BAY OF BENGAL PROGRAMME

DEVELOPMENT OF SMALL-SCALE FISHERIES

THE POSSIBILITIES FOR TECHNICAL COOPERATION BETWEEN DEVELOPING COUNTRIES (T.C.D.C) IN FISHERIES

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PREFACE

This paper briefly assesses possibilities for TCDC (Technical Cooperation Among Developing Countries) in the fisheries sector of countries in the Bay of Bengal region. It also outlines proposals for TCDC activities in the region, and gives a fairly detailed description of institutions in the region through which TCDC may be implemented.

The paper examines the history of the TCDC concept and summarises past and current TCDC activities of the Bay of Bengal Programme. It assesses the interest and willingness of governments in TCDC, and describes funding and administrative arrangements.

The paper was prepared by Mr. E. H. Nichols, till recently Director of Agriculture and Fisheries in Hong Kong, who was a consultant to the Bay of Bengal Programme for a study on TCDC. The paper was prepared after a four-week tour of the Bay of Bengal region (October 4 to November 2, 1980), when the consultant met fisheries experts and officials of the BOBP's member countries, and held discussions with them on TCDC.

The views expressed in the paper are those of the consultant and do not necessarily reflect the views of the FAO or the BOB P.

The preparation of this paper is an activity of the Bay of Bengal Programme for the Development of Small-Scale Fisheries, GCP/RAS/040/SWE, referred to in brief as the Bay of Bengal Programme (BOBP). The BOBP is funded by the Swedish International Development Authority (SIDA) and executed by the FAO. Five countries — Bangladesh, India, Malaysia, Sri Lanka and Thailand — are members of the programme. Its main aims are to develop and demonstrate technologies and methodologies to improve the conditions of small-scale fisherfolk and the supply of fish from the small-scale sector in the Bay of Bengal region.

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1. SUMMARY

1.1 There are identifiable opportunities for TCDC activities within fisheries in the Bay of Bengal. Both need and matching competence are available and it only remains to marry the two under suitable funding and procedural arrangements.

1.2 No objections have been expressed in principle to TCDC either by government policymakers or by executing agencies, Policy attitudes are, however, tempered by assessment of the advantages to be derived from such involvement. This applies both to TCDC as such and to the BOBP as an integral part thereto as a supportive agency. There are, in many cases alternatives available. What remains to be tested is the strength of the expressed willingness to effectively implement TCDC arrangements.

1.3 A major problem area for TCDC is funding. This applies both to national governments and to supportive organisations. Although certain basic funding can be met from within normal national budgetary processes, there are extraneous costs — usually involving foreign exchange — which present particular funding constraints at the national level.

1.4 A further major constraint is the availability of competent staff for assignment to TCDC activities. This is becoming an increasing problem as development plans take shape and get implemented. Governments and/or executing agencies are becoming more reluctant to release staff for anything other than short-term assignments (2-3 months or preferably less) and are imposing tighter conditions upon their use.

1.5 Attitudinal barriers exist and cannot be ignored. If TCDC is to be a reality such barriers must be overcome or at least neutralised.

1.6 In broad terms those countries declaring the greatest needs are seeking assistance on a priority basis in the aquaculture sector of the industry. This includes both inland freshwater fisheries and coastal brackishwater fisheries. Lower priority is accorded to marine fisheries even though identifiable TCDC activities are known.

1.7 "Needs" and "solutions" reflecting the opinions of several member-governments have to be precisely identified. Priority and urgency of need have to be established. This is urgent — and an essential prerequisite if limited resources in terms of funding, staff and facilities are to be used to the greatest advantage.

1.8 One way of facilitating 1.7 above would be for member countries, through their executing agencies, to prepare twin and complementary "shopping lists", which identify need and priority on the one hand and competence and availability on the other.

1.9 Hitherto the secret of successful implementation of TCDC activities has been the capacity of supportive agencies to provide "seed funding", or "topping up" monies to cover areas of financial deficit. An ongoing need for such supportive funding is clearly seen, both by member-governments and the consultant. Withdrawal or non-availability of such funding will seriously jeopardise TCDC application within fisheiers; and will undoubtedly slow down the development process as a whole unless it is replaced by alternative input arrangements.

1.10 There are adequate mechanisms and procedures for effecting TCDC activities. There is, however, need for these to be better known and understood within executing agencies. In particular the coordinative and facilitating supportive role of the BOBP should be recognised. Strengthening of the BOBP, by more core staff to cover the new interest areas now opening up and by increased funding for TCDC activities, should be seen as a key to future development within the region.

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1.11 There are several identifiable institutions and organisations capable of participating in TCDC activities. Training is an integral part of TCDC.

1.12 It must be remembered that TCDC is a means to an end, not an end in itself.

2. INTRODUCTION AND TERMS OF REFERENCE

2.1 During the Fourth Advisory Committee Meeting of the BOBP there was lively discussion on the subject of increased TCDC within the framework of the programme's fields of interest. All delegates strongly endorsed the concept of TCDC, and expressed their governments' willingness to increasingly participate in its implementation.

2.2 It was suggested that the major problem in increasing the crossflow of technical expertise and knowledge was the absence of adequate procedures for implementation. In this context it was considered that the BOBP could help stimulate TCDC by preparing a document outlining the give-and-take possibilities of the participating countries in subjects covered by the Programme. Later a high-level consultation among the participating countries could be convened to discuss areas for priority action, and procedures for implementation.

2.3 Following further discussions within FAO, a mission was established with the following terms of reference:

"The mission will prepare outline proposals for TCDC activities in the areas of marine and brackishwater fisheries of the Bay of Bengal region for implementation and collaboration with the BOBP. In preparing the proposals, the mission will in particular:

(i) Identify for each country the specific areas of activity, not necessarily confined to small-scale fisheries, which offer good scope for TCDC and the institutions!organisations/ individuals who would be instrumental in the process of such cooperation;

(ii) On the basis of discussions with the authorities concerned assess the extent of interest and willingness of the respective governments to participate in a process of mutual technical cooperation, and ascertain their areas of priority;

(iii) Examine the funding arrangements involved, including the nature and extent of funding support that would be extended by the respective governments;

(iv) Outline the procedures to be followed in the different countries in implementing the respective proposals.

2.4 Originally a two-man mission had been envisaged. In the event, however, only one consultant was available. The consultancy was undertaken in the four weeks immediately preceding, and in conjunction with, the Fifth Advisory Committee Meeting held in Penang. Malaysia, from 4-7 November, 1980. Since time was short, the visits to each country were, of necessity, all too brief; and since final travel arrangements were made at short notice governments did not have time to prepare documentation or make plans for meetings and discussions. The itinerary followed is detailed in Appendix 1.

2.5 Every endeavour was made, however, to meet all concerned, or likely to be concerned, with TCDC at both technical and procedural levels in each country. Several policy-makers of executing agencies and of ministries concerned with finance and planning were met. The consultant is most grateful to those who met him, often at short notice and despite other commitments. He is also grateful to FAO, project staff and liaison officers for all the arrangements made. Persons with whom major discussions were held are listed in Appendix 2. Documents consulted are listed in Appendix 5.

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2.6 It became obvious from an early stage—this was confirmed as the mission developed—that in looking at both procedures and funding it was essential to view fisheries TCDC in the wider context of TCDC in the entire economy and in relation to the priority ratings given in the U.N. development system for supportive action.

2.7 Given this broad interpretation of the mission's brief and the time constraints, the following report can only be indicative. It should always be remembered that TCDC is a mechanism; a means to an end and *not* an end in itself.

3. BACKGROUND TO TECHNICAL COOPERATION BETWEEN DEVELOPING COUNTRIES (TCDC)

3.1 Technical cooperation between developing countries is not a new phenomenon. It has taken place in a variety of ways, and under differing guises, in the past. The concept was, however, brought into sharper focus and received wider international recognition and acclaim at a meeting held in Buenos Aires in 1978; and which manifested itself in the "Buenos Aires plan of action" for promoting and implementing TCDC.

3.2 It may be helpful therefore to briefly outline the basic elements of TCDC as envisaged by the Buenos Aires plan of action, and in the subsequent relevant resolutions of the United Nations General Assembly and decisions of the Governing Council of the United Nations Development Programme. These are as follows:

(a) TCDC activities or projects must involve the deliberate and voluntary sharing or exchange of technical resources, skills and capabilities between two or more developing countries for their individual or mutual development.

(b) TCDC is to be initiated and organised primarily by developing countries themselves. In such a process governments of developing countries would usually take the lead or responsibility. TCDC could, however, also involved the participation of public institutions, private organisations, and individuals.

(c) The provision of project inputs—such as expertise, consultancy services, research and training facilities, equipment and supplies, etc. — in a TCDC activity or project should be provided entirely, or to the largest extent possible, by the partner developing countries themselves.

(d) TCDC can include all sectors and all kinds of technical cooperation activities of developing countries. It can be bilateral or multilateral in scope, sub-regional, regional or inter-regional in character. It should try whenever possible innovative approaches, methods and techniques particularly adapted to local needs, as well as existing modalities of technical cooperation, to the extent that they are considered useful.

3.3 The United Nations development system has an important catalytic and *supportive* role to play in complementing the efforts of the governments of developing countries in the pursuance, development and implementation of TCDC. The action of the United Nations development system may be:

(a) *Promotional:* Identifying TCDC potential; bringing parties together; organising training on TCDC; collecting, processing and disseminating information.

(b) *Operational and supportive:* Designing TCDC projects; assisting and participating in the execution of TCDC projects; strengthening regional or inter-regional institutions used for TCDC purposes.

(c) *Financial:* Partial financing from UNDP or agencies' regular budget sources; mobilising external resources; making other financial arrangements for TCDC projects and activities.

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4. PAST AND PRESENT FISHERIES ACTIVITIES WITHIN THE REGION WHICH FALL WITHIN THE CONCEPT OF TCDC

4.1 Technical cooperation between developing countries predates, by many years, the acceptance of the Buenos Aires plan of action. Examples may be quoted of a wide range of activities possessing what is now defined as "TCDC elements", and some of these examples can be dated as far back as 1966.

4.2 Experience to date indicates that countries not only accept but welcome opportunities for technical cooperation; and to this end various formal and informal agreements and arrangements have evolved over the years. In practical terms bilateral arrangements appear to be effective channels for technical cooperation as they involve accepted commitments, procedural arrangements and funding. Additionally they facilitate "third country" participation, if funding is deficient, by providing a readymade infrastructure on which to base action and additional inputs.

4.3 Many past activities, however, each containing a large TCDC element, have been organised purely and simply on an *ad hoc* basis as needs and solutions have been identified. Invariably such action has been facilitated by the intervention of a "third party" within a bilateral or multilateral agency, with the required knowledge, experience and coordinating capacity (including supplementary funding). While it may be desirable to establish procedures which can replace such action by more regular arrangements, and this is debatable especially in relation to fisheries TCDC within the BOBP—the intrinsic value of flexible *ad hoc* arrangements should not be overlooked as they allow quick reaction to an urgently stated need; and can obviate the long procedural delays involved in using normal bureaucratic channels.

4.4 Acceptance of the Buenos Aires plan of action has brought, or can introduce, further dimensions to already established relationships by stimulating and broadening their concepts, promoting new and additional TCDC agreements, and encouraging focal centres within national governments for the coordination of all TCDC activities and for their ongoing funding. The establishment of focal centres for national TCDC coordination and funding has obvious advantages in national planning and allocation of resources for development. There is, however, room for both formal and less formal procedures in the interests of efficiency.

4.5 Analysing the 1980 Progress Report of the Bay of Bengal Programme it is interesting to note that the following items either possess TCDC elements or have TCDC potential in the future. These are:

(a) Motorisation of fishing craft (BGD/MCC).

(b) Beachcraft development (IN D/BCD).

(c) Inboard motorisation of small FRP boats (SRL/IBM).

(d) Reinforced vulcanised rubber (RVR) boats (BOB/RVR).

(e) Coastal aquaculture, Bangladesh (BGD/CAC).

(f) Aquaculture demonstration of family size units in Ban Merbok, Kedah state, Malaysia, (MAL/CAC).

(g) Aquaculture demonstration for small-scale fisheries development, Phang Nga, Thailand (THA/ACD).

(h) Indonesian mission to Andhra Pradesh, India.

(i) Release of Tamil Nadu staff (under TCDC) to Sri Lanka to help design and implement an experimental shrimp farm project.

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(j) Participation from other member-countries in a coastal aquaculture symposium in Cochin, India.

(k) Sponsored tour of Singapore and Thailand to view brackishwater fish-pond farming by six persons from Sri Lanka.

(i) Study tour of Sri Lanka by staff from Orissa, India to study fishing craft and gear.

(m) Consultation on stock assessment for small-scale fisheries in the Bay of Bengal.

5. OUTLINE PROPOSALS FOR TCDC ACTIVITIES IN MARINE AND BRACKISHWATER FISHERIES WITHIN THE BAY OF BENGAL REGION

5.1 Although interest in and uptake of the following will, in the final analysis, depend upon a variety of factors — including the interest of individual countries, agreement on funding arrangements, and the establishment of suitable procedures — several areas for ongoing and perhaps increasing TCOC activities suggest themselves as worthy of more detailed consideration. While such activities can in the main be met by cooperation within the BOBP region, the extension of such cooperative efforts to adjacent countries and areas, such as the South China Sea Programme **(SCSP)** region, should be considered. There are links whereby such joint activities can be effected through the normal liaison channels of the BOBP and SCSP.

5.2 *Coastal and brackishwater fisheries:* Interest in the region is heavily weighted in favour **of the development** of this sector. There are many reasons for this, not necessary to enumerate, and it would appear that this is one of the major areas in which TCDC activities should be concentrated. Bangladesh, Sri Lanka and Malaysia have all expressed interest in this sector; both Thailand and India are actively promoting this sector and have considerable expertise in it.

5.3 Although there is need to precisely identify and define individual TCDC activities before embarking on them, the following outline areas would seem to hold out promise of fruitful **results:**

(a) There is interest in the culture of penaeid prawns, both for exports and for domestic consumption. India and Thailand, and neighbouring Indonesia, have experience and expertise that can be tapped to advantage by other participating countries.

(b) Any development of this sector fishery will inevitably lead to the culture of pondfish, such as milkfish, *Chanos,* etc. and here there is expertise to be obtained from Indonesia and the Philippines.

(c) Where feasible cage culture should be developed; and this could include a wide range of species including *Lates* and *Siganus,* and also others if true marine cage culture is included. Although this is a relatively new area for development, there is expertise within the region in Malaysia and Thailand, and — particularly in marine cage culture — in Hong Kong.

(d) The culture of oysters and mussels could be important in individual economies; and interest has already been expressed therein by Bangladesh; expertise is available from India and **Thailand.**

(e) With the current proposals for relatively rapid expansion of coastal and brackishwater fisheries in such countries as Sri Lanka and Bangladesh, there is a very real need foreseen for training of staff. This includes not only scientific/research staff involved in the foregoing types of TCDC activities, but also specialised technicians and others concerned with extension activities. Such training could perhaps best be given at least initially by "tailor-made" courses for trainers at, say, suitable institutes in India, Thailand and elsewhere according to individual country needs; and followed up by wider-impact workshops within the concerned countries using trained local staff backed up by TCDC experts.

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(f) Although stated in the context of reservoir and fresh water "tank" farming, there would appear to be need for further enquiry into the development of fishing gear for harvesting from lagoon and estuarine fisheries. This is a difficult area in which to pin down expertise but, dependent upon the individual fishery as referred to in (a) to (d) above, such expertise will probably be best obtainable in the countries mentioned; but special attention would need to be paid to this particular aspect of production.

(g) Although not specifically identified as such by any country, difficulties in the field of aquaculture engineering are perceived by the consultant. These needs will assume increasing importance and relevance as hydraulic and associated problems emerge with expanded development. Attention is therefore invited to the fact that the Asian Institute of Technology (AIT), Bangkok, is considering aquaculture engineering as part of its future syllabus. In the interim, expertise is available, albeit on a limited scale, from the Philippines.

5.4 *Marine fisheries:* While development of this sector attracted less "political" interest than the former, it remains very important for most countries within the region. This is especially valid when considering the development of coastal fishing, where there is still much to be achieved in terms of improved craft and design, fishing gear technology and methods, navigation and engineering standards, etc.

5.5 Discussions with fisheries department staff concerned with operational development problems within the industry lead one to suggest that there is scope for TCDC activities in the following major areas within marine fisheries:

(a) There continues to be interest in evolving new and improved fishing gear technology and associated fishing techniques. Although all countries have, or are developing, their own centres specialising in this area, there would seem to be merit in promoting TCDC exchange with expertise available from, say, India, Thailand and Malaysia.

(b) Likewise there are needs seen in further expanding and developing navigation and engineering skills; and here again expertise is available from, say, India.

(c) One country in particular expressed interest in what may be described as "craft technician" training, to equip the extension worker with the necessary expertise to advise both fishermen and boatbuilders on craft design and adaptation to more modern designs or more flexible fishing techniques, and to facilitate monitoring of loan funds given for construction of new boats, etc. (This does not imply training to the level of a naval architect but to sub-professional/specialised technician standards.) There probably is wider need for such training; and this is available from India.

(d) There is need for the training of extension workers, in both "overview" and more specialised techniques, for the development of the marine fishery. Although most countries have developed, or are developing, their own centres for such training, in the interim countries such as Sri Lanka and Bangladesh may wish to take advantage of facilities available in India and Thailand.

(e) Marketing and post-harvest technology, including quality control, continue to present problems for marine fisheries and all countries are actively engaged in these subject areas. Exchange of knowledge and expertise could be advantageous to all countries; and TCDC "workshop" approaches may be considered, based on selected centres of excellence in differing countries— India, Thailand and Sri Lanka for example, with focus on *specific* subjects, such as fish and prawn processing, quality control measures, etc.

(f) Although enquiry evoked a negative response from India, there does seem scope for the introduction of technical cooperation in joint stock assessment where countries have contiguous fisheries boundaries and where migratory common stocks are being fished. There are several global examples where failure to reach agreement on such stock exploitation and this can mainly be agreed only through joint stock assessment discussions— has led to disastrous diminution of specific stocks, with serious effects for both producers and consumers as well as the economy as a whole. Successful joint stock assessment work-

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shops have been held between Malaysia and Indonesia in respect of the Malacca Straits. Comparable workshops could be fruitful between, say, India and Sri Lanka in respect of the Gulf of Mannar and Palk Bay.

5.6 *In/and freshwater fisheries:* This was not specifically included in the consultant's terms of reference. However, in view of the very strong interest expressed by most countries and especially by Bangladesh and Sri Lanka in developing this sector, attention is drawn to the possibilities of TCDC activities in inland freshwater fisheries. It is appreciated that it may be necessary to broaden the BOB P's "brief" to enable it to facilitate such activities.

5.7 All countries are engaged in development/production activities in this fishery; but not all production is at the same developmental stage and thus useful TCDC exchange can take place. This even applies in areas where activities are on a par but where all share common problems. The following outline areas are put forward for further and more detailed consideration:

(a) A major interest in the development of inland fisheries is through the massive pond culture of carps. Both India and Malaysia have expertise and experience in this field, as has Indonesia; and this can be used with advantage especially by Bangladesh and Sri Lanka,

(b) Commercial catfish culture *(Pangasis)* is well developed in Thailand and India; and again this experience and expertise could be used with advantage in other countries especially Bangladesh and Sri Lanka.

(c) *Tilapia* culture is well developed in India and Indonesia, and this technology merits transfer to other countries of the region.

(d) Polyculture of carps, with or without other fish species, is another area in which there are distinct possibilities for TCDC activities improving production. Here the greatest expertise lies in India, China, Indonesia and Hong Kong, although Malaysia and India could provide alternative focal points for training and exchange of experience.

(e) Integrated fish culture, with ducks, poultry and pigs, also provides TCDC opportunities within the region with Thailand but more especially with China, Hong Kong and to a lesser extent, with the Philippines.

(f) A potentially important area for development is in the culture of the giant freshwater prawn, *Macrobrachium rosenbergii,* and here there is expertise and experience available — especially from Malaysia and Thailand within the BOBP, and Indonesia through the SCSP.

6. ASSESSMENT OF INTEREST AND WILLINGNESS OF RESPECTIVE GOVERNMENTS IN TCDC AND THEIR ORDERS OF PRIORITY

6.1 Most if not all of the participant governments have been involved in some form of mutual technical cooperation with other developing countries for many years now. They are politically committed to the concept of TCDC and all are in one way or another, actively engaged in implementing that concept. TCDC involves more than the fisheries sector however; and in the final analysis commitment resolves itself as a matter of priorities — usually in relation to funding availability—other than interest and willingness as such. Having said this it must be noted that attitudes to TCDC, and thereby the BOB P. are tempered — at least at policy levels, if not so much at executing agency levels — by the direct advantages to be obtained from it. Where no discernible advantages accrue there is reluctance to committal, other than in expression of agreement in principle. Conversely, where there are clearly discernible advantages to be seen then there is marked increase in enthusiasm. Both these stances are, in turn, further modified by the question of from where funding will originate.

6.2 *Bangladesh* relies on inland and freshwater fisheries for two thirds of its fish consumption, which in turn provides the greater part of the country's protein intake. Marine fisheries, apart

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from providing a lesser amount of the national diet intake, face consumer product resistance which keeps prices depressed relative to freshwater fish. The recently stated fisheries development target for the next four to five years clearly indicated the priority given to the expansion of inland freshwater fisheries production. To a lesser extent it is hoped to expand development of the coastal brackishwater fisheries. Marine fishery expansion is the least important in planning priorities. Hitherto, in the main, marine fisheries exploitation has been by joint venture with Thailand; this has however led to problems.

6.3 Attitudes to TCDC inputs at policy levels are undoubtedly influenced by the plethora of other "aid" inputs which are currently being injected into Bangladesh. While the need for assistance in the priority fisheries areas indicated is clearly seen within national planning, the part to be played by TCDC may be less certainly defined. The need for TCDC assistance to supplement national efforts is most clearly seen within the executing agencies (mainly the Department of Fisheries).

6.4 Fisheries TCDC activities in Bangladesh should concentrate on inland and coastal brackishwater fisheries. Other fisheries TCDC activities to take second place.

6.5 *Sr/Lanka* has clearly defined its interests and priorities in a "Master Plan" for 1979-1983. This plan advocates development of the deep sea resources through foreign assistance (probably joint ventures). Offshore fishing (30-50 miles) is to be developed with foreign assistance — largely under foreign aid programmes — but this does not preclude TCDC involvement, although clearly there is no TCDC input into deep sea fishing development. Government's direct marine fisheries development programme will concentrate on the coastal zone (up to 25/30 miles); and will aim at increased catch and effort by introducing more modern craft and gear and better techniques and by strengthening the infrastructure. There is thus scope for TCDC activities within this sphere.

6.6 However, a *major effort* is to be made in fisheries development within the 344,000 acres of inland tanks and reservoirs, and the 300,000 acres of brackishwater lagoons, estuaries and mangrove swamps which are currently under-exploited. At the time of the mission, an FAO Aquaculture Development Project Team was in Sri Lanka to make a study and formulate development proposals for UNDP funding for these areas. There is, or should be, considerable scope for TCDC involvement in such a development programme.

6.7 The Sri Lanka government quite clearly expressed the view that, priority should be given to aquaculture development in fisheries TCDC activities.

6.8 *India's* expressed fisheries interests presently lie in developing the shrimp resources off its eastern seaboard for export-oriented production. The "startline" for such development rests in a basic survey and assessment of these resources; and this clearly lies outside the scope of TCDC capabilities.

6.9 Generally there is no objection to TCDC, but as a country more likely to be giving than taking, it is worth noting that a recent policy statement (by the Minister responsible for fisheries matters) indicated that a much more critical assessment will be made of the release of Indian expertise at least for assignments overseas. Whether or not there will be a comparable tightening of criteria in accepting trainees, including those under TCDC arrangements, remains to be seen. At present the climate of opinion remains optimistic in this respect. This is somewhat critical because, by virtue of sheer size and capacity, India is probably the best suited to accept reasonable numbers of trainees at any given time.

6.10 Although India has allocated a sizeable portion of its current IPF to fund TCDC activities it may well be significant that there are examples of expertise now only being offered on a "commercial basis" as paid consultancies in competition with normal TCDC activities. (This development of locally based consultancy services in developing countries has been noted elsewhere and in adjacent regions. The implications for TCDC activities are self-evident.)

6.11 Discussion with the directorates of the various central institutes liable to be involved in training or linked research-cum-training commitments indicated a willingness to participate in TCDC activities, subject of course to policy clearance and satisfactory funding arrangements.

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6.12 At policy levels stress was strongly placed on the need to precisely identify and define need and capacity existing within TCDC undertakings. Given that these criteria can be met then India could participate.

6.13 *Thailand* has long expressed its interest in obtaining wider fishing access to new grounds to absorb the catching capacity of its fleet. It is keen therefore to establish fishing agreements and joint ventures. Although not in themselves TCDC activities there can be TCDC elements within the related agreements and joint ventures.

6.14 Thailand is firmly committed to TCDC, and is willing to participate, and does so over a wide front. Willingness to become involved faces two constraints. These are funding limits and limited manpower-availability for overseas assignments. The latter must be of only short term (two or three months) duration. There are fewer constraints on training within Thailand, although the preference is to set up complete training courses as such rather than deal with indefinite numbers of individual trainees. Details can be worked out, but disappointment was expressed at the poor response to a comprehensive fisheries training course offered this year. There were less than 10 participants in a course set up for 40; and Thailand was meeting all costs including travel.

6.15 It should be recognised that Thailand has alternative options open to it in respect of TCDC affiliations. It already has strong linkages with the SCSP, and through SEAFDEC and the ASEAN secretariat. There are also bilateral arrangements for cooperation with Malaysia and other countries. In hard terms it does not obviously stand to gain from TCDC linkages within the BOBP except through satisfactory joint venture, arrangements arising therefrom. This is not to say that Thailand will not support TCDC — it is already heavily committed to TCDC as such and to Thai-Aid programmes complementary to such concepts.

6.16 *Malaysia's* interest in marine fisheries within the Bay of Bengal is limited. Its "regional" marine fishing activities lie within the coastal waters of the Malacca Straits, which it shares with Indonesia. Most of its future marine fisheries development lies in its eastern waters in the South China Sea. Within marine fisheries therefore there seems little likelihood of TCDC involvement other than in response to requests. There is, however, keen interest in aquaculture activities; and subject to the normal funding and staffing constraints there is willingness to cooperate in this sector in particular.

6.17 Malaysia also has alternative options open to it in respect of TCDC affiliation. These options, which are to all intents and purposes similar to those for Thailand, in many ways offer more positively advantageous TCDC exchange than are available through the BOBP. This factor should be borne in mind as a potential influence on policy attitudes and commitments to the programme.

7. FUNDING AND PROCEDURAL MATTERS RELEVANT TO TCDC

7.1 There are various options open to countries for the funding of TCDC activities, and there are examples of these alternatives within the region. It must, however, be remembered that when a country decides to make a TCDC allocation from its national budget, or its IPF, that allocation relates to all areas that fall within TCDC jurisdiction and not just fisheries. While it has therefore proved possible to obtain a broad view of funding allocations, it has not been possible to determine precise details for the fisheries sector — if indeed they are fully known due to a "masking" effect when fisheries resources are used in a variety of ways.

7.2 *India* has allocated 10% of its current IPF budget to TCDC activities; this represents some US $ 5 million. *Thailand* on the other hand does not allocate any of its IPF, and instead has allocated US $500,000 for all its TCDC activities. *Sri Lanka* has fully utilised its own IPF and cannot make an allocation, *per se,* from the national budget. It would however, be prepared to agree to an allocation to TCDC activities from the regional IPF. *Bangladesh* also has fully

committed its IPF and is not in a position to budget nationally for TCDC activities. *Malaysia* tends to the view that national IPF funds should not be used for TCDC activities. It was not possible to determine the specific provision for TCDC in the national budget but such a provision exists; and what seems most likely would be additional provision for a specific project which was attractive.

7.3 Till now the success of fisheries TCDC has revolved round the availability of supportive funding from within the U.N. development system and or from trust funds. These funds have been used either as "seed" money to "prime the pump" or to supply hard currency foreign exchange monies for external travelling expenses, air tickets, etc. Unless such funding is continued, and preferably expanded, the future for TCDC does not look bright in practical terms despite the financial inputs by member countries—for staff salaries and local costs. Failure of the TCDC mechanism could have a severe impact on fisheries development— especially on programme planning and timely implementation.

7.4 What is also significant in relation to TCDC generally, or to the fisheries sector in particular, is the presence of several other established mechanisms for "TCDC" activities. These include:

(a) The Indo-Ceylon Joint Economic Cooperation Agreement under which some TCDC activities have been effected.

(b) The Thai-Bangladesh Fishery Agreement—through which joint ventures have been effected.

(c) A formal agreement between Malaysia and Thailand to cooperate in "agriculture" including fisheries.

(d) An informal understanding between India and Thailand, from which private sector joint ventures in fisheries have been effected.

(e) An Indonesian-Sri Lankan agreement to cover cooperation in expert services and mutual use of training facilities is currently under "formalisation".

(f) ASEAN (Association of South East Asian Nations), through a joint secretariat in Bangkok, provides a standing mechanism for TCDC activities — through in this case its Committee on Fisheries (at present only two BOBP members, Malaysia and Thailand, are also in ASEAN).

(g) SEAFDEC (Southeast Asian Fisheries Development Center), which is specifically for collaborative fisheries research, training and extension activities. Again only Malaysia and Thailand are directly involved but, subject to negotiation, staff from other countries may be accepted for training purposes.

This is not an exhaustive list and should be treated as indicative only. The point made is that there are alternative mechanisms, funding and procedures for TCDC implementation.

7.5 While the above mechanisms may, in theory, have a role to play in fisheries TCDC activities, in practice their BOBP impact to date has been nominal. This does not apply to the same degree to (f) and (g) which are marginal to BOBP but whose impact within their own organisational parameters have been most effective.

7.6 At the national level TCDC focal points have been, or are being, established. The extent and effectiveness of coordination between the national and sectoral (e.g. fisheries) focal points varies among countries. In many instances sectoral focal points are well established and have long-standing reciprocal contacts in neighbouring countries. The national focal point could well concentrate on overall policy and planning, and assist by obtaining increased funding for TCDC projects, which are then handed over to the executing agencies to implement.

7.7 *Thailand* has a national focal point within the Department of Technical and Economic Cooperation; the sectoral focal point is the Department of Fisheries. *India* has a focal point,

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the Director of the International Cooperation Division within the Ministry of Agriculture; and this focal point coordinates TCDC activities in the fisheries department and in the central (fisheries) institutes administered by the Indian Council of Agricultural Research. *Sri Lanka* coordinates its TCDC through the International Economic Cooperation Division of the Ministry of Finance and Planning, in association with the external resources department of the same ministry. *Malaysia* has the national focal point in the Economic Planning Unit of the Prime Minister's office with the sectoral focal point in the Department of Fisheries. In *Bangladesh* all fisheries TCDC is channelled through the Ministry of Fisheries, which then undertakes clearances with other ministries.

7.8 There are adequate mechanisms and procedures for effecting TCDC activities. There is, however, need for these to be better known and understood within executing agencies. In particular, however, the coordinative and facilitating supportive role of the BOBP should be recognised. Strengthening of the BOBP role, by more core staff to cover the new interest areas now opening up and by increased funding for TCDC activities, should be seen as a key to future fisheries development within the region.

7.9 In the light of known constraints, and reflecting the opinion of several member governments, there is urgency in the need to *precisely* identify and define "needs" and "solutions", and to clearly identify priority and urgency of need. This is a pre-requisite if limited resources in terms of funding, staff and facilities are to be used to the greatest advantage. One way of facilitating this could be for member-countries, through their executing agencies, to prepare twin and complementary "shopping lists", which identify need and priority on the one hand, and competence and availability on the other. These lists would preferably also indicate any conditions that individual countries may wish to impose on arrangements. Such conditions could include apportioning of payment of airline ticketing costs, local D.S.A. payment, transport, etc., or even the grant and terms of fellowships. An example of the "shopping list" approach is given in Appendix 3.

Funding footnote: Although there may be constitutional and legal constraints in effecting the following within the present terms of reference of the BOBP, member-countries may wish to sponsor the following proposal for consideration by the Indian Ocean Fishery Commission/Indo-Pacific Fishery Commission (IOFC/IPFC) as regional parent bodies. Namely, that the Commission considers amending its constitution to allow it to establish local currency funds, in each country, to facilitate funding arrangements for the Commission's activities, including support of TCDC activities. At the same time provision could be included to provide for acceptance of donations to permit supplementary third party funding to achieve the same objective. This proposal might well be considered in relation to the establishment of the Bay of Bengal Committee.

The foregoing suggestion is made in the knowledge that such arrangements are extended in the Regional Animal Production and Health Commission for Asia (APHCA). All BOBP member-countries are also members of APHCA, as are the majority of member-countries of the IPFC. Thus the proposal is already acceptable in principle to member-governments. Details could be obtained from the APHCA Secretariat, Bangkok.

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8. INSTITUTIONS AND ORGANISATIONS THROUGH WHICH TCDC MAY BE IMPLEMENTED

8.1 The existing executing agencies, namely the fisheries department in each country, will continue to function as the normal channel for implementing TCDC activities. These departments have already more or less well established counterpart relationships throughout the region and with the supportive organisations concerned. There is room for strengthening relationships in certain cases; and countries should re-examine attitudes and policies to stimulate optimal cross flow of information and technological exchanges that can lead to practical TCDC activities.

8.2 There are, however, additional sources that can be tapped in furthering TCDC. These include various central institutes in India, the Southeast Asian Fisheries Development Center, and the National Inland Fisheries Institute in Thailand. Outlines of the facilities, work programmes and training possibilities of the above are given in Appendix IV (a) - (i).

8.3 There are, potentially, other institutions which could be included in the future, but which have been omitted from the current list to enable them to establish themselves firmly in servicing national needs before embarking upon technology transfers under TCDC auspices. These institutions include the Institute of Fish Technology and the Fisheries Research Institute of Sri Lanka, soon to be brought within the ambit of a new bureau, the National Aquatic Resources Development Agency.

8.4 Other institutes, such as the Fisheries Research Institute, Penang, could be approached through the relevant fisheries department.

8.5 In addition, the U.N. development system, mainly through FAO and UNDP, should continue to play a major supportive role in activating and sustaining TCDC. Other supportive agencies, such as ESCAP, SIDA, DANIDA, CARITAS, etc., should not be overlooked, however, but rather brought into a coordinated multilateral approach as and when opportunity offers.

8.6 It is also important that TCDC possibilities be explored beyond the boundaries of the BOBP; and as an initial step the informal linkages with the countries of the South China Sea Programme (SCSP) should be strengthened. This is already happening, through closer and more frequent liaison between the secretariats of the two programmes, and should be encouraged at every opportunity.

8.7 While all recognise and acknowledge the need for communication and exchange of information, it is noteworthy that exchange of publications and literature which could have considerable relevance to TCDC innovative thinking is at best patchy and uneven. It could be that such documentation is present in research establishments but ready availability to TCDC decision-makers is also called for.

8.8 ESCAP has recognised this need and has called for a TCDC-oriented Regional Information System. While the system envisaged is longer term, sophisticated, and will no doubt prove expensive, the concept has merit. Of more immediate interest and concern are ESCAP's own TCDC publications which include:

(a) Sectoral directories of experts, training facilities, research programmes and technical publications;

(b) Directories and reviews of inter-country institutional arrangements for TCDC and ECDC; and

(c) *Ad hoc* papers on programmes, systems, and techniques for implementing TCDC.

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In view of ESCAP's marginal interest at present in fisheries, there will no doubt be only nominal coverage in that sphere, if at all. It would, however, seem well advised to make at least a modest start within fisheries to provide comparable coverage, perhaps in conjunction with ESCAP, but through IPFC rather than BOBP.

8.9 *At present and within their respective sub-regions, both the SCSP and the BOBP fulfil a vital role as compendiums of knowledge and experience that can quickly and effectively identify TCDC linkages.* There is no doubt that the above role of the two Programmes can be foreseen for many years.

9. TRAINING AS AN INTEGRAL PART OF TCDC

9.1 While TCDC embraces cooperation in the widest possible sense, and includes the physical transfer of items such as foundation "seed" stocks of selected species of crustacea, finfish, molluscs, etc. and exchange of innovative/prototype gear and equipment, there is general agreement that transfer of technology through training offers the most promising scope for early and rapid realisation of TCDC activities. It also appears to be the most likely area to attract bilateral and multilateral support and funding.

9.2 Such "training" can range from the exchange of experience and techniques at the highest scientific and other levels to the more practical and pragmatic training of extension field workers and even fishermen themselves.

9.3 It must be noted, however, that at least two countries, Bangladesh and Sri Lanka, intend to embark upon ambitious and far-reaching development plans for the expansion of their fisheries. These plans recognise the need for and envisage concomitant recruitment and training proposals to bring staff availability up to the level necessary to undertake plan implementation. Such action must be realistically phased both to permit adequate training and to allow progressive recruitment into the existing organisational structure. There is also need for phased staff expansion to allow for the evolution of a natural hierarchical structure in accordance with relative experience and seniorities. Too rapid staff expansion will place an additional and onerous burden on the limited numbers of experienced and competent staff currently available. (Staffing constraints were a recurrent theme throughout discussions in all countries.)

9.4 Availability of adequately (nationally) trained staff is a pre-requisite to undertaking transfer of technology through training under TCDC auspices. Unless the basic training has already been inculcated much of the advantage to be gained from TCDC will be lost or seriously eroded. It also follows that there must be adequate and effective means for internal/national technological transfer within each country to ensure that the knowledge and experience gained reaches the fishermen with a minimum of delay and with the necessary infrastructural support.

9.5 This is particularly relevant in the sphere of aquaculture. Here every effort must be directed at transferring breeding and hatchery techniques, including induced spawning, to the fish farmers themselves rather than rely upon this being undertaken solely by highly specialised scientists and technicians. The need for the latter is there; but ultimately their task is in the problem areas of breeding, and routine techniques should be handed over as soon as possible to fish farmers if development plans are to fulfil their targets. Where natural breeding areas are readily available, these should be conserved and "tapped" under controlled exploitation, at least in the initial stages of development. This philosophy should underlie training activities in aquaculture.

9.6 Aquaculture training should also aim at ensuring, in so far as is possible, that almost all the major inputs, such as seed, fertiliser and feed, are produced on the farm where the operation is sited. This can be best achieved via integrated rural development farm planning.

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9.7 As has been previously stated, resources to undertake TCDC are at a premium, and will be so into the froeseeable future. It is essential therefore to ensure that activities are undertaken with a view to maximising their effectiveness and with a minimum of "wastage". Training requirements under TCDC must be precisely defined and be essentially practical. When implemented, the training itself must meetthe same criteria and avoid time-consuming philosophic discourses.

10. FUTURE ACTION WITHIN **BOBP**

10.1 Action should be taken up at once to maximise the TCDC elements within current and future BOBP projects.

10.2 Based on an analysis and evaluation of the collated "needs" as defined by the relevant "shopping list", new projects should be identified for inclusion in the ongoing work programme.

10.3 One of the most important criteria to be used in selecting new projects and determining their priority rating should be the extent of possible TCDC identified from the relevant "shopping list", indicating competence available or known to be available within the Indo-Pacific Region.

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Appendix 1

CONSULTANT'S ITINERARY:

T.C.D.C. EVALUATION & DISCUSSION

Date	*Place*	*Details*
October 4 - 6, 1980	Madras	Discussions and briefing with BOBP Director and staff members; reference to documentation and reports.
October 7, 1980	Calcutta	En route Dacca.
October 8-11, 1980	Dacca	Discussions with FAQ Resident Representative, BOBP Project Officer, Secretary and staff of Bangladesh Ministry of Fisheries & Livestock, Bangladesh Fisheries Corporation, Fisheries Department, DANIDA and CAR ITAS.
October 11 - 14, 1980	New Delhi	Discussions with FAQ Resident Representative, UNDP Representative, Secretary and staff of the Union Ministry of Agriculture & Irrigation, including Indian Council of Agricultural Research, Director of the International Cooperation Division, etc.
October 15, 1980	Bombay	Discussions with Director and staff, Central Institute of Fisheries Education *(N.B.* Due to a general strike in Bombay it was not possible to meet the Director and staff of the Exploratory Fisheries Project).
October 16 - 18, 1980	Cochin	Discussions with the Director and staff of the Central Institute of Fisheries, Nautical and Engineering Training (CIFNET); the Integrated Fisheries Project (IFP): the Central Institute of Fisheries Technology (CIFT); the Central Marine Fisheries Research Institute (CMFRI); and the Marine Products Export Development Authority (MPEDA).
October 18 - 19, 1980	Madras	En route to Colombo (documentation and discussion at BOBP Madras).
October 20- 22, 1980	Colombo	Discussions with Secretary of Fisheries, Ministry of Fisheries and Directors of Inland Fisheries & Planning Division, Fisheries Research Institute and Institute of Fish Technology; Ministry of Finance and Planning—External Resources Division and International Economic Cooperation Division; and FAO Resident Representative and staff.
October **23, 1980**	Singapore	En route to Manila.
October 24- 27, 1980	Manila	Discussions with the Programme Leader and staff of the South China Sea Fisheries Development Programme.

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October 27 - 29, 1980	Bangkok	Discussions with the Director-General and staff of the Department of Fisheries, Ministry of Agriculture and Cooperatives, Thailand; ESCAP staff and staff of the Department of Technical Economic Cooperation.
October29 - November 2,1980	Kuala Lumpur	Discussions with the Deputy Representative, UNDP; the Director-General and staff of the Department of Fisheries, Ministry of Agriculture, Malaysia; Fisheries Industry Director, MAJUIKAN; (Fisheries Development Authority, Malaysia).
November 4 - **7,** 1980	Penang	Attending the 5th Meeting of the Advisory Committee, Bay of Bengal Programme, and to discuss TCDC with the Committee.
November 8 - 11, 1980	Madras	Return to Madras to finalise discussions with BOBP director and complete report.

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Appendix 2

LIST OF PRINCIPAL ORGANISATIONS & PERSONS WITH WHOM DISCUSSIONS WERE HELD

A. *Bangladesh*

1.	FAO Staff	Mr. E. W. Hem, Resident Representative Mr. A. Kashem, BOBP Project Officer
2.	Ministry of Fisheries & Livestock	Mr. Hussain Ahmed, Secretary Dr. M. Youssouf Ali, Additional Secretary Mr. B. R. Chowdhury, Deputy Secretary
3.	Department of Fisheries	Mr. A. Huq, Director Mr. A. Jalil, Assistant Director (Headquarters)
4.	Bangladesh Fisheries Development Corporation	Dr. M. B. Rahman, Chairman
5.	DAN IDA Mission	Mr. Jensen
6.	CARITAS	Mr. L. C. Perera, Peripatetic Fisheries Adviser

B. *India*

1.	FAO/UNDP staff, Delhi	Mr. J. P. Huyser, UNDP Resident Representative Dr. A. S. Alwan, FAQ Resident Representative Dr. Hans V. Henle, Senior Agricultural Economist
2.	Ministry of Agriculture Er Irrigation, Delhi	Mr. M. A. K. Thayab, Joint Secretary (Fisheries) Dr. B. B. L. Mathur, Asst. Commissioner (Fisheries) Mr. C. S. Rangachari, Director, International Cooperation Division Dr. R. R. S. Thampi, Senior Scientist (Fisheries), Indian Council of Agricultural Research (ICAR)
3.	Central Institute of Fisheries Education, Bombay (CIFE)	Dr. S. N. Dwivedi, Director Prof. Y. Sreekrishna, Fisheries Technology
4.	Central Institute for Fisheries Nautical and Engineering Training (CIFNET), Cochin	Dr. M. Swaminath, Director
5.	Integrated Fisheries Project (IFP), Cochin	Dr. M. Swaminath, Director Mr. M. Mukundan, Deputy Director
6.	Central Institute of Fisheries Technology (CIFT), Cochin	Dr. Rajendranathan Nair, Director Dr. K. Ravindran, Scientist
7.	Central Marine Fisheries Research Institute (CMFRI), Cochin	Dr. E. G. Silas, Director
8.	Marine Products Export Development Authority (MPEDA), Cochin	Mr. R. C. Chaudhury, Chairman Mr. S. N. Rao, Director

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C. *Sri Lanka*

1. FAO Colombo	Mr. G. Laurent, FAO Resident Representative Mr. B. W. Perera, BOBP Project Officer
2. Ministry of Fisheries	Mr. A. Weeraratne, Secretary of Fisheries Mr. K. Thayaparan, Director, Inland Fisheries Mr. E. A. Nanayakkara, Director, Extension and Regulation Mr. V. Thurairajah, Deputy Director, Planning and Programming Mr. K. 1. Weerasooriya, Research Officer
3. Fisheries Research Institute, Crow Island, Mattakaliya	Miss Yoga Raphael, Acting Director
4. Institute of Fish Technology Crow Island, Mattakaliya	Mr. Jinadasa, Deputy Director Mr. S. Etoh, Fish Handling/Processing Technologist
5. Ministry of Finance and Planning	Mr. Paul V. Thamber, Deputy Director, External Resources Department Dr. Lloyd Fernando, Deputy Director, International Economic Cooperation Division
6. FAO Aquaculture Team	Mr. U. N. Wijkstrom (Aquaculture Economist and Team Leader) Mr. H. L. Cook (Aquaculturist, Brackishwater) Mr. K. H. Alikunhi (Aquaculturist, Freshwater) Mr. J. Kovari (Aquaculture Engineer)

D. *Phihppines*

South China Sea Fisheries Development Programme, Manila	Mr. A. G. Woodland, Director Mr. E. 0. Oswald, Deputy Director Mr. P. N. McLeod, Senior Development Officer

E. *Thailand*

1. FAO/UNDP, Bangkok	Mr. 0. D. Tapiador, Regional Fishery Officer and Secretary, IPFC Mr. M. N. Delmendo, Regional Fishery Officer, Aquaculture Dr. B. P. Dhital, FAO/RAPA Planning Economist Mr. N. S. Subbaraman, Deputy Regional Representative, UNDP
2. Department of Fisheries, Ministry of Agriculture and Cooperatives	Cmdr. Swarng Charenpol, Director-General Mr. Ariya Sidthimunka, Deputy Director-General Mr. Umpol Pongsuwana, Director, Brackishwater Fisheries Division Dr. Veravat Hongskul, Director, Marine Fisheries Laboratory Mr. Kachornsak Wetchagarun, Chief, Fisheries Economics Section Ms. Sumalee Yukatanonda, Chief, Foreign Relations Unit Miss Arunee, Foreign Relations Officer Mr. Manu Potharos, Chief, Fisheries Extension Section

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3.	Department of Technical and Economic Cooperation, Government of Thailand	Mr. Krisda Piampongsaut, Acting Chief of the TCDC Division Miss Sirisupa Soonsiri, Programme Officer
4.	Economic and Social Commission for Asia and the Pacific (ESCAP)	Mr. T. Manokaran, Chief, TCDC Division Mr. Sultan Z. Khan, Chief, Agriculture Division Miss Christine Alfsen, Assistant Economic Affairs Officer Mr. Manalac, Chief, Water Resources Section, Division of Natural Resources

F. *Malaysia*

1.	UNDP, Kuala Lumpur	Mr. Jack Goulden, Deputy Resident Representative
2.	Department of Fisheries, Ministry of Agriculture, Kuala Lumpur	Y. M. Tengku Ubaidullah bin Abdul Kadir, Director-General of Fisheries Wan Awang Bin Wan Yaacob, Deputy Director-General of Fisheries (Administration) Encik Mazlan Jusoh, Senior Fisheries Officer
3.	MAJUIKAN, Kuala Lumpur	Encik Sabri bin Ahmed, Fisheries Industry Director (Fisheries Development Authority, Malaysia)
4.	Advisory Committee, Bay of Bengal Programme, Penang	Members of the Advisory Committee representing the member countries; SIDA (Swedish International Development Authority) representatives Ms. E. Liljeberg, Dr. A. Lindquist and Mr. L. Hannerz.

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Appendix 3

EXAMPLE OF "SHOPPING LIST" APPROACH TO IDENTIFY POTENTIAL TCDC ACTIVITIES

A. *REQUIREMENTS*

Technical assistance is required for the following programmes/activities:

1. Training/study tour on:
   (a) breeding techniques of freshwater and brackishwater fishes and prawns
   (b) culture techniques of freshwater and brackishwater fishes and prawns
   (c) fish nutrition and disease studies
   (d) aquaculture hatchery design and operations.

2. **Expert** Services:
   (a) hatchery design expert —to prepare a detailed layout plan and design with technical specifications inclusive of the equipment needed for Pates and penaeid prawn hatcheries.
   (b) hatchery technicians — to assist and demonstrate the techniques of breeding Pates and penaeid prawns to local counterparts as well as to manage and operate the hatchery.
   (c) fishery biologist — to advise on the biological and hatchery requirements for the spawning and artificial propagation of saltwater finfish and shrimp species selected for culture, particularly Pates and penaeid prawns.
   (d) experts in the field of induced breeding and rearing of freshwater fish species.
   (e) master fish farmer—to serve as demonstrator for actual fish farming management in the farm ponds and in the field.
   (f) feeds and feed preparation expert—to formulate inert feeds for the cultivated species using a number of possible locally available ingredients.
   (g) expert on culture of food organisms — to initiate culture of appropriate food organisms for use in hatchery and train counterparts in this work.

PRIORITY & URGENCY: (to be inserted)

B. *COMPETENCE AVAILABLE*

The following technical assistance can be offered by Malaysia

(i) *Study tour on artificial reef programme*
To discuss and observe activities related to artificial reef in Fisheries Research Institute, Penang.

(ii) *Study tour on aquarium management*
To study aquarium management at Fisheries Research Institute, Penang.

(iii) *Study tour on seed collection and farming of cock/es (Anadara granosa)*
To study the methods of seed collection, transportation and culture of seed to the rearing ground.

(iv) *Study tour on pearl culture and other mollusc culture*
To study pearl culture operation and culture of mollusc being carried out in Sabah.

(v) *Study tour on mangrove ecology system*
To discuss and observe the studies carried out on the mangrove ecology system in Malaysia

(vi) *Study tour on commercial catch landing and marketing*
To observe the commercial catch landing and marketing presently carried out in Malaysia.

CONDITIONS: To be discussed in relation to each item.

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Appendix 4

INSTITUTES AND ORGANISATIONS THROUGH WHICH TCDC IS OR MAY BE IMPLEMENTED

(a) The Central Institute of Fisheries Education (CIFE), Bombay

The Institute was established at Bombay in July 1961 with the objective **of** training fisheries **officers** in service in various states in the country in a comprehensive course of fisheries education aimed at equipping them with the necessary technical know-how for implementing fisheries development projects. A limited number of private candidates, nominees from the industry and foreign countries are also admitted.

Facilities: The Institute offers a two-year post-graduate diploma course in fishery science. The syllabi cover fisheries biology (inland and marine), fish processing technology, fishing technology, fisheries administration and economics, fisheries statistics, marketing and co-operation. The intake capacity is 60 candidates per year. The Institute has been strengthened under UNDP/SF Project during 1964-69. The Institute is housed in its own buildings. There is also a hostel for students.

Activities: With the help of highly qualified and experienced national staff, a very high standard of training is maintained at the Institute. Theoretical instruction on different aspects of fishery science is followed by extensive laboratory practicals and field work. The Institute has well equipped laboratories, a library and a 15.25 metre long fishery training vessel which is equipped for effective instruction in marine fishing techniques, fishery biology and oceanography. Two field stations, one for brackishwater fish culture and the other for freshwater fish culture have been set up at Kakinada and Balabhadrapuram in Andhra Pradesh. At these centres, students receive field training in all aspects of fish culture work.

Achievements: After completion of the course, the Institute awards an Associate Diploma which is recognised as an alternative qualification to the M.Sc. degree in biological sciences of Indian universities for the purpose of recruitment to posts of fisheries officers and other higher posts.

The Institute has 211 *staff members.*

The Institute also conducts lower-level training courses in the following subordinate establishments.

(a) *Inland Fisheries Training Unit, Barrackpore:* The unit was started in 1947. At present, it offers a one-year certificate course in inland fisheries development and administration. Candidates sponsored by states, private candidates as well as nominees from foreign countries are admitted to the course. Intake capacity is 40 candidates per year. The entry qualification to the course is a B.Sc. degree with zoology as one of the subjects.

(b) *Regional Training Centre for Inland Fisheries Operatives, Agra:* The Centre was established in 1967 to impart organized training in inland fish culture practices. The Centre offers a 9-month certificate course to nominees of State Governments as well as private candidates. The syllabus includes general fish culture practices and specialised subjects on different aspects of inland fish culture. Entry qualification is Secondary School Leaving Certificate. Intake capacity is 80 candidates per batch.

(c) *Central Fisheries Extension Training Centre, Hyderabad:* The Centre was set up in 1973 for imparting specialized training in extension techniques and methods in fish culture practices at the post-graduate level, mainly for in-service personnel from different states in the country. The duration of the course is 10 months; intake capacity is 25 candidates for

each session. The syllabus includes fish culture, fisheries extension methods and techniques. Field work projects and seminars are also conducted.

Short-term Training Courses: In addition, the Institute can offer tailor-made courses of varying length to suit particular requests. At least three months' previous notice is required to prepare such courses. Examples of such courses conducted in aquaculture and other subjects in 1979/80 are as follows:

Sl. No.	Name of the Course	Duration	No. of participants
1.	Lab to Land Programme and Workshop on Ocean Management, Bombay	April, 5 - 6	75
2.	Management of Prawn Hatcheries, Bombay	April - September	4
3.	Management of Freshwater Fish Seed Farms, Balabhadrapuram	August 2 - 23	51
4.	Management of Brackishwater Fish & Prawn Culture, Kakinada (for Gramsri Project in Krishna district, A.P.)	September 12 - 28	25
5.	Management of Brackishwater Fish and Prawn Culture (for personnel from different States)	October 4 - 23	23
6.	Management of Brackishwater Fish and Prawn Culture (nominated by Collector, Srikakulam district, A.P. under Vomaravalli project)	November 6 - 26	31
7.	Management of Brackishwater Fish and Prawn Culture (nominated by Collector, Srikakulam district, A.P. under Vomaravalli project)	December 3 - **22**	30
8.	Fish Farming in collaboration with Krishi Vigyan Kendra, Kosbad Hill	December 26 - 30	55
9.	Management of Prawn Hatcheries under Gramsri Project	September 1979 - February 1980	3
10.	Utilisation of Low-priced Fish	November 1979	20
11.	Quality control in Fish Production	3 weeks	10

Workshops: The Institute also specialises in workshop approaches to national problems. These workshops are usually conducted in conjunction with co-sponsors. Recent examples are:

(a) Workshop on Ocean Management, April 5 & 6 1979; co-sponsor: The Indian National Science Academy, New Delhi.

(b) Workshop on Reservoir Fisheries for Rural Development April 8 & 9, 1980; co-sponsors: The Indian National Science Academy and the Indian Fisheries Association, Bombay.

Further information can be obtained from:

The Director
Central Institute for Fisheries Education
Versova
Bombay 400 061
INDIA

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(b) The Central Institute of Fisheries Nautical & Engineering Training (CIFNET)

The Institute:

The Central Institute of Fisheries Nautical and Engineering Training was established by the Government of India at Cochin in 1963 and its unit at Madras in 1968 for training deck and engineer officers required statutorily to be in charge of large ocean-going fishing vessels and the skilled personnel required for the allied industries connected with the development of marine fisheries in the country. The training imparted by the Institute leads to the following Certificates of Competency, issued by the concerned Ministries of the Government of India.

1. Skipper (Fishing Vessel)
2. Secondhand (Fishing)
3. Engineer (Fishing Vessel)
4. Engine Driver (Fishing Vessel)

} Ministry of Transport

5. Certificate of Proficiency in Radio Telephony (Maritime Mobile service)
   (1) General
   (2) Restricted
   (3) Inland Maritime

} Ministry Communications

Other courses offered are:

1. Fishing Boat Building Foreman
2. Fishing Gear Technicians
3. Shore Mechanics for Fishing Vessels.

Ad hoc training courses for teachers of the Fishermen Training Centres of the maritime states, courses for updating of engine drivers of fishing vessels and electronic technicians in handling acoustic fish finding equipment etc. are conducted periodically. The manpower training requirements of the fishing industry are constantly reviewed and *ad hoc* and crash training programmes to meet with urgent needs of the industry are also organised whenever necessary.

Facilities:

The Institute at Cochin is located in a 4.35 acre campus at Dewan's Road, Ernakulam. The Institute at Madras is located at Royapuram, off Surya Narayana Chetty Road in a 2½ acre campus.

In both centres, buildings have been improved and additional semi-permanent structures added to meet immediate needs. Plans for modern building complexes in both institutes have been finalised and construction will soon commence.

The training in the institute is job oriented and facilities for the following main disciplines have been created:

1. Navigation and Seamanship
2. Fishing Gear Technology
3. Fishing Technique
4. Fishing Biology
5. Marine Engineering
6. Workshop Technology
7. Electrical Technology
8. Boatbuilding Technology
9. Electronics
10. Oceanography and Marine Meteorology
11. Language and General Subjects.

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Training Vessels

The training fleet of the Institute consists of:

M.V. Blue Fin (28.3 M) — Multi-purpose training vessel M.V. Masterfisherman (17.5 — Stern trawlers M.V. Masterfisherman III (13.3 M) — Purse seiner	Based at Cochin
M.V. Red Snapper (28.3 M) — Multipurpose vessel M.V. Masterfisherman 11(17.5 M) — Stern trawler	Based at Madras

Under the Norwegian Aid Programme a 33.5 M multi-purpose training vessel is being made available to the institute. One 17.5 M wooden purse seiner will be added to the training fleet at Madras.

Organisation:

The technical functions of the Institute are divided among the following main divisions:

1. Navigation and Seamanship
2. Marine Engineering
3. Craft and Gear
4. Boatbuilding
5. Vessel maintenance and operation

Each division is headed by a Chief Instructor assisted by other technical officers for every discipline. All technical officers are specialists and most have received advanced training abroad. The Director at Cochin is the technical and administrative head of the organisation and is assisted by a Deputy Director at Madras.

Capacity of the Institute:

The intake capacity of the Institute is:

	Cochin	*Madras*
1. Fishing Secondhand Course	40	40
2. Engine Driver Course	40	40
3. Radio Telephone Operators Course	15	15
4. Gear Technicians Course	10	10
5. Shore Mechanics Course	10	10
6. Boatbuilding Foreman Course	15	

Post-institutional training facilities by way of deck and engine room positions in fishing vessels and apprenticeship positions in workshops have been created in collaboration with sister organisations of the Government of India such as the Integrated Fisheries Project, Cochin, and the Exploratory Fisheries Project, Bombay.

Other facilities:

The Institutes have their own students' hostel where residence is compulsory for the fishing secondhand and engine driver trainees. The library of the Institute contains a wide selection of scientific and technical literature, magazines and periodicals. Regular physical training, rowing and swimming form part of the disciplines of the Institute.

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Guidance services:

For the candidates appearing for the examinations of Certificates of Competency, the Institute provides special coaching and guidance. The Institute also functions as a clearing house for information about job opportunities and maintains a live register of certified personnel available for the industry. Consultancy services are rendered by the Institute in all technical fields related to fishing and allied disciplines. The Institute has brought out handbooks on various aspects of fisheries technology. The Institute has also been recognised as a Regional Training Institute for South East Asia by the FAO of the United Nations.

Address: The Director
Central Institute of Fisheries Nautical
and Engineering Training
Ministry of Agriculture and Irrigation
Indian Council of Agricultural Research
P. O. Box 1724, Dewan's Road,
Cochin 682 016
INDIA

(c) The Central Institute of Fisheries Technology (CIFT)

The Central Institute of Fisheries Technology, established in 1957 with its headquarters at Cochin, is under the Indian Council of Agricultural Research. Research centres of the institute function at Calicut (Kerala), Panaji (Goa), Bombay (Maharashtra), Veraval (Gujarat), Burla (Orissa), Kakinada (Andhra Pradesh) and Madras (Tamil Nadu).

The aims of CIFT are as follows:

1. *Research:*

(i) To develop improved fishing techniques, gear, craft and implements so as to achieve sustained yields in fish production from the sea and oceans around the country and the increasing inland water resources.

(ii) To develop improved and new technology for the optimum and economic utilisation of fish catch, which includes development of improved and new preservation methods suited to individual groups of fish and machinery and equipment for processing different types of fish products both for home and export markets.

(iii) To develop technology for economic utilisation of wastes from the fishery industry and also fish and shellfish which do not have a ready market for human consumption.

2. *Extension and Training:*

(i) To popularise the research results for the overall development of the fishery industry in the country.

(ii) To provide a forum for feedback to the Institute on technical problems faced by the fishermen, fisheries departments and the fishery industry as a whole.

(iii) To conduct short-term refresher training courses to technical personnel sponsored by the fisheries departments, fishermen cooperatives and the fishery industry in the improved technology evolved.

Organisational set-up

The Institute is organised into six divisions viz. (i) craft (ii) gear (iii) processing and packaging (iv) biochemistry, nutrition and microbiology (v) engineering and (vi) extension, information and statistics.

Main achievements so far:

The investigations conducted at the Institute have yielded useful results, contributing substantially to the modernisation and expansion of the fishery industry. The more important of such results are briefly mentioned below.

Tweleve standard designs of mechanised fishing boats in the size range of 8 to 15 metres prepared by the Institute form the basis of the mechanisation programme of the different Indian states. Over 7,000 such boats have been builtto these popular CIFT designs and are in operation.

Substitute wooden construction materials and cheaper fastenings recommended resulted in a saving of about 35% in the overall cost of construction of a fishing boat.

The quality specifications evolved for different fishing net materials have been adopted as the Indian standards.

Trawling as a successful method of commercial exploitation of prawn and fish resources was introduced at different centres along the coastline of India. Over 30 designs of trawl nets have been prepared for operation from different sizes of boats, in the small and medium groups.

Other gear designs developed and introduced in commercial operations include the designs of gillnets for seer, pomfret, lobster, etc. Further investigations on artificial baits and trolling lines have paved the way for introduction of trolling, a new technique of fishing for seer, barracuda, etc., especially from small mechanised boats.

Designs of trawl winches suitable for boats in the size range of 8 to 18 metres; and other mechanicalfishing accessories like gallows, gurdies and line haulers have paved the wayfor the indigenous manufacture of these fishing ancillaries.

A machine was developed for removing floating as well as submerged weeds from inland water areas such as bheels and tanks. The machine is under consideration for manufacture by a private firm. Several electric and electronic testing and measuring instruments have been developed for use in experimental and commercial fishing operations.

Another contribution is the development of cheap and effective packing containers for short and long distance transport of chilled/frozen fish by road and rail. Extensive field trials confirmed the feasibility of regular distribution of quality chilled/frozen fish to interior fish markets. This has also helped fishermen to fully utilise their catch to obtain better returns.

Freezing conditions have been standardised for different varieties of commercially important fish and shell fish; and many of the technical problems faced by the freezing industry have been effectively solved. The improved technology evolved and passed on to the industry for processing frozen froglegs free of pathogens has helped to revive the international trade in this commodity.

In the field of canning, methods were standardised for canning several species of prawns, sardines, mackerel, tuna, seer, lactarius, tilapia, mirror carp, carnatic carp, silver pomfret, clam, mussel, and smoked eel fillets. The defect of blackening alone was responsible for 50% of the total quantity of canned prawns rejected in one year. Techniques worked out by the institute have helped bring down the incidence of blackening to an insignificant level.

Designing of a tunnel drier of one tonne raw material capacity has marked the advent of commercial scale artificial drying of fish in India. More fish dehydration units of this design are now being established in different parts of the country. A solar drier was also designed, a prototype made and successfully used for dehydration of fish.

Effective utilisation of prawn shell waste, at present discarded in processing factories, has assumed significance. The preparation of chitosan is under pilot scale trials and appears to have valuable industrial application.

The production of low-cost fish powder can go a long way in solving the problem of protein malnutrition in the country.

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Processes have also been developed for preparing a variety of speciality products like fish flakes, fish soup powder, "instant protein food" etc. from low quality fishes constituting the by-catch of trawlers; and for such diversified products as shrimp extract, breaded fish sticks and fish paste.

Quality standards for different processed fishery products have been established, agreed to by the Indian Standards Institution (ISI), and subsequently issued as IS specifications. These standards form the basis for compulsory quality control inspection for commodities for which the inspection scheme has been introduced.

Main facilities available:

Investigational fishing vessels (in the size group from 9 to 15 metres)	9
Pilot plants	3

Main services rendered for the development of the industry:

1. Technical consultancy services including technical assistance and guidance for establishment of fishery industrial units.
2. Field demonstrations, open house discussions, etc. on improved and new technology.
3. Testing of materials, processing fish products, raw materials, etc. for quality evaluation and rendering suggestions for improvement.
4. Testing of marine engines and accessories.

Information:

The annual report of the Institute is the regular publication. Bulletins, booklets, leaflets and technical notes are occasional publications. Seven bulletins, four booklets, five printed leaflets and 80 technical notes have been issued so far.

Address: The Director
Central Institute of Fisheries Technology
Ministry of Agriculture and Irrigation
(Indian Council of Agricultural Research)
Cochin 682029
INDIA

(d) **The Central Marine Fisheries Research Institute**

Established	:	1947	
Location	:	Headquarters	— P.B. No.1912, Cochin 682018, India
		Regional Centre	— Mandapam Camp
		Research Centres	— Veraval, Bombay, Karwar, Mangalore, Calicut, Vizhinjam, Tuticorin, Madras, Waltair, Kakinada and Minicoy
		Field Centres	— 29
Director	:	Dr. E. G. Silas	
Staff Strength	:	940 (Scientific and Technical 539)	

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Objectives:

To conduct short-term and long-term multidisciplinary research on the marine capture and culture fisheries of the country in order to provide RESEARCH support for rational exploitation, conservation and management of the marine and brackishwater resources, and DEVELOPMENT support for growth with stability of the industrial, artisanal and culture fisheries through transfer of technology, dissemination of information and education, training and extension.

Organisation and major research areas:

- Fishery Resources Assessment Division
  Estimation of marine fish production and fishing effort, stock assessment, quinquennial fishery inventory surveys, fishery data centre, data dissemination.

- Pelagic Fisheries Division
  Resource characteristics of pelagic resources, fisheries forecasting, mark-recovery studies, fishery atlases, resources of Exclusive Economic Zone.

- Demersal Fisheries Division
  Resource characteristics of demersal resources, exploratory surveys, fisheries forecasting, finfish culture, fish genetics.

- Crustacean Fisheries Division
  Monitoring of exploited prawn, spiny lobster and crab resources, deep-sea lobster and prawns, recruitment, fisheries forecasting, crustacean culture, hatchery production of seed.

- Molluscan Fisheries Division
  Survey and assessment of moltuscan fishery resources, cephalopod resources of Exclusive Economic Zone, fisheries forecasting, culture of molluscs, pearl culture, hatchery production of seed.

- Fishery Environment Management Division
  Fishery oceanography, oceanographic atlases, upwelling, productivity, energy transfer, pollution, farm engineering and instrumentation, fishery regulations and management.

- Physiology, Nutrition and Pathology Division
  Reproductive physiology, endocrinology, fish nutrition, feed development, fish diseases and control.

- Extension and Fishery Economics Division
  Extension programmes, economic studies on artisanal, industrial and culture fisheries.

- Library and Documentation Division

- Trainers' Training Centre and Krishi Vigyan Kendra (Farm Science Centre)
  Transfer of technology, training of technical personnel and fish farmers.

- Operational Research Project
  Rural fisheries development through integrated programmes inputs.

- Lab-to-Land Programme
  Transfer of appropriate technologies in coastal aquaculture.
- UNDP/FAO Centre of Advanced Studies in Mariculture

  Post-graduate and doctoral courses in coastal aquaculture.

- Research Vessels

- Administration

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Publications:

Indian Journal of Fisheries (Vol.1,1954—Vol. 23,1976: continuing)
Bulletin (No. 1, 1968—No. 28, 1979)
Special Publication (No. 1, 1977—No. 6, 1979)
Marine Fisheries Information Service (No. 1, September 1978— No. 10, August 1979)
Newsletter (No. 1, September 1975— No. 10, December 1979).

(e) The Integrated Fisheries Project (IFP)

Facilities and Activities:

The Integrated Fisheries Project at Cochin consists of a modern fisheries complex with various sections dealing with fishing gear, processing, marketing, ship repairs, scientific data processing and training.

The project conducts experimental fishing operations with a fleet of twelve vessels ranging in size from 9.8 to 28 metres. The operational efficiency of the different types of boa ts and gear and different vessel-gear combinations, and the diversification of fishing operations to study the economic and commercial feasibility of such operations, form part of the objectives of the project.

The gear section carries out all types of repairs and maintenance of nets of the different vessels. Design and fabrication of different types of nets enables the project to carry out experimental and diversified fishing. Servicing of self-inflatable rafts is also carried out.

The ice plant complex, commissioned in 1965, has a production capacity of 25 tonnes of ice per day in three shifts and an ice storage capacity of 25 tonnes. The capacity of the tunnel freezer is 8-10 tonnes. The capacity of the contact freezer is four tonnes. Frozen storage capacity of 25 tonnes is also provided besides a chilled room of 25 tonnes capacity.

The project has set up a modern processing section with machinery for production of diversified fish products. The equipment includes a mincing machine, skinning machine, filleting machine, slicing machine, smoking unit, an artificial drying unit and a modern and sophisticated canning line where aluminium cans are used instead of conventional tin cans. The range of machinery and equipment serves as a model for adaptation by the industry to develop diversified marine products.

Marketing is done through modern fish stalls at Ernakulam, Alwaye and Palai to popularise the diversified products and to study the customer reactions and marketability trends of these new products. The project has introduced several diversified fish products and various types of packing through fish stalls. The stalls are run on a no-profit-no-loss basis as the entire processing and marketing activities serve as promotional work for the easier adaptation of these products by the industry.

The project's workshop and slipway provide servicing facilities for all the vessels of the project and other sister organisations and private entrepreneurs around Cochin. The workshop is provided with modern equipment, machinery and tools to take in repair of wooden and steel fishing vessels. The slipway has six berths and can berth vessels up to 250 tonnes displacement.

Sophisticated electronic equipment on board the vessels are repaired and maintained by a modern electronic workshop equipped with oscilloscope, oscillators, automatic coil winding machine etc.

Biological and statistical data are collected by the scientific and statistical sections which make data available on the economics of operations, fish resources at different grounds, efficiency of different fishing gear, suitability of different equipment for processing, fishing, etc., which also provide consultancy services for the fishing industry.

The project conducts training courses for refrigeration technicians and master fishermen for purse-seining for ten months each, for processing technicians for six months and for fishing secondhands and engine drivers to acquire necessary qualifying sea-service.

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Achievements:

(a) Rich fishing grounds and new potential resources like deep-sea lobsters, prawns, kalava, velameen, pink perch, crabs, squids, etc. have been located as a result of extensive exploratory and experimental fishing operations carried out along the continental shelf and continental slope up to 250 fathoms on the southwest and southeast coasts.

(b) Different types of fishing gear like trawls, purse seines, handlines and traps for different types of vessels have been developed.

(c) Diversified fishing techniques like single-boat and two-boat midwater trawling, purse-seining, handlining, longlining, light-attracted purse-seining and trap fishing have been introduced.

(d) Practical workshops to help fishermen to take up new types of fishing methods, and a seminar on fish canning have been conducted.

(e) Training of deck and engine apprentices for fishing vessels, service mechanics, master fishermen in purse-seining, fishing boat designers, refrigeration technicians, processing technicians, etc. have been carried out.

(f) A variety of marine products have been successfully developed. Examples: fish fillets, slices, keema squid rolls, fish balls, fritters, and different types of dried and canned products like sardine, mackerel, tuna in different packing media (vegetable oil, tomato sauce and curry) and fish spreads of anchovies and sardine which are excellent for making sandwiches.

Future Plans:

(a) intensify purse-seining for tuna, mackerel, oil sardine and anchovies

(b) develop exploitation methods for squid resources

(c) conduct deep water and slope trawling

(d) conduct market surveys for diversified products in major cities of India, develop rural markets for diversified products

(e) operate full fledged canning line for utilisation of pelagic resources

(f) introduce IQF products

(g) expand workshop facilities

(h) expand frozen products storage to 120 tonnes and

(i) outline and implement plan programmes as approved from time to time for the development of Indian fishing industry.

Address: The Director
Integrated Fisheries Project
Ministry of Agriculture and Irrigation
(Department of Agriculture)
P.B. No.1801, Cochin 682016
INDIA

(f) The Marine **Products Export Development Authority**

This is a statutory body set up by the Government of India in 1972 with the main object of developing the marine products industry and promoting exports of Indian marine products. The headquarters of the Authority is at Cochin. There are regional offices at Cochin, Madras, Bombay, Calcutta and New Delhi. The first overseas office has been opened at Tokyo.

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Export Development:

The Authority provides consultancy services to entrepreneurs in all aspects of the seafood industry. The regional offices render assistance to exporters at various centres of production and export.

The Authority provides exclusive marketing support to the trade. It establishes contact with seafood importers, conducts external publicity of Indian seafoods, arranges buyer-seller meetings, sponsors trade delegations abroad, invites overseas delegations for export promotion visits to India and assists exporters in undertaking trade promotion tours overseas. The Authority is also setting up cold storages at principal ports of export.

Research Training and Quality Control:

Research programmes of special significance to exports have been sponsored by the Authority so as to (a) ensure the quality of marine products in relation to toxic elements including mercury; (b) to improve the quality and packaging of export products; and (c) diversify the range of export products. Training programmes are also organised, at different centres, to impart improved processing techniques for traditional products, and for the processing of new products, under foreign technical experts wherever necessary.

The Authority also has an ambitious programme of hygiene education among people at all levels of the industry—fishermen, ice plant operators, workers in "peeling" sheds and pre-processing centres, and those engaged in the transport and handling of seafood products from catch to freezing and storage. The programme not only educates all concerned on the need for hygienic practices, but also aims at popularising the use of ice and insulated containers for the transport of marine products.

Sales Promotion:

The Authority periodically but regularly sends out sales team delegations and study teams abroad to investigate, assess and develop foreign markets.

One of the most important promotional measures undertaken by MPEDA aimed at product and market diversification is the organisation of seafood trade fairs in India. Large numbers of seafood importers from foreign countries are invited to these fairs to see the range of products available and to negotiate deals. The first fair was held in Bombay in 1973, the second in Madras in 1976, the third in Bombay in 1979, the fourth in Madras in 1981.

Another important export publicity activity is participation in international food fairs abroad — such as those in Tokyo, Cologne, Brussels, Munich and Paris.

Registration of Exporters:

All exporters of marine products are required to register with the Authority as a statutory pre-requisite for exporting marine products from India.

Address: The Chairman
Marine Products Export Development Authority
Collis Estate, P.B. 1708
M G Road
Cochin 682016
INDIA

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(g) Southeast Asian Fisheries Development Centre

(SEAFDEC) Training Department

1. *General background information:*

The Southeast Asian Fisheries Development Centre (SEAFDEC) is an autonomous regional technical organisation established in 1968 under the aegis of the Ministerial Conference for the Economic Development of Southeast Asia. Countries adhering to the agreement establishing the Centre at present are Japan, Malaysia, Philippines, Singapore, Thailand and the Socialist Republic of Vietnam.

Membership of the Centre is still open to other Southeast Asian nations; namely Burma, Indonesia, Laos and Kampuchea.

The purpose of the Centre is to promote fisheries development in Southeast Asia by mutual cooperation among the member governments of the Centre, through collaboration with international organizations and governments which are interested in Southeast Asian fisheries development.

To further this purpose the Centre has the following functions:

(i) To train fisheries technicians of the southeast Asian countries.

(ii) To study such fisheries techniques as are suited to the fisheries of southeast Asia.

(iii) To develop fishing grounds, investigate fisheries resources and conduct research in fisheries oceanography of southeast Asia.

(iv) To collect and analyse information related to the fisheries of Southeast Asia.

(v) To provide the members with the results of studies and research by the Centre.

(vi) To handle other matters related to the functions referred to in (i) to (v).

The policy-making body of the Centre is the Council of Directors, whose members are the directors of fisheries or senior fisheries administrators appointed to the Council by their respective member governments. The executive arm of the Centre is the secretariat located at present in Samutprakarn, Thailand.

The Centre has received financial support from the governments of host countries, which are the Philippines, the Republic of Singapore and Thailand, and from other member governments and from the governments of Japan, the United States of America, Australia and New Zealand.

The Centre currently operates three departments—the training department (TO) located in Samutprakarn, Thailand; the marine fisheries research department (MFRD) in Changi, Singapore; and the Aquaculture Department (AOD) in Iloilo, Philippines. These departments are headed by chiefs nominated by the host countries for the departments concerned. There are also deputy chiefs appointed by the Council for a two-year term.

The department offers two courses for trainees nominated from member countries namely, fishing gear technology and marine engineering.

Emphasis has been placed on practical shipboard training aboard the Training Department's training vessel, *M V "Paknam",* a 380 G.T. steel stern trawler and on some commercial fishing vessels operating in Thai waters. It is the policy of the Centre that the period of sea training should, if possible, be not less than 180 days for a regular two-year programme.

Emphasis for fishing gear technology training has been directed towards deep sea fishing operations including the utilisation of otter-board trawl nets for capturing demersal fish and tuna longlines for large-sized tunas and deep-swimming oceanic species. For the marine engineering course, emphasis has been directed towards the operation of marine engines of medium and large-sized fishing vessels. However, with the anticipated changes in the sea regimes arising from the United Nations Law of the Sea Conference and the limitation of the demersal fishery

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resources in the region, the Training Department is making adjustments in its policies and programme of activities to serve the immediate and long-term needs of member countries.

While deep-sea fishing activities will continue to be in the department's programme, increasing emphasis will be placed on coastal and inshore fisheries training with a view to making the best use of these resources. Future training programmes will expose trainees to the socio-economic problems of small-scale fishermen, the operation and maintenance of small-sized engines for coastal fishing boats, fishing for coastal pelagic fish, fish handling and processing, fisheries cooperatives, and general fisheries and resource management concepts. The department will also launch a research study on the development of fishing gear for coastal and small-scale fisheries.

Since the establishment of the training department, five batches of trainees from member-countries, totalling 81 persons, have successfully completed the training programme. In the 1976/77 training programme, there have been 22 trainees, including two from non-member countries: Indonesia and Sri Lanka.

Also since 1977 the Training Department has offered two special short-term courses (four weeks) for Thai fishermen from various fishermen's groups and from the Fishermen's Association of Thailand. A total of 56 fishermen have successfully completed this training programme. The objective of this type of training is to familiarize fishermen with the fundamentals of modern navigation techniques including map reading, etc. and to brief them on the current international and national maritime laws and regulations. This programme was found to be successful, and the Training Department plans to hold regular short-term courses on a continuing basis. Subjects for training will be expanded to include maintenance of small engines, fish handling at sea, etc.

Address: Chief of the Training Department,
SEAFDEC,
P.O. Box No. 4,
Phrapradaeng, Samutprakarn,
THAILAND.

Fishing Course Curriculum, SEAFDEC

F - 1 *Fisheries in General*
General introduction, history of fisheries, general characteristics of fish, fishing gears and methods, fishing grounds and seasons, fisheries resources and conservation.

F - 2 *Fishing boats*
Characteristics of fishing boats, description of each type of fishing boat.

F - 3 *Navigation and Seamanship*
General navigation, piloting, geo-navigation, celo-navigation, radio navigation, nautical instruments, general seamanship, upkeep, manoeuvering ship, applied mathematics on navigation and seamanship.

F - 4 *Fishing Gear and Methods*
Fishing gear materials, fishing gear design and construction, fishing efficiency, trawlnet fisheries, tuna longline fisheries, bottom longline fisheries, purse-seine fisheries, gillnet fisheries, fishing mechanisation, fish gathering, fish detecting and luring, fish handling, post-harvest management and fisheries statistics.

F - 5 *Oceanography and Meteorology*
Oceanography, meteorology, oceanographical survey.

F - 6 *Fishery Biology*
General knowledge, classification, fishery resources.

F - 7 *Basic Science /*
Physics, chemistry, mathematics, statistics.

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F - 8 *Basic Marine Engineering*
Machine design and workmanship, marine engines, refrigeration facilities.

F - 9 *Marine Electronics and Telecommunication*
Marine electricity, radio navigation instruments, outline of telecommunication in fisheries.

Marine Engineering Course Curriculum, SEAFDEC

E - 1 *Basic Science II*
Physics, chemistry, mathematics.

E - 2 *General Engineering*
Mechanics, statistics, dynamics, strength of materials engineering drawing.

E - 3 *Seamanship for Engineers*
General ship description, ship's stability, international conventions.

E - *4 Marine Engineering*
Main engine, auxiliary machinery, propulsion system, piping systems, remote control system, operation maintenance, repair and testing, steam boiler, prevention of corrosion, watch duty, damage control, docking, safety precautions.

E - 5 *Internal Combustion Engine*
Classification and general structure, thermodynamics, characteristics, fuel and fuel combustion, lubrication, indicator diagram and valve setting diagram, components and system in detail, examples of engines for fishing boats.

E - *6 Marine Electricity*
Electricity, basic electricity, measurement of electricity, structure and theory of electrical machines and appliances, transmission and distribution, operation, electronics, basic electronics.

E - 7 *Refrigeration*
Refrigeration in general, refrigerant and brine, principles of refrigerating machine (vapour compression type), structure of refrigerating machines.

E - 8 *Workshop Technology*
Materials, casting; plastic working, heat treatment, cutting, welding, manual fabrication, machine fabrication, measuring.

(h) The Asian Institute of Aquaculture

Established as a unit of the SEAFDEC Aquaculture Department on May 23, 1978, the Asian Institute of Aquaculture, Iloilo, Philippines, envisions a mechanism to train manpower and facilitate the transfer of aquaculture technology. It has four main functions:

- provide opportunities for regional and international scientists and technologists to conduct development oriented research in aquaculture, and avail themselves of the facilities and resources of the SEAFDEC Aquaculture department and other institutions;
- train scientific and technical manpower in applied aquaculture research and development in Southeast Asia and other developing regions of the world;
- promote regional and international cooperation among scientists, technologists and fish farmers, as well as institutions engaged in aquaculture development; and
- provide opportunities for verifying and packaging aquaculture technology and disseminating this to interested countries and institutions.

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The AIA has taken over the training and extension functions of the former training and extension division of the aquaculture department. The AIA runs both international and local training programmes.

International Training Programme, AIA:

The objective of the AIA's international training programme is two-fold: to alleviate the shortage of technical manpower for the aquaculture industry in Southeast Asia, from the researcher to the technician; and to hasten the transfer of technology at SEAFDEC laboratories to end-users to improve fish production, generate employment, and increase rural income. The specific objectives are:

- To actively participate in formal graduate programmes (leading to the M.S. and Ph.D. degrees) in cooperation with other colleges, universities and institutions in the region, particularly on reproductive physiology and fish nutrition, farming systems and socio-economics.
- To conduct short-term non-degree training programmes on various aspects of aquaculture technology.
- To award scholarships and administer research grants as well as faculty exchange programmes.

The non-formal training programmes deal with various aspects of aquaculture technology and are normally offered for a period of one to five months.

1. *Aquaculture Research Methodology:* This four-month live-in training programme will accept participants from developing countries, particularly Southeast Asia. Grants will be awarded to participants from Malaysia, Singapore, Thailand, and the Philippines, as well as to other Southeast Asian and South Asian countries like Bangladesh, India, Pakistan, Burma, Vietnam, Sri Lanka and Nepal. Additional grants will be awarded to developing countries in the Pacific, Africa and South America.

The course is designed for aquaculturists who have little or no training or experience in research. Topics on research methodology include literature review, research design and strategy, proposal preparation, experimental design, data sources, methods of data collection, methods, tion and analysis, and report writing. The participant will submit a research paper on a specific problem as part of his practicum. Topics on aquaculture technology include an overview of the different aspects of aquaculture like seed production, production farming, post-harvest technology and marketing.

2. *Aquaculture Management:* Also a four-month live-in course but for farm managers, pond owners and operators, technicians and extension workers. The programme will accommodate participants from developing countries, especially those in the Asian region. Trainees from Africa, Latin America as well as other global regions are also accommodated.

The programme includes fundamentals of broodstock development, hatchery operations, pond! pen/cage construction, nursery/grow out pond management, stocking, feeds and feeding, pest/disease control, water management, farm recording, harvest and post-harvest operations, and marketing.

3. *Aquaculture Engineering:* The four-week live-in seminar is designed for engineers interested in aquaculture oraquaculturists with some background, experience and interest in the engineering aspects of aquaculture.

The programme involves fundamentals of the biology of cultured animals, the relationship of engineering to aquaculture, hydrological and climatological studies, tides, site selection, planning, designing, and infrastructure development, layout schemes, programming and costing. Practicum activities are on site selection, topographical surveys, earth work computations, etc.

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4. *Small-scale Prawn Hatchery Management:* This four-week live-in workshop is designed for aquaculturists, farm managers, pond owners/operators and others interested in managing prawn hatcheries.

The programme includes topics on fundamentals of different types of prawn hatchery systems, broodstock development, ecology and larval rearing studies, natural and supplementary feeding, feeds development, pests and diseases, water quality control and hatchery operations. Each participant will undergo at least one actual run in the hatchery.

The *formal or graduate degree programme* of the SEAFDEC Aquaculture Department leads to the master's and doctoral degrees in aquaculture and is open to international participants. The programme is of two types:

1. *Local (UPS-SEAFDEC) Graduate Programme:* To provide opportunities for graduate training in aquaculture, the SEAFDEC Aquaculture Department and the University of the Philippines System (UPS) jointly sponsor a two-year M.S. programme in fisheries, major in aquaculture. Classes are conducted at the UPS Brackishwater Aquaculture Centre in Leganes, Iloilo and at the department's main station in Tigbauan, also in Iloilo. Graduate students come from various government institutions in the Philippines. The programmes is open to students from other developing countries.

2. *Consortium Graduate Study – Research Training:* The department is now expanding its graduate programme to develop more aquaculture researchers in the region by involving a consortium of international universities in Southeast Asia, Japan and North America. Under the arrangement, graduate students on scholarship grants take courses in these consortium universities abroad and conduct their master's theses or doctoral dissertations at the aquaculture department. The degree will be awarded by the consortium university where the student takes his academic course work.

Initial emphasis for the graduate study-research training will be on

(a) Nutrition and Reproduction Physiology

(b) Farming Systems

(c) Aquabusiness.

A thorough understanding of the reproductive physiology and nutrition of cultivated species is needed for the development of appropriate techQologies to increase seed production.

Farming systems studies will help in the proper application of technologies for optimum production. Programmes will give emphasis to stock manipulation, polyculture, nutrient enrichment, feed development, environmental management, parasite and diseases control, fry handling and transporting.

Aquabusiness and socio-economics help determine the appropriate application of technology in various farming situations and environmental settings. Attention will be on risk analysis, cooperatives, post-harvest studies, alternative systems of resource management and ecological aspects of fish farming.

Implementation of this programme may be done through consortium arrangements with appropriate academic and research institutions in the region such that:

- students enrolled in consortium institutions may carry out their theses/dissertations through the AIA mechanism;
- students from consortium institutions may elect to follow courses or carry out their theses! dissertations or do both in another consortium university or institution;
- researchers may undertake research in a consortium university or institution or at the AIA; and
- contract research may be granted to an individual or a group or even an institution, on a priority project identified by AIA.

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Local Training Programme, A/A

1. *Prawn Culture:* This is a 1- to 2-week live-in seminar intended for pond/pen/cage owners or operators, technicians, extension workers, teachers of fisheries schools and bank loan appraisers.

The course includes seed production and hatchery operations, pond/pen/cage culture, pond management, integrated fish farming, harvesting, post-harvest operations and marketing. Field trips and study tours will supplement training.

2. *Small-scale Prawn Hatchery Operation:* This is designed for farm owners/operators, fish farm villagers, and investors who desire to operate a prawn hatchery. The course is similar to the one offered to participants from overseas.

3. *Fish Pond Engineering.* This is similar to the one offered to participants from overseas.

4. *Mussel and Oyster Farming:* This is a one-week workshop intended for subsistence fishermen, small fish farmers or other persons interested in mussel and oyster culture.

The course includes the following species and distribution, site selection, substrata, different culture methods, spat collection, fouling organisms, Imanagement routine, harvest and post-harvest handling.

5. *Special Skills Training:* Practical training will also be offered to qualified aquaculturists, which may be conducted from two to four weeks in the following areas: research management, pond construction, feed development, nursery pond system, fish parasites and diseases, fish pen construction and management, fin fish breeding, post harvest operations, and land-based maturation of spawners.

Venues for AIA Training Programmes

The main work of the training programme is undertaken at the principal facilities of the Aquaculture Department in Tigbauan and Leganes, Iloilo, Philippines. The sites are about an hour's jet flight from Manila. However, practicum and field work would be conducted in any of the Department's various stations.

- The main station at Tigbauan is 26 kilometres west of Iloilo City. Facilities include hatcheries; nursery pond; laboratories; library and training hall; dormitory and apartments for trainees and researchers; cafetaria; staff cottages and guest houses; and administration building.

- The SEAFDEC Aquaculture Department operates a field laboratory and a 96 hectare pond system in Leganes, 17 kilometres northeast of Iloilo City. The ponds are used to demonstrate the economic viability of producing hatchery-bred prawns and otheraquaticspecieson a mass scale. The facilities in the station are the chemical and biological laboratory; library; seminar and audio-visual rooms; dormitory for trainees; staff cottages; and administrative offices.

- The milkfish research station in Panda, Antique, is a four-hour drive from the Tigbauan main station. Facilities in the station are a biology-chemistry laboratory; wet laboratory; library and conference room; dehumidified equipment room; and large canvas tanks to hold adult milkfish in captivity. The station also operates a seawater pond system for stocking milkfish spawners caught in trap-in nets or otoshiami.

- At Igang, Guimaras Island, about half an hour's boat ride from Tigbauan, the Department runsa seafarming station. It serves as broodstock farm for prawn and milkfish. Cages and pens in coves have been installed and are used for maturation experiments on prawn and milkfish.

- *Freshwater Station at Binangonan, Rizal:* The station is situated on a 45-hectare site at Tapao Point, Binangonan, Rizal along the shores of Lake Laguna de Bay. Freshwater fisheries and lake ecology researches are undertaken here. Initial facilities include the

limnological laboratory; fishpens and cages; hatchery; and administrative offices.

- An outreach seafarming station in Zamboanga for pilot seafarming projects was established to demonstrate the feasibility of seafarming technology in coves and lagoons.

Other Stations: The department maintains stations at Hamtik, Antique for milkfish fry studies; Batan, Akian for prawn and milkfish maturation; Himalayan, Negros Occidental for prawn spawner collection, and for mussel and oyster farms.

Qualifications of Prospective Participants: Prospective participants satisfying the following requirements are preferred:

- Holders of at least the bachelor's degree or equivalent degrees in fisheries; biology; zoology; botany; chemistry and agriculture.
- Nomination from their respective Government or from the SEAFDEC Council Director of the home government.
- Previous employment of at least two years in teaching; research and development, and extension work in inland fisheries or related areas.

  Proficiency in spoken and written English.

  Of good health and moral character.
- Not more than 35 years old.

For inquiries, communicate with:

The Director
Asian Institute of Aquaculture
P.O. Box 256, Iloilo City 5901
PHILIPPINES

(i) National **Inland Fisheries Institute, Thailand (NIFI)**

Objectives:

The central objective of the institute is to identify the principles and methods that will maximise inland fish production. The pursuant approaches entail:

(i) the development of sound fish husbandry techniques along modern lines for application in culture fisheries (attendant studies include fish diseases, the formulation of artificial feeds, pond management, stock genetics, and controlled breeding, among others);

(ii) investigations on the monitoring of, and methods for optimising yields from, capture fisheries (as supported by disciplinary studies on ecology, environmental quality, fish population, dynamics, management, gear development, etc.);

(iii) adding to the knowledge of the biology of freshwater fishes with an emphasis on food fishes;

(iv) extension of the generated information to the Department of Fisheries to help develop and manage inland fisheries, and to fisheries groups (public and private) both in Thailand; and extension in regional countries through press releases, workshops and training programmes.

NIFI also provides specialised services to the government and the public in support of fisheries concerns. Examples are fish disease diagnosis along with recommendations for treatment, water quality assays, programme planning and coordination and fisheries studies in multiple land use programmes.

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A strong and deliberate emphasis has been placed on applied biology. Further, while some NIFI activities are of a continuing nature with extensive application, others are oriented to immediate needs, especially in rural areas where fish production can be increased through pisciculture.

As part of the mechanism for developing internal capabilities, NIFI arranges for some of its staff to train and study at outside institutions and for the continuing inputs of foreign experts at the Institute. The latter are brought in to demonstrate a particular expertise and to work with NIFI staff in designing programmes related to that expertise.

Organisation and Staff: NIFI operates within the administrative jurisdiction of the division of Ireshwater fisheries reporting to the Director-General of Fisheries. The programme policies of NIFI are determined by the Director-General. the Director of Freshwater Fisheries, and the Director of the Institute. The latter is responsible for the management of NIFI. He is assisted by two senior scientists; one advises on hydrobiological matters, the other on aquaculture-related matters.

The core of NIFI is the scientific component made up of 10 disciplines. The aquarium is an ancillary component that serves the cause of both research and public educational display. Each unit, as well as the aquarium, has a supervisory head and some staff; they work within an annual budget to complete programmes determined by the unit head and the Director of NIFI along with his advisors. General support for these components is provided through pooled services and facilities such as the library, laboratories and offices, and technical, attendant and maintenance staff.

Field station services — such as the production and distribution of seed fish, and the management of regional public waters and extension —are provided by NIFI in general.

The staff strength of NIFI at the outset in 1975 was 147 while the present number is 181. Further increases of about five staff per annum are expected over the next few years.

Training Extended by NIFI:

All training programmesconducted by NIFI inthefirstthreeyearsof operation were *ad hoc.* They were either requested by other agencies of the Government of Thailand or emerged as the resultof the circumstantial availability of experts. Nonetheless the conduct of these programmes, 23 in all, demonstrated the institute's ability to provide training and also established precedence for structuring regularly scheduled programmes. At least one training programme for regional fisheries workers, dealing primarily with aquaculture methods — will now be provided regularly (annually). Additional *ad hoc* programmes are anticipated and will be conducted as requested and as circumstances allow.

The training sessions conducted to date are:

1976

(i) Two workshops on the storage of fish sperm and eggs were held during July and August, 1976 under the tutorage of Mr. F. C. Withler, fish endocrinologist from Canada (see 2.8.2). Methods for holding sperm and eggs under refrigeration or by freezing were discussed and demonstrated. Fourteen fisheries workers attended the first workshop, July 19 to 23; 12 were from Thailand and two from Bangladesh. Eighteen workers attended the second session, August 9 to 11; 2 were from the Philippines and the others from Thailand.

(ii) Two fisheries workers from Bangladesh worked at NIFI during the period July 14 to September, 1976. They were introduced to fish culture methods employed at the Institute and participated with NIFI staff in field programmes. The participants were supported by a Thai Aid Programme administered by DTEC (Department of Technical and Economic Cooperation).

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1977

(i) A workshop on fish genetics was conducted for staff of regional fisheries stations on May 9 and 10, 1977, under the direction of Dr. G. B. Ayles (see 2.8.4). Discussions focused on methods for selective breeding and analytical procedures for genetic experiments. Theoretical breeding models were designed as a practical exercise. Fourteen Thai fisheries workers attended.

(ii) A six-week "Freshwater Fish Culture Training Programme" for regional fisheries workers was conducted July 11 to August 13, 1977. There were 12 participants from 9 countries: Bangladesh, Indonesia, Iran, Malaysia, Nepal, Philippines, Singapore, Sri Lanka and Thailand. The programme supported by Thai Aid under the Colombo Plan, was managed jointly by NIFI and DTEC; it included lectures, field trips and practical demonstrations. The teaching staff was chiefly from NIFI but also included personnel from the Faculty of Fisheries, SEAFDEC and various offices of the Department of Fisheries. The central theme was aquaculture methods that apply to fishes cultivated in Thailand, with emphasis on controlled breeding, feed supplies, nursery techniques and disease management.

1978

(i) *Military personnel:* Two three-week workshops on fish culture principles and methods were conducted for instructors from the military forces; one was held in June and the other during August, 1978, with 25 participants at each session. The purpose was to introduce fish culture as an opportunity for livelihood. The military instructors, all holding the rank of sergeant, were provided the training so that they could in turn tell military personnel who would be leaving the service and returning to civilian life about the opportunity. The course consisted of lectures, field trips and practical demonstrations such as induced spawning methods.

(ii) *Prospective fish farmers:* Two-day workshops on fish culture methods were conducted at eight regional fisheries stations in the period June to September, 1978. This training was presented as a supplement to the "public fish stocking program" (2.11 .6) which was an endeavour to encourage the people of Thailand to adopt fish farming as an enterprise. The Department of Fisheries made 60 million fingerlings available for public waters. The public was invited to manage and harvest the fish; appropriate instruction was given at the training sessions by staff from NIFI and the fisheries stations. The total participation was 440.

(iii) *National Scout Training:* Five workshops on aquaculture principles and methods were conducted for teacher groups of village scouts and boy scouts from June to September, 1978. The training was held at regional fisheries stations by NIFI and station personnel. The participants, numbering 165 in all, were introduced to basic aquaculture methods through discussion and demonstration; they, in turn, would extend the information to trainee groups of their respective organisations. This initiative was part of the national programme to encourage the practice of aquaculture by using scouting groups as para-extension agencies.

(iv) Two fisheries workers from Bangladesh received training in aquaculture at NIFI from June 28 to August 26 under a Thai Aid Programme through DTEC with UNICEF support. The participants worked with NIFI staff on a variety of related projects and observed procedures at a number of private operations.

(v) NIFI conducted a seminar August 7 to 11, 1978 for 30 junior staff biologists of the Department of Fisheries. Current fisheries methods employed by NIFI were reviewed and an explanation was given of how NIFI programmes relate to inland fisheries development.

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Training by Visiting Experts

Methods for Assessing Fisheries: Dr. Roger Green from the Department of Zoology, University of Manitoba, Canada, worked with NIFI staff in Thailand during October and November 1974. He provided instruction on the experimental design and statistical analysis of methods for assessing capture fisheries, partcularly in large reservoirs. Using the Bung Boraped and Ubol Ratana reservoirs as working examples, procedures were developed for sampling the fisheries and for analysing data. Biological and limnological parameters, as well as those relating to socio economic aspects of fish harvest and use, were included. The resulting designs formed the basis for subsequent studies on large inland fisheries.

Storage of Fish Sperm and Eggs: Mr. F. C. Withler, fish endocrinologist from the Pacific Biological Station, Nanaimo, Canada, conducted studies, lectures and demonstrations on the storage of fish sperm and eggs during July and August, 1976. Mr. Withler has developed some effective techniques for both short-and long-term storage of eggs and sperm of Pacific salmon. The principles and methods were conveyed and tested on Thai fishes.

Two training sessions were held at NIFI with biologists from the Institute, the regional fisheries stations, the Philippines and Bangladesh in attendance. Apart from lectures and discussions, there were demonstrations of methods for storage using both refrigeration and freezing (liquid nitrogen). The trainees participated in the practical exercises.

Further information may be obtained from:

The Director
National Inland Fisheries Institute
Kasetsart University Campus
Bangkhen, Bangkok 9
THAILAND

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Appendix 5

LIST OF MAJOR DOCUMENTS CONSULTED

1. Project for the Development of Small-Scale Fisheries in the Bay of Bengal — Preparatory Phase (IOFC/DEV/78/44.1 Report and/44.2 Working Papers.)
2. Report of the Third Meeting of The Advisory Committee (BOBP/REP/3).
3. Report of the Fourth Meeting of The Advisory Committee (BOBP/REP/4).
4. Report of the Workshop on Social Feasibility in Small-Scale Fisheries Development (BOBP/REP/5).
5. Report of the Workshop on Extension Service Requirements in Small-Scale Fisheries (BOBP/REP/6).
6. Prefeasibility Study of a Floating Fish Receiving and Distribution Unit for Dubla Char, Bangladesh (BOBP/REP/8).
7. Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal (BOBP/REP/10.1).
8. Improvement of Large Mesh Drift Nets for Small-Scale Fisheries in the Bay of Bengal (BOBP/WP/5).
9. Fishing Trials with Bottom-Set Longlines in Sri Lanka (BOB P/WP/6).
10. Current Knowledge of Fisheries Resources in the Shelf Area of the Bay of Bengal (BOBP/WP/8).
11. Master Plan for the Development of Fisheries in Sri Lanka, 1979-82.
12. Seminar on the Role of Small-Scale Fisheries and Coastal Aquaculture in Integrated Rural Development (CMFRI Newsletter No. 9, 1978).
13. Workshop on Ocean Management, CIFE Lab to Land Programme (India Today and Tomorrow Vol. 8, No. 3, 1979).
14. Workshop on Reservoir Fisheries for Rural Development, CIFE Lab to Land Programme (India Today and Tomorrow.)
15. Inaugural Report of the National Inland Fisheries Institute (NIFE), Bangkhen, Thailand.
16. Activities and Achievements of the Central Institute of Fisheries Technology, Cochin, India.
17. Lab to Land Programme, Central Institute of Fisheries Education, Bombay, India — key papers "Brackishwater Culture", "Paddy Fields to Fish Seed Farms", etc.
18. Coastal Aquaculture, Proceedings of the First Workshop on Technology Transfer, Cochin and Mandapam (CM FRI. Cochin, 1979).
19. E.S.C.A.P. Report on T.C.D.C. Activities in Relation to its own Work Programme, 1980/81 (E/ESCAP/177).
20. T.C.D.C.: Policy and Trends, Thailand — proposed by the Department of Technical & Economic Cooperation, Thailand, August 1980.
21. Report of the Study Tour of Agricultural & Rural Development Institutions in Bangladesh, E.S.C.A.P. 1980.
22. BOBP 1980 Progress Report on Programme of Work (AC 5/6).

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Publications of the Bay of Bengal Programme (BOBP)

Development of Small-Scale Fisheries (GCP/RAS/040/SWE)

Reports (BOBP/REP/....)

1. Report of the First Meeting of the Advisory Committee.
   Colombo, Sri Lanka, 28-29 October 1976.
   (Published as Appendix 1 of IOFC/DEV/78/44.1, FAO, Rome, 1978)

2. Report of the Second Meeting of the Advisory Committee.
   Madras, India, 29-30 June 1977.
   (Published as Appendix 2 of IOFC/DEV/78/44.1, FAO, Rome, 1978)

3. Report of the Third Meeting of the Advisory Committee.
   Chittagong, Bangladesh, 1-10 November 1978. Colombo, Sri Lanka, 1978.
   (Reissued Madras, India, September 1980).

4. Role of Women in Small-Scale Fisheries of the Bay of Bengal.
   Madras, India, October 1980.

5. Report of the Workshop on Social Feasibility in Small-Scale Fisheries Development.
   Madras, India, 3-8 September 1979. Madras, India, April 1980.

6. Report of the Workshop on Extension Service Requirements in Small-Scale Fisheries.
   Colombo, Sri Lanka, 8-12 October 1979. Madras, India, June 1980.

7. Report of the Fourth Meeting of the Advisory Committee.
   Phuket, Thailand, 27-30 November 1979. Madras, India, February 1980.

8. Pre-feasibility Study of a Floating Fish Receiving and Distribution Unit for Dubla Char, Bangladesh. G. Eddie, M. T. Nathan. Madras, India, April 1980.

9. Report of the Training Course for Fish Marketing Personnel of Tamil Nadu.
   Madras, India, 3-14 December 1979. Madras, India, September 1980.

10.1 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16-21 June, 1980.
   Volume 1: Proceedings. Madras, India, September 1980.

10.2 Report of the Consultation on Stock Assessment for Small-Scale Fisheries in the Bay of Bengal. Chittagong, Bangladesh, 16-21 June 1980.
   Volume 2: Papers. Madras, India, October 1980.

11. Report of the Fifth Meeting of the Advisory Committee, Penang, Malaysia, 4-7 November 1980. Madras, India, January 1981.

12. Report of the Training Course for Fish Marketing Personnel of Andhra Pradesh, Hyderabad, India, 11-26 November 1980. Madras, India, September 1981.

Working Papers (BOBP/WP/....)

1. Investment Reduction and Increase in Service Life of Kattumaram Logs.
   R. Balan. Madras, India, February 1980.

2. Inventory of Kattumarams and their Fishing Gear in Andhra Pradesh and Tamil Nadu.
   T. R. Menon. Madras, India, October 1980.

3. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Sri Lanka.
   G. Pajot. Madras, June 1980.

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4. Inboard Motorisation of Small G.R.P. Boats in Sri Lanka.
Madras, India, September 1980.

5. Improvement of Large-Mesh Driftnets for Small-Scale Fisheries in Bangladesh.
G. Pajot. Madras, India, September 1980.

6. Fishing Trials with Bottom-Set Longlines in Sri Lanka.
G. Pajot, K. T. Weerasooriya. Madras, India, September 1980.

7. Technical Trials of Beachcraft Prototypes in India.
ø. Guibrandsen, G. P. Gowing, R. Ravikumar. Madras, India, October 1980.

8. Current Knowledge of Fisheries Resources in the Shelf Area of the Bay of Bengal.
B. T. Antony Raja. Madras, India, September 1980.

9. Boatbuilding Materials for Small-Scale Fisheries in India.
Madras, India, October 1980.

10. Fishing Trials with High-Opening Bottom Trawls in Tamil Nadu, India.
G. Pajot, John Crockett. Madras, India, October 1980.

11. The Possibilities for Technical Cooperation between Developing Countries (TCDC) in Fisheries.
E. H. Nichols, Madras, India, August 1981

Miscellaneous Papers (BOBP/MIS/....)

1. Fishermen's Cooperatives in Kerala: A Critique.
John Kurien. Madras, India, October 1980.

Newsletters:

1. Bay of Bengal News, January 1981
2. Bay of Bengal News, May 1981
3. Bay of Bengal News, September 1981

Published by the Bay of Bengal Programme, FAO, 91, St. Mary's Road, Abhiramapuram, Madras— 600 01 8, India. Printed at Amra Press, Madras—600 041.

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