carried out on improved handling of fish in ice in collaboration with CODEC, Chittagong, and a study tour by three of their staff to discuss institutional development with South Indian fishermen's federations was successfully completed.

Set bagnet marketing activities were restricted to the presentation of the findings of the study of socioeconomic aspects of SBN marketing to the seminar on SBN bioeconomics held at Cox's Bazaar in January.

PHASE 3 (1993-1998)

The Project's proposed third phase will continue mainly to build on activities already initiated. The stated objectives are :

- to enhance the incomes of artisanal fishing communities and petty fish traders in India, Bangladesh and Shri Lanka;
- to identify and develop the potential for increasing the diversity of fish products marketed by these communities; and
- to strengthen the ability of NGOs and grassroots organizations to replicate and secure sustainable benefit from project activities.

These objectives will be achieved through value addition, improvements in fish quality and reduction of losses during distribution and marketing. Project activities will be directly focussed on low-income groups and will be implemented in a fully participative manner. As women play a major role in handling, processing and marketing, they will be specifically targeted.

In order to raise the profile and assist in the prioritization of post-harvest issues in the region, the Project will commission a critical regional overview of post-harvest problems, institutional capacity and expertise, and of post-harvest projects recently completed, current and planned.

Monitoring and Evaluation Unit : the assessment of Project impact carried out at the end of 1991 by Integrated Marine Management Ltd. highlighted the need to improve planning and monitoring of subprojects in order to better focus on the means of achieving measurable impact. To meet this requirement, an Internal Monitoring Unit has been recently set up in Madras, the role of which is to advise project management in the appraisal, monitoring and evaluation of activities. Emphasis is placed on identifying practical means of verifying impact of Project inputs, as well as assessing progress against set targets. The work of this new unit will become increasingly important throughout the proposed third phase.

Further details of the subprojects and related activities follow.

INDIA

Subproject : Improved Utilization of Low-value Fish (ODA/PI/IND)

OBJECTIVES To assess the market potential for expanding the utilization of certain low-value/low-demand species by identifying novel marketing strategies which would enhance their value both as fresh fish and processed, value-added products.

STATUS 1991 Small-scale pilot processing trials of dried anchovies completed in Kanniyakumari District. Market trials on improved (clean, sand-free) product in Madras demonstrates quality premium price payable. Extension training carried out through fishermen workshops, and dissemination leaflets produced. Study tour by KDFSf staff to Shri Lanka completed.

Study on spoilage of flyingfish carried out by CIFT staff. Report indicated high value losses and histamine contamination of products.

Subproject : Dried Anchovy (ODA/PIB/IND)

Targets 1992

Market development of high quality dried anchovy in India and Shri Lanka, including the identification of new marketing channels, improved product packaging and promotion.

Achievements

Economic feasibility study for the anchovy drying project completed (BOBP/WP/85). Funding of upto Rs. 12 lakhs made available from the Indian Bank to KDFSf. Ninety drying racks (@2,500m²) constructed in three villages. 1.5 tons of high quality product made by fishermen using new racks. Marketing Adviser to KDFSf and three extension officers, funded by the Project, have assisted the development and implementation of the anchovy drying project. Initial socioeconomic baseline data collected. Trial marketing programme set up. Market research into consumer attitudes to dry fish and anchovy consumption commissioned with MARG.

Continue with support to KDFSf in the expansion and promotion of improved anchovy drying and marketing.

Consolidation of programme in preparation for 1993 season, continuing the assessment of market potential, and initiating a study of the impact potential of this subproject on the local fishing community. Several workshops and training courses, for a total of 360 participants, have been held under the auspices of the KDFSf. Subjects covered have included: fresh fish handling; marketing; anchovy flake making.

Initiate production trials with anchovy traders in southeast Tamil Nadu. Not done.

Subproject : Tuna processing (ODA/PID/IND)

Unscheduled Appraisal for new subproject activity on tuna utilization completed. The potential for introducing smoke-dried *masmin* (or Maldive fish) processing to women's fish marketing groups in the South Arcot District of Tamil Nadu investigated. Market studies completed, target groups identified and skills training initiated. Socioeconomic baselines completed. Collaborating NGO identified.

Assessment

Progress has been slower than expected due to a combination of factors, including: delay in release of Bank funds due to KDFSFS's dilatory response to supply of equity capital required by creditor; corresponding delay in rack construction beyond fishing/cyclone season in Kanniyakumari.

Fisherfolk beneficiaries have already savoured the economic advantages of this simple technology and are very keen to collaborate in the coming season's production.

Local management and coordination of the subproject will be critical to its success. The response of KDFSFS so far has been less than encouraging.

Tuna is an underutilized resource in India and market prices are very low compared to neighbouring Sri Lanka and Maldives where *masmin* is traditionally manufactured. Considerable scope appears to exist for developing cottage-level processing in areas of traditional tuna landings in Tamil Nadu.

Targets 1993

- * Maintain strong support to KDFSFS through the provision of technical, economic and institutional advice, training and manpower inputs.
- * Increase pilot production towards fully commercial levels.
- * Continue with market promotion of anchovy products at home and overseas.
- * Identify other potential areas where value added anchovy drying could be promoted.
- * Initiate pilot processing and marketing of *masmin*.

Future

Establishment of improved anchovy drying methodology and supporting marketing infrastructure in the subregion. Gradual withdrawal of direct support to KDFSFS as subproject development objectives are met. Establishment of production and marketing of tuna products.

Subproject : Use of Ice (ODA/P3A/IND)

OBJECTIVES To improve the quality and value of fish landed by artisanal fishing craft through the promotion of the use on board of ice and insulated boxes made from low-cost materials.

STATUS 1991 Trial introduction of 124 GRP boxes to artisanal fishermen in Andhra Pradesh and Tamil Nadu. Private sector companies take up production and promotion of insulated boxes of differing capacities and various materials based on Project's recommendations to suit

the specific and heterogeneous needs of fishermen. Offtake of boxes is slow due to their high cost, large size and single design. Target group is over-specific and box fails to address needs of general fishermen population. A trial PIB constructed in Kanniyakumari helps to increase and stabilize fish prices paid to fishermen's *sangams*.

Targets 1992

Development and promotion of appropriate, low-cost technologies to enable fishermen both to take ice to sea and to use ice on shore to preserve fish quality.

Continuation of cost reduction for alternative insulated boxes and ice-cum-fish storage systems, such as the PIB, to be used in fishing communities.

Provision of support to State Govt. DOFs in promoting the use of ice in general.

Assessment

It has become increasingly clear that there is great potential for achieving substantial increases in the extent of ice usage even in the least capital-intensive, small-scale fisheries. An increasing dependency by these groups on income-generation through high-value export products, mainly shrimp, in combination with their lack of infrastructure and storage facilities, means that they are particularly vulnerable to trade distortions and distress sales.

The challenges, especially related to the *kattumaram* fishery, are to demonstrate successfully both the technical advantages and cost effectiveness of simple systems for handling fish in ice. Each system would be tailored in such a way as to meet individual community needs. In order to achieve any degree of success, work must be fully participative in nature and credit systems (rather than subsidies) should play an integral role. The generally poor track record of many fishing communities, in terms of debt repayment to official creditors, will tend to operate against this component.

Equally important is to develop an appreciation amongst villagers of the advantages which can, depending on the fishery, be offered by the PIB. Demonstration and verification of socioeconomic benefits are key factors.

Achievements

Technical development postponed pending Phase 3 approvals. Programme of needs assessment workshops planned with target (mainly *kattumaram*) fishermen. Initial *ad hoc* response from fishermen is very positive.

Fishing trials were carried out to demonstrate cost benefit of low-cost insulated ice boxes on nonmotorized nava craft. Boxes used were 100 kg High Density Polyethelene (Sintex Ltd) and FRP (AP Boatyards). A total of 2,911 hours of fishing time by four fishermen in three villages monitored and net income compared to that of a control group of fishermen not using ice boxes. The results of this demonstration showed that the significant quality premium available would allow payback time of 1 - 2 months for the ice boxes. As a result of these trials, 35 fishermen from the respective villages have received credit for new boxes through a DRDA scheme.

Further trials of a similar kind have been planned for Andhra Pradesh and Tamil Nadu.

The PIB at Kanniyakumari has continued to assist the *kattumaram* fishermen in obtaining stable, increased fish prices. Although the box is seldom used (except during heavy landings), it plays an effective fail-safe role, acting as a potential threat to the traders. Oxfam has agreed to fund a further four PIBs in strategic locations identified by KDFSF in southern Tamil Nadu.

Activities above carried out in cooperation with DOFs.

Targets 1993

- * Initiate needs-based activities aimed at the development and promotion of simple icing systems for traditional, non-motorized craft, especially *kattumarams* on the southern and eastern coasts of India.
- * Provide advice to NGOs and state DOFs on the implementation of PIB activities in fishing communities

Future

Provision of technical support and promotion by the Project until the use of ice becomes fully accepted by the target communities.

Subproject : Fish Marketing (ODA/P6/IND)

OBJECTIVES	To improve post-harvest handling and marketing, and, thereby, enhance the incomes of the small-scale marketing sector in general through the provision of advice on infrastructural improvements and marketing strategies,
STATUS 1991	Fresh fish consumption survey conducted in Madras and report issued. New aluminium fish container designed and disseminated in Tamil Nadu. Marketing Adviser post created in KDFS, post filled and advice provided on TORs and strategies.

Subproject : Domestic Market Research (ODA/P6E/IND)

Targets 1992

Achievements

Carry out further market research into dry fish consumption patterns.	Market Research Group Ltd. (MARC) commissioned to carry out survey in Madras and Hyderabad on dry fish consumption patterns with emphasis on anchovy. Qualitative part completed and results presented. Fresh fish survey edited and published as BOBP/WP/83. Database of fish and fish product prices established.
Carry out feasibility study for formation of non-governmental agency responsible for improving and developing internal marketing of fish and products.	Postponed pending Phase 3 approvals.
Regional seminar on internal fish marketing.	Postponed pending Phase 3 approvals.

Subproject : Itinerant Women Traders (ODA/P6A/IND)

Targets 1992

Achievements

Establish manufacture and supply links directly with NGOs or government departments for marketing fish containers.	South India Aluminium Co. Ltd. manufacturing containers to order for two NGOs and a fishermen's federation. Orders for 265 containers met. Smaller sized container (25 kg) developed against demand and 115 sold.
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Monitoring of container usage carried out in six villages/three districts.

Needs assessment workshops held with eight women's marketing groups. Priority issues of credit, transport, training and other issues of an appropriate nature raised.

Subproject : Marketing Support to NGOs (ODA/P6B/IND)

Targets 1992

Develop support to KDFSFS through providing marketing strategy advice. Pilot scale marketing of high value fish to be evaluated.

Achievements

Marketing Adviser post maintained. Advice on marketing strategies and 'cool chain' evaluation proposal postponed pending Phase 3 approvals.

Other advice on marketing provided directly through anchovy drying programme (ODA/PIB/IND).

Eleven workshops and training courses for a total of 360 participants have been held under the auspices of the KDFSFS. Subjects covered have included: fresh fish handling; marketing; anchovy flake making.

Assessment

Consumer based market research is proving to be an essential tool in guiding market development strategies which may be implemented by NGOs such as KDFSFS.

Besides tackling key problem areas, such as transport (e.g. container and bus routes), the complex overall needs of itinerant women fish traders need to be addressed and are best done in an integrated manner through NGOs and grassroots organizations. An area in which the Project has had clear impact is in terms of raising the profile of this much-neglected group.

Training at the grassroots level has been very positive and has been the primary vehicle for participation in development activities. Involvement of local entrepreneurial traders and fishermen in fresh fish handling workshops has helped to improve local fishermen/trader relationships.

Targets 1993

- * Continue support to women's marketing groups and petty traders in general so that they have better access to markets. Improved transportation and credit are among the factors which would have considerable impact in reducing distress sales and losses.
- * Provide women's groups with appropriate skills and awareness training. This may have positive impact in several ways, e.g. improved access to credit; resolution of community problems; adoption of new income-generation activities.
- * Provide support and advice to local intermediary development institutions and grassroots organizations in resolving general community needs.
- * Carry out feasibility study for formation of nongovernmental agency responsible for improving and developing internal marketing of fish and products.
- * Regional seminar on internal fish marketing to be held during first quarter 1994.

Future

Stronger grassroots level organizations in fishing communities and enhanced ability of intermediary development institutions to support appropriate fisheries development in communities.

Subproject : Shark (ODA/P7A/IND)

OBJECTIVES	To promote the use of shark and shark products. Specifically, to develop the technology for shark skin leather production.
STATUS 1991	Technical work by Central Leather Research Institute under contract to BOBP resulted in considerable progress in quality improvement. Interest from external markets had quickened and two skin suppliers identified. Targets 1992.
<i>Targets 1992</i>	<i>Achievements</i>
Finalize production technology and specifications, enabling private sector tanneries to take over processing and marketing.	An expatriate consultancy provided to CLRI made several further advances in processing technology. Reports by CLRI and the consultant completed. Training in shark skinning provided to supplier through CLRI. Irregular supplies of poor quality skins have hampered development work and prejudiced product quality.
Provide support to private sector in establishing overseas market contacts.	Good collaboration with skin supplier and tanneries established. The former skin supplier has carried out own market research in Europe and US.
Conclude subproject by March 31, 1992.	Conclusion postponed pending Phase 3 approvals.

Assessment

Quality problems with the shark raw material derive from the fact that sharks of suitable size for skinning are captured primarily for their fins. Fin prices in Singapore (the main market for this product, India being the main supplier) have risen by upto **five times** over the last three years, representing the majority of the derived income. Not surprisingly, opportunistic fisheries have developed rapidly to capture this market boom and have not given much thought to the 'by-products'. Shark is landed un-iced, often in poor condition, and the meat is salted in large chunks for the Kerala markets. Yet ODA market research in Madras (MARG) has shown shark to be amongst the most highly appreciated fresh meats with a market price considerably higher than when salted. This discrepancy is led by producers' needs for quick profit-making.

A good international market certainly exists for a good quality shark skin product. If raw material quality problems can be overcome, a situation which looks increasingly remote at present, then this industry would be quickly taken up by the private sector. The net cash benefits for the small-scale fisherman, however, remain doubtful.

Target 1993

- * Investigate alternative sources of raw material (Andamans; west coast fisheries).
- * Terminate subproject by end of 1993.

BANGLADESH

Subproject : Fisheries Extension Development (EXT/FED/BGD)

OBJECTIVES	To provide advice to extension services and NGOs on potential improvements in post-harvest fisheries. Aimed principally at loss reduction and income enhancement.
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STATUS 1991 Screening programme of DDT usage in dried fish postponed due to cyclone destruction in Chittagong.

Training and advice on the use of ice (incl. PIB) provided to Community Development Centre (CODEC) and Chittagong villages.

Subproject : Insect Control in Dried Fish (ODA/P3/BGD)

Targets 1992

Insecticide screening programme to be implemented with support from Chittagong Univ. and Dept. of Fisheries

Achievements

Screening programme and analysis of 252 samples of dried fish collected in Chittagong and Dhaka markets show that 94.4 per cent have levels of DDT higher than CODEX international standards (29.4 per cent and 8.3 per cent have 10x and 100x of this level respectively).

Carry out study of the use and efficacy of alternative, safe insecticides.

Postponed, pending approvals of Phase 3.

Subproject : Support to NGOs (ODA/P1/BGD)

Target 1992

Continue to provide support to CODEC on the use of ice, fish drying etc. and provide training for staff in project planning for NGO staff.

Achievements

A study tour to India, to discuss institutional aspects of NGO development, completed by three CODEC staff. CODEC report produced.

Technical advice on handling fish in ice and shark processing provided to fishing communities in Chittagong through CODEC.

Assessment

The use of insecticides for insect control has become standard practice at all levels of production and marketing. Vulnerable groups are the poor rural consumers, the main market for dried fish. It is disturbing to note that not only is DDT in use, but also such potentially more toxic compounds as benzene hexachloride and dichlorvos. Anecdotal information from the study shows that 'DDT' is a term used generically to cover many kinds of powder and spray applications. DDT is probably the most cost-effective and technically efficacious compound used. Some samples of DDT analyzed, however, were shown to have little remaining active agent due to defective manufacturing. The implications this has on the dried fish residues is unclear: possible user scenarios include "put more on as it's still not working" or "put less on, because it's no good"

CODEC has benefited considerably from exposure to technical, economic and institutional aspects of small-scale fisheries development. Previous experience was heavily biased toward the social aspects, with little consideration for, say, fish marketing or processing options.

Targets 1993

* Set up a joint programme with Chittagong University to address the problems of insect control; specifically, to carry out study of the use of alternative, safe insect control measures.

* Continue with support to CODEC and other NGOs involved in fisheries development.

Subproject : Bioeconomics of Set Bagnet Fisheries (RES/SBN/BGD)

OBJECTIVES Socioeconomic evaluation of the marketing of set bagnet catch by the respective communities involved.

STATUS 1991 Study completed and recommendations made. The study highlighted the great importance that the set bagnet catch has on the small-scale sector, from fisherman to consumer.

Targets 1992

Achievements

Carry out in-depth and longer-term socioeconomic study of the marketing activities related to the set bagnet catch. Consultants identified and TORs drawn up. Postponed pending approvals for Phase 3 project.

Assessment

Any measures aimed at curbing the use of bagnets for fisheries management purposes would have to take into account the vital social and economic importance this fishery has, however unproductive, to many small-scale fishing communities. Not only does it provide scarce food on a subsistence basis, but it also drives a vast and diverse marketing infrastructure designed to convey low-cost products to poor consumers throughout Bangladesh.

Targets 1993

* Carry out an in-depth socioeconomic study of the marketing activities related to the set bagnet catch and define further subproject activities around this.

SHRI LANKA

Subproject : Reduction of Post-harvest Losses (ODA/SRL)

OBJECTIVES Reduction of losses through improved onboard and onshore handling procedures.

STATUS 1991 Study of potential for improved onboard handling of tuna through gutting shown to be non-viable. Ice supply to southeast identified as constraint to marketing, but social problems hinder project inputs. Importance of role of cycle vendors in fish marketing recognized and socioeconomic baseline study initiated.

Targets 1992

Achievements

Continue with socioeconomic baseline study of cycle traders and evaluate new technologies to assist their operation. Baseline study of Colombo traders completed. Needs assessment workshops held. Improved cycle fish carrier developed participatively with traders and GRP manufacturer. Fifteen units, tested in use over five months, show cost-saving in ice use, improved customer attraction and value-addition.

Similar activities initiated with analogous traders in Kandy, Negombo and Doddanduwa.

Training in benefits of group formation given to selected traders.

Work implemented through Innovations and Research for Development (IRED) under agreed work programme.

Assessment

Driven by an increasing demand for fresh fish, private sector entrepreneurs are playing increasingly important roles in fish marketing in the major urban demand centres and, through efficient deployment of capital resources, are able to resolve efficiently any shortfalls in ice supplies. However, the corresponding small-scale marketing sector, which is largely responsible for supplying the more traditional, inland, rural and semi-urban markets from landing sites (and, more recently, urban wholesale markets), works under extremely arduous conditions for meagre financial reward. Competition for fish from the more capital intensive sector has not helped to improve its situation. This group is backward in terms of technical innovation and social organization. Benefits would accrue from a degree of empowerment, possibly through the formation of trade associations.

IRED has benefited from this joint activity, as they had no previous experience of working in fisheries.

Targets 1993

- * Continue with IRED in identifying needs and potential activities (such as the use of the new cycle fish carrier) in Negombo and Doddanduwa.
- * Provide assistance in setting up a traders' association in Colombo.

Appendix F

BIOECONOMICS OF SMALL-SCALE FISHERIES (RAS/91/006)

Annual Report - 1992

INTRODUCTION

This regional project commenced in May 1991 with a duration of 2.75 years, *i.e.* till the end of 1993. It has a budget of US \$ 1 million.

The main objectives are (1) to introduce new methodologies for the assessment of the bioeconomics and socioeconomics of selected fisheries, and (2) to improve the understanding of the concerned fisherfolk, in order to enable them to participate in the rational utilization of the resources and in the establishment and implementation of fishery management measures.

The project was to start much earlier and, in anticipation of this, bioeconomic studies of *Kattumaram* Fisheries in India (Kothapatnam, Andhra Pradesh, 1988-89) and Set Bagnet Fisheries in Bangladesh (1988- 89) were funded by the Small-Scale Fisherfolk Communities project GCP/RAS/118/MUL. Regional meetings/workshops on bioeconomics (Penang; May and October 1990) and on Artificial Reefs (Phuket; November 1990) were also held, sponsored by GCP/RAS/118/MUL and GCP/RAS/ 126/AGF.

In view of the highly interactive nature of the Bangladesh estuarine set bagnet (ESBN) fishery, with shrimp seed collection, marine set bagnet, beach seine, trammelnet, bottom longline for croakers and bottom trawl fisheries for high-value species of penaeid shrimp, Croakers, Bombay Duck etc. all prevalent, all these fisheries were investigated, but to a lesser degree than the ESBN. A socioeconomic survey of the fisherfolk, particularly those involved in ESBN, was also undertaken to determine the consequences of introducing any management measures on the livelihood of these fisherfolk. The results were discussed in a national seminar in January 1992 where over 20 management-oriented recommendations were made on the basis of the status of the individual fisheries and collectively on the basis of the state of major fishery resources involved.

In the other five countries, the following subprojects are in progress : **Maldives** — Biosocioeconomic assessment of the tuna fishery around fish aggregating devices; **Shri Lanka** — Biosocioeconomic assessment of the fisheries on small pelagic species along the southwest coast; **Thailand** — Biosocioeconomic assessment of fisheries adjacent to the artificial reef in the Ranong Province; **Malaysia** and **Indonesia** — Biosocioeconomic assessment of the shrimp fisheries in Kuala Sepetang (Perak) and Langkat District (North Sumatera). Progress in some countries has been slower than anticipated. The main difficulties are that national staff in various disciplines, such as fisheries biology, economics, sociology and fishing technology, are not available in **one** institution in any of the participating countries. Consequently, a well-coordinated workplan has been difficult to achieve among a national staff with different workplans in their respective institutions.

Data collection will be completed by the middle of 1993. After the analysis and preparation of reports, a regional workshop will be held to further analyze the findings, share experiences and identify suitable follow-up activities.

Status reports of the subprojects are presented below :

Subproject : General Services (RES/GEN)

Targets 1992

'Comic book' on biology of fish and fisheries management.

Achievements

'Comic book II' on biological characteristics of commercially important species was completed and handed over to the Extension Unit for further action. The third issue, on Fisheries Management, may be included in book II before finalization.

Review of pelagic shark fisheries. The development of pelagic shark fisheries in the Indian Ocean, and the Bay of Bengal in particular, and the lack of information on the resources and their exploitation was highlighted in an article in *Bay of Bengal News* No.48. It is suggested that it is important to improve the monitoring of the fisheries and to learn more about the biology of the species.

National seminar on set bagnet fisheries in Bangladesh. This was held in January 1992, in Cox's Bazar, and was well-attended by national scientists and administrators. Eleven reports on the set bagnet study were presented. Observers from Myanmar, Malaysia, Indonesia and Thailand also attended and made presentations on set bagnet fisheries in their respective countries. Immediate follow-up work has been identified, but the implementation of it is dependent on national organizational arrangements and external support. A summary of the set bagnet study appeared in *Bay of Bengal News* No 47.

Targets 1993

- * Regional seminar (September).
- * Terminal project report (November).

Subproject : Biosocioeconomic Impact of Fish Aggregating Devices in the Maldives, (RES/FAD/MCV)

OBJECTIVES To assess the impact of FADs on productivity in small-scale fishing for tuna and on the living conditions of fisherfolk, and to study the economics of FADs.

STATUS 1991 Three national staff, a biologist, fishing technologist and socioeconomist, and eight fishermen were assigned and trained. Two deployment sites were identified — S. Male and Meemu/Vaavu. Predeployment state of the fisheries was assessed by analyzing the catch, effort and species composition in the identified areas and by conducting a socioeconomic baseline survey in eight islands. Suitable type of FAD had been identified and equipment was ordered. Necessary forms and questionnaires were prepared.

Targets 1992

Achievements

Predeployment survey of catch and effort, and biological characteristics of tuna. Conducted until May 1992 on the catches of the pole-and-line craft operating from the selected islands. Catches from some of the islands in S. Male atoll are landed directly at the market in Malt (N. Male Atoll). Though catch statistics of such landings were obtainable, length frequency sampling by field staff, based on the S. Male islands, was difficult.

Monitoring of all tuna fisheries conducted on the selected islands. Sampling of catches was carried out throughout the year on all the selected islands, on a monthly basis.

Fabrication of FADs and deployment. Two FADS were fabricated — one deployed off S. Male at the end of the second quarter and the other deployed off Meemu/Vaavu in the last quarter.

baseline survey of households was completed. Forms and questionnaires were prepared and bioeconomic data collection commenced in November. Fisherfolk at sampling stations were briefed about the subproject and related issues in a series of meetings.

Targets 1992

Complete one year of data collection on catches and biological characteristics.

Procuring micro-computer and preparation of programmes for data processing and analysis.

Socioeconomic baseline survey.

Seasonal surveys of income activities and sociocultural conditions.

Discussions with fisherfolk on issues of small pelagic fisheries.

Analysis of data collected.

Achievements

Done in November, but data collection is being continued to cover a second peak season ending March/April 1993.

Done.

Delayed due to corrections to frame survey data analysis, but conducted in the third quarter.

The first seasonal survey was combined with the baseline survey because of the delay in conducting the latter. The second and final seasonal survey will be done in the first quarter of 1993.

Organized discussions were held during the baseline survey. Several additional sporadic and unprepared discussions were prompted by fishermen, consequent to the decision by the Ministry of Fisheries to ban purse-seining for small pelagics.

Computerization of the processing of bioeconomic data is proceeding slowly but steadily. The processing of the socioeconomic data is considerably delayed due to resignation of the socioeconomist. A new incumbent has been appointed and action taken to subcontract the data entry.

Assessment

The bioeconomic component of the field work has progressed satisfactorily, while the socioeconomic component is delayed for various reasons. Relocation of the socioeconomist from DOF to NARA, from the latter part of this year, has helped to improve coordination between the two groups. Computerization of the data processing and analysis appears to be a major constraint which perhaps cannot be overcome without subcontracting personnel from outside the government agencies. Overcoming this constraint may be crucial for successful implementation of similar projects in the future.

Targets 1993

- * Bioeconomic data collection (till February) and computerization (May).
- * Second socioeconomic seasonal survey (April).
- * Analysis (June).
- * Reporting (August).

Subproject : Biosocioeconomics of Small-scale Fisheries in an Artificial Reef (AR) Area in Thailand (RES/ART/THA)

- OBJECTIVES
- Bioeconomic and socioeconomic assessment of the effects of artificial reefs.
 - Identification and demonstration of fishing methods suitable for small-scale fisheries near artificial reefs.
 - Strengthening the capabilities of national staff in conducting biosocioeconomic assessments.

STATUS 1992

A national workshop was held in 1990 to summarize knowledge and experiences and identify future approaches. National staff were assigned and briefed. A preliminary analysis of predeployment catches by major commercial fishing methods was undertaken. Questionnaires for surveys were ready.

Targets 1992

Achievements

Year-round collection of catch, effort and biological data of fisheries at and around the AR.

Not done at all during the first half of the year and, thereafter, only periodically, due to insufficient time input from the biologist.

Periodic observations of environmental conditions at the reefs.

Surveys were conducted in February and November and data collected on currents, sedimentation and water mass. Surface flow of water near the AR was independent of bottom flow. Suspended solid matters indicate that the reef has an effect on sedimentation. Differences in the mixing of water on the seaward and leeward sides of the reef were noted.

Visual underwater observations of seasonal changes in animal community and growth of organisms.

Surveys were conducted in February and November at three sites at the southern AR only; poor visibility prevented work at others. Fish, sedentary organisms and a succession of organisms on concrete were studied. Seasonal changes were difficult to observe due to sea conditions and poor visibility in summer months. Thirty-nine species of fish were observed, including some coral fish. Snappers, groupers and corbia were of small sizes. Fouling organisms on the concrete framework were oyster, barnacles, sponges etc.

Socioeconomic survey of selected villages on the basis of a frame survey.

Six villages were selected in which a baseline survey was conducted. Analysis and reporting are yet to be finalized. Migration of fisherfolk from the northern AR area to the southern AR area is evident, due to better fishing by the southernmost artificial reef. People are taking up year-round fishing with squid traps near the artificial reef.

Seasonal survey of income from fisheries and nonfisheries activities.

Initiated but not completed. Better coordinated work programme between bioeconomic and socioeconomic components is required.

Computerization of data processing.

Computerization of the socioeconomic data is on schedule while that for bioeconomics is lagging behind.

Procurement of equipment.

Done – two underwater scooters, underwater video cameras, fishing gear materials for test fishing with trammelnet, bottom longline and gillnet.

Discussions with fisherfolk about benefits, problems and management of AR. Awareness of the objectives of constructing artificial reefs has been created to some degree, but discussions on benefits and management should be taken up when results of investigations are in hand.

Unscheduled. Experimental fishing was conducted with bottom longline, trammelnet and whiting gillnet. The latter two gear exhibited relatively better catch rates, while the longlining produced poor results. The interpretation of fishing trial results is difficult without coordinated inputs from environmental and underwater observations.

Assessment

The status of the subproject is below expectations. The progress has been affected by the insufficient time inputs from national staff, particularly in bioeconomics. This has been a constraint in maintaining continuity in the monthly sampling and in coupling secondary data necessary for assessing the predeployment scenario. The limited availability of staff in bioeconomics has also affected the coordination between the three institutions involved. Finally, the changes (twice) of the project coordinator have not helped in implementing the subproject in an efficient and coordinated way. Urgent remedial actions of a managerial nature are required to recapture some of the lost ground and produce reasonably meaningful results before the end of the project.

Targets 1993

- * Bioeconomic and socioeconomic data collection (till April/May).
- * Periodic observations of the environmental conditions (March/April).
- * Visual underwater observations (before April).
- * Underwater video of the artificial reefs and the life around it (March/April).
- * Laboratory analysis of chemical and biological samples (June).
- * Analysis of collected data and other information (July).
- * Reporting (August).

Subproject : Biosocioeconomics of a Shrimp Fishery in Malaysia (RES/SHR/MAL)

OBJECTIVES Assessment of the bioeconomics of the fisheries exploiting the shrimp resources in the Larut District (Perak). Improving the capabilities of the national staff through on-the-job training in the methodologies introduced.

STATUS 1991 National staff, biologist from FRI and socioeconomicist from DOF, were assigned. Recruitment of field staff was initiated. Forms for data collection were ready. Equipment was identified and quotations called for.

Targets 1992

Achievements

Training of field staff. Done, at FRI and in the field.

Data collection on shrimp fisheries and relevant biological characteristics. The data collection, which commenced in the second quarter according to a sampling programme designed after a preliminary survey of the different shrimp fisheries (trawl, trammelnet, bagnet and pushnet), continued through December 1992.

Frame survey for socioeconomic parameters.	Done and conducted at the three locations – Kuala Sepetang (for trawl and trammelnet fisherfolk), Kampung Mantri (for pushnet fisherfolk) and Kuala Senga (for set bagnet fisherfolk).
Socioeconomic baseline survey.	Done, but it had to be combined with the seasonal survey of income activities. This was to limit the number of visits to the households as many of them had demonstrated reluctance to answer questions repeatedly, resulting in a decline in the reliability of the answers.
Seasonal survey of income activities.	Executed in combination with the baseline survey, for reasons explained above.
Procuring microcomputer and computerization of data processing.	Done. The bioeconomic data were computerized without any delay and monthly summary analyses of results are up-to-date. The socioeconomic data base was delayed until the last quarter.
Discussion with fisherfolk groups on issues relating to shrimp fisheries and their management.	Very preliminary discussions were held during sampling of catches and interviews with fisherfolk. Issues and management matters will not be discussed until results of the investigations are in hand.

Assessment

The progress of the work has been satisfactory thanks to timely and efficient inputs from all national staff and good coordination between them.

Targets 1993

- * Completion of bioeconomic data collection (April/May).
- * Socioeconomic survey to be completed (mid February).
- * Compilation of supplementary data on fisheries and fisherfolk exploiting the resources (April/May).
- * Analysis of data (July).
- * Reporting (August).

Subproject : Bioeconomks of Shrimp Fisheries on the East Coast of N. Sumatera, Indonesia (RES/SHR/INS)

OBJECTIVES	<ul style="list-style-type: none"> – Assessment of bioeconomics and socioeconomics of the fisheries exploiting shrimp (penaeid) in a specified area, consideration of a preliminary management plan for shrimp fisheries and identification of fishing method(s) that may provide optimum economic and social benefits from shrimp resources. – In the process, the fisheries officers and fisherfolk are expected to acquire a better understanding of the various aspects.
STATUS 1991	A frame survey of the shrimp fisheries and the fishing villages were undertaken by the two officers participating in the regional workshops on bioeconomics held in 1990. Preparation of detailed workplan, assignment of counterpart staff and coordinator, and identification of equipment were done.

Targets 1992

Achievements

Training of national staff.	Done, including field demonstration of sampling techniques. Second-stage training, specific to the survey location, was provided to the samplers, after being deployed at their respective stations.
Deployment of field staff at the stations.	Seven samplers were deployed at three locations to cover five stations selected for sampling the catches, and to assist in the socioeconomic survey.
Further training in socioeconomic baseline survey.	Provided by the national staff.
Procuring equipment.	Done. A microcomputer, length and weight measuring scales and field manual were provided.
Computerization of data processing.	Done, but delayed until the fourth quarter due to nonfamiliarity with computers by national staff and delays in obtaining the services of a programmer to prepare the database.
Commencement of catch, effort and biological data collection.	Forms were prepared and the sampling at all stations commenced in the second quarter and continued through December 1992.
Socioeconomic baseline survey.	The survey was undertaken but, due to shortcomings, the results were not satisfactory. In view of the time lost, a combined baseline survey and seasonal survey of income activities other than the shrimp fisheries, was started in the last quarter with participation of additional fisheries officers based in the district.
Seasonal survey of income activities.	It started in the fourth quarter in combination with the baseline survey, as explained above.
Discussions with fisherfolk on issues in shrimp fisheries and management concepts.	Will not be undertaken in any organized manner until relevant results become available.

Assessment

There have been delays in achieving the targets and there has been need for repeating, as well as improving, some activities in stages due to the background and experience of the national staff not being appropriate. Since the study area is far away from the capital, where qualified personnel are based, it has been difficult to get suitably qualified personnel to undertake the work. More frequent visits by DGF staff to the study area is expected to improve the performance in the future. Communication between Medan and Madras has been poor between the quarterly visits by the Project personnel. Recent decisions by the Chief of PFS, that the Coordinator will hold weekly progress meetings with senior staff and fortnightly meetings with the Chief of PFS himself, was a step taken to improve the performance in the future.

Targets 1993

- * Continuation of bioeconomic sampling and computerization of data (May).
- * Socioeconomic baseline survey and seasonal surveys of incomes (February).
- * Compilation of data on shrimp fisheries outside the areas studied, in the Langkat District (May).
- * Analysis (June).
- * Reporting (August).

PROJECT INPUTS

The project has a budget of about US \$ 1 million, nearly half of which remains for the last year. Details are given in the table below :

<i>RAS/91/006 – Budget and Expenditure (US \$)</i>						
<i>Line</i>	<i>Object of Exp</i>	<i>Total 1991-93</i>	<i>Expenditure 1991</i>	<i>Est. exp. 1992</i>	<i>Budget 1993</i>	
10	Personnel	524,642	97,791	206,851	220,000	
15	Duty travel	93,576	3,014	50,562	40,000	
20	Subcontracts	54,391	4,059	20,332	30,000	
30	Training	149,662	10,725	38,937	100,000	
40	Equipment	72,634	20,126	37,508	15,000	
50	Misc. exp.	119,649	9,989	32,377	77,283	
TOTAL		1,014,554	145,704	386,567	482,283	

The project personnel during the year have been :

		Work-months	
		1992	Total
Project Manager	Engvall L O (Sweden)	2	4
Fishery Biologist	Sivasubramaniam K (Shri Lanka)	12	32
Socioeconomist	Thompson K T (India)	12	21
Secretary	Gordon P (India)	12	32

As proposed in last year's report, a socioeconomist was recruited as a long-term consultant. His service is being extended till September 1993. In the budget for 1993 there is provision for specialized consultancy services in bioeconomics and extension (four work-months) which will be utilized in connection with a regional workshop and follow-up work.

Expenditures under subcontracts refer mainly to compilation and computerization of bioeconomic and socioeconomic data and for additional skilled personnel to support field survey work.

Most of the training conducted during 1992 was of in-service nature at the national level, due to differences in the field work and data collection systems specific to each subproject. However, towards the end of the project, in connection with analysis of data, interpretation of results and identification of follow-up actions etc, a regional workshop will be organized to exchange experiences and discuss common methodologies of biosocioeconomic assessments.

The major equipment purchased are microcomputers for each of the participating countries, materials for fabricating fish aggregating devices, underwater scooters and camera, motorcycles and echo-sounder.

Major expenditures under miscellaneous are for operation of cars, motorcycles and boats in connection with field work and for printing of forms and purchase of samples.

Appendix G

REPORT OF THE ASSESSMENT OF ENVIRONMENTAL HAZARDS IN FISHERIES OF THE BAY OF BENGAL

INTRODUCTION

The coasts of the Bay of Bengal are deteriorating. The causes for this are:

- Siltation,
- Pollution, and
- Uncontrolled coastal development.

Some parts of the coasts are particularly bad, affected by industrial and municipal effluents as well as by indiscriminate development of brackishwater culture systems. This poses a serious threat to the production of wild finfish and shellfish as well as to mariculture.

Fisheries, with its supporting activities, provides a livelihood for millions of people in the region. Fish is an important part of the diet of much of the population. It also is a valuable source of foreign exchange for many countries in the region. It is, therefore, important that the marine environment be used in a sustainable way and that the resource base is not damaged or destroyed.

The damage done is often unintentional, being a consequence of

- Bad planning,
- Lack of basic knowledge, and
- Little coordination between agencies and authorities.

The first step towards remedial action would therefore be to collect relevant data on the state of the coastal environment and the processes that are changing it. Unfortunately, the information about the effects of pollution and other types of environmental degradation on fish and fisheries is often scattered, unsystematically recorded or not available in a comprehensible form. The Swedish International Development Administration (SIDA) in 1989 decided to support a project to this end.

The activities of the project started in April 1991 under the umbrella of the Bay of Bengal Programme (BOBP) and were executed by SWEDMAR, a unit of the National Swedish Board of Fisheries.

The objective was to assess environmental problems, which may be affecting fisheries in the Bay of Bengal, by reviewing the existing information, analyzing available data and collating it all as a fundamental information base.

METHODS

To obtain basic data on the marine environment of the Bay of Bengal, desk studies of the member countries were made and these countries were visited by the project expert as part of a study programme. To identify local and regional problems, local consultants were involved in the work. They analyzed and interpreted data from the authorities, agencies and research institutes and have compiled the information acquired in country reports, which are being published by BOBP. A Workshop on Environment and Fisheries in the Bay of Bengal was arranged February 2 - 6, 1993 in Colombo, Sri Lanka, as the culmination of this multinational exercise. The workshop's agenda included :

- Country presentations by the country consultants.
- Studies of the marine habitats, coral reefs, mangroves and seagrass beds by invited specialists in order to provide an overview of their status, management and importance to fisheries.

- Remedial suggestions from invited scientists who offered examples of ways to mitigate the problems of the marine environment and make it more beneficial to fisheries.
- A discussion to arrive at a consensus about problems, solutions and need for further R & D.

The issues that arose from the findings presented in the country papers are summarized below.

COUNTRY FINDINGS

BANGLADESH

1. Several water resource development projects have been recently built in Bangladesh to protect the villagers from devastating floods and to increase foodgrain production. These have resulted in changes in aquatic ecosystems and in the country's fish production. The free movement from freshwater to brackishwater has been hampered and the migration of *hilsa* and other anadromous and catadromous species obstructed.

2. The Sundarbans mangrove forests in the southwestern part of the country cover almost 600,000 ha. It is the largest single compact mangrove resource in the world. An Overseas Development Administration (ODA), U.K, sponsored survey in 1985 showed that the standing volume of the main species had declined alarmingly in the Sundarbans since the previous inventory 20 years earlier. Overcutting and overestimation of regeneration times were reasons for a smaller inventory being recorded. The Farakka Barrage across the border, which diverts as much as 40 per cent of the dry season flow of the Ganga, causes increased salinity, and this is another reason given for the impaired growth of the mangroves.

There is a growing conflict among mangrove forests, shrimp farms and rice cultivation. The Chakaria Sundarbans in the delta of the Mathamuhuri River, in Cox's Bazaar District in eastern Bangladesh, has virtually been cleared for aquaculture. But the very low productivity of shrimp – only 50 kg/ha/yr indicates that the conditions are not optimal. On the other hand, felling of the mangrove forests has entailed loss of protection from cyclones and tidal waves, increased salinity by tidal water being retained longer, and greater evaporation and acidification of surface water. The conversion of mangrove forests for aquaculture would appear to be uneconomic if the potential yields are compared with the combined yields of the forests and the traditional fisheries which are now both lost.

3. Nearshore fisheries are overexploited. The extensive use of destructive set bagnets is believed to be responsible for this in the estuaries and neritic waters. In the absence of an adequate number of hatcheries, the collection of wild tiger shrimp post-larvae in estuaries and nearshore waters by this fishing method leads to destruction of other shrimp and finfish species; estimates show that more than 1,600 individuals of nontarget macro-zooplankton are killed while collecting a single tiger shrimp post-larva.

4. Bangladesh is not an industrialized country; only about a tenth of its GDP comes from this sector. Industrial production has, however, grown substantially over the last few years –an overall increase by about 50 per cent. Since there is no treatment before waste products are discharged, local environmental degradation has occurred. Fish kills and accumulation of toxic substances in fish and shrimp flesh have been recorded in the five industrial zones : Dhaka, Chittagong, Narayanganj, Khulna and Ghorashal.

Dhaka has a sewage treatment plant, but it can only take care of about a fifth of its population's wastes. Other big cities, such as Chittagong and Khulna, have no waste treatment facilities at all. Most freshwater in Bangladesh is, therefore, badly polluted and huge quantities of untreated wastes find their way through open drains, canals, and rivers into the Bay of Bengal.

5. Since the introduction of HYVs, the use of fertilizers and pesticides have increased many fold (more than four times since 1977). There are 340 different brands of pesticides in use, with organochlorides, organophosphorus and carbamates being their major components. The annual

transport of pesticides into the Bay of Bengal has been estimated at 1800 tonnes. There are few studies on the impact of agrochemical residues on fisheries, but toxic residues have been recorded in both shell and finfish.

6. Siltation at the mouth of the Ganga-Brahmaputra-Meghna river systems is actively reshaping the coastal and nearshore habitats. Since the rate of sedimentation has increased exponentially during the last century, this is believed to have had a great impact on fisheries. Change in bottom topography, increased turbidity, entrapment of pollutants are some of the detrimental effects.

7. Existing environmental laws cover marine pollution control, use of pesticides, fishing and conservation of fishery resources, shipping etc. But the enforcing mechanism is inadequate due to institutional, strategic and financial drawbacks.

INDIA

Andhra Pradesh

1. The annual use of pesticides, including such toxic types as DDT, CHC Endosulphan, lindan and heptachlor, exceeds 26,000 tonnes in Andhra Pradesh – a third of the total used in India. Residues are found in shrimp, bivalves, gastropods, molluscs and fish. But considering the amounts released, the concentrations are surprisingly moderate. It is evident that the biomagnification in the tropics is lower than in cold climates. One reason could be that pesticides are volatilized into the atmosphere. A better understanding of the relevant food chains and associated conditions connected with pesticides in the tropical aquatic environment is badly needed.

A particularly appropriate area for such studies would be the Kolleru Lake, located between the deltas of the Godavari and Krishna Rivers. The drainage area of this lake has been identified as the area where pesticides and fertilizers are most intensely used in Andhra Pradesh, and perhaps even in India and the tropics.

2. The marine environment in Andhra Pradesh is still in a good condition and no great threats to fisheries have been identified.

Orissa

1. More than 80 per cent of the population here earn their living from agriculture. Orissa is not very industrialized, but is very rich in natural resources – the mineral deposits equal those of Western Europe.

The marine environment of Orissa is still in a good condition, but algal blooms occur occasionally. They are mainly caused by diatom genera like *Asterionella*, *Chaetoceras* and *Skeletonema*, which are innocuous to marine organisms.

A marine monitoring programme was started in the State in 1990. Since then, bottom samples have been collected along five transections at the main river mouths twice every year. Rather large amounts of mercury and lead have been found far from possible industrial sources. Complicated current patterns evidently transport these pollutants long distances. Analyses of mercury in fish downstream a chloroalkali industry in the Rushikulya Estuary showed values well above the 0.5 mg/kg W.W. limit recommended by WHO.

2. Significant environmental degradation has taken place in Chilika Lake in southern Orissa. The main problems are the large siltation load, causing decreased water exchange with the sea, and the proliferation of weeds in the lake. No significant change in fish catches has yet been demonstrated, but an increase in freshwater species has been observed.

Tamil Nadu

1. Tamil Nadu is a fairly heavily industrialized State with 12,000 industrial units, of which about 80 per cent are located close to the coast. There are three major industrial concentrations on the

coast, Madras, Pondicherry and Tuticorin. There are also 2,200 tanneries in the State, accounting for more than 80 per cent of the total leather production in India.

The industrial pollution is worst in the Madras area, with high concentrations of heavy metals in water and sediments. Surprisingly, though, the concentrations of metals in fish and seafood are still well below health limits.

Bacterial contamination of seawater is most prominent in the coastal areas around Madras, but almost all samples taken close to the shore in Tamil Nadu indicate bacterial pollution. The bad water quality along the coasts is a serious health threat to the coastal population and the establishment of a tourist industry.

2. Electricity is generated from coal-fired thermal stations (70 per cent) and nuclear plant (10 per cent). The coal-fired units cause damage to fisheries through the elevation of water temperatures and the discharge of fly ash slurry. The environmental effects of nuclear plants are little known and better studies are required. Statistics on the discharge of radioactive tritium shows an increasing trend, which has caused concern. It is planned to construct a new nuclear plant near Tirunelveli in southern Tamil Nadu, and this may increase the radioactive discharges significantly.

West Bengal

1. The Hugli Estuary in West Bengal is probably the most polluted estuary in the world. There are 96 factories from Nabadwip inland to the bar mouth, discharging almost half a billion litres of untreated wastes a day. Almost everything producing hazardous wastes is to be found in this industrial concentration : Pulp and paper mills, pesticide manufacturing plants, chloralkali plants, distilleries, thermal power plants, factories manufacturing yeast, rayon, cotton vegetable oil and soap, fertilizers, antibiotics etc. Bioassays have shown that cotton effluents are very toxic to *Machrobrachium*. Varnishes, rubber, and rayons are deleterious to shrimp. Distillery wastes cause most damage to *Puntilus sophore* and *Mystus vittatus*. The cycle rim factory wastes are highly toxic to *Catla catla* and *Labeo rohita*.

A rather comprehensive study of the environmental conditions in the Ganga and the Hugli Estuary was made in 1960. When a similar study was made in 1988, it showed a clear deterioration in conditions: chloride concentrations and alkalinity had increased, while oxygen had decreased. But the nutrients too had increased significantly. And, surprisingly enough, there were no significant changes in the chemical parameters in the estuary during the two decades. The regular flushing by tidal water had evidently taken most wastes out to sea and the estuary itself had not changed significantly.

A look at the statistics for fish catches is still more intriguing. The catches in the Ganga had fallen from 50.3 kg/ha/year in 1960 to less than 20 kg now. Of the 600 species found in the Ganga, 100 were endangered. But in the estuary, the catches had increased:

– 1960: 7.5 t, 1970: 14.6 t, and 1980: 24.0 t !

Most of the increase was from the outer zone of the estuary. Scientific measurement of the primary production showed that it was a real increase in production of fish and not due to increased fishing effort. If average primary production is set at 1 in the Ganga, it is 0.5 in the inner and middle zones, but 2 in the outer zone. There is evidently damage in the inner zones due to pollution, but the increased loads of nutrients have been beneficial to fish production in the outer zone! Almost 200 kg of fish is produced per ha/year in the estuary and only 30 kg is harvested. The fishing could consequently increase significantly without endangering the stocks.

2. The sewage treatment system in Calcutta is most interesting. Almost all municipal wastes pass through one or two systems of fish ponds before being released into the Hugh River.

The Mudiali fishermen's cooperative is one of the eighty cooperatives in Calcutta. By getting the industrial waste water to pass through an ingenious system of ditches dense with a vegetation of water hyacinths, *Eichhornia* and *Valesneria*, they reduce the toxic compounds and use the treated

water to produce 5 - 7 tonnes of fish per hectare without any additions of feed or fertilizers! By refining this method it will be possible to produce 15-20 tonnes of fish/ha/yr.

The treated waste water is also used for irrigating and fertilizing gardens and orchards. The income from the fish ponds together with that from vegetables and fruits supports about 2000 - 3000 people on 65 ha. The area was earlier wasteland belonging to the Port authorities who used it for waste disposal.

Most cooperatives and private enterprise fish ponds in Calcutta take their waste water from the sewage canal that mainly contains the municipal waste. Most of the industrial waste is led into a separate storm drainage canal. The mercury and pesticide residues in the flesh of fish grown in the ponds, as well as the bacterial contents, are below WHO recommendations.

INDONESIA

1. The west coast of northern Sumatera, adjacent to the Bay of Bengal, is still a comparatively unpolluted area. The east coast of this area, along the Straits of Malacca, does, however, in some areas around Lhokseumawe, Asahan and Deli Serdang, have a deteriorated water quality due to industrial and municipal wastes. Organic compounds, heavy metals and coliform bacteria often exceed national standards for bathing and swimming as well as for the health of marine organisms. The concentrations of lead and cadmium in the tissue of molluscs have sometimes exceeded environmental standards. The concentrations of hydrocarbons in the Malacca Straits also sometimes exceed the limit of 5 ppm for marine organisms. The heavy use of the straits by oil tankers evidently has a negative impact on the water quality. There have been of late several large oil spills, following oil tanker accidents in the Straits of Malacca.

2. An ODA study of the mangroves of Sumatera compared remote sensing data from 1977 with that of 1989-90 and found that the primary mangroves along the east coast of Sumatera had diminished by 30 per cent, while the secondary mangroves had increased by almost 90 per cent during this period. The reason was that earlier cultivated land had been abandoned and the mangroves could recover. In 1977, there were about 300 ha of ponds, mainly for milk fish, in extensive *tambaks*. There are now 11,000 ha of ponds, mainly shrimp — an increase of almost 40 times! Only about 7 per cent of those new ponds occupy earlier primary mangrove forests, while about 15 per cent cover earlier cultivated land.

MALAYSIA

1. Bacterial contamination seems to be a problem in the coastal waters of the western peninsular Malaysia, with 50-90 per cent of the analyzed samples being above the limit for recreational purposes, namely 100 MPN/100 ml. Discharge of municipal sewage and wastes from piggeries are the reasons. Only the large piggeries can afford waste treatment.

Turbid water and sedimentation from existing land management is another coastal problem and it could possibly cause more damage to fisheries than bacterial contamination. The diminished light penetration reduces primary production, which means lower growth rates of fish.

2. A recent study of the rivers of peninsular Malaysia showed that about 50 per cent of them were heavily polluted, 10 per cent moderately polluted and only 40 per cent characterized as clean.

Concentrations of heavy metals found in most of the rivers and coastal waters are well above proposed standards. Fortunately, the biomagnification is insignificant and all samples of residues in fish and molluscs are well under health limits. The same is true for pesticide residues that are under the limit of acceptability for human consumption in spite of a widespread and often indiscriminate *use* of pesticides. Oil and grease in the marine environment also exceed the standard for marine aquatic resources, with 75-100 per cent samples from the southern states above the limit. All samples from Penang and Kedah/Perlis were below the limit.

3. Red tide is often reported from the Malaysian coasts, but only innocuous genera like *Noctiluca* have bloomed on the west coast. *Hormellia marina*, however, has caused fish and shrimp kills in Johore in the south. Paralytic Shellfish Poisoning has been reported only from Sabah. As the frequency of toxic algal blooms have increased significantly in Korea and Japan over the last decade, great care should be taken to prevent any similar development in Malaysia.

MALDIVES

1. Sewage disposal is one of the most challenging issues in the densely populated islands. Septic tanks can leak and destroy the groundwater, the only source of freshwater, and lack of space makes it impossible to construct sewage treatment plants. The only practical solution, consequently, is to discharge the sewage into the sea, and that is a potential danger to coral reefs and marine water quality, though water currents, wave action and other water movements, it is hoped, might act as mitigative factors. In thinly populated islands, where only small amounts of sewage are discharged into huge areas of water, this solution is certainly adequate, but sewage discharge poses a serious threat in Male and other densely populated islands.

The potential threats from this practice are:

- Eutrophication, which causes algal blooms and algal growth on coral, thereby killing them, changes fish species composition and biomass, lowers diversity etc.
- Oxygen depletion, causing fish kills.
- Silt formation smothering coral and killing them.
- Microbial pollution, causing health threats to swimmers and contaminating sea food.

2. When a reef flat is reclaimed, the renewable fish resource is lost for ever. There is no production of coral, aquarium fish, giant clams, bait fish and other commercially valuable resources. The reclamation of a sandy lagoon, however, has less environmental and economic effects. Dredging and harbour construction also cause sedimentation and turbid water that can kill coral and change fish species composition.

3. While coral and sand mining, land reclamation and sewage discharges cause local environmental degradation in the Maldives, they have negligible effects on the deep reef habitats and the open sea – the grounds for commercial fishing. No reduction in overall catch of commercial reef fish or open water fisheries can be related to environmental degradation in shallow reef habitats. There are also no other obvious threats to the open water fisheries. But reef-associated organisms are susceptible to over-exploitation. Present threats to the fisheries are connected with this problem rather than with pollution or other forms of environmental degradation.

SHRI LANKA

1. The open sea appears to be unaffected by pollution, even if Colombo municipality discharges sewage into the coastal waters by means of two ocean outfalls. Sometimes signs of oil pollution are seen in increased occurrence of tar balls along the southern beaches. But no signs have been found of the pelagic fishery being influenced by pollution or environmental degradation. The main marine problem, however, is coral mining, which has degraded many coral reefs along the coasts and caused severe local erosion.

2. Many lagoons and estuaries, however, have been damaged by overfishing, sedimentation and other types of environmental degradation. Industrial discharges have been detrimental to fisheries in the Lunawa Lagoon south of Colombo, where there are regular fish kills and the fish has a tainted taste. Fish kills have also been reported from the Kelani River, due to ammonia discharges downstream the Embilipitiya pulp and paper mill. Irrigation schemes have diverted freshwater to some lagoons in the south like Kalametiya and Rekewa, and significantly reduced the production of shrimp and fish.

3. Most industries in Sri Lanka are situated in the Greater Colombo area and only a few have inhouse waste treatment facilities. All new industrial activities will have to get a licence according to the National Environmental Act, which requires installation of treatment facilities. The industrial zones established under the Greater Colombo Economic Commission have been provided with central waste treatment facilities that are regularly monitored.
4. Coastal degradation caused by unplanned utilization of resources, like municipal development, agriculture, tourism, has caused local pollution and sedimentation problems. Pollution of coastal waters, however, has had negative effects on shrimp farming. The use of pesticides is high in Sri Lanka but the environmental impacts are not studied.
5. Sri Lanka is fairly well equipped with legal provisions to protect the marine environment. Enforcement is, however, inadequate. NGOs in Sri Lanka play a vital role in mobilizing people to improve the environment. This growing awareness among the general public is probably the best way of strengthening law enforcement and the monitoring of the environment.

THAILAND

1. Tin mining used to be on a very large scale in Thailand, with Phuket accounting for 10 per cent of the world production. Low prices in the world market have now reduced the activities considerably. Offshore dredging for tin sand has had negative impacts on primary production because of reduced light penetration. A study has shown that an area about 5 km square had a 50 per cent reduction of primary production. Any increase in tin mining activities along the Andaman coast in Thailand would, consequently, have serious impacts on fish production.
2. Mariculture has taken up about 400 ha along the Andaman coast while mollusc beds cover 1030 ha. Shrimp farming has increased and production was 16,000 t in 1988. To avoid the pollution problems that occurred in the upper part of the Gulf of Thailand, regulations have been introduced that require treatment of wastewater discharged by the larger establishments.
3. The annual sustainable yield of commercial pelagic and demersal fish is estimated to 50,000 t and 200, 000 t respectively. The present catch is approaching these figures and there is a risk of overfishing.
4. Urban development and the tourist industry have caused increased loads of organic compounds and bacterial contamination of the coastal waters, especially along the southern coasts and around Phuket. Monitoring by the Phuket Marine Biological Center shows that the northern coasts are still rather clean whereas the southern coasts show signs of environmental degradation. In general, however, the Andaman Sea is still rather unpolluted and clean, especially when compared with conditions in the Gulf of Thailand.

CONCLUSIONS

The impact of environmental degradation on fisheries in the Bay of Bengal is, as yet, slight or, at worst, moderate. Only the coastal areas, lagoons and estuaries in some parts of the region have been affected. Algal blooms are rare and there have been few outbreaks of Paralytic and Diarrhoeic Shellfish Poisoning or similar diseases. Even where high concentrations of pesticides and heavy metals have been found in the water or in the sediments, the residues in fish and other marine organisms are still below recommended health limits. The threats that have been well documented are summarized below.

Sewage pollution is of particular concern in all countries around the Bay of Bengal. Wastes, without any treatment, are directly discharged into the waters of the densely populated coastal regions. Rivers, lakes, lagoons, bays etc., are anoxic for shorter or longer periods during the year, causing fish kills, In addition, serious health problems connected with such pollution are also prevalent. About three-quarters of all diseases in India are caused by waterborne micro-organisms. The most promising remedy suggested is sewage-fed fish farming and biological treatment in oxygen ponds

or ditches. These methods offer a revenue, in addition to serving as a waste treatment process. Some farming methods have been developed, but others will have to be explored to suit differing local conditions.

Siltation, causing reduced primary production and obstruction of the outlets of lagoons and estuaries, is another major problem. Large amounts of fertile soils are lost due to existing agricultural and forestry practices. Some studies indicate that the sedimentation loads in the large rivers around the Bay of Bengal have increased a hundred times in the last century. This reduces carrying capacity, both in the terrestrial and aquatic habitats, and the long-term consequences can be disastrous in view of the continued population growth. It is, therefore, important that this problem is at least mitigated, if not solved, as soon as possible.

Destruction of marine habitats has also been causing great concern over the future of fisheries in the region. Coral reefs and mangroves are degraded in all countries bordering the Bay and many coastal areas are overexploited. The delicate balance between marine life and such coastal habitats as lagoons, estuaries, mangroves and coastal wetlands is disturbed almost everywhere. Only small pockets along the west coast of Sumatra and the northern Andaman Sea coast of Thailand are still pristine to an extent.

Overexploitation of the marine living resource and the environmental **impact of aquaculture** are also major concerns of the region and need new management plans, a closer look at habitat destruction and a review of fishing methods.

On the more positive side is the fact that, in spite of large discharges and lack of treatment of industrial wastes, pesticide residues and fertilizers leakages – all dangerous to the environment in many ways – residues of heavy metals and pesticides seldom exceed health limits in fish and other seafood caught in the region. The tropical aquatic food web seems to be more beneficent than in temperate habitats. But studies have shown that young herbivorous fish here often have higher concentrations of mercury than the top predators, which, in cold climates, always have the highest toxic residues. This phenomenon deserves further scientific research.

The present situation in the Bay of Bengal is not too alarming, but this is no reason for complacency; it only means that there is still time for appropriate action to be taken to, at least, preserve the Bay as it is, if not, improve it.

Coastal planning must be strictly vetted and rigorously implemented. Ways must be found to curb not only the loss of valuable fertile soils by the side of rivers inland, but also to prevent these soils making coastal waters turbid and silting estuaries and lagoons. Better management of fisheries – preventing overfishing – is also necessary to ensure that the limited resources are sustainable.

The growing aquaculture industry is constrained by different types of environmental degradation of the coast, but aquaculture has its own environmental impact and could itself suffer from it. Lessons must be learnt from Taiwan and Thailand, which have had large economic losses due to these reasons, if future problems in the Bay are to be avoided.

Appendix H

CLEANER FISHERY HARBOURS OF THE BAY OF BENGAL

Annual Report 1992

INTRODUCTION

The steady demand for seafood has resulted in intensive use of the Phuket Fishery Harbour by the Thai fishing fleet. There is a strain on existing port infrastructure, and some facilities, required to prevent negative environmental effects, are simply inadequate or altogether lacking. Continuous dumping of garbage, overboard discharge of oily bilge water, dumping of used engine oil and discharge of toilet and kitchen waste from boats into harbour waters, resulting in the degradation of the port environment in general and the water quality in particular, are cause for serious concern. Localized pollution, affecting water quality, can lead to deterioration in fish quality, especially since harbour water is used for cleaning the fish at some stage after landing. Furthermore, the pollutants can affect the rich mangrove ecosystem of the estuary, so important to the breeding and rearing of marine fauna.

The Phuket Fishery Harbour complex comprises of a main government-operated facility and several privately-owned jetties. Though the Department of Fisheries advises the Office of the National Environment Board (ONEB) on environmental issues relating to fisheries, there is no specific strategy at present to combat and curtail pollution in the port environment. The limited number of specific and enforceable regulations is a major constraint.

In keeping with IMO's strategy for the protection of the marine environment by cooperative efforts, a project formulated by BOBP to improve the port environment at Phuket Fishery Harbour has been sponsored by IMO. The project is expected to be completed one year after its October 1992 commencement. The total cost is US\$ 118,000. IMO's contribution is \$ 93,000 and the balance is covered by FAO and BOBP (*see Bay of Bengal News No.47*).

OBJECTIVES

The **primary immediate objective** of the project is to upgrade reception facilities at the FMO (Fish Marketing Organization) port for the two main pollutants – garbage and oily waste.

The **secondary objective** is to begin community organization, create an awareness of the importance of a clean environment and establish effective community control over the problem.

Progress of work

The project was formulated in March 1992 and approved by the Ministry of Agriculture and Cooperatives, Thailand, in July 1992. Transfer of key personnel to the project from FMO, Phuket – the implementing agency – and establishment of administrative arrangements between BOBP, PMBC (Phuket Marine Biological Centre) and FMO permitted project commencement only as late as October 1992.

A one-day meeting was held in Phuket in November to bring together key persons – from the Departments of Fisheries, Urban Development, Town Planning and Health; Municipality; private sector; commercial ports; local university; and senior citizen groups – to ensure cooperation in meeting the objectives of the project.

A study tour of fishery harbours in Penang, Kuala Kedah, Kuala Lumpur (Port Klang) and to the Port of Singapore Authority was arranged for five participants (PMBC (1), FMO (2) and commercial fishing companies(2) to observe and imbibe port management methods with particular reference to pollution control.

A baseline video recording of the port environment has been completed. Recordings will be made from time to time of project progress and utilization of equipment provided.

Equipment specifications were finalized with reference to the garbage dump truck, garbage bins, oily waste reception tank and pumping system. The strategy adopted for the awareness campaign was finalized in close cooperation with key persons from the private jetties to ensure community participation.

Targets 1993

- * Purchase of equipment.
- * Awareness campaign to promote the cleanliness ethic and solicit community cooperation.
- * Solicit community cooperation.
- * Periodic monitoring of fish and water quality.
- * Reporting.

Appendix I

NATIONAL PROJECTS IMPLEMENTED THROUGH BOBP

Annual Report - 1992

Two national projects, with funding arrangements separate from the regional projects, have been implemented through the programme. Both of them were in Bangladesh.

Project : Motorization of Chandi Boats in Bhola District, Bangladesh
(DE V/MCB/BGD)

This project is sponsored by DANIDA (US \$ 180,000) and was to have a duration of about three years (1990-92). The immediate objective is to motorize some fifty *chandi* boats in Bhola District, thereby improving the income of the small-scale fishermen through increased productivity.

In anticipation of formal project approval, BOBP, using its own funds, started motorizing ten boats in January 1988 and ten more in June 1988 in Daulatkhan. Loan recovery was eventually 100 per cent but instalments were often not on schedule.

DANIDA funds became available in April 1990 and 53 engines were procured. Sixteen engines were installed in Charfesson and Daulatkhan and about 100 operators were trained. In 1991, 17 more engines were issued and corresponding training conducted. During 1992, a last batch of 17 have been installed, reaching beneficiaries in two new *thanas*, Tajmuddin and Monpura.

The good repayment record which prevailed in the first phase deteriorated and, by the middle of the year, the repayment was quite low. Though poor fish landings was a contributory factor, there was evidence of wilful default.

In spite of the decisions taken by the Project Committee, punitive action was not taken by the DOF against defaulters until the close of 1992. By December, the overall recovery rate for the project was 73 per cent. It is expected to reach about 90 per cent in 1993.

The cash credit programme, financed from BOBP sources, that started in 1991 on request of the fisherfolk, continued in 1992 with a high overall recovery rate of 92 per cent.

A national 'Seminar on *Chandi* Boat Motorization' will be held in Bhola in January 1993 to discuss the achievements and follow-up actions. Remaining tasks are the completion of economic monitoring, continued loan recovery, liquidation of inventory and reporting. The subproject is expected to be completed in October 1993.

Project : Rehabilitation of Cyclone and Tidal Bore Affected Artisanal Fishermen
(FAO/TCP/BGD/0156 E)

This project came about as a response to the colossal damage sustained by the fisheries sector following the cyclone and tidal bore of April 29, 1991. After comprehensive damage assessment carried out by DOF officials in Bhola, Noakhali and Chittagong Districts with the assistance of BOBP, the FAO-funded project began in July 1991 by identifying areas and allocations of inputs to be dispersed. Funds, to the tune of US \$ 245,000, were provided by FAO under its Technical Cooperation Programme (TCP).

DOF officers, in consultation with BOBP field staff, NGOs and fisherfolk organizations, identified beneficiaries. Funds could be dispersed on certification of repairs/construction of craft. Fishing gear was directly distributed to beneficiaries. By October 1991, almost all fishing gear and initial funds for boat repairs/construction had been distributed.

The second instalments for boat repairs/construction were made available only after work progress was checked, thereby reducing misuse of funds. In all, 3380 fishermen of 968 different units could be assisted under the project, exceeding the 1000 anticipated. Likewise, 132 new boats and 246 repaired boats were launched thanks to project funds, while only 100 new and 100 repaired craft were planned for. The project, which has been monitored by a committee consisting of representatives of the Ministry, DOF, FAO and BOBP, completed assistance in September 1992. The terminal report was submitted in December 1992.

PUBLICATIONS OF THE BAY OF BENGAL PROGRAMME (BOBP)

The BOBP brings out the following types of publications :

Reports (BOBP/REP/...) which describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and subprojects in member-countries for which BOBP inputs have ended.

Working Papers (BOBP/WP/...) which are progress reports that discuss the findings of ongoing work.

Manuals and Guides (BOBP/MAG/...) which are instructional documents for specific audiences.

Information Documents (BOBP/INF/...) which are bibliographies and descriptive documents on the fisheries of member-countries in the region.

Newsletters (*Bay of Bengal News*) which are issued quarterly and which contain illustrated articles and features in nontechnical style on BOBP work and related subjects.

Other publications which include books and other miscellaneous reports.

Those marked with an asterisk (*) are out of stock but photocopies can be supplied.

Reports (BOBP/REP/...)

32. *Bank Credit for Artisanal Marine Fisherfolk of Orissa, India.* U. Tietze. (Madras, 1987.)
33. *Nonformal Primary Education for Children of Marine Fisherfolk in Orissa, India.* U. Tietze, N. Ray. (Madras, 1987.)
34. *The Coastal Set Bagnet Fishery of Bangladesh – Fishing Trials and Investigations.* S. E. Akerman. (Madras, 1986.)
35. *Brackishwater Shrimp Culture Demonstration in Bangladesh.* M. Karim. (Madras, 1986.)
36. *Hilsa Investigations in Bangladesh.* (Colombo, 1987.)
37. *High-Opening Bottom Trawling in Tamil Nadu, Gujarat and Orissa, India : A Summary of Effort and Impact.* (Madras, 1987 .)
38. *Report of the Eleventh Meeting of the Advisory Committee.* Bangkok, Thailand, 26-28 March, 1987. (Madras, 1987.)
39. *Investigations on the Mackerel and Scad Resources of the Malacca Straits.* (Colombo, 1987.)
40. *Tuna in the Andaman Sea.* (Colombo, 1987.)
41. *Studies of the Tuna Resource in the EEZs of Shri Lanka and Maldives.* (Colombo, 1988.)
42. *Report of the Twelfth Meeting of the Advisory Committee.* Bhubaneswar, India, 12-15 January 1988. (Madras, 1988.)
43. *Report of the Thirteenth Meeting of the Advisory Committee.* Penang, Malaysia, 26-28 January, 1989. (Madras, 1989.)
44. *Report of the Fourteenth Meeting of the Advisory Committee.* Medan, Indonesia, 22-25 January, 1990. (Madras, 1990.)
45. *Gracilaria Production and Utilization in the Bay of Bengal Region: Report of a seminar held in Songkhla, Thailand, 23-27 October 1989.* (Madras, 1990.)
46. *Exploratory Fishing for Large Pelagic Species in the Maldives.* R.C. Anderson, A.Waheed, (Madras, 1990.)
47. *Exploratory Fishing for Large Pelagic Species in Shri Lanka.* R. Maldeniya, S.L. Suraweera. (Madras, 1991.)
48. *Report of the Fifteenth Meeting of the Advisory Committee.* Colombo, Shri Lanka, 28-30 January 1991. (Madras, 1991)
49. *Introduction of New Small Fishing Craft in Kerala, India.* O. Gulbrandsen and M. R. Anderson. (Madras, 1992.)
50. *Report of the Sixteenth Meeting of the Advisory Committee.* Phuket, Thailand, 20-23 January 1992. (Madras, 1992.)
51. *Report of the Seminar on the Mud Crab Culture and Trade in the Bay of Bengal Region,* November 5-8, Surat Thani, Thailand. Ed. by C. A. Angell. (Madras, 1992.)
52. *Feeds for Artisanal Shrimp Culture in India – Their Development and Evaluation.* J. F. Wood *et al.* (Madras, 1992.)
53. *A Radio Programme for Fisherfolk in Shri Lanka.* R.N. Roy. (Madras, 1992.)
54. *Developing and Introducing a Beachlanding Craft on the East Coast of India.* V. L. C. Pietersz. (Madras, 1993.)
55. *A Shri Lanka Credit Project to Provide Banking Services to Fisherfolk.* C. Fernando, D. Attanayake. (Madras, 1992.)
56. *A Study on Dolphin Catches in Shri Lanka.* L Joseph. (Madras, April 1993.)
57. *Introduction of New Outrigger Canoes in Indonesia.* G. Pajot, O Gulbrandsen. (Madras, 1993.)
58. *Report of the Seventeenth Meeting of the Advisory Committee.* Dhaka, Bangladesh, 6-8 April 1993. (Madras, 1993.)
59. *Development of Canoes in Shri Lanka.* O. Gulbrandsen, G. Pajot. (Madras, 1993.)

Working Papers (BOBP/ WPl.)

49. *Pen Culture of shrimp by Fisherfolk : The BOBP Experience in Killai, Tamil Nadu, India.* E. Drewes, G. Rajappan. (Madras, 1987.)
50. *Experiences with a Manually Operated Net-Braiding Machine in Bangladesh.* B. C. Gillgren, A. Kashem. (Madras, 1986.)
51. *Hauling Devices for Beachlanding Craft,* A. Overa, P. A. Hemminghyfh. (Madras, 1986.)
52. *Experimental Culture of Seaweeds (Gracilaria Sp.) in Penang, Malaysia.* (Based on a report by M. Doty and J. Fisher). (Madras, 1987.)
53. *Atlas of Deep Water Demersal Fishery Resources in the Bay of Bengal.* T. Nishida, K. Sivasubramaniam. (Colombo, 1986.)
54. *Experiences with Fish Aggregating Devices in Shri Lanka.* K. T. Weerasooriya. (Madras, 1987.)
55. *Study of Income, Indebtedness and Savings among Fisherfolk of Orissa, India.* T. Mammo. (Madras, 1987.)
56. *Fishing Trials with Beachlanding Craft at Uppada, Andhra Pradesh, India.* L. Nyberg. (Madras, 1987.)
57. *Identifying Extension Activities for Fisherwomen in Vishakhapatnam District, Andhra Pradesh, India.* D. Tempelman. (Madras, 1987 .)
58. *Shrimp Fisheries in the Bay of Bengal.* M. Van der Knaap. (Madras, 1989.)
59. *Fishery Statistics in the Bay of Bengal.* T. Nishida. (Colombo. 1988.)
60. *Pen Culture of Shrimp in Chilaw, Shri Lanka.* D. Reyntjens. (Madras, 1989.)
61. *Development of Outrigger Canoes in Shri Lanka.* O. Gulbrandsen, (Madras, 1990.)
62. *Silvi-Pisciculture Project in Sunderbans, West Bengal : A Summary Report of BOBP's assistance.* C. L. Angell, J. Muir. (Madras, 1990.)
63. *Shrimp Seed Collectors of Bangladesh.* (Based on a study by UBINIG.) (Madras, 1990.)
64. *Reef Fish Resources Survey in the Maldives.* M. Van Der Knaap et al. (Madras, 1991.)
65. *Seaweed (Gracilaria Edulis) Farming in Vedalai and Chinnapalam, India.* I. Kalkman, I. Rajendran, C. L. Angell. (Madras, 1991.)
66. *Improving Marketing Conditions for Women Fish Vendors in Besant Nagar, Madras.* K. Menezes. (Madras, 1991.)
67. *Design and Trial of Ice Boxes for Use on Fishing Boats in Kakrnda, India.* I. J. Clucas. (Madras, 1991.)
68. *The By-catch from Indian Shrimp Trawlers in the Bay of Bengal: The potential for its improved utilisation.* A. Gordon. (Madras, 1991.)
69. *Agar and Algrnate Production from Seaweed in India.* J. J. W. Coopen, P. Nambiar. (Madras, 1991.)
70. *The Kattumaram of Kothapatnam-Pallipalem, Andhra Pradesh, India – A survey of the fisheries and fisherfolk.* K. Sivasubramaniam. (Madras, 1991.)
71. *Manual Boat Hauling Devices in the Maldives.* (Madras, 1992.)
72. *Giant Clams in the Maldives – A stock assessment and study of their potential for culture.* J R. Barker. (Madras, 1991.)
73. *Small-scale Culture of the Flat Oyster (Ostrea folium) in Pulau Langkawi, Kedah, Malaysia.* D. Nair, B. Lindeblad. (Madras, 1991.)
74. *A Study of the Performance of Selected Small Fishing Craft on the East Coast of India.* G. El Gendy. (Madras, 1992.)
75. *Fishing Trials with Beachlanding Craft at Thirumullaivasal, Tamil Nadu, India 1989-1992.* G. Pajot (Madras, 1992.)
76. *A View from the Beach – Understanding the status and needs of fisherfolk in the Meemu, Vaavu and Faafu Atolls of the Republic of Maldives.* The Extension and Projects Section of the Ministry of Fisheries and Agriculture, The Republic of Maldives. (Madras, 1991.)
77. *Development of Canoe Fisheries in Sumatera, Indonesia.* O. Gulbrandsen, G. Pajot. (Madras, 1992.)
78. *The Fisheries and Fisherfolk of Nias Island, Indonesia. A description of the fisheries and a socio-economic appraisal of the fisherfolk.* Based on reports by G. Pajot, P. Townsley. (Madras, 1991.)
79. *Review of the Beche De Mer (Sea Cucumber) Fishery in the Maldives.* L. Joseph. (Madras, 1992.)
80. *Reef Fish Resources Survey in the Maldives – Phase Two.* R. C. Anderson, Z. Waheed, A. Arif. (Madras, 1992.)
81. *Exploratory Fishing for Large Pelagic Species in South Indian Water.* J. Gallene, R. Hall. (Madras, 1992.)
82. *Cleaner Fishery Harbours in the Bay of Bengal.* Comp. by R. Ravi Kumar (Madras, 1992.)
83. *Survey of Fish Consumption in Madras.* Marketing and Research Group, Madras, India. (Madras, 1992.)
84. *Flyingfish Fishing on the Coromandel Coast.* G. Pajot, C. R. Prabhakaradu. (Madras, 1993.)
85. *The Processing and Marketing of Anchovy in the Kanniyakumari District of South India: Scope for Development.* T. W. Bostock, M. H. Kalavathy, R. Vijaynidhi. (Madras, 1992.)

Manuals and Guides (BOBP/MAG/)

1. *Towards Shared Learning : Non-formal Adult Education for Marine Fisherfolk. Trainers' Manual.* (Madras, June 1985.)
2. *Towards Shared Learning : Non-formal Adult Education for Marine Fisherfolk. Animators' Guide.* (Madras, June 1985.)
3. *Fishery Statistics on the Microcomputer : A BASIC Version of Hasselblad's NORMSEP Program.* D. Pauly, N. David, J. Hertel-Wulff. (Colombo, 1986.)
4. *Separating Mixtures of Normal Distributions : Basic programs for Bhattacharya's Method and Their Application for Fish Population Analysis.* H. Goonetilleke, K. Sivasubramaniam. (Madras, 1987.)
5. *Bay of Bengal Fisheries Information System (BOBFINS): User's Manual.* (Colombo, 1987.)
7. *Guidelines for Extension Workers in Group Management, Savings Promotion and Selection of Enterprise.* H. Setyawati, P. Limawan. Directorate General of Fisheries, Ministry of Agriculture, Government of Indonesia, Jakarta and Bay of Bengal Programme. (In Indonesian). (Madras, 1992.)
8. *Extension Approaches to Coastal Fisherfolk Development in Bangladesh: Guidelines for Trainers and Field Level Fishery Extension Workers.* Department of Fisheries, Ministry of Fisheries and Livestock, Government of Bangladesh and Bay of Bengal Programme. (In Bangla). (Bangladesh, 1992.)
9. *Guidelines on Fisheries Extension in the Bay of Bengal Region.* I. Jungeling. (Madras, 1993.)
10. *Our Fish, Our Wealth. A guide to fisherfolk on resources management. – In 'comic book' style (English/Tamil/Telugu).* K. Chandrakant with K. Sivasubramaniam, R. Roy. (Madras, 1991.)
12. *How to Build a Timber Outrigger Canoe.* O. Gulbrandsen. (In English and Indonesian) (Madras, 1993.)
13. *A Manual for Operating a Small-scale Recirculation Freshwater Prawn Hatchery.* R. Chowdhury, H. Bhattacharjee, C. Angell. (Madras, 1993.)
14. *Building a Liftable Propulsion System for Small Fishing Craft – The BOB Drive.* O. Gulbrandsen, M. R. Andersen. (Madras, 1993.)

Information Documents (BOBP/INF/..)

10. *Bibliography on Gracilaria – Production and Utilization in the Bay of Bengal.* (Madras, 1990.)
11. *Marine Small-Scale Fisheries of West Bengal : An Introduction.* (Madras, 1990.)
12. *The Fisherfolk of Puttalam, Chilaw, Galle and Matara – A study of the economic status of the fisherfolk of four fisheries districts in Sri Lanka.* (Madras, 1991.)
13. *Bibliography on the Mud Crab Culture and Trade in the Bay of Bengal Region.* (Madras, 1992.)

Newsletters (Bay of Bengal News)

Quarterly from 1981

Other Publications

1. *Helping Fisherfolk to Help Themselves : A Study in People's Participation* , (Madras, 1990.).
2. *The Shark Fisheries of the Maldives.* R. C. Andersen, H. Ahmed. Ministry of Fisheries and Agriculture, Maldives. (Madras, 1993.)

NOTE :

Apart from these publications, the BOBP has brought out several folders, leaflets, posters *etc.*, as part of its extension activities. These include Post-Harvest Fisheries folders in English and in some South Indian languages on anchovy drying, insulated fish boxes, fish containers, ice boxes the use of ice etc. Several unpublished reports connected with BOBP's activities over the years are also available in its Library.

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