

GOVERNMENT OF INDIA
MINISTRY OF FOOD & AGRICULTURE
(DEPTT. OF AGRICULTURE)



REPORT
OF THE
COMMITTEE
ON
FISHERIES EDUCATION

Dr. N. K. Panikkar
Dr. B. N. Chopra
Prof. G. M. Gerhardsen
Dr. G. L. Kesteven

Chairman

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NOTE—The major conclusions and recommendations as summarised in Chapter of this Report were signed during the last meeting of the Committee F.VIII Bombay on 14th April, 1959. The drafts of the remaining chapters were discussed and finalised by correspondence between April and August, 1959.

CONTENTS

CHAPTER	PAGES
I Introduction	3—5
II Indian Fisheries and their development	9—19
III Fisheries Administration in India	23—28
IV Manpower Requirements	31—41
V Existing arrangements for training in fisheries	45—50
VI Proposals for a Central Institute of Fisheries Education (CIFE)	53—71
VII Ancillary Training	75—81
VIII Summary of conclusions and recommendations	83—86
Acknowledgements	87
Appendices I to X	91—144

CHAPTER I
Introduction

Contents

	PAGES
1.1. Constitution of the Committee and its Terms of Reference	3
1.2. Programmes and Methods of work	3—5
1.3. Why Trainings should have Top Priority	5

CHAPTER I

INTRODUCTION

1.1. Constitution of the Committee and its Terms of Reference

The facilities established by the Government of India in the First Five Year Plan and in the initial stages of the Second Plan, for training of fishery workers were essentially *ad hoc* intended to provide specialised personnel rather than to constitute an integrated system of education in this field. However, as the development schemes progressed, the manpower problems became so pressing that the entire question came up for review early in 1957; with the result the Government decided to appoint a Committee to examine the needs of the fishery programmes for trained persons and the facilities required for training them. In the Government of India Resolution No. F.7-15/57-FY(D) dated the 4th June, 1958 (Appendix I, IA, IB and II), this Committee was appointed consisting of:—

Dr. N.K. Panikkar, Fisheries Development Adviser to the Government of India.	<i>Chairman.</i>
Dr. G.L. Kesteven, Chief, Fishery Biology Branch, Food and Agriculture Organisation of the United Nations.	<i>Member.</i>
Professor G.M. Gerhardsen, of the Chair of Fishery Economics, The Norwegian School of Economics and Business Administration.	<i>Ditto.</i>
Dr. B.N. Chopra, Formerly the Fisheries Development Adviser to the Government of India.	<i>Ditto.</i>

The Committee was given the following terms of reference:—

1. To review and assess the training requirements for fisheries personnel to man the administrative & executive and research projects in India and for the growing needs of the industry.
2. To examine the need for higher or ancillary training facilities in the field of fisheries in the light of the present and future requirements of the Second and Third Plans and of the training courses now available.
3. To recommend the location, courses of study, the staff required and other practical details for the establishment of such training institute (institutes).

1.2. Programmes and Methods of Work

Prior to the official constitution of the Committee, an extensive study of the question was made by the Chairman and a considerable amount of material assembled in connection with the work of the Agricultural Personnel Committee of the Planning Commission. Dr. Kesteven visited India in January, 1958, and discussed the outline of the various fisheries training projects in view of the long-standing interest which the F.A.O. had in a project for training fishery administrators.

The first series of formal meetings of the Committee, then consisting of the Chairman, Dr. Kesteven and Professor Gerhardsen was held from the 18th to 28th August, 1958. Visits to Calcutta and Bombay were made to take note of the major existing training facilities in these cities likely to be available and to prepare a programme for the Committee's work. At that time an interim report was prepared in compliance with para 4 of the Government of India Resolution¹ and submitted to the Government of India on 28th August, 1958. The main recommendation in the interim report was that, as an immediate step, a course of training for District Fishery Officers should be organised. The Committee proposed Bombay for the location of this course because of the facilities which could be made available there without delay and regarded this course of action as a prelude to the setting up of a fisheries higher training institute at a suitable place.

¹Please see page 95.

Dr. Chopra, the 4th Member joined the Committee in October, 1958, and has generally endorsed the recommendations contained in the interim report. The next series of the meetings of the Committee took place in 1959, from the 9th January to 14th February, without Dr. Kesteven, who could not be present. The committee made an extensive tour of places of major fishery and academic interest in India, beginning with visits to Bombay and Cochin, both of which have special importance in view of an expanding fishery industry and facilities for higher training. The broad concepts of the substantive proposals were arrived at during these meetings and a summary of recommendations and conclusions was drafted to serve as a basis for writing the final report; these were later endorsed by Dr. Kesteven. The final series of meetings, of the whole Committee, were held in April, 1959.

Lists of places and institutes visited, and of the chief persons with whom the Committee held discussions, are given in Appendices III and IV.

Between the time of the Committee's first sittings and that of the later series of sittings, a large volume of material relating to curricula of training in various subjects and of the administrative arrangements in the various States was collected for study. The Vice-Chancellors of Indian Universities were informed of certain views on the need for organised training in fisheries and were invited to communicate their views on the subject (Appendix V). The State Fisheries Departments were also contacted to ascertain their views.

In acting on its terms of reference, interpreting these in a broad sense, the Committee has studied carefully many aspects of fisheries education, research and development. It has had detailed discussion with many persons, drawn from different levels, directly engaged in or concerned with fisheries developmental work and educational, industrial and training activities in fisheries and related subjects. The information which the Committee has gathered, and the views that have been expressed to it, have forced it to the conclusion that not only is there a considerable and urgent need for an intensive programme of training in fisheries at all levels, but that, among the various courses of action that may be taken to meet this situation, the establishment of an institute for higher training in fisheries should be given very high priority. In the face of this conclusion, the Committee felt itself obliged to devote considerable amount of its time and thought to general and particular aspects of such an institute of higher training.

As to the magnitude and nature of the training which the Committee proposes, its work has been guided by a clear recognition of the need to fulfil the targets of the Third Five Year Plan, which would increase fish production by more than 50 per cent of the present total. This point has considerable bearing on the proposals the Committee wishes to make and is discussed in the later sections of this report.

The lines along which the Committee has developed its work have been roughly as follows:—

It had, first of all, to formulate some views on the extent to which manpower deficiencies, at some or all levels of industry and in Government fishery services, impeded smooth functioning and proper and rapid development of the industry. Having satisfied itself, qualitatively, that there existed such deficiencies and that these constituted genuine deterrents, the Committee sought to assess the magnitude of the lack of manpower of various categories. It then turned its attention to the means available in universities and other institutions for providing various types of training required. This survey revealed that whilst fundamental education could be provided by existing colleges and universities, these institutions could not provide the specialised training and education required for fisheries.

The manpower deficiencies lie principally in two major categories; firstly, in the category of operatives in various sectors of the industry; secondly, in the category of management, both in public and in private sector. Certain arrangements exist and others are under consideration for training operatives and some arrangements also exist for training management personnel but at relatively low level, and no arrangements have been made for their training at higher levels. The Committee has been impressed by the fact that the Government's responsibilities under the development plans call for high level officials of considerable competence and, therefore, reached the conclusion that first priority should be given to the establishment of an institute of higher training in fisheries. The

Committee has, therefore, made a detailed examination of the needs and requirements of such an institute referred to in its terms of reference and has reported on these in the final chapters of this report.

1.3. Why training should have Top Priority

In India, Fisheries Science is, unlike Agriculture, largely a new and unfamiliar discipline. In Japan, Norway, Great Britain and the United States, to mention only a few instances, fishing and fishery industries have been organised and developed by private enterprise in the course of several generations. In these countries Governmental intervention followed in response to the needs of industry which have set a pattern for training in and assistance from the public sector. But even among the countries mentioned above, Japan may be cited as an example of forthright Governmental assistance in which establishment of training institutes played a major role in the modernisation of fishery industries. At the end of the 19th century the fishery industry of Japan, although substantial in the numbers of its fishermen and in its total production, was exceedingly backward in its methods and low in its productivity; in many respects it resembled the condition in which the fisheries of India now stand. The conversion of this primary industry from its backward stage was decided upon by the Government of Japan as an important element of its programme of industrialisation and modernisation of that country. It was recognised that achievement of that conversion in step with other changes would call for intensive programmes of training and research. It is by no means a coincidence that Japan is both the foremost fishing country of the world and the country with the greatest network of fishery research institutions and fishery schools, colleges and universities.

In India, mostly for historical reasons, the fishery industries are, to a large extent, in a primitive state. If the pace of development is to be accelerated in an effective manner, Governmental intervention will have to come in forcefully at a stage of development much earlier than was necessary in the countries where fisheries are now well-established. One of the most fruitful forms of Governmental assistance, on a national scale, is to provide facilities for training of personnel at various levels. The Committee is convinced that if training is neglected or even unduly postponed, the development of fisheries and connected industries in India to their full stature will not be achieved within a reasonable period of time.

CHAPTER II

II. Indian Fisheries and their Development

Contents

	PAGES
2.0. Introduction	9
2.1. Structure and Magnitude of Fishery Industries of India	9—12
2.2. Development Patterns	12—16
2.3. Governmental Activities : 5 Year Plans	16—17
2.4. Integrated Projects	17—18
2.5. Conclusion : The Nature of the Manpower Problems	18—19

CHAPTER II

INDIAN FISHERIES AND THEIR DEVELOPMENT

2.0. Introduction

The programme of training the Committee has been asked to consider, must not only meet such needs as might exist at present but also anticipate needs that are likely to emerge with the development of Indian fisheries. The Committee has, therefore, reviewed extensive evidence relating to the complex structure of the existing fisheries and the prospective changes, as a means of determining the existing manpower deficiencies and the prospective requirements.

2.1: Structure and Magnitude of Fishery Industries of India

Although the living aquatic resources in the seas surrounding India and in its inland waters are varied and abundant, there is substantial evidence that current operations neither fully exploit nor make best use of them. The average annual production is about 800,000 metric tons of sea fish (Table I) and about 300,000 metric tons of inland fish, although in one individual year (1957), the total production was as high as 1,230,000 metric tons. This total, which represents about 3 kg. per annum for each person of the entire population, and about 6 kg. for each fish-eating person, falls far below the required level of fish supply which is set, in terms of nutritional requirements, at something more than 4,000,000 tons. Moreover, this total although considerable, is produced by about one million fishermen, which means that each fisherman produces little more than one ton per annum, an average which can be contrasted with 80 tons per annum produced per fisherman in countries where fishing is highly developed.

The evidence available on the resources gives strong indication that the level of production that has been reached is by no means at the limit of optimal yield to be obtained from these resources.

For example, the most abundant of the marine fishes are the sardines which account for over a fourth of the total production. One of these sardines, the Oil Sardine of Malabar, supports a most profitable fishery, but this unfortunately is liable to great fluctuations from year to year. These fluctuations may be due to natural changes in the total amount of stocks in the seas, or alternatively, may be due to changes in distribution of these stocks as a result of which fish may in some years move into waters beyond the reach of the fishing boats. There is, however, evidence that indicates that one of the main reasons why catches fluctuate so widely from year to year is that the fishing operations have purely inshore range, being limited by the small size of boats and absence of mechanised propulsion. It is to be expected that the range of fluctuations will be reduced when fishermen become able to pursue and capture the schools of fish over a much greater area. Modification of the fishing boats, to extend their range of operations and improve their ability to find fish, supported by the availability of more accurate information on the habits of this species, must lead to expansion of production in this section of the industry.

The Indian Mackerel fishery is next in importance and although fluctuations of this fishery are not as wide as those of the Oil Sardine fishery, nevertheless, there are good grounds for believing that substantial stocks of this species lie in distant waters beyond the reach of the existing craft. Improvement of the craft, therefore, will permit an increase in production from this fishery.

As an even clearer example of the possibility of increase, reference may be made to the demonstrated existence of Tuna stocks in oceanic grounds, which could be fished from ports on the mainland of India. Coming closer to the coastline, we may consider the stocks of Crustacea—prawns, shrimps and lobsters. The present catch of prawns is in the order of over a lakh of tons each year, but the bulk of this catch is taken on the west coast of the Peninsula and in fact, not all the grounds known

TABLE I

SEA FISH PRODUCTION IN INDIA

State-wise figures of marine fish landings, catch per boat and catch per fisherman

STATES	Landings (in metric tons)		Average (in metric tons)	Catch per boat (in Kilograms)	Catch per fisherman (in Kilograms)
	1957	1958			
1. West Bengal & Orissa	8,266	6,266	7,266	2,510	580 290
2. Andhra	40,462	28,845	34,654	1,720	
3. Madras	79,684	1,18,075	98,880	3,740	780 4,020
4. Kerala	3,09,926	2,95,363	3,02,644	16,300	
5. Mysore	76,090	80,243	78,166	11,960	6,820 4,830
6. Bombay	3,56,660	2,20,906	2,88,783	28,310	
7. Kutch	Data not Collect- ed.	1,980	1,980	8,350	920
Mechanised Vessels	4,332	Data not available yet.	4,332		
Average for whole India ..				9,550	2,060
	8,75,420	7,51,678	8,16,705		

TABLE II

State-wise statistics of Sea Fishing Villages, Fishing Boats and Fishing populations (1956-57)

STATES	No. of fishing villages having boats:					Total No. of villages	Total No. of Boats	Total Fishermen engaged in fishing
	200	101—200	51—100	21—50	below 20			
1. West Bengal	Nil	Nil	Nil	Nil	26	26	55	1,243
2. Orissa	3	5	6	11	90	115	2,837	11,159
3. Andhra	17	36	75	90	160	378	20,166	1,16,684
4. Madras	34	33	75	79	119	340	26,463	1,27,205
5. Kerala	12	37	55	75	48	227	18,566	75,308
6. Mysore	5	13	25	40	32	115	6,537	11,465
7. Bombay	6	15	50	98	336	505	10,202*	50,020
8. Kutch	—	—	—	3	25	28	237	2,146
TOTAL	77	139	286	396	836	1,734	85,063	3,95,230

*Small canoes which are used in creek fishing excluded (=3004).

to exist there are fished. Ecological evidence suggests that the stocks of these species in the Bay of Bengal are abundant although they have been scarcely touched.

Turning to the inland waters, there are innumerable small bodies of water which could be used for fish culture but which are yet lying fallow. Vigorous campaigns in various States have already shown how production can be increased by effective Governmental assistance to fish farmers. Note may also be taken of recent water impoundment schemes which provide large bodies of water to be stocked with fish and yield substantial production. Stocking already done has given very profitable results.

It will thus be seen, from the instances quoted, that the resources available to the fishermen of India do not yet place a limitation on total production. On the other hand, the equipment employed by the fishermen does place limitations on them. Sea fishing is carried out by nearly 80,000 indigenous craft of a great variety, employing a very large range of methods. It has been estimated that the investment value of these craft is about 8 crores of rupees. But these craft are exceedingly limited in their range, as indicated above in connection with the Oil Sardine and Mackerel fisheries. They have no mechanical power and lack navigational and fish finding equipment.

In recent years, diesel engines have been installed in some of the larger boats of the Bombay area and newly designed coastal craft have been introduced in other parts of India. At present about 1,400 boats are mechanised and are capable of operating at ranges much wider than those of the non-powered boats. This development has been supplemented by attempts, during the last 10 years, at power fishing by non-indigenous fishing craft. About 25 vessels, varying in size from 35 ft. to 85 ft. have been introduced to Indian waters.

There is, however, an important difference between the mechanised indigenous craft and the non-indigenous fishing craft in that the latter use power for the operation of gear as well as for propulsion. Moreover, they carry navigational and fish finding equipment which the former lack. Obviously, the modification of Indian fishing craft to use power for propulsion and fishing and to use navigational and fish finding equipment will require the training of fishermen to handle this equipment.

With the introduction of power to the fishing craft, modification will take place in the gears used on them. A very wide range of gears is employed at present and it is to be supposed that most of these will continue to be used for considerable time to come. But artificial fibres (*e.g.*, nylon) are being introduced and large nets such as trawls and purse seines will be brought into use. The adoption of these will call for the training of fishermen in the construction of these nets and their repairs and in special problems of handling the new fibres.

From the administrative and managerial point of view, the most noteworthy feature of the sea fishing is the scattered distribution of the production units (Table II). The villages range in size from those of a few thousands to tiny hamlets each of hardly a hundred fishermen. They vary greatly in adequacy of equipment and prosperity. The annual landings in each village probably range between 500 and 10,000 tons, but Bombay and Calcutta which are the only really large consumption centres, receive landings of the order of 30,000 and 40,000 tons per annum respectively.

In comparison with marine fishing, fishing operations in inland areas are still more diffuse, production units smaller and landings correspondingly low. There is, however, a further important difference, that whereas the sea fisheries are based entirely on capture operations, the inland fisheries include besides the capture fisheries of the rivers, lakes and large bodies of water, the culture of the thousands of fish ponds whose contribution to the dietary of the rural population is of the highest importance.

The fish marketing is, to a great extent, determined by this pattern of fish landings. Excepting in the major consumption centres, Bombay and Calcutta, no large markets, exclusively for fish, are in existence. Moreover, the transport arrangements and the handling capacity of the fish merchants are very limited so that, often, only a small proportion of the catch reaches consumers in fresh

condition. One result of this is that glut in certain seasons in coastal areas has a seriously depressing effect on prices. There is also wide fluctuation in prices in the landing places due largely to the absence of storage facilities and to the inadequacy and high cost of transport. The processing industry also is at a low stage of development in the techniques employed.

As a result of these inadequacies in the equipment which they employ and of the disabilities to which they are subjected by the inadequacies of the processing industry and of the machinery of marketing and distribution, the economic condition of the fishermen is very depressed. Catch per man is low and, by and large, the prices obtained for the catches are also low. The weak bargaining position of the fishermen prevents them from making changes in this situation.

2.2. Developmental Patterns

Distinct developmental patterns can be recognised in at least seven sections of the industry:—

- (a) Onshore fishing
- (b) Inshore fishing
- (c) Off-shore fishing
- (d) Inland capture fishing
- (e) Inland fish culture
- (f) Processing industry
- (g) Marketing and distribution

In this part of the report, no attention is paid to the more remote possibilities such as distant water fishing for Tuna, which are very real and would have to be taken into consideration at a later stage.

(a) *Onshore fishing*—These operations include fishing carried out by nets, traps and other methods from the beach, and operations from small boats which work within a short distance of the shore and are landed on the beach. In exceptional cases, in the former operations, a boat is used to carry the catch to the landing point.

In this section of the industry, two primary trends of change are taking place. The first is the modification of the fishing boats to mechanise them and to make them of a design better suited to their being landed directly on the beach. Such beach landing operations call for special characteristics of the craft with regard to strength, buoyancy and manoeuvrability and may also require special equipment, such as power winches. This development will increase the range and fishing power of the boats and the number of days of each year, on which fishing can be carried out. It will require additional skills in the fishermen and since it will increase production, will require expanded facilities for handling the catch. The change is still in an early stage and will require further research work by naval architects. When a successful design is found, the industry will need assistance from Government for the reconstruction and acquisition of these boats.

The second line which development has followed in this fishery is the adoption of synthetic fibres (*e.g.*, nylon) for the making of fishing gear. These fibres have very great advantage over natural fibres, but since their adoption will call for substantial expenditure, Governmental assistance will be required. There is reason to believe that adoption of these fibres not only reduces operational costs but also increases production. Increased production would necessitate corresponding changes in secondary (processing) and tertiary (marketing) phases of the industry.

An important feature of this section of the industry is the diffuse nature of the landings. Neither of the developments just referred to will lead to any concentration of these operations, and landings will continue to take place along the entire coast. Reduction of the time between landing and delivery at market or storage or processing plant will be an obvious course of development and one that

increased landings will make easier to realise. Fleets of lorries and carrier launches, refrigerated or at least insulated, will be required and in fact this development has already started.

(b) *Inshore fishing*—Inshore fishing is carried out from existing harbours, some of which are small and some e.g., Cochin, are quite large. The small harbours are generally river mouths and natural havens. The boats that work out from these situations will be modified, and in some cases have already been modified, for mechanisation. In this section of the industry also there will be adoption of the use of artificial fibres. These developmental trends will give increase in production and in yield per man and will call for corresponding changes in secondary and tertiary industries.

It should be noted that in so far as a port constitutes a focal point for the landing of catches and thus reduces the diffusiveness referred to before, its existence is a direct advantage to the industry. For this reason, the Government of India has had a survey made of the localities in which fishing port facilities might be improved or artificial harbours created. Such fishing ports, small and large are obviously the sites to be chosen for integrated developmental projects referred to later, where ice factories should be located, boat building and repair facilities provided and other ancillary facilities established. Thus, inshore fishing will offer opportunities of effecting concentration of industrial operations, which will be of great importance considering that the largest proportion of the increase in catch will come from this section of the industry.

(c) *Off-shore fishing*—The Government of India has devoted considerable attention to the exploration of off-shore trawling grounds out to the edge of the Continental Shelf. These operations, which are still continuing, have led to the establishment of one off-shore fishing company based at Bombay. There are similar operations of the Government of West Bengal from Calcutta and those of the Indo-Norwegian project at Cochin. There is no reason to doubt that these operations will continue and that the fleet of off-shore fishing vessels for fishing the bottom grounds both on the West Coast and the Bay of Bengal will steadily increase. These operations are not confined, however, to the bottom stocks. The Government of India boats based at Bombay already fish pelagic species. As indicated earlier in this section, there are good grounds for believing that substantial operations could be carried out in fishing the oil sardines and the mackerel in off-shore waters.

Continuation of this trend of development will have very considerable consequences on Indian fisheries and in particular on its manpower. The boats of this section of the industry are larger than those of the inshore waters, and are mechanised and provided with navigational and fish-finding equipment. They use larger fishing gear requiring skilful handling. Specially trained fishermen will be required for these boats, as well as mechanics for operation of their engines. Increase in the fleet of these boats will make special demands on harbour facilities and as the fleet increases, Government must face its obligations to ensure precautions with regard to safety at sea. Shore installations at fishing ports, already referred to above, will have to be increased. Considering the investment likely to be made in these operations, it is also likely that Government will find itself obliged to give substantial assistance for fish finding operations and to step up its exploratory fishing.

All these developments in the fishing phase will bring about increased production and require appropriate adjustment of secondary and tertiary industries. They will require the training of operatives for private industry and the availability of specially trained staff in Governmental sector to operate and manage the special facilities that such fishing operations will require. If Government should be called upon to provide any large part of the finances for these developments, trained managerial staff will obviously be needed for the management of such schemes.

(d) *Inland Capture Fisheries*—These fisheries exploit the stocks in rivers, lakes, reservoirs, back waters, estuaries and other large bodies of water. The resources here are abundant. Fishing methods cover a very wide range, many of them are exceedingly primitive and almost all of them rely chiefly on manual labour. Fishing boats are of traditional type and few are mechanised. As mentioned

earlier, the operations are also exceedingly diffuse. In spite of these backward characteristics the catch of the inland capture fisheries is of considerable importance.

There has, in fact, been very little development in this section but the opportunities are considerable. In the case of the resources, the stocks can be improved and increased by the techniques developed in other countries for management of wild stocks. But sight should not be lost of the fact that there is often a need to conserve the stocks of these waters and even to protect them from certain damaging influences, such as pollution and the effects of irrigation systems and barriers across migration courses. Work in this field falls chiefly on Government and calls for intensive research and for the efforts of special fishery officers concerned with the management of these stocks.

There is opportunity to design new gears and to introduce the use of artificial fibres. Such development will call for more research on the part of Government. It will certainly call for financial assistance and require that the fishermen should be assisted in the acquisition of new supplies.

In the case of the fishing boats, it can be foreseen that developments should take place roughly along the same lines as those envisaged for the inshore fisheries. Mechanisation will be introduced and subsequently new designs will be evolved for these craft. Government will have to assist the work of design and construction and give financial support.

Both these processes of development, that is, improvements in gear and in boats will lead to increase in fishing effort and can lead to increased production if the resources are already large enough or if appropriate steps can be taken to ensure the adequacy of the stocks. This means that, on the one hand, Government must ensure the effective management of these fisheries since these stocks are more susceptible to over-fishing than are the stocks in the vast areas of the seas. On the other hand, if these developments prove successful, appropriate expansion should take place in secondary and tertiary industry. It is probable that the arrangements and facilities for collecting the catch and transporting it to consuming centres could be improved. This is specially true of the estuarine fisheries and those of the large natural lakes. Mechanised and refrigerated carrier vessels might be appropriate for this situation. Such development will call for Governmental intervention and the availability of technical and managerial staff to assist and manage such operations.

(e) *Inland Fish Culture*—Here we refer to all fish cultural operations in natural and artificial bodies of water, in estuarine, backwater and fresh water areas. These operations vary greatly in the degree of development, some of them being scarcely more than the trapping and holding of wild stocks, whilst others involve a complex programme of collection and rearing of fish spawn and fry, stocking of ponds, careful rearing and intelligent harvesting of the fish.

Development in this section can be seen in four directions : firstly, the increase of production from units at present under cultivation, by improving and increasing distribution of fish seed and by securing the adoption of the better methods already tested; these improvements, of course, will apply also to the new units brought under cultivation. Secondly, extension of operations of these kinds to any body of water whatsoever that lies fallow at present. Thirdly, the bringing under cultivation of swamp-land and other areas which at present are unsuitable for fish culture, and application on them of all the improved methods referred to above. Fourthly, the development of cultivation techniques and the finding of species better suited to cultivation than some of those being used at present. A great deal of work has already been done and continues to be done along the above lines and still more will be done within the next few years.

Developments of these types call for much research work by Government and will call for vigorous Governmental action through extension services. The improvements in this direction will have very considerable impact on the dietary of rural population, whose protein supplies are already low and for whom marine fish are not easily available. Pond fish production is also important as supplementary cash income to rural population.

(f) *Processing (Secondary) Industry*—Processing of fish by relatively simple methods is traditional and of long standing in India. A considerable quantity of sea fish is utilized in this manner. Although the most common methods, of drying, salting and curing, leave much room for improvement, these methods help in coping with the problems of spoilage of surplus catch in the seasons of heavy landings. The provision of refrigerated storage and transport and accelerated means of movement of fish supplies will not eliminate the need for processing, and not only will drying, salting and curing be continued and improved but other methods of processing will be, and in fact, are being introduced and extended. Reference here is primarily to introduction of special means of treatment and packing of prawns and lobsters. As production increases and consequential changes in tertiary industries indicated in the previous four sub-sections take place, corresponding changes will be required and made possible in secondary industry. The fishery for prawns shows every sign of steady increase which will demand continued expansion of the processing establishments to handle the catch.

Again, increased catches and the concentration of landings made possible by certain developments described earlier will make possible the development of meal and oil industries for which wastages, offals and inferior quality fish will be available in sufficient quantities. Certain special types of oils and fish products, such as shark liver oil, are already being produced and the output will most probably increase corresponding to the expansion of the industry. There have for long been, more or less traditional avenues of disposal of these processed commodities to foreign countries, and in recent years new avenues have been opened. In all cases, the local processing industry has the obligation to meet the particular demand and requirements of each overseas market. Government has the obligation to intervene in order to ensure the observance of good trade practices and maintenance of quality.

The developments in this sector of the industry will call for continued research activity by Government which will also be required to provide some measure of control of the operations, more particularly with regard to quality of exports. The industrial units themselves will require technically qualified operatives for many different operations and will also require personnel for management. Government will have responsibility to provide facilities for training these categories of personnel.

(g) *Marketing and Distribution (Tertiary) Industry*—The modern trend in the development of tertiary industry aims at the use of equipment to eliminate spoilage, to reduce the time involved in all operations, especially in the movement of fish supplies and to reduce the distributional costs so that, on the one hand, the producer may be assured of best possible price without, on the other hand, demanding an excessive price from the consumer. These developments call for efficient facilities for the landing of fish from the fishing boats and equipment for handling and moving the catch through the various stages of industry. Refrigerated storage and transport equipment has been developed and special refrigerated display equipment is being used in retail outlets.

Some of these developments have been initiated in India. Ice making units have been provided at very many centres, and large cold storage and freezing plants have been provided at Bombay, Cochin and a few other centres. Insulated road transport has been provided in some instances while un-insulated transport, by road trucks and rail wagons, has been very considerably expanded. A small beginning has also been made in the use of refrigerated display cabinets in retail shops.

Acceleration of these trends will require substantial expenditure on ice making, refrigeration, handling and transport equipment. In particular, transport equipment should be refrigerated, or at least insulated, and the craft for collecting and carrying fish from fishing villages to assembly and consumption centres should be provided with better equipment. It is important that this programme should be seen as an integrated whole. Government, therefore, should have high level properly qualified staff available to plan development and continued operation of this sector of industry. The industry will require skilled operators to work in the storage and other units and trained personnel for the business management of these operations.

(h) *Industrial undertakings*—The fishery industries of India are characterised, as mentioned earlier, by their diffuse nature. There is, in fact, very little of industrial organisation. There are very few industrial firms engaged either in fishing or in processing or marketing. On the other hand, in recent years, many co-operatives have been formed, chiefly to give credit and to organise the purchase of gear and supplies on behalf of their members. Some of these cooperatives are also engaged in marketing and other activities. It is clear that the technical trends of the industry described in the preceding sections will call for certain changes in the forms of industrial organisation within the industry, and most likely a considerable development of co-operatives. There is indication that the numbers of private firms and of co-operatives will increase and this will mean a steady increase in the need for qualified personnel to assume the responsibilities of management and operation of these companies and co-operative societies.

2.3. Governmental Activities : Five Year Plans

At various points in the previous section the Committee has referred to Governmental activities associated with the different trends of development. These activities are to guide, promote, assist and participate in industrial activities. In this connection the Committee had to analyse evidence available to it, concerning Governmental activities, with a view to reaching conclusions of two kinds: first, as to the kinds and numbers of Government staff required for implementation of the Plans, and second, as to the manpower requirements in the private sector consequent upon Governmental intervention.

Post-war activities—Although there has for many years been some governmental activity in connection with fisheries, this was dealt with almost completely by State Governments. A major change was effected when, on account of the difficult food situation during the post-war years, the Central Government began taking direct interest in fisheries and appointed some special staff for this purpose. The Central Government established in 1946-47 research stations for inland and marine fisheries as well as a Deep Sea Fishing Station. In addition, the Central Government gave considerable technical and financial assistance to the developmental activities carried out by the State Governments through the "Grow More Food Campaign", and in the early years special attention was devoted to extension of fish culture in inland waters.

First Five Year Plan—The actual expenditure incurred during this Plan was 278 lakhs. Part of this money was spent directly by the Central Government on expansion of the work of its Research Stations and of the operations of its Deep Sea Fishing Station. The bulk of the money was spent by the State Governments on the survey of inland waters (1 million acres), reclamation of areas for fish culture (68 thousand acres), the mechanisation of indigenous fishing craft and on the provision of storage, transport and marketing facilities. The existing staffs of the State Fisheries Departments were able, with small additions, to carry the responsibilities involved in implementation of these schemes.

Second Plan—Considerably larger allocations have been made for fisheries in the Second Plan than those in the First Plan. Shortage of foreign exchange and modification of schemes led to a reduction of the initial allocation of Rs. 1,226 lakhs to 1,073 lakhs. The direct expenditure by the Central Government continued to relate chiefly to the expansion of the inland and marine research stations and the Deep Sea Fishing Station. To these were added the activities of a fisheries extension programme. Considerable expansion of the facilities and the staff was effected at both research stations in order to extend the range of problems under investigation. In inland waters, attention was paid to control of aquatic weeds, the problems of water pollution and the artificial inducement of breeding in carps. In marine fisheries there was considerable expansion in the range of the investigations much of which was made possible by addition of further field sub-stations. A Central Fisheries Technological Research Station was established at Cochin for the improvement of boats and gear and of methods of preservation. In the programme of deep sea fishing, substantial expansion and re-organisation was effected by pooling of all vessels engaged in this kind of work, on behalf of the Central and State Governments. New Stations have been established at Cochin and Tuticorin while a third Station is being organised at Visakhapatnam.

The Central Government also organised for the benefit of Government officers of the maritime States, two special six-monthly courses in designing and construction of small power-fishing boats. These courses were conducted under the supervision of a Naval Architect assigned to India under ETAP.

State Governments continued the work of survey, reclamation and stocking of inland waters. Mechanisation of fishing craft continued in several States and provision was made, to a small extent, of shore facilities required for such craft. The rate of progress in this field, however, became seriously retarded by the acute shortage of foreign exchange. Boat building yards are being established in several States. In order to ensure effective operation of the mechanised craft being introduced, several States established, with the assistance of the Central Government, special training courses for fishermen.

In 1956 fish production had reached the level of approximately 11 lakh metric tons. The target set for achievement by the end of the Second Plan is 14.5 lakh metric tons and since the production in 1957 reached 12.33 lakh metric tons, it would seem possible, even in the face of the fall to about 11 lakh metric tons in 1958, that the target might be achieved by the end of this period. However, the shortage of manpower, which had caused some apprehension in the First Plan, was still existent during the Second Plan and could, with the brake placed on mechanisation by the difficulty of importation of engines, cause production to fall short of the target. The Committee, in fact is quite apprehensive that unless vigorous steps are taken to provide trained personnel required by the Governmental activities proposed in the Second Plan, the production might continue to lag seriously in its rate of increase.

Third Plan—From its study of the structure of the Indian fishery industries and the trends of change taking place in these industries, the Committee sees no reason to suppose that the general picture of developments during the Third Plan period would be other than along the lines described in section 2.2 above. From its discussion with the Fisheries Development Adviser (who is Chairman of this Committee), it understands, that the intention of the Government is to promote the continuance of these developmental trends while ensuring an even greater degree of integration and coordination of all activities in fisheries. Expansion of primary industry will be promoted in marine waters by continuance of the programmes of training, mechanisation and provision of shore facilities and in inland waters by extension services to secure increases in the area under cultivation or exploitation and by improvement in the methods employed. Corresponding and appropriate development in the processing, handling and marketing industries would be promoted to accommodate the increased production, to reduce losses by spoilage, to improve quality and wherever possible, to reduce costs, ensuring better returns to the producer and better quality and reasonable price to the consumer.

2.4. Integrated Projects

It will have been noted from the previous section that the Third Plan would call for about 5,000 small mechanised fishing boats, the annual yield of which may be between 300,000 and 400,000 tons or up to about two-thirds of the proposed increase during the Third Plan. Successful completion of the Plan would require that these boats should be concentrated in a number of development centres, most of which are still to be established. The aim might be to have at the end of the Third Plan, on an average, 100 boats in each centre. Clearly, each centre with such a number of fishing units, should be more or less self-contained, provided with all the technical means of carrying out its fishing, processing and distributing operations, and of maintaining the equipment of these operations in a state of efficiency. Ancillary facilities for addition to such equipment or its replacement when outworn (net-making, boat construction, etc.), should also be provided.

Development centres of the pattern described will permit of simultaneous approach to all problems requiring attention, *i.e.*, making the boats ready to go to sea, receiving their fish landings, having these marketed, having boats repaired, etc. Such an approach is being attempted

by the Indo-Norwegian Project in Kerala and the experience gained thus would be valuable to and reproducible in many parts of India.

The 50 or 60 centres which may be necessary might be organised on a co-operative basis either with one multi-purpose co-operative society taking care of all fields of work or with a number of specialised societies in fields such as boat building, financing and insurance, marketing, gear and craft maintenance (service-cooperative) etc., these specialised societies being affiliated through an overall society of which all would be members. In places where private firms are engaged in one or more of the activities which are necessary to a self-contained centre or might be induced to engage in one or more of such, the co-operatives could confine their interest to activities not handled by others, provided the services rendered by private firms were satisfactory. Thus, it is expected that such centres will be organised on either a purely co-operative system, or on a system combining co-operatives with private enterprises.

The members of such co-operative societies will be professional fishermen and perhaps also some persons working for them, and it can hardly be expected that they will be able to find among their members someone ready or able to take over full managerial responsibility. Although rapid development of self-reliance must be encouraged, it is probable that management of such societies will be a full-time occupation and that this would mean for any member wishing to do such work, both abandonment of other activities, and acquisition of special skills. A period of transition will, therefore, exist when some outside guidance will be necessary or at least highly desirable. This guidance must, in the Committee's opinion, come from the fisheries administrations of the Central and State Governments; this will necessarily mean special responsibility for fisheries officers.

2.5. Conclusion

In the foregoing sections the Committee has reviewed the present status of Indian fisheries and the lines along which the resources, manpower and other elements of the industry present possibilities of changes. These changes would lead to increased production, increased efficiency, reduced spoilage and other benefits. Their ultimate result will be better nutrition for the fish-eating peoples and improved welfare for the fishermen.

In this discussion it has shown that the expansion of the industry and the changes in its structure will call both for an increased manpower and for improvement in technical skills. Modifications in existing operations (e.g., mechanisation of indigenous craft) will require that existing fishermen should be trained in the running and maintenance of their engines and in the operation of their boats under power. Introduction of new types of boats will call for increased versatility among fishermen. Similar additions to skills will be called for among operatives in the secondary and tertiary industries. The training of fishermen and other operatives constitutes only one among a number of sets of problems that these developments will bring. There will be other problems such as:

- of supply*: the importation, construction and distribution of craft, gear, engines and other production requisites;
- of organisation* : the setting up of co-operatives, of boat-building and other ancillary industries, of fry collection and distribution centres, of fish collection schemes, of fish processing schemes and of marketing schemes;
- of finance* : the setting up and management of credit schemes and of other methods of financial assistance; and
- of coordination* : the ensuring of effective and smooth working together of the several phases of the industry.

Activities relating to these problems lie in some cases only partly, in other cases wholly, with Government; in no case can Government disregard any of these activities, permitting itself to remain

in ignorance of events in any part of the industry, unable to intervene should stresses or emergencies arise. The risk element of this industry, and the perishability of its products make the responsibilities of Government toward it perhaps greater than those towards other industries. Discharge of these responsibilities will have the greatest prospect of success if guided by research and controlled by analysis of current intelligence of operations relating to fishing and other phases of the industry; this implies that there should be a closely knit integration of Governmental activities. The Committee is then confronted with the question of whether the existing fishery administrations and their staff, are adequate in numbers and competence to carry out these operations. This forms the subject of the next chapter.

CHAPTER III

Fisheries Administration in India

Contents

	PAGES
3.1. Present Administrative structure for fisheries in Government of India and in the States	23—24
3.2. The Nature of Governmental Fishery Programmes and of the duties to be performed by Governmental Staff	24—25
3.3. Competence of Staff	25
3.4. Conditions of Service in Fisheries Administrations	25—27
3.5. District Fishery Development Officers, the Key Personnel	27—28
3.6. Conclusion	28

CHAPTER III
FISHERIES ADMINISTRATION IN INDIA

3.1. Present Administrative Structure for Fisheries in Government of India and in the States

Under the Constitution of India, the subject of "Fisheries" is included in the list of State responsibilities; "Fishing and Fisheries" in extra-territorial waters and "Fisheries Research" are, however, the direct concern of the Union Government. In addition, the Union Government coordinates fisheries work in the States and exercises a considerable amount of supervision of the developmental and other aspects of fisheries.

Central Government—The fisheries work at the Centre is handled in the Agriculture Department of the Ministry of Food and Agriculture. On the technical side, the Fisheries Development Adviser is in-charge of this work. His functions are, among others, to advise the Government of India on all matters relating to the development of, and research on, fisheries. He supervises the work of the Central Marine Fisheries Research Station, the Central Inland Fisheries Research Station, the Central Fisheries Technological Research Station and the Central Deep Sea Fishing Station. He is also responsible for coordinating fisheries work of State Governments. The Fisheries Development Adviser is assisted by a Deputy Adviser, an Assistant Fisheries Adviser and a team of other technical officers dealing with marketing, technology, extension, research, etc. Each of the Central Research Stations is under the charge of a Chief Research Officer, while the Head of the Deep Sea Fishing Station is a marine engineer with the rank of a Superintending Engineer. The technical staffs of these Stations include many scientific and technical officers who have specialized in various fields.

State Governments—There is a great diversity in the organisation of Fisheries Departments in States in India. The broad categories of administrative and research staff in the States are listed below:—

1. Administrative Personnel—

- (a) Senior personnel such as Directors, Deputy Directors, Assistant Directors, Superintendents of Fisheries, District Fishery Officers and Wardens.
- (b) Junior personnel such as Inspectors of Fisheries, Fisheries Demonstrators and Assistant Fisheries Wardens.

2. Research Personnel—

- (a) Senior Research personnel such as Research Officers, etc.
- (b) Junior Research personnel such as Research Assistants, etc.

At the Centre and in States engaged in off-shore fishing there are also the following categories of staff:—

1. Personnel for Fishing Vessels—

- (a) Senior personnel such as Skippers, Master-Fishermen, Mates, Bosuns and Engine Drivers.
- (b) Junior staff such as Assistant Engine Drivers, Deckhands and Fishermen.

2. Engineers—

- (a) Senior personnel such as Marine Engineers, Electrical Engineers.
- (b) Junior personnel such as Assistant Engineers, Supervisors, Draftsmen and Mechanics.

In Bombay, Kerala, Madras, Mysore, Orissa and West Bengal, there are Directorates of Fisheries under the charge of technical officers. In certain other States, Fisheries Departments form a part of the Directorates of Animal Husbandry (Andhra, Uttar Pradesh, Madhya Pradesh, Punjab and Rajasthan), Agriculture (Assam and Bihar) or of other Departments. The Heads of Fisheries Sections in these States are variously designated as Deputy Directors, Fisheries Development Officers, Fisheries Officers, Wardens of Fisheries, etc. In West Bengal, Bombay, Orissa, Madras, Kerala and some other States, there are large Departments of Fisheries, staffed, to some extent by suitably qualified and experienced technical officers. In some other States, such as Rajasthan, Punjab and Madhya Pradesh, the Fisheries Departments are small and relatively poorly staffed.

The organisational pattern at lower levels also varies from State to State. In Madras, for instance, the Director of Fisheries is assisted by two Deputy Directors between whom the work is divided on a regional or functional basis. Below the Deputy Directors are Assistant Directors, each in-charge of a District or of a small group of districts or of special projects. Each Assistant Director has 2 to 4 inspectors and below them are Sub-Inspectors and Demonstrators, etc. Andhra and Kerala have a somewhat similar pattern, the essential point being that the Assistant Director is in-charge of fisheries work at District level.

In West Bengal, on the other hand, there is an Assistant Director who may be, more or less equated in status with the Deputy Directors of Madras. Below the Assistant Directors are Superintendents in-charge of work in a District or a group of Districts. Next below the Superintendents are District Officers who are, more or less, equivalent to Inspectors in Madras.

The organisational set-up of Fisheries Departments in most of the States in India is given in Appendix VI.

3.2. The nature of Governmental Fishery Programmes and of the duties to be performed by Governmental Staff.

In order to be able to assess the requirements of Governmental services for training facilities, the Committee had to ascertain the duties to be performed by the staffs of those services. The Committee has first made a review of the programmes themselves, more especially of the programmes established under the Plans and has sought to identify the essential elements of these programmes. It has found it convenient to consider these elements in two principal groups: firstly, the programme activities directly concerned with assisting or managing the fisheries; secondly, those concerned with collecting information relating to the fisheries and fishery industries. These activities may be listed thus:—

Direct:

Supply.—The procurement and allocation according to appropriate systems of producer requisites such as twine, lines, hooks, nets, engines and their spare parts, fishing boats, etc.

Coordination.—Measures taken to ensure that the operation of the several phases of the fishing and fishery industries are appropriately linked to ensure smooth working.

Organisation.—Work to promote and assist the formation of cooperatives and private firms and the setting up and operation of ice-making plants, cold storages, processing establishments and boat making and other ancillary industry. Included here also are the organisation of transportation systems by water, road and rail and of wholesale markets.

Operation.—Executive action in connection with fish seed collection and distribution, working of fishing vessels, swamp reclamation, weed control, etc.

Finance.—Disbursement of loans, subsidies and other financial assistance.

Regulation.—The enforcement of such controls over fishing, processing and marketing as may be required for smooth and efficient working and to ensure the highest quality of the product.

Extension.—Dissemination of information to operatives to enable them improve their operating methods and carry these out with the greatest efficiency.

Indirect:

Intelligence.—Making reports at regular intervals on events in the industry and the collection, compilation and analysis of statistical data.

Research.—The conduct of studies on resources and other factors of production in order to maintain and properly utilize these resources under varying circumstances, and to discover means of augmenting them by intervention (e.g., fish culture).

The nature and scope of the work of these kinds carried out in the various States is described in periodic reports on the progress of schemes under the Plans and in statements prefacing new proposals. The Committee has direct acquaintance with many of these activities in the States and is convinced that these activities are not only necessary but that there is a need to expand them especially on account of the five year plans.

The staff of the Governmental services required for the performance of these duties fall under two principal categories: the generalist staff, who have responsibilities of some kind for most, if not all, of these activities, and specialist staff required for particular activities. The generalist staff are best represented by the District Fishery Development Officer concerning whom the Committee offers detailed comments later in this chapter. As examples of the specialist staff may be mentioned the cooperators, extension officers, statisticians, technologists and research workers of various kinds.

3.3. Competence of Staff

In the course of work on developmental plans, it has often been found that for various reasons targets could not be reached and allocation of funds had to be reduced. Mention has already been made of the effect of restrictions on foreign currency that have limited procurement of certain necessary supplies, which has been an important factor in reducing the pace of development of some of the schemes. In others, however, it has been found that the deterrent has been the inadequacy in terms of numbers and of competence of staff responsible for carrying out the schemes. In discussions with State Fishery officials, the Committee was frequently informed both that the staff available was inadequate for execution either of the current schemes or those under consideration in the Third Plan, and that certain categories of staff had insufficient practical experience to be able to discharge their duties.

3.4. Conditions of Service in Fisheries Administrations

The Committee has found that, generally speaking, the conditions of employment in the fishery services are such that they do not attract staff of the right quality required for Governmental programmes.

In the first place, the remuneration is insufficient. Emoluments of fishery officers doing similar work vary from State to State. In States having separate Directorates under the charge of technical officers, the scale of pay of the Director may vary between Rs. 500—800 and Rs. 1,000—1,800. In other States in which Fisheries Departments form a part of the Directorates of Agriculture or Animal Husbandry, etc., the scale of pay of the topmost officer in-charge of fisheries work may be anything between Rs. 250—750 and Rs. 500—1,200. There is a similar disparity in the pay scales of officers in charge of work at the zonal, district and lower levels. One result of this difference in emoluments is that whereas States offering relatively higher salaries to their Fisheries Officers are able to attract reasonably good quality recruits to staff their Fisheries Departments, States with poor scales of pay often get only the “rejects” of other Departments.

There is also considerable disparity between the emoluments of fisheries officers and those of comparable officers employed in the Departments of Agriculture, Animal Husbandry or Forestry, almost invariably to the disadvantage of the former. Because of the poor emoluments of fisheries officers in general, young men with good University careers seldom seek employment in Fisheries Departments.

What is stated above has a direct bearing on the question of setting up training courses for fisheries personnel. However good a training may be, the quality of the graduate will depend materially on his initial capacity to assimilate the training. The courses of training in fisheries at the Polytechnic Institutes illustrate this point. The syllabus of these courses is excellent, but because of the low level of educational qualifications and intellectual development of the entrants, this training is not serving any useful purpose.

It is, therefore, of the utmost importance to offer sufficient inducement to young men with good University education to seek careers in Fisheries Departments. Unless emoluments of fisheries officers in general are made more attractive than they are at present, Fisheries Departments will continue to be staffed mostly by the rejects of other Departments offering better pay and conditions of service. The Committee is, therefore, strongly of the opinion that the salaries of fisheries officers at different levels should not be lower than those of comparable officers in Departments of Agriculture, Forestry, etc. This has been accepted as a principle at the Conference of State Ministers in charge of Fisheries held at Mysore in August 1958, but has yet to be implemented in most States.

Secondly, the Committee has found that the status and structure of the fishery services are such as to reduce the professional standards of the work. There is usually an excessive concentration of authority and responsibility at the higher levels of these services and insufficient delegation of powers at District level to such an extent as to destroy capacity for initiative. The Committee, therefore, considers that to improve morale, to increase efficiency and to develop initiative on the part of officers handling programmes in the field, there should be greater delegation of powers.

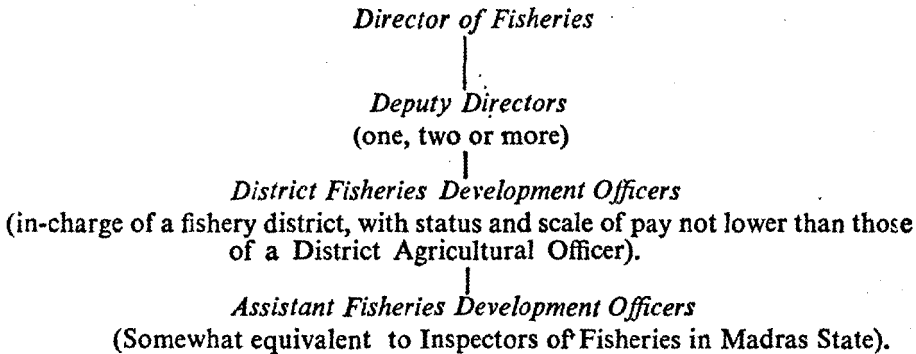
Another feature of Fisheries services which, in the Committee's opinion tends to lower and reduce efficiency is the unusually large number of temporary posts and the Committee would recommend that as large a proportion of these posts as possible should be made permanent.

The Committee would also like to recommend that the cadres of Fisheries Departments should be simplified and, as far as possible, made uniform in all the States. In the first place, it is absolutely necessary that there should be separate Directorates of Fisheries under the charge of technical officers. Experience in the past has been that in States in which Fisheries Departments form a part of other Directorates, such as Agriculture, Animal Husbandry, etc., fisheries work has generally suffered. This work is of a highly technical nature and a non-technical officer at the head of a Fisheries Directorate is seldom able to perform the duties of this post, other than those of a purely routine administrative nature, with the efficiency, speed and economy of effort that the situation requires. The Committee has come across instances of orders being issued by non-technical Heads of Fisheries Departments which are not only technically unsound but of a kind that compliance with them is altogether impossible. As an extreme instance of this kind may be mentioned the prescribing of fry collecting and stocking of ponds throughout the year by an administrator who refused to take into consideration that fish have spawning seasons! Situations of this kind cause confusion and slow down the tempo of fisheries development.

At the present time, in many departments of fisheries, it is not uncommon to find persons in responsible positions handling fishing projects without the requisite practical experience, often to the detriment of developmental plans. This is not intended as a reproach on the personnel now engaged in fisheries work, many of whom are extremely enthusiastic but their contribution would have been far superior if they had better training.

The Committee would suggest the following pattern of administrative organisation for fisheries for the States :

Under the Director of Fisheries, there should be one, two or more Deputy Directors to handle work on a regional basis, their number depending on the importance and potentialities of fisheries in the State. The Deputy Director should supervise the work of a number of Fisheries Development Officers, each in-charge of a fishery district. The District Fisheries Development Officer should be made responsible for all aspects of fisheries work in his district. He should be a gazetted officer and his status and scale of pay should not be lower than those of a District Agriculture Officer. A number of Assistant Fisheries Development Officers, somewhat equivalent to Inspectors in Madras and some other States, should assist each District Fisheries Development Officer, their number, again, depending on the importance and nature of fisheries work in the district.



Special projects such as administration of integrated development projects already referred to in Chapter II, organisation of large fish farms, development of reservoir fisheries, etc., should be treated as Fishery Districts. Each of these should be under the charge of a Fishery Development Officer who may have Assistant Fisheries Development Officers and other technical staff to assist him as in a fishery district. Officers of this kind would correspond to the "General Officers" mentioned in the Report of the Agricultural Personnel Committee.

The organisational set-up suggested above will not only be suitable from administrative and development point of view but will also help in developing a pattern of training for fisheries officers. Though the Committee's intention is that the trainees of the proposed Central Institute of Fisheries Education, after successfully completing their course of training, should be eligible for appointment as District Fishery Development Officers, it realises that for administrative reasons it may not always be convenient or feasible to appoint them as District Officers in the first instance. Some of the trainees of the Institute will thus be appointed as District Officers, whilst others will be appointed, initially as Assistant Fisheries Development Officers. In the latter case, it is expected that they will have every prospect of being promoted as District Officers within a short time, say, 3 to 5 years. It will thus be necessary to have at the Institute only one main course, for the training of officers of the status of District Fisheries Officers. The Committee visualises that in course of time the vast majority of District Fisheries Officers, and Deputy Directors and Directors of Fisheries, in all States of India will have received at the Institute a thorough and comprehensive training in fisheries of the kind proposed in this Report.

3.5. District Fishery Development Officers, the Key Personnel

Of the various levels of administration at which State Fisheries Departments operate, the most important is that of the District. The gap between the Administrative and Research personnel on the one hand, and the fishermen, on the other, is unfortunately a large one in India. Government effort should be directed to narrowing this by the provision of appropriate officers with the right type of training in the field of fisheries and with requisite administrative competence.

It is important to recognise the distinction between the training to be given to officers of this kind and that which is required by the fishermen who are to employ the new techniques of fishing. The latter are to be trained exclusively to a high degree in fishing operations. The former, although they must have direct personal acquaintance with such operations, must be trained in an entirely different range of techniques. This will become clearer from the account given in the following section of the duties of the District Fishery Officers and the qualifications that they would require to possess in order to perform such duties.

Duties of the District Fishery Development Officers—The Committee envisages the District Fishery Officer as the senior Governmental Officer with responsibility for the administration of Governmental services of the fishery industries of his district, for keeping his Government fully informed of the status of the industries along with their need for and possibilities of development and with special responsibility for the implementation of Developmental programmes. His administrative duties would include the collection of statistical and general information concerning the industries; functions relating to financial assistance; general regulatory functions; organisation of training, boat building, etc.; organisation of cooperatives and of marketing and distribution and assistance to the industry in obtaining its supply of equipment, material and commodities. His developmental responsibilities would also include the management of extension services and of schemes for the distribution of new equipment and supplies. A detailed job description is given in the Appendix I.

Qualifications and experience of District Fishery Officers—In order to discharge the foregoing duties, the District Fishery Officer would have to be well acquainted with the natural resources being exploited and with the natural setting of the industry. He would have to know the technical characters of its capital equipment, *i.e.*, its craft and gear, its fish farming units, processing and transport equipment. He would also need to know the kinds of skill possessed by the manpower of the industry. Government programmes and administrative techniques by which they are implemented would have to be at his fingertips and, especially, he would need to know the contribution that research work would make to fishery management and development.

Essentially, the District Fishery Officer would need to know the fisheries of his district in considerable detail and be able to identify and to form plans to deal with their problems. The Committee envisages that, at least eventually, the District Fishery Officer would have a team of technicians to deal with particular sectors of the industry and it would be his responsibility to ensure that his team functioned efficiently in accordance with the directives that he will have received from his Government. It is expected that he himself would be possessed of certain technical abilities such as the identification and measurement of fishing units and the survey of situations where it is contemplated to establish fish farms. The range of such abilities that might be possessed by the District Fishery Officer is given in the Appendix I(b). The Committee wishes to emphasise that it does not expect that every District Fishery Officer would be highly skilled in all of these, although it would expect him to be highly skilled in some and well acquainted with the others.

3.6. Conclusion

Result of the Committee's enquiries with regard to the activities which the Central and State Governments wish to carry out has been to indicate that the staffs available to them for these activities are inadequate both in numbers and in competence. The Committee believes that in the States the insufficiency in numbers of the District Fisheries Officers of appropriate qualifications is one of the most powerful factors retarding the progress of the developmental schemes. There are also manpower deficiencies in other fields which are discussed in the next Chapter.

CHAPTER IV
Manpower Requirements

Contents

	PAGES
4.0. Introduction	31
4.1. Discussion of Agricultural Personnel Committee's findings on requirements of trained personnel	31—33
4.2. Research and Technological Personnel	33
4.3. Technical Administrators	33—35
4.4. Extension Specialists and Instructors	35—36
4.5. Requirements of Fish Culture Specialists	36
4.6. Fishery Statisticians	36
4.7. Marketing Specialists	36—37
4.8. Fishery Co-operators	37
4.9. Fishery Engineers	37—39
4.10. Fisheries Boat Personnel	39—40
4.11. Technical Shore personnel	40—41
4.12. Conclusion	41

CHAPTER IV

MANPOWER REQUIREMENTS

4.0. Introduction

The analysis which the Committee has made of the structure of Indian fisheries industries has revealed deficiencies in the existing manpower complements in various fields. These deficiencies exist even with regard to current operations so that wastage is greater and cost higher in certain sectors than they need be. Possession of greater skills by certain operatives and the availability of greater numbers of operatives at certain key points would reduce losses, increase production and reduce unit cost. This situation is serious with regard to the developments in the Second Plan and will be even more serious with regard to the developments contemplated in the Third Plan.

The importance of trained manpower has been emphasised in the Interim Report. In the following sections, the Committee proposes to discuss the various categories of manpower required and to indicate the skill which personnel in each category should have. Wherever possible, the best estimates available of the numbers of personnel in each category is indicated. These numerical assessments are, at best, only tentative estimations and the Committee realises the severe limitations confronted in working out exact manpower required in a developing economy which is so closely inter-linked with parallel activities taking place in various phases of the fishing industry.

Before dealing with these requirements in detail, the Committee must draw attention to two principal requirements in general with regard to the necessary manpower complement. First, the changes expected to be effected in the industry call for considerably improved skill among its operatives. Secondly, these developments require that a more practical outlook towards the problems of the industry should be maintained by all categories of personnel in the prosecution of their duties and in particular by those who are responsible for imparting training. There must be a shift from a purely academic training to training with a strong applied bias intended for the solution of practical problems in fisheries.

In this Chapter the skills required and the types of personnel are dealt with together with notes on possible lines in which training could meet the existing deficiencies. In Chapter VI and VII the training projects advocated by the Committee are dealt with in detail.

4.1. Discussion of Agricultural Personnel Committee's Findings on requirements of trained personnel

As much of the initiative in developing India's fisheries will have to be provided from the public sector, extra demands are put on the administrators in the Central and State Fisheries Departments. According to the Agricultural Personnel Committee of the Planning Commission, the lack of regular training facilities has hampered progress and fisheries work, therefore, developed in a haphazard manner. The Personnel Committee summarises its views on this point as follows :—

“Now that the preliminary work has been completed and a programme for the development of fisheries has been undertaken it is time that the *ad hoc* arrangements for training of personnel are replaced by regular system of institutional training to prepare candidates for taking up higher position in the Government and in the industry”.

The Agricultural Personnel Committee has assessed the need for senior administrative personnel at 350, i.e., 200 District Fishery Officers and 150 General Officers and that of specialist personnel as shown in the table below :—

<i>Designation</i>	<i>Requirements</i>
Fish Culturists	120
Fishery Co-operators	120
Fishery Technologists	80
Fishery Engineers	50
Research Personnel	150
Marine Engineers	50
Master Fishermen	50

While the Committee is in general agreement with the above assessment, it feels certain changes are necessary in the numbers indicated as well as in the classification of skills given in that report. This is not surprising, since much further work towards planning the development of fisheries has taken place subsequent to the preparation of the report of the Agricultural Personnel Committee. It is felt that a stratification of duties somewhat different from the above is likely to develop as a result of the existing and future administrative arrangements for fisheries. The Committee agrees with the broad pattern of district administration for fisheries, providing for above 200 District Officers and another 150 officers of comparable status for development projects, development centres and for duties somewhat similar to those of the District Officer. To differentiate between research personnel and development personnel, the Committee also thinks it desirable to designate the latter as District Fishery Development Officers. Officers of a lower status, *i.e.*, Assistant Fisheries Development Officers or Inspectors as now exist in many States, are also likely to find a definite place in the administrative machinery as indicated in Chapter III.

In addition to the above, the Committee recognises the need for specialist personnel in the field of Marketing, Extension and Statistics. The State-wise distribution of all these categories of posts is extremely difficult but the Committee is giving its assessment of trained personnel (Table III) required for a country as a whole by 1966.

Table III
FISHERIES PERSONNEL FOR INDIA
Revised Assessment of Technical Personnel for Fisheries required by 1966*

<i>Category of Personnel</i>	<i>Estimated Number</i>
District Fisheries Development Officers	350
Assistant Fisheries Development Officers, Fisheries Inspectors etc. ..	500
Research & Technological Personnel	250
Extension Specialists	50
Fishery Statisticians	50
Fishery Marketing Specialists	75
Fishery Co-operators	200
Fishery Engineers—	
Fish Farm Engineers	} 30
Reservoir Engineers	
Refrigeration Engineers	
Electronics Engineers	
Marine Engineers	50
Engine Drivers	100
Boat Building Foremen	50
Naval Architects	10
Fishing Boat Personnel—	
Skippers for large vessels	50
Skippers, Master Fishermen, Mates etc. for large and medium vessels	150
Gear Technicians	50
Technical Shore Personnel—	
Master Mechanics	50
Fish Processing Technicians	120

*This list does not include trained fishermen, field staff and lower administrative and extension staff below the level of Inspectors.

A more detailed analysis of the categories of personnel required is now possible. This is attempted in the broad classification given below :—

1. Fishery Research and technological personnel;
2. Fishery management and development personnel and executives with varying ranges of responsibilities and staff for assisting them;
3. Fishery Extension workers and extension instructors to give training to field workers;
4. Technical shore personnel which would include skilled labour and technicians for shore equipment, cold storage ice factories, transportation, processing and packaging;
5. Fish culture specialists, primarily for work in inland waters;
6. Fishery engineers;
7. Fishing Boat Personnel which would include skippers, master-fishermen, gear technicians, engine drivers, marine engineers and trained fishermen for mechanised fishing;
8. Specialists in marketing and co-operation; and
9. Fishery Economists and Statisticians.

4.2. Research and Technological Personnel

Research and technological personnel are required for the research institutes dealing with fisheries and it is obvious that such personnel should have very sound and complete academic education pertaining to their own basic fields of study followed by research experience. This category of persons, who would require high level institutional and academic training consists of scientists engaged in creating new knowledge or effecting improvement in existing knowledge, for application in the various fields of development. It cannot be too strongly emphasised that the highest possible educational standards should be maintained in the initial and later training of research and technological personnel. This training is at present done principally by the Universities, although, with the gradual elimination of Master's Degree by research at the University centres, the responsibility of research institutions to train this category of personnel is on the increase. The Committee would, however, like to emphasise that initial training in basic research should continue to be with the Universities and academic institutions and the recent efforts of the Ministry of Education and the University Grants Commission to strengthen fundamental research in University centres in physical and natural sciences are a necessary and welcome development. The Committee would, therefore, like to see increased emphasis placed by Universities on the training of researchers in the field of aquatic biology and, in fact, all fields of research pertaining to fisheries.

In the Committee's opinion, the attention which problems pertaining to fisheries have so far received from the Departments of Economics in the Indian Universities is negligible. The Committee would like to see intensive studies taken up in different parts of the country with more active workers taking up research problems in fisheries economics pertaining to production, trade, marketing, utilisation, price structure, consumer preferences, sociology of fishing populations, impact of modernisation of fishing industry on the social structure and similar other problems.

It is anticipated that there is need for about 250 persons trained for undertaking research on biological, technological and other fishery problems during the Third Plan.

4.3. Technical Administrators

One of the most efficient means of establishing a stable administrative machinery in fisheries is to follow the pattern of district-wise administration so that all parts of the country will receive due attention from the point of view of development and utilisation of fishery resources. Of the

large number of administrative districts in the Indian Union, numbering about 375, it is not considered necessary that there should be a corresponding number of fishery districts. On the other hand, there are certain administrative districts which require division into more than one fishery district. The Committee feels that the country could conveniently be divided into about 200—220 fishery districts from the point of view of resources or development potential. This pattern has been accepted in the Agricultural Personnel Committee's report, where it is indicated that in addition to the district officers there would be need for about 150 officers of comparable status who would handle, other fishery work in the public sector or occupy corresponding positions in the industry. Allowing for the small number of officers already trained and available in the various States and who could discharge their duties without further special training, the Committee agrees with the Agricultural Personnel Committee that about 300 persons will have to be trained as District Fisheries Development Officers by the end of the Third Plan.

The need for training in this field has been brought out in the previous chapters where the structure of Indian fisheries, its scope for development, existing shortages of personnel and deficiencies in current training programmes have been indicated. It may still be asked whether the need for the training of personnel required for administrative purposes could not be met by in-service training, in existing State Fisheries Departments, of persons recruited through normal channels.

In-service training always tends to become stereotyped and in the long run means isolation and stagnation, unless sustained effort is made to assimilate from outside full knowledge of recent advances. The reliability of in-service training alone is questionable as it is more by accident than by design that a man who goes through the fisheries service at the various stages of promotion will have as his superior an officer who has a real ability for training his subordinates. Further, the training is in most cases haphazard and ineffective. The Committee feels, therefore, that the country should not place too much reliance on in-service training unless it is preceded by regular institutional training. This view is also supported by many Directors of Fisheries in the States.

Unless the trained personnel or at least part of the required personnel is placed in positions by the beginning of the Third Plan, the Committee feels that the country would run a great risk of not being able fully to implement fishery development plans and would fall far short of the target envisaged in regard to fish production. It is evident that fisheries has not received the attention it deserves during the Second Plan in several States and although reasonably good financial allocations were made in the beginning these have had to be drastically reduced mainly because of the rather slow rate of progress in utilisation of funds. The Committee hopes that this will not be repeated in the Third Plan.

(1) *District Officers*—In its Interim Report, the Committee has recommended the establishment of training facilities for this category of officers on a temporary basis at Bombay, taking advantage of certain institutional facilities currently available there. The Committee hopes that this training would be started as early as possible in 1959.

It may be noted that against the anticipated requirements of about 350 persons by the end of the Third Plan there are in the country scarcely 50 persons available at present to man positions corresponding to the status of the District Fisheries Officers. The deficit will have to be made good during the coming six years and this will be possible only if theoretically about 50 officers are trained every year. However, there is likely to be a time lag in the absorption of trained persons, as posts have to be created by the Central and State Governments against planned programmes. This calls for caution against an undue increase in the number of trainees during the first few years. For the interim course for District Fisheries Development Officers the Committee recommended that a batch of 30 trainees from various States may be admitted at a time and that this course should start in 1959.

When the Committee's proposal was discussed with the various State Governments, the response has been most encouraging and so far the States of West Bengal, Orissa, Andhra Pradesh, Madras,

Kerala, Mysore and Bombay have agreed to send nominees. Similar discussions with the Directors or Senior Fisheries Officers of Uttar Pradesh, Bihar, Madhya Pradesh, Punjab and Kashmir, held by the Committee at New Delhi, have revealed an equally encouraging response to the proposed programme of training. The Committee has no doubt that all, or almost all the States will be keen to participate in the training programme when it is started.

It is the Committee's view that when a permanent institute for higher training in fisheries is established its basic course should conform to the pattern of training proposed for the District Fisheries Development Officers, as outlined in the Committee's interim report.

(2) *Assistant Fisheries Development Officers*—It was impressed on the Committee during its visit to certain States that in addition to the need for training District Officers, there is a real need for the training of a lower category of officers, known in different States as Fisheries Inspectors, Assistant Fisheries Development Officers, Assistant District Fishery Officers, etc. In all States, a good proportion of some of the higher posts is reserved for promotion from the junior officers and unless these officers have had a good training to begin with, it is doubtful if, after promotion, they will be able efficiently to perform the duties of the District Officer. The Committee feels that there is some force in this argument.

The need for junior officers is particularly manifest in the field of inland fisheries where a considerable amount of technical administration and supervision is handled at levels lower than that of the District Officer. In view of the importance of inland fish culture in a large number of States, the Committee feels that if a training course lower than that for the District Officers is organised, it is desirable to give it a strong bias towards inland fisheries. It is estimated that about 500 persons of this category including fish culture specialists would have to be trained.

4.4. Extension Specialists and Instructors

One of the weaknesses of fisheries development work in India has been the absence of an adequate extension service. In several fields, especially those pertaining to inland fisheries, considerable advances have been made in research laboratories but the results of research seldom reach the fish farmer expeditiously. The Cuttack sub-station of the Central Inland Fisheries Research Station and some State institutions have developed useful techniques in fry rearing and transport, artificial spawning of carps, swamp reclamation and in various other fields, but few State Governments have made full use of these developments. There is hardly any arrangement for instructing the fish farmer about the suitability of a pond for fish culture, of the sources of fish fry, of the species to be stocked, the density of stocking, artificial feeding, if necessary, eradication of predators, pests and excessive vegetation and other problems that arise from day-to-day. The entire technique of mechanised fishing involving new boats or engines for existing boats, new fishing gear and modern fishing methods, is a field of extension work in sea fishing. As other instances in which fishermen need instruction in marine fisheries may be mentioned improved methods of handling, transport, preservation, processing and marketing of fish, utilisation of sea weeds, sea shells and fishery by-products.

Though extension is legitimately the responsibility of State Governments, there is no organised extension service in any State. The Central Government has recently set up a small number of extension units on a regional basis but these can hardly meet the requirements of a properly organised extension service, which should go down to the village level. The Committee is, however, gratified to learn that in some States, especially Orissa, the need for a well-organised extension service is now being fully appreciated. The Committee was informed that, in this State there is a proposal to have some 500 extension workers at the village level and it expects that similar proposals will be taken up in other States also in the Third Plan. Though the village level workers can be trained by the State Directorate of Fisheries or the Central Fisheries Extension Units, there is a need for the training of extension instructors.

Extension specialists are required at different levels of work and as instructors. There are difficulties in giving a numerical assessment of the numbers but in the Committee's opinion 50 district and other Senior Extension Specialists, some of whom will be instructors for lower staff, would probably meet the requirements of the Third Plan.

4.5. Requirements of Fish Culture Specialists

Both in district as well as in selected areas, the Committee feels that services of fish culturists will be required in increasing numbers at what may be called at specialist or technician level. The Agricultural Personnel Committee estimates that 120 such persons may be required. It is difficult to differentiate clearly between functions which may fall on fish culturists of this type and those who work in inland areas as Assistant Fisheries Development Officers with special reference to inland fishery problems. The Committee considers that the demands for such trained persons will not be confined to Government services and that private agencies will increasingly draw trained people to work in the fish culture industry.

A very considerable emphasis on inland fisheries development is being placed in the Third Plan and the actual number of persons who would require training is much more than what has been envisaged by the Agricultural Personnel Committee. For organising technicians training for fish farming and village level workers a good number of persons will also be required as instructors. In view of these, the Committee is inclined to think that training for fish culture should be combined with the training proposed for Assistant Fisheries Development Officers for which special arrangements have been recommended in Chapter VII. The estimate of 500 persons given in para 4.3(2) would include the fish culturists mentioned in this paragraph.

4.6. Requirements of Fishery Statisticians

There is no organised machinery in the country for the collection of fisheries statistics. While some information is available about the total landings of sea fish, no data are available on the production of inland fisheries, disposal and utilisation of fish catches, market prices, etc. There is also no arrangement for statistical assessment of the progress made in the implementation of various developmental schemes. The collection, analysis and interpretation of fisheries data of various kinds in a reliable manner are of great importance not only in assessing the present status of the resources and its exploitation but also in planning future development.

In recent years, the Central Marine Fisheries Research Station has started the collection and analysis of data of sea-fish landings on the basis of random sampling. The existing machinery for collecting these data along the coastline of nearly 3,000 miles is rather inadequate. The Indian Council of Agricultural Research has also undertaken some experiments in certain parts of the country with a view to devising suitable techniques of sampling of sea-fish landings. In most of the States, however, there is hardly any organisation for the collection of fisheries statistics. Though statistical work in agriculture and certain other fields has made considerable progress in India and statisticians are being trained for this work, similar attention has not been paid to fisheries and there is acute shortage of statisticians specially trained for fishery work.

The Committee hopes that effective organisations for fisheries statistics will be developed in India during the coming years. It is estimated that by the end of the Third Plan there will be need for some 50 statisticians specially trained in various aspects of fishery statistics.

4.7. Requirements of Marketing Specialists

Even though fish production in India is relatively large, arrangements for marketing require a great deal of improvement. The gap between the price that the fisherman gets for his produce and that the consumer has to pay for it is generally unduly large. The existence, in some cases, of three or more stages of 'middlemen' operating in the marketing chain adversely affects the interests

of both the producer and the consumer. Supplies of fish are not only uneven in different parts of the year, but there are areas of glut side by side with large parts of the country where the supplies are extremely meagre. Loss through spoilage is often heavy. With proper marketing arrangements and the expansion of transport, packaging and refrigeration facilities, the position can be greatly improved.

The Agricultural Personnel Committee do not appear to have made any assessment of the requirements of trained personnel for marketing of fish in the country. The present Committee estimates that at least 75 trained persons would be required for this work by the end of the Third Plan. It is expected that in addition to the existing fleet, approximately 5,000 mechanised boats would go into operation for sea fishing by the end of 1966 and that there will be some 50 coastal centres at which most of these boats will be concentrated. As each of these centres will become an area of major production and will require the services of a marketing expert, 50 trained persons will be absorbed for this work alone. Another 25 will be needed for work in inland centres and to help large marketing co-operatives.

4.8. Fishery Co-operators

Though the organisation of cooperative societies has made considerable progress in the field of Agriculture, a sound cooperative movement has still to be developed in fisheries. On account of the increasing emphasis on cooperation, the Committee envisages that much of the developmental work in fisheries in future will be handled by cooperative societies of different kinds, such as those dealing with production, marketing and other services. For a proper organisation and management of these societies, personnel specially trained in cooperation work will be urgently required. These trained personnel will not only help in promoting the setting up of cooperative societies but will also provide managers, secretaries, etc. to such societies.

According to the estimate of the Agricultural Personnel Committee, 120 trained cooperators will be required by the end of the Third Plan. On account of the large-scale expansion of fisheries in Third Plan and the emphasis on cooperation, the Committee is inclined to raise this to 200 trained persons.

4.9. Fishery Engineers

It is increasingly realised that persons with basic training in engineering and with special knowledge of particular fields of engineering related to fisheries activities are essential for the successful prosecution of some of the fishery programmes. Five special fields of engineering experience have application in fisheries work. The Committee is not separately dealing with a very small number of electronics and harbour engineers who would also be required in addition to the skilled engineers discussed below.

(1) *Fish Farm Engineers*—Although constructing fish ponds and reclaiming swampy areas for fish culture are fairly simple problems, much could be achieved by improved methods in the design, construction and maintenance of fish ponds. This is particularly so if full use is to be made of available area and water supply. Fish pond engineering has also become important in connection with soil conservation problems. In the marine field also engineering problems impinge on questions of reclamation of coastal fallow waters for conversion into marine or brackish water fish farms. Persons required for this kind of work are essentially civil engineers who have had opportunities for specialisation either by in-service training or by specialised study in this field after obtaining an engineering degree.

(2) *Reservoir Engineers*—The Committee has, in Chapter II indicated the importance of development of fisheries associated with large bodies of inland waters, particularly those resulting from multi-purpose river valley projects. Fishery management in these waters is connected with engineering problems of a very different type. As example of these problems may be mentioned

regulation of inflow and outflow, maintenance of water level, prevention of fish from overflowing from areas where they are stocked, etc. There is the special problem of migratory fish stocks the maintenance of which, for regular fisheries, may depend on the provision of fish ladders, fish passes or other specially designed fish ways. For this also persons with basic engineering qualifications but with special training or experience in this kind of work would be required. A problem which has recently come to the fore in the development of fisheries of larger reservoirs is the obstruction caused by boulders and large trees which have to be removed before the reservoirs are initially filled.

(3) *Marine Engineers*—Engineers for large fishing vessels require very special training in the theory and working of internal combustion engines. Fishing industry of the world is at present largely based on diesel power and it is well-known that qualified persons with sufficient experience in the operation of diesel engines for larger vessels are in short supply in India. About 50 qualified engineers will be required for fisheries by 1966.

Apart from marine engineers with a high degree of competence in the operation and maintenance of marine diesel engines, there is need for a very large number of engine drivers, who although not specialists in marine engines nor sufficiently well-versed in theory, should have practical training in the handling of engines on the small and medium sized fishing vessels. In many of the smaller mechanised vessels the skipper is also the engine driver. Until recently, most of the mechanised boat operators on the Bombay coast secured their training in engine driving by actual work on the boats. The new fishermen's training centres for mechanised fishing opened in a number of States during the Second Plan provide for institutional training in the operation and maintenance of engines. The number of these centres will be largely increased in the Third Plan and the skipper engine drivers required for about 5,000 small mechanised boats proposed by 1966, will be trained at these centres. There will, however, be need for training engineers for the larger vessels and engine drivers for medium sized boats of say 50'—60' length.

The Committee estimates that in addition to 50 engineers for the larger vessels, at least 100 certificated hands will be required as engine drivers for medium sized boats.

(4) *Naval Architects and Boat Builders*—Improvements in the marine fishing techniques are closely connected with improved designs of boats to be operated from different parts of the Indian coast. These may either be by the introduction of entirely new types of craft or by improving the existing types of craft. Boat building activities are expected to increase on a considerable scale in the III Plan but if these activities are to succeed, the Committee foresees the need for a small number of boat building engineers or naval architects. Such persons should be qualified naval architects or persons with engineering qualifications followed by training in boat designing and building. These persons will design new types of boats, improve existing designs, supervise boat building yards and organise training of foremen referred to below.

Apart from naval architects, a fairly large number of persons skilled in the actual construction of boats will be needed. These persons would conform roughly to the category of foremen and their assistants in the boat building yards. In addition, there will also be the need for a large number of trained carpenters. While the latter could be selected from existing craftsmen, it is very necessary that the foremen should be given organised training. An attempt to give this type of training has been made at the Central Fisheries Technological Station, Cochin, with the help of FAO naval architects. While this has served a useful purpose in training fisheries officers in some aspects of work related to boat designing and building, the Committee is of the opinion that this kind of training is not suitable for foremen and that special arrangements should be made to train them. About 50 boat building foremen will be necessary by 1966.

(5) *Refrigeration Engineers*—Large-scale expansion in fishing and the attendant increase in the secondary and tertiary phases of the fisheries industries would place heavy demands on skilled persons, familiar with the installation, operation and maintenance of ice and cold storage machinery

and refrigerated transportation. These are again specialised engineering skills to be acquired by persons with basic training in electrical engineering. As refrigeration industry is rapidly expanding at various other fields as well, it is likely that organised facilities for training such engineers will be developed by engineering institutions. But failing this, electrical engineers joining fisheries work should be given suitable in-service training in existing installations.

4.10. Fisheries Boat Personnel

(1) *Fishermen for mechanised fishing*—The most important category of personnel to be trained in the field of marine fisheries is the fisherman. In the Third Plan it is proposed that about 5,000 mechanised boats will go into operation in the different maritime States and assuming that on an average at least 2 persons trained in the handling of mechanised boats and in fishing from these boats are required for each mechanised craft, 10,000 trained fishermen will be needed by the end of the Third Plan. This would mean a turn-over of about 2,000 trained fishermen per annum. The Committee has noted that the *Ad Hoc* Enquiry Committee appointed to investigate the working of mechanised fishing boats has recommended a minimum course of study of one year for such fishermen. During its visits, the Committee observed that 20 to 30 fishermen are given training at a time in the centres which have already come into existence. It is, therefore, visualised that at least 50 centres for giving training to fishermen, will have to be instituted, each centre handling 40 trainees. As part of the scheme of marine fisheries development, the starting of about 50 integrated development centres has been indicated and the Committee is of the view that trained fishermen in mechanised fishing should be brought within the scope of activities of these integrated centres.

(2) *Gear Technicians*—With the expansion of mechanised fishing in in-shore and off-shore waters, the Committee feels that persons skilled in the design, construction and operation of improved types of fishing gear will be required at many centres. It is estimated that about 50 persons would be required by the end of the Third Plan. They will also be employed as instructors at the fishermen's training centres while others may be required in the shore organisations from where fishing fleets operate. A beginning to impart training to gear technicians should be made at the Craft and Gear Wing of the Central Fisheries Technological Station and the Committee understands that this Station has started, on an experimental basis, organised training in the construction and operation of gear for shrimp trawling. In the light of experience gained, it should be possible to decide how best a general course in gear technique could be evolved and to what extent, if any provision should be made for specialisation in particular fields.

(3) *Skippers, Master Fishermen, Mates, etc.*—The rapid development that has taken place in the sea fisheries of India and its anticipated acceleration in the Third Plan will necessarily require the employment of a large number of persons competent in fishing operations of various kinds and qualified to take charge of fishing vessels of different types and sizes. It is expected that there will be a substantial increase in the number of large vessels fishing in distant waters and a much larger increase in the medium sized and small mechanised boats operating in coastal and adjoining off-shore waters.

According to the report of the Agricultural Personnel Committee of the Planning Commission, it is estimated that 50 skippers-cum-master fishermen will be required in the Third Plan for operating larger vessels. There is no assessment of the personnel required to be trained for manning the medium sized and smaller boats. The Third Plan targets for mechanised fishing boats is about 5,000. The Committee envisages that not more than 150 boats are likely to require certificated skippers. The number of persons to be trained as Skippers-cum-Master fishermen will thus be about 200. This estimate is on the conservative side since some of the larger vessels will require more than one certificated hand.

The Committee understands that according to the present rules of the Indian Mercantile Marine Department, four years' work on sea on a vessel or vessels above a certain specified tonnage or length is required for qualifying a person to appear in the examination for Mate's certificate. It is estimated that it will require about the same length of time to give a person suitable training to fit him for the

work of a master fisherman. Some relaxation in the rules of the Mercantile Marine Department may be necessary in so far as work on sea on boats of a minimum specified tonnage or length is concerned.

The Committee is informed that the Government of India is giving at present a training of this kind to 12 candidates on their larger fishing vessels operating from Bombay and Cochin. A somewhat similar training is being given to a small number of candidates on the vessels of the Indo-Norwegian Project also. Likewise, the Nautical College at Bombay, under the Ministry of Transport, gives training in navigation and handling of ships but this training does not naturally concern itself with fishing operations.

In order to arrange for the training of some 200 persons required for the expansion of sea fisheries as envisaged in the Third Plan it will be necessary to expand materially the existing training facilities. In addition to the 12 candidates now under training on Government vessels, it should be possible to give training to another 20 or 30 candidates. As the trainees will mostly replace the normal crew of the fishing boats, there should be no difficulty in placing one or two trainees on each of the medium sized boats also. Similarly, the boats of the Indo-Norwegian Project could probably train 10—15 candidates. The possibility of obtaining from the open market persons already possessing Mate's certificates granted by the Ministry of Transport and giving them intensive training in fishing methods for a year or so, may possibly provide another 2-3 candidates per year.

The Committee understands that there is a proposal under the consideration of the Ministry to set up an institute, possibly with assistance from some foreign aid fund, for the training of fishing operatives at various levels. Such an institute will no doubt be equipped with suitable fishing vessels. It may be possible to train a small number of skippers-cum-master fishermen, say 8—10 at this institute. The number of trained candidates could be increased if persons with some years of approved sea service are taken for training.

The total turn-over of certificated hands for manning the larger and medium vessels would be of the following order:

Central & State Government vessels	..	..	..	..	..	50
Indo-Norwegian Project vessels	..	..	..	..	..	15
Open market	..	..	..	..	..	15
Operatives Training Institute	..	..	..	..	..	20
						100
						by 1966

As against the anticipated requirements of about 200 persons only 100 will be available even on a very liberal estimate. This reveals a serious shortage in the availability of master fishermen, skippers and other certificated hands. In the opinion of the Committee this deserves immediate attention because the expansion of the sea fishing industry both in the public and the private sector is so closely connected with the availability of trained fishing boat personnel.

4.11. Technical Shore Personnel

Personnel required for work on the shore at mechanised fishing centres and at larger assembling centres of inland fisheries are of various kinds. The higher technical and supervising personnel are included in the District and sub-District level training and under the headlines Fishery Engineers, some of the remaining categories of personnel for whom organised training will be necessary are given below:

(1) *Master Mechanics*—Almost all of the 50 coastal centres at which large-scale mechanisation of fishing will take place, will require proper workshop facilities for the installation and maintenance of engines. Each workshop will require a number of mechanics. A least

one trained foreman or Master-mechanic will be needed in each workshop. Progress in mechanisation of fishing boats has been somewhat slow in the past on account of the inadequacy or lack of facilities for the proper maintenance of and repairs to diesel engines. The Committee is convinced that setting up of suitably equipped workshops under properly trained mechanics is absolutely necessary for accelerating the rate of mechanisation. This is also essential to obtain long and economic service from the engines. The number of trained master mechanics will be about 50.

(2) *Food Processing Technicians*—There is even now a highly organised fish curing industry in India. The Committee has indicated in Chapter II the possible changes which the industry will undergo *i.e.*, the substantial improvement in the fish curing practices, the establishment of freezing and canning plants on a much larger scale than at present and increased emphasis on the efficient utilisation of by-products of the fisheries industries. These changes would require trained persons on a considerable scale. Fish processing by the use of machinery is in its infancy in India but rapid expansion is indicated and it is likely that persons required for fish processing industries will not be readily available in the open market. The Committee realises the need to have a considerable number of persons trained in the chemistry and the technique of processing fish and fishery products. It is possible to differentiate between the higher category of technological personnel who should have a sound background of chemistry and allied sciences and who would be responsible for the scientific and technological work relating to fish processing industry as against a large number of technicians required for fish curing yards and other fish processing establishments. The industrial establishments which the Committee has visited have emphasised the need for providing trained personnel who would act as foremen in the fish processing factories and who would be supervising the work of skilled and semi-skilled labour employed in the handling and processing of fish and fishery products.

4.12. Conclusion

In various aspects of the fishery industries the Committee realises that there would be need for technicians skilled in many other fields than have been outlined above. It is not easy for the Committee to tabulate all such skills but an attempt has been made in the above paragraphs to indicate the more important types of technical skills which the expanding fishery industries of India would require in the coming few years covered by the Third Plan period.

CHAPTER V
Existing Arrangements for Training in Fisheries

Contents

	PAGES
5.0. Introduction: General considerations	45
5.1. Training of research workers, specialists and senior staff .. .	45—47
5.2. Training of staff of middle levels	47—49
5.3. Training of Operatives	49—50
5.4. Conclusion	50

CHAPTER V

EXISTING ARRANGEMENTS FOR TRAINING IN FISHERIES

5.0. Introduction: general considerations

Fisheries science, as a subject of study, has not received much attention from educationists in India. The low status of fishermen, lack of education among them and the general apathy towards fisheries in a country where higher learning was largely associated with persons of a strictly vegetarian upbringing may be some of the reasons for the omission of this subject from the curricula of studies in schools in general and in most universities of India. The lack of attention to fisheries education is not surprising for other reasons also; institutional training even for agriculture, is somewhat recent. Training in fisheries, as a composite science, has developed only in recent years even in countries in which fishing and fishery industries are old and well-established.

The training in fisheries still continues to be on an *ad hoc* basis in India. There is no institution in the country where composite training in the different fishery subjects is provided to prepare candidates for appointment to senior administrative and research posts in Government or to managerial posts in private industry. The senior personnel in Government posts have largely depended on foreign training after taking a good degree in Zoology in an Indian university. This has been supplemented by in-service training.

The number of persons who could go abroad to seek higher education is relatively small and such persons often select subjects which offer them, on return to India, a more attractive career than fisheries service does at present. A very small number of persons is selected by Government and sent abroad for higher training under foreign aid programmes but this training is for some special subjects only and does not cover a general field of studies in fisheries.

The training facilities presently available in India can be classified into two groups; firstly those provided by the universities, which are autonomous bodies, and secondly those under the control of the Union or State Governments.

5.1. Training of research workers, specialists and senior staff

(1) *In Indian Universities*—No university in India provides comprehensive course of study in fisheries. Among the 35 universities in the Indian Union, 20 have provision for instruction on "Fish and Fisheries" to meet the requirements of one out of several papers for the M.Sc. or B.Sc. (Hons.) Degree in Zoology. Of the remaining fifteen, some universities, as for example, those of Roorkee (U.P.), Jadavpur and Vishvabharati (both in West Bengal), give training in certain specialised fields only, and it is beyond their scope to provide courses in fisheries. The Jadavpur University, however, gives facilities to its students in chemical engineering degrees courses to study some aspects of fishery technology as a part of one paper on food technology.

The table given below indicates the universities which provide, have provision for, or propose to initiate courses which have a bearing on fisheries as part of their advanced teaching in Zoology.

<i>Subjects</i>	<i>Universities</i>
Fishes	Allahabad, Agra, Lucknow, Saugor and Patna.
Fish and Fisheries	Aligarh, Banaras, Patna, Calcutta, Delhi, Kerala, Osmania and Rajasthan.

<i>Subjects</i>	<i>Universities</i>
Marine biology	Annamalai and Kerala
Freshwater and Marine Zoology	Bombay
Marine Zoology	Gujerat and Madras
Biological Oceanography	Madras, Andhra and Kerala
Hydrobiology	M.S. University ¹ of Baroda
Food technology	Jadavpur
Limnology	Poona ²

Extracts from the syllabi for fish and fisheries and other subjects of allied nature provided for study in different universities are appended (Appendix VIII). In several instances, there are no facilities for practical training.

The emphasis in all the university courses is naturally on academic teaching only. Many of the universities where fishes or fish and fisheries are taught as a special subject at the B.Sc. (Hons.) or M.Sc. (final year) level, impart knowledge relevant to either inland or marine fisheries. Teaching is mostly on fisheris rather than fisheries.

One of the most serious deficiencies in these university courses of study is that teaching is restricted almost entirely to the zoological aspects of fisheries. Important aspects of Botany, Chemistry, Economics and some other subjects, which, along with Zoology, are the essential components of Fishery Science, receive little or no attention. The concept that Fishery Science is only a branch of Zoology, which unfortunately still exists in India, is, in the Committee's opinion, largely responsible for the uneven development in various fields of fisheries. The existing instruction in fisheries in the Indian universities tends to foster this concept.

The pattern of post-graduate studies in Zoology in Indian universities is at present undergoing a radical change. In many universities, the M.Sc. degree was being awarded on the basis of research work only, while in some other universities written examination, coupled with varying amount of research, formed the basis for the award of this Degree. It is now proposed that research work will be practically abolished; except, perhaps, for one paper out of a total of six or seven papers, the M.Sc. Degree will be awarded by regular written and practical examinations. Further, in most universities there will be one optional paper for which a student will be free to choose fisheries as a subject. While the proposed changes will, no doubt, strengthen the quality of general education, it will not make the graduates more suited to be of immediate use either to a fisheries department or to the fishery industries. University authorities also are generally of this view.

The Committee visited a number of Indian universities and held discussions with several Vice-Chancellors and Professors. The opinion was expressed very strongly that there is a real and urgent need to establish a regular course of training in fisheries science as a professional course, comparable to the existing courses in agriculture, veterinary science, forestry, dairy science, etc. Similarly, the Committee found, what it believed to be, unanimous opinion on the part of university authorities that a course of this nature should be established by the Government as it will not be practicable or even appropriate for a university to undertake this work. Further, practically all the contacts with whom this matter was discussed agreed that the course of training should be at degree level, that its duration should be two years, and that the basic qualifications for admission to the course should be the Bachelor's Degree in Science. Only one Vice-Chancellor suggested that admission to the course should be open to candidates who have passed Intermediate Science Examination and that the course should last for three years, the first for teaching of a pre-professional nature and the remaining two for regular training in fisheries subjects.

Mention may be made here of the training in naval architecture and marine engineering at the Indian Institute of Techonology, Kharagpur where a degree of Bachelor of Techonology, with

1. Proposal for starting this subject is under consideration.
2. May consider the possibility of introducing this subject at the post-graduate level.

Honours in Naval Architecture is awarded. The duration of the course is four years and twelve candidates are admitted annually. Minimum qualification for admission is Intermediate in Science with Physics, Chemistry and Mathematics. Training is mainly in the design and construction of large ships and there is no specialised course in fisheries naval architecture.

(2) *In foreign countries*—Many senior fishery workers in administration and research have received training in foreign countries over and above their university training in India. Since Independence, some fifty or more persons have been trained abroad in one subject or another relating to fisheries under Government training schemes. The training period has varied from a few weeks to three or four years. Most people who went abroad have been trained in research institutions under the guidance of well-reputed scientists and the research work on which the trainees have been engaged, after their return to India, has often been of a very specialised nature. Such specialised experts are highly necessary for the research institutes in India. The overseas training has not always been followed by employment of the trainee on his return in the field of his specialisation and the investment in their training thus has not always been fully used.

The trainees have gone to a number of countries; the majority went to the United Kingdom and the United States. Since many of the students have been trained with financial help from various technical assistance programmes, it is possible that the choice of subjects and the place of training may have been restricted. The Committee feels that the most effective arrangement may not have been made in all cases. In addition, some officials and others have gone on brief study tours of a few weeks' duration to various countries and still others have participated in *ad hoc* regional training centres.

The Committee has been impressed, in going through the list of scholarships for training in fisheries granted over the last ten to twelve years, by the fact that a relatively large proportion of these was awarded for specialised branches of natural sciences whilst relatively few were for fisheries technology and economics. This is due chiefly to the absence of formal training in fisheries technology and economics in India and the lack of posts to which students could aspire, as a consequence of which few were attracted to these subjects. In the interest of fisheries development in India, the Committee recommends that steps be taken to encourage students of engineering, industrial chemistry, economics and other related subjects to specialise in fisheries technology and fisheries economics.

The Committee's conclusions with regard to training in foreign countries is that much of what must be called "waste" has occurred; and whilst obviously this "waste" ought to be reduced, the Committee considers that, in the long run, India must give the greatest part of the training to fisheries workers within the country itself. Visits to foreign countries, which should not be altogether abandoned, should only be for very specialised subjects directly connected with the line of work that the persons concerned will take up after their specialisation.

Indian workers have participated in FAO training centres in fisheries in statistics (Bangkok, 1953; Bombay, 1959), inland fisheries (Indonesia, 1953 and 1956), marketing (Hong Kong, 1954) and cooperatives (Australia, 1958).

5.2. Training of staff of middle levels

(1) *Central Fisheries Training Schemes*—A programme of training in fisheries was initiated in India by the Union and State Governments during the last decade. The Union Government (Ministry of Food and Agriculture) has organised training at various places and of late some of the State Governments have either started training institutions on a small scale or contemplated doing so. Many States are, however, still relying on the in-service training of their fresh and old employees or on the training organised by the Union Government at the Central Inland Fisheries Research Station.

The Central Inland Fisheries Research Station at Calcutta (Barrackpore) has provided, since 1948 a ten months' training course in the development and administration of inland fisheries. Most of the trainees are generally nominated by different States. A small number of private candidates is also admitted, although every year more and more such candidates show their willingness to join this course. Previously there was provision for training only twenty candidates; later, in view of the large expansion of developmental programme in India and the increasing need for trained personnel, the training capacity has been increased, since 1956, to 35 per year.

Minimum qualification of private candidates for admission to the course is B.Sc. with Zoology. So far, 195 candidates have been trained. The detailed syllabus for this training course is given in Appendix VIII (a) Briefly speaking, the course includes: fishes; fundamentals of fishery biology; ecology of inland waters; riverine fisheries; lacustrine fisheries; estuarine fisheries; inland fish farming; fishery statistics; fishery technology; fish marketing; socio-economics and fisheries administration.

A training centre was started at the Central Marine Fisheries Research Station, Mandapam, in 1948. Two sessions were held in 1948-49 and 1949-50, but for lack of sufficient nominees from State Government, the training was abandoned in 1950. The syllabus given in Appendix VIII (b) included oceanography, marine fisheries, fishery biology, pearl and chank fisheries, socio-economics, inland pisciculture, fisheries technology, elementary navigation and seamanship, fishery food products and fishery by-products.

Although the Barrackpore Course is serving some useful purpose in so far as it is the only organised and institutional training in fisheries available in the country at present, the Committee is not satisfied either with the syllabus of this course or the way in which the candidates are trained. The training is mostly of a theoretical nature, is more or less restricted to inland fisheries and lays undue stress on the biological aspects of fisheries. The staff provided for this course is extremely inadequate.

All Technical Assistance, channelled through FAO, TCM, Colombo Plan and other agencies has an educational purpose also. A relatively large number of experts in various subjects, provided under these programmes, have worked in India and trained their counterpart workers.

Two *ad hoc* courses of training in boat-building were organised by FAO Naval Architects in 1957 and 1958 at the Central Fisheries Technological Research Station, Cochin. Trainees were nominated by the States. The first two elementary courses were of six months' duration. The third course was of three months, duration and at a more advanced level.

(2) *State Fishery Training Schemes*—In 1946, the Madras Government established a Ploytechnic Institute at Kakinada (which has now become a part of the Andhra State) and the Government School of Technology at Madras was converted into a Central Polytechnic. There is also a Central Polytechnic at Kozhikode in Kerala with which is amalgamated a former Polytechnic in the old Travancore-Cochin State at Kalamassery.

The syllabus of the Madras Polytechnic is very similar to the syllabi followed at the Central Marine Fisheries Research Station, Mandapam [Appendix VIII (b)] and the Kakinada Polytechnic [Appendix VIII(g)]. These courses comprise three years' work in the Institute and one year of practical training in the State Fisheries Department, at the end of which a diploma—licentiate in fisheries technology and navigation is awarded. The Polytechnic at Kakinada also gives a six months' certificate course to fishermen.

The Committee visited both Polytechnic Institutes on the east coast and discussed their training courses with the Principals and members of the teaching staff. The syllabi of these courses are perhaps over-comprehensive, dealing with practically all aspects of fisheries science. The practical

course prescribed is also fairly comprehensive. The syllabi contain many highly technical topics beyond the comprehension of trainees with education up to Matriculation standard, the qualification required for entrance to these courses. In actual fact, however, the training is of an extremely elementary and theoretical nature, and facilities for practical work are almost non-existent. Discussions with several fisheries experts have fully supported the view formed by the Committee from its own study and enquiries that the diploma course in fisheries in the Polytechnic Institutes is not sufficiently useful to justify its continuance. The Committee understands that the fisheries course at the Institute in Kozhikode is about to be discontinued.

Assam, Madras, Orissa and Uttar Pradesh have training arrangements of their own giving six months' training to their future employees, mainly in the lower grades. Bihar also proposes to start a training centre. These centres also train personnel of the Community Development Projects and National Extension Blocks.

The Uttar Pradesh State Fisheries Department conducts an eight-week refresher course at Lucknow for senior personnel. Each batch consists of ten officers, two from each of the five circles into which this State has been divided.

An *ad hoc* refresher course in inland fisheries for the benefit of officers of the Central and State Governments was conducted in 1958 at Cuttack and Calcutta under the joint auspices of the Central Inland Fisheries Research Station and the Fisheries Department, Orissa. Similarly, training was also organised to demonstrate hormone treatment for the artificial breeding of carps.

Most of the training arrangements in the States are in the nature of "In-service training". Training of this kind has its own disadvantages because it becomes stereotyped and rarely brings in new ideas. Instruction is mostly given in a casual manner and the success of training is entirely left to the enterprise and enthusiasm of the trainee. In the Committee's opinion, in-service training is serving only a very limited purpose and will be totally inadequate unless preceded by regular institutional training.

5.3. Training of Operatives

Training in navigation and seamanship is provided in the Nautical and Engineering College, Bombay, for skippers and second hands of fishing vessels.

There are now eight fishermen's training centres located at Veraval, Satpati, Mangalore, Beypore, Cochin, Tuticorin, Nagapattinam and Kakinada; these centres, which are organised jointly by the Union and State Governments, give six months' training courses on a uniform pattern. The candidates are first given theory classes and classroom practicals, and are then trained for three months in mechanised fishing under the supervision of the staff of the Centre. This course includes fishing methods, gear technology, elementary principles of navigation and maintenance of internal combustion engines. There is need to extend the period of training to one year or at least nine months and to increase the number of centres.

On more or less the same pattern the Indo-Norwegian project has been providing six months' training in mechanised fishing to the fishermen of three villages near Quilon since 1953. On completion of training, the fishermen become eligible for the supply of a mechanised boat at subsidised rates. Some 140 fishermen have so far been trained.

Training in mechanised fishing is also provided on large boats of the Central Deep Sea Fishing Station, Bombay, Offshore Fishing Station at Cochin and Tuticorin and on the vessels of the Government of West Bengal (Calcutta) and of the Indo-Norwegian Project (Cochin). The training at the Central Deep Sea Fishing Station, Bombay is for four years and twelve candidates are trained every four years. In view of the larger number of vessels now available with the Government of India, and the increasing need for trained personnel, the number of trainees is being increased to twentytwo.

On the completion of training and on fulfilling certain conditions the trainees become eligible for appearing in the examination for the Mates Certificates held by the Ministry of Transport.

With a view to disseminating scientific information of practical value on fisheries to fishermen, fish farmers, villagers in Community Development and National Extension Service Blocks, and field staffs of the State Fisheries Departments, nine Fisheries Extension Units have been established by the Central Government at Calcutta, Mandapam, Bangalore, Hyderabad, Bhopal, Allahabad, Delhi, Patna and Gauhati. In addition to the usual extension activities, these units also train village level workers, Gram Sahayaks and field fishery staff of State Governments.

One hundred and ninety demonstration fish farms have been established in West Bengal for the purpose of training local farmers in improved methods of pisciculture; a short-term training course for the departmental extension staff has been organised.

5.4. Conclusion

The foregoing review discloses a most unsatisfactory situation with regard to provision in India of training of fishery workers of various categories. The training is largely *ad hoc*, with an excessively academic bias and with inadequate facilities for giving practical experience. The existing arrangements are not capable of training personnel in the numbers required nor do they train to the required levels of proficiency.

The review in Chapter IV has shown that the developmental plans call for a great increase in the numbers of skilled operatives at various levels of industry, and simultaneously a correspondingly large increase in the number of officers able to carry the burden of development on behalf of Government.

One approach to this situation consists in setting up practical training courses for fishermen and other operatives; certain steps have been taken along these lines. However, the Committee considers that equal importance attaches to the provision of persons to become Government officials of practical outlook and with a comprehensive view of the problems of fisheries development. Considering the newness of fisheries science, the Committee is convinced that the latter objective could be achieved only by very strong measures to establish a proper understanding of this science among the fishery workers of India, and it believes that this can be effected only by the establishment of an institution completely and solely devoted to this purpose. From a consideration of the evidence collected by it concerning university arrangement, and other field facilities required for training in fisheries, Governmental Development Programmes, all-India nature of the required training, selection and placement of trainees, and various other factors, the Committee is of the view that the situation calls for the establishment of a Central Institute of Fisheries Education. This does not mean that the proposed Institute will have no connection with the universities; on the contrary, it would rely on them to give basic training to those who enter it; it would rely on the universities also to maintain specialist research work and, in fact, to give certain categories of specialist training.

The Committee envisages the proposed Institute as the pivotal point for all fisheries training in India. Its staff should represent the best of fishery skills in the country, and by its teaching and its research work, the Institute should maintain itself in the fore of the development of fisheries. In addition to giving a general and comprehensive training in fisheries, it should also be possible for the Institute to give instruction to certain specialist categories of fisheries personnel and to give considerable assistance to those responsible for training operatives and other specialists.

CHAPTER VI

Proposals for a Central Institute of Fisheries Education (CIFE)

Contents

	PAGES
6.0. Introduction	53
6.1. Separation of training for Fishery Development Personnel from that for Operatives	53—54
6.2. General considerations concerning the Institute	54—55
6.3. Status of Training	55—56
6.4. Course of Study	56—57
6.5. Curriculum and Time Table for the proposed professional course in Fisheries	57—60
6.6. Staff	61—63
6.7. Duration of the Course	63
6.8. Qualifications required for admission to the Course	63—64
6.9. Proposed field of Research for the new Institute	64—65
6.10. Physical facilities required for the Central Institute of Fisheries Education	65—66
6.11. Location of the Institute	66—71

CHAPTER VI

PROPOSALS FOR A CENTRAL INSTITUTE OF FISHERIES EDUCATION (CIFE)

6.0 Introduction

The Committee's terms of reference required it to assess India's requirements for training in the field of fisheries and to appraise existing facilities in order to determine whether they could cope with the requirements. If it was found that further facilities should be provided, the Committee was then required to report on those facilities. The Committee's work has led it to the conclusion that manpower deficiencies constitute real and serious deterrents to development of Indian fisheries; the Committee has identified these deficiencies even if in some cases it has been unable to give exact estimates of their magnitude. In its view the most serious deficiency, in the sense of the importance of its effect on development, is in personnel required for technical administration and management. Since training for these categories is very similar, the Committee finds itself able to propose a single plan of training to overcome this deficiency. The plan involves the establishment of a special Institute for the purpose and in the following pages a detailed account of various aspects of this Institute is given.

6.1. Separation of training for Fishery Development personnel from that for operatives

Although the training of operatives is equally important, the very nature of the varied skills in which training is required makes it imperative that this should be diversified to an extent that it could not be combined with the training proposed for District Officers. The Committee had the difficult problem of finding a way in which specialised training in different skills, and administrative training for organisation of programmes and efficient supervision, could be separated. The first broad separation is based on the nature of training required by the actual operative for fishing, handling of boats and various other processes in the primary and secondary phases of the industry from the nature of training required for managerial and supervisory positions in the industry and for technical administration in Government departments.

The first category of persons, the operatives who would no doubt require highly specialised training will not require high academic qualifications. They will have to be trained to a high degree of proficiency in actual work with their hands or in the skilled supervision of field or factory operations. In this category may be placed officers and crew on fishing boats, fishing boat engineers, those working in shore installations, processing industries, foremen, master mechanics, specialists in different types of fishing, net making, etc. In the field of marine fishing experience in the handling of fishing boats, practical knowledge of engines and their maintenance, navigational skill and experience in fishing technique will play a large part. In the field of inland fisheries, practical knowledge of collection and transportation of fish seed, artificial raising of fish seed, maintenance and stocking of nurseries and stocking tanks and related skills will be required. In both the fields, an intimate knowledge of craft and gear and of how to use them will be necessary.

The administrative personnel, on the other hand, will require a composite training in a large number of fields pertaining to fisheries, starting with a much higher educational background. While they themselves may not be specialists required to discharge the practical duties expected in every aspect of the fishing industry, they should have sufficient width of experience to diagnose the situation as may arise in the day-to-day handling of programmes and should, above all, know when and at what level to consult the specialist and to enlist his services. They should further be qualified in office organisation and be able to translate in the practical field the directives they may receive from governmental or business organisations in which they may be working. They should also act as co-ordinators of activities in a large number of fields and would naturally wield financial powers and authority to make the work effective.

The Committee has considered whether all these categories of persons should be trained at one Institute or at different Institutes. There are no doubt advantages if the administrative training and the operatives' training are organised at the same place, but practical considerations, however, prompted the Committee to recommend that these two broad categories of training be taken up separately: one specialising in training administrative and supervisory personnel at different levels—a training which will be developed essentially on all-India basis with a single medium of instruction; and the second training specialising in instructing operatives which, although imparting training in various skills on an all-India pattern, should provide, in course of time, for the establishment of several centres to train fishermen under conditions prevailing in their areas and through the medium of their respective local languages. The second type of training, *i.e.*, for operatives will also integrate the training programmes of mechanised fishing which have now been started at the centres established in the States at Satpati, Versova, Mangalore, Bepore, Cochin, Tuticorin, Nagapattinam and Kakinada. The two schemes of training should also maintain the closest liaison, because both in the programmes of training and in the placement of trained personnel in developmental programmes, the two categories of personnel should have opportunities to know fully the type of skills being taught. There should, however, be some suitable arrangements for administrative integration of the two types of training and it should be possible for trainees in the administrative field to spend some time at the centres where operatives are trained and *vice-versa*.

In suggesting the separation of administrative and operative training, the Committee has also in mind the possible development of the Administrative Training Centre as a Regional Fisheries Institute with assistance from the United Nations Special Projects Fund as well as the possibility of an Indian Operative's Training being organised under some other foreign aid programmes. In case the Institute becomes a regional or an International Training Centre, steps should be taken to ensure that adequate number of seats are reserved for Indian trainees.

6.2. General considerations concerning the Institute

(1) *Its primary function to train development and managerial personnel*—The Committee wishes to emphasise that it is of the essence of its proposal with regard to the Central Institute of Fisheries Education that its primary function is to train District Fishery Development Officers to be able to assume the broad responsibilities of their post as outlined in another section and to make effective contribution to the developmental schemes initiated within their district. Two considerations have led to this view. Firstly, as described in Chapter III and further developed in Chapter IV, the Committee believes that considering the initiative being taken by Government, at Central and State levels, and the dependence of the developmental plans on Governmental participation in various forms, much will depend on the efficiency with which this participation can be effected. In this picture the role in which the District Officer is cast is of determining significance. Secondly, the wide scope of duties attributed to the District Fishery Officer is such that the course required for his effective training must traverse the entire field of fisheries science; hence the setting up of a course for this officer will provide a broad and satisfactory basis from which training could be developed for other staff, at higher as well as at lower levels. This may either be by specialisation in particular fields, or by modified versions of the District Officers' course. In addition, the course designed for the District Officer contains many elements required by those who will undertake management of private enterprises and the Committee envisages that this course should be suitable also for such personnel.

Hence, although this Chapter deals with the establishment of an Institute to train District Fishery Development Officers, it is to be recognised that the Committee has these other aspects also in view, some of which are dealt with in more detail in the following paragraphs.

(2) *The relative value of generalisation and specialisation*—During the different stages of its work in the organisation of a training course in Fisheries, the Committee was confronted with the problems of specialisation. In India, where problems of inland culture fisheries, on the one hand, and of the sea fisheries, their adequate development and utilisation, on the other, are so different

in their scope, organisational approach and administrative arrangements, it is natural to think that the country would benefit by separate courses of training in inland and marine fisheries. The special situation prevailing in some States concerned with inland fisheries only must also be noted. The success of any system of training will largely depend on the States' participation in the training.

In spite of apparent divergence in the training required for inland and marine fisheries, the Committee feels that an all-round professional training in a composite subject like Fisheries should be a basic training in the science as a whole rather than a somewhat narrow specialisation in one field or the other. The academic reasons in favour of this approach are strong particularly if the proposed course is to form the basis for a degree in later years. There are also strong practical considerations which make it necessary to combine inland and marine fishery training. The major fishery resources of the country are in the field of marine fisheries. Most of States where fisheries wealth rank high are those having interests both in marine and inland fisheries. The Committee's discussions with the Directors of Fisheries have indicated that many of them would prefer a common training for marine as well as inland work because administrative considerations may necessitate transfers and change of responsibilities from marine to inland work and *vice-versa*. There are many areas of the country which require equal attention in marine, estuarine and inland fisheries. Many basic ideas relating to management of fishery resources, introduction of improved techniques of fishing, fish handling, fish processing and marketing have been developed in connection with marine fisheries. Persons who have had the benefit of education in these branches of study would be better equipped to deal with situations that may arise in inland fisheries as well in an expanding fishing industry than those trained only in inland fisheries. The special techniques requiring emphasis in inland fisheries work are those connected with fish cultural practices and knowledge of this appears to us to be essential also for fishery workers whose primary interests are in the field of marine fisheries.

In the early stages of its work, the Committee was strongly inclined to suggest a bifurcation of the proposed course of study into inland and marine fisheries but with fuller knowledge of the administrative structure and following discussions with fishery specialists working in different part of the country, it has accepted the view that specialisation in branches of fisheries like inland fisheries, marine fisheries, fishery technology and possibly other subjects should be taken up only after the two years' course of study which has been recommended.

6.3. Status of Training

Correct determination of the status of any training programme is often linked with factors other than academic but these are the very factors which may prove decisive for the success or failure of training projects. The Committee has examined in some detail the stage of education at which training in Fisheries should be imparted to trainees. In its proposals for interim training, the Committee has drawn attention to the key position held by officers of the status of District Fishery Officers in the execution of fishery development programmes. One fact that clearly emerges in connection with the training which should be prescribed for such officers is that emphasis should be placed on, what might be called, professional training with equal emphasis on the theoretical and practical aspects of work as against academic training in Zoology and Marine Biology given by the universities. Professional training of this kind exists in India in the fields of Agriculture, Animal Husbandry, Dairy Science and Forestry, not to speak of the more organised courses such as Medical and Engineering Sciences. With the establishment of large institutes such as the Indian Institute of Technology at Kharagpur and other Indian Institutes of its kind planned both for Madras and Bombay, the Committee foresees the emergence of a number of other professional courses. In Fisheries, similar training is long over due, considering the magnitude of the resources, the opportunities offered for their development and the special skills essential for achieving it. The Committee feels that this training in fisheries should begin with a course of study parallel to the one given in Agricultural Sciences having a composite curriculum which would eventually qualify candidates for the Bachelor's degree.

For training in the Agricultural Sciences, trainees are drawn from students who have completed the Intermediate Science Course. While this minimum qualification is prescribed, many entrants to

Agricultural and Veterinary Colleges are in possession of a degree in Science with Botany, Chemistry or Zoology as main subjects. The trainees after a period of two years in Agricultural Colleges qualify for B.Sc. in Agriculture. The Committee would recommend a comparable status to the proposed new course although it realises the difficulty of securing degree status for this course of study in the first instance. The Committee has had before it two proposals in this connection. Firstly, the establishment of a course of training in fisheries at post-graduate level comparable in status to the Master's Degree, secondly, the establishment of a course of study at the level of Bachelor's Degree. Many educationists and specialists in fisheries strongly advocated the former proposal of a post-graduate fisheries course. On purely practical grounds, however, the Committee believes that a beginning should be made with a course of study comparable to the Bachelor's Degree, recognition for which should be secured after the first one or two courses have been given leading to a Diploma in fisheries granted by the Institute.

In course of time, with the establishment and stabilisation of this instruction at Bachelor's level, the Institute may develop post-graduate teaching or research at Master's Degree level in any specialised fields of fisheries, but that will no doubt depend on the growth of the Institute and the opportunities for specialisation. The question whether the Institute itself should acquire university status will also depend on the growth of different branches of study at the Institute and the academic standing which the Institute would acquire in different disciplines of study.

6.4. Course of Study

The Committee made a study of the courses given in various countries in the field of fisheries and reviewed the qualifications which the training is intended to give and has proposed a comprehensive syllabus.

The existing method of recruiting graduates in Zoology or persons with advanced degrees in Zoology for fishery developmental work is deficient since such persons, despite possible academic brilliance, lack practical knowledge of the problems connected with fisheries. Fisheries science does not consist of biological knowledge alone; it is a growing science requiring the synthesis of a variety of disciplines of study.

Problems in fresh water fisheries often require for their solution an intimate knowledge of physico-chemical and biological problems constituting the science of Limnology. In the marine field the science of oceanography, so essential for the exploration of the living resources of the sea, has become an indispensable tool for fishery workers. Fisheries are based on living aquatic resources which are renewable and are, therefore, regulated by biological laws, periodicities and natural fluctuations; study of these requires specialised knowledge of population problems in which statistics plays a vital part. One of the chief lines on which information has to be obtained and regularly reported is the progress achieved in the field of development and rating that progress. In this field new methods and techniques remain to be evolved. The candidates to be trained as fishery administrators should also know modern developments in craft and gear technology and the application of recent results in this field for the improvement of fishing operations. What is likely in the Third Plan is a substantial increase in investments for increasing fish production and if that is to be achieved economically and successfully in relation to the capital outlay, the fishery workers should know principles of economics, business administration, commercial practices and related subjects. It is not intended as a reproach on existing fishery administrations that a business like attitude is at present lacking in many fishery projects and unless this deficiency is rectified, it is doubtful if fisheries industries will attract capital investment from the private sector and impress on the public that investments in fisheries can be profitable.

The syllabus which the Committee has proposed takes into consideration all these requirements. It is needless to stipulate here that the experience at the Institute itself will lead to modifications in the curriculum, but the Committee strongly recommends that, to begin with, the programme of instruction should be based on this curriculum. The Committee has also prepared a two year time table for this course based on the curriculum.

It will be seen from this time table that a substantial portion of the time is devoted to practical work. The Committee feels that one of the principal deficiencies in fisheries staff at the present time is the lack of adequate practical experience and would, therefore, place great emphasis on this aspect of training. The proposed course of study places equal emphasis on theoretical and practical training which, among others, includes work on fishing boats, on fish farms and in processing industries.

6.5. Curriculum and time table for the proposed professional course in fisheries (2 years)

I. GENERAL

1. *General Introduction to "Fisheries Science".*

Application to Fisheries of various natural, social and other Sciences.

2. *Geography*

Physiographic, Climatological, Demographic, Economic.

3. *General Economics*

Population; its age, composition, employment, structure, vital statistics, etc. The economic and social structure of a country. Basic concepts such as supply and demand. Role of money. Cost. Rates of interest. Depreciation. Insurance, etc. Government role in economic activities and Fiscal system. Efficiency and productivity. Foreign trade. Exchange rates. Inflation. Deflation. Economic stability. Computation of National income. Contribution to it by fishery industry.

4. *Nutrition*

Basic principles of human and animal nutrition. Balanced diet. Chemistry of foodstuffs-Vitamins. Importance of fish as a source of proteins. Medicinal fish products and Vitamin concentrates.

II. FISHERY INDUSTRIES

Concept of Unit Fishery. General classification of fishery industries. Structure of a fishery in Primary (fishing and fish culture), Secondary (processing) and Tertiary (marketing) phases. Description of fishery industries in India. Dynamics of fishery industries. Operation. History.

III. FISHERY RESOURCES

1. Economic organisms. Identification. Location and general biology.

2. Economic Fish stocks. Location. Structure and magnitude. Dynamics and Theory of Fishing.

3. Environmental studies.

(a) Oceanography

(b) Meteorology

(c) Limnology.

4. Application of resources data for management of fishing, fish culture and protection of resources.

IV. FISHING GEAR AND METHODS

Description of the various fishing methods and discussion of their relative merits. Systematics of fishing gear. Common gear used in India. Gear manufacturing industries. Fishing gear experiments. Design, construction and operation of gear for fishing both in inland waters and in the

sea. Harvesting methods in fish cultivation. Study of materials used for fishing gear and methods for maintaining, repairing and preserving gear of various types. Gear selectivity.

V. FISHING BOATS

Description of various fishing and ancillary craft, their use and relative merits. Fishing craft of India, Principles of specifications of fishing boats, designing to meet special needs of fishing. Choice, operation, maintenance and repair of hull, engine, fish hold, standing fishing gear, fish finding and navigational equipment. Analysis of performance.

VI. NAVIGATION

General Principles of Navigation. Use of Navigation instruments and charts. Fish finding equipment and methods. National and international regulations in navigation. Pilotage. Harbour Rules.

VII. FISHERY ENGINEERING

Elements of Hydrodynamics. Hydrological regimes. Fish passes, ladders, etc. Fish pond engineering. Stream improvement. Design and layout of fishery industrial establishments and markets. Design and layout of Fishing Ports.

VIII. INLAND FISHERIES

River Fisheries—Protection and improvement of spawning grounds and migration routes. Prevention of pollution and protection of stocks against its effects. Improvements of fisheries in irrigation systems. Management of fishing operations.

Lake and Reservoir Fisheries—Establishment of stocks and control of their composition. Fertilisation and other measures to increase basic productivity.

IX. FISH CULTURE

Principles of fish culture—Principal practices of India and of other countries. Main features of carp culture, trout culture, prawn rearing, brackish-water fish culture including cultivation of *chanos*. Selection of species for culture.

Stocking operations—Collection of spawn, hatching and rearing. Hatching and nursery practices. Natural and induced spawning and artificial fertilization.

Fish-farm operations—Different classes of ponds. Preparation of ponds. Stocking rates. Management of water supply and quality. Control of predators and weeds. Feeding practices. Harvesting. Control of diseases.

X. TECHNOLOGY OF FISHERY COMMODITIES

Elements of biochemistry and microbiology of fish and fish products. Problems of spoilage. Preservation, its aims and methods. Classification and characterisation of fishery commodities and commodity standards. Production processes in India and other countries. Fish curing, freezing, canning, dehydration. Fish meal and oils. Vitaminised oils. By-product and ancillary industries. Sea weeds. Quality control and its application to production processes. Refrigeration principles. Ice making and cold storage. Technology of packaging and transport.

XI. FISH TRADE, MARKETING, TRANSPORT AND DISTRIBUTION

Principles of marketing. Physical facilities for marketing :

Premises. Handling facilities.
Transport equipment. Storage.

Sales procedure—Wholesale and retail. Marketing and distribution organisation. Marketing Laws—regulated Market. Use of marketing schemes in Government programmes. Internal and external trade in fish and fish products.

XII. BUSINESS MANAGEMENT INCLUDING COOPERATIVE PRINCIPLES

Principles of cost accounting. Office management. Stock-taking and store accounts. Auditing. Business correspondence. Personnel management. Managerial problems of fishing boats, workshops, processing plants, wholesale and retail firms. General cooperative principles. Review of Cooperative Societies in fisheries of other countries. Cooperative movement in India. Cooperative legislation. Fisheries Cooperatives. Consumers', Producers', Marketing and Service Cooperatives. Cooperatives in relation to other elements of private sector. Specialised versus multi-purpose cooperatives.

XIII. SOCIO-ECONOMICS

Manpower as a factor in production. Review of living conditions of fishermen, their health, housing, income, education and social amenities. Schemes to raise standard of living of fishermen. Social and other insurance schemes. Indebtedness and other problems of fishermen. Role of Cooperatives.

XIV. FISHERIES STATISTICS

Principles of statistics. Techniques of census and sample survey. Collection, compilation and analysis of data on manpower, equipment, fishing operations, catches, processing and marketing. Statistics on prices, costs, earnings, etc. Techniques of measuring progress in development programmes. Use of statistics in Fisheries Research including design of field experiments.

XV. FISHERIES ECONOMICS

Composition, structure, organisation and operation of fishery industries and their cost and earning analysis. Role of fisheries with respect to employment, domestic and foreign trade, standards of living and national income, etc. Special features in the Economics of fisheries industries. Operational analysis. Cost benefit ratios. Considerations of economics in decisions on development programmes.

XVI. LAWS AND REGULATIONS

Concepts of regulation of fishing operations. Methods of Regulation. Laws and regulations pertaining to fishing and fish processing and trade, domestic and foreign. Food and public health laws pertaining to fisheries. International Fisheries Laws and Conventions.

XVII. FISHERIES ADMINISTRATION

Role of Government in Fisheries industry. Patterns of Fisheries Administration in selected countries. Structure of Indian Fisheries Administration. Duties of fisheries staff at various levels. Principles of Public Administration and financial procedures.

XVIII. SPECIAL SUBJECTS

In addition to the general training in the fore going subjects, the Institute should also provide specialised instructions in one of the following subjects within the curriculum approved by the Institute:

- (i) Inland Fisheries
- (ii) Fish Handling and Processing Technology
- (iii) Fishing Gear Technology
- (iv) Fishery Economics and Business Management
- (v) Fish Marketing and Trade

Provisional outline time table for training of Fishery Development Officers—A two year course.

Month	Activity	Vacation	Theoretical		Demonstrations, seminars and laboratory work
			Practical experience	No. of lectures	
(1)	(2)	(3)	(4)	(5)	(6)
		weeks	days	hours	hours
July	Orientation Courses	0		50	100
August	Ditto.	0		50	100
September	Lectures and Seminars	0	5	60	90
October	Ditto.	1	0	40	80
November	Ditto.	0	5	60	90
December	Ditto.	1	0	35	100
January	Ditto.	0	5	50	100
February	Ditto.	0	5	50	100
March	Ditto.	0	5	50	100
April	Ditto.	0	5	50	100
May	Ditto.	0	0	50	100
June	Ditto.	2	0	25	50
July	Work on fish farms	0	30	0	10
August	Ditto.	0	30	0	10
September	Ditto.	0	30	0	10
October	Work as members of fishing team	1	20	0	10
November	Ditto.	0	30	0	10
December	Ditto.	1	20	0	10
January	Statistical field work	0	45	0	10
February	Statistical field work	0			
March	Visits to technological establishments	0	45	0	10
	Ditto.	0			
April	Visits to research institutes.	2	15	0	—
May	Concluding lectures and seminars	0	0	30	60
June	Examinations	0	—	0	20
24 months	Total	2 months	295	600	1270

(To be covered in 22 months)

6.6 Staff

The Central Institute of Fisheries Education, the establishment of which the Committee recommends should have full time staff like any other educational or research institute. The organisation of teaching practical courses and the day to day working of the main course and the ancillary courses will be the responsibility of the staff of the institute. In the paragraphs below are given the minimum requirements of staff for the proper working of the Institute.

The Head of the Institute who would be designated as Director or as Principal, should be a person of wide fishery and administrative experience. The Director will not only organise and conduct the main course for District Fishery Officers, but would also coordinate the various ancillary training courses handled at, or by, the Institute. As Head of a Department, he will be responsible to the Government for the management and administration of the Institute. The greatest possible care should be exercised in the selection of this officer. The Committee is convinced that the success of the Institute especially in its formative phase, will largely depend not only on the technical qualifications and experience of its Director, but also on his personality, initiative, breadth of vision, organising ability and professional standing among fishery scientists of the world. The Committee would also suggest that, in case its main recommendation regarding the establishment of the Central Institute of Fisheries Education is accepted, the Director and some skeleton staff should be appointed immediately, so that the large volume of necessary preparatory work may be taken in hand with the least possible delay.

It will be seen from the curriculum that the proposed course of instruction at the Institute broadly comprises of three divisions. For these three divisions, the Committee proposes Chairs in the subjects of Fisheries Biology, Fisheries Economics and Fisheries Technology.

The professor of Fisheries Biology should be a person with good knowledge of fisheries and with research experience in fishery resources. The course of instruction will be from the resources point of view and not for researches on individual species. To assist in the work of the Fisheries Biology Division, there should be two Assistant Professors. One of them is earmarked for specialised teaching in inland fisheries, particularly fish culture and the other for teaching Oceanography, Limnology and Meteorology.

The Professor of Fisheries Economics should, likewise, be a person with good background of general economics, supplemented with specialised knowledge of fishery economic problems. Apart from Economics, teaching in most of the general subjects other than biological and technological will fall within the responsibilities of the Economics Division. Two Assistant Professorships are proposed for this Section, one dealing with Statistics, Commerce and Business Administration and the other with Marketing and Cooperation.

The Division of Fishery Technology should have as Professor a person with wide technological experience in the field of fishing. The Committee would specially emphasise the importance of selecting a person who has specialised in the primary phases of the industry rather than in the more specialised fields of processing technology for which an Assistant Professorship is suggested. Another Assistant Professorship is necessary for the subjects of fishing boat construction and technological problems of fishing gear. The grouping of subjects in the three divisions is given in Table:—

Central Institute of Fisheries Education

1. Director Assisted by Administrative Officer and Office staff.

Division of Fisheries Technology:

1. Professor Specialist in fishing technology theory and practice.

1. Assistant Professor Fish Processing.

1. Assistant Professor Fishing boat and gear technology.

Division of Fisheries Biology :

1. Professor Specialist in fishery Resource Biology.

1. Assistant Professor Inland Fisheries particularly Fish Culture.

1. Assistant Professor Oceanography-Limnology and Meteorology.

Division of Fisheries Economics :

1. Professor Specialist in Fishery Economics.

1. Assistant Professor Statistics and Commerce.

1. Assistant Professor Marketing and Cooperation (Public Administration under one of the Assistant Professors).

Demonstrators
Field Instructors
Staff for Training Vessels

The distribution of subjects between the Professor and Assistant Professors in any one division will have to remain somewhat flexible to ensure that between the three of them, most subjects in the field of work of the division are covered.

The Committee wishes to place great emphasis on the need for staff of the highest calibre to man the Institute. This is particularly so during its formative years because in this period much of the courses of instruction and studies have to be developed by the staff. Fisheries science is relatively new and there are no text books for composite instruction in fisheries. The creative work involved in the organisation of a new course of study like the present one should be entrusted to persons of the highest professional competence. The success of the training project on which the orderly development of Indian fisheries largely depends can be insured only if instruction is at a high professional and academic level.

Persons of the requisite training and experience are not available in India for the Professorships of Fishery Economics and Fisheries Technology. For these positions, and to some extent, for the organisation of the Institute, it will be desirable to obtain outstanding persons in the respective fields for a few years under any of the Technical Assistance Programmes and to attach promising Indian specialists to work with them so that they will be trained and equipped to take over the full responsibilities within a few years, not exceeding five. Short term external help to cover certain aspects of fisheries biology will also be desirable during the first few years.

It might appear that the staff indicated above as necessary for the Institute, together with the facilities listed in later Sections will make training at the Institute somewhat expensive when calculated in terms of cost per trainee. Even at the highest level of cost, this expenditure will be justified because of the increase of developmental potential that will flow from the increase in competence in personnel.

Furthermore, a relatively high expenditure on training is unavoidable, because of the newness of Fisheries Science and of the wide diversity of subjects to be taught in the different sections of the curriculum. As a consequence of these features, it is quite impossible to find individual members of the staff able to teach more than one or two sub-sections of the curriculum. A parallel example of the need for a large staff exists also in professional institutes in Engineering, Medicine, Agriculture and Veterinary Sciences.

It may be pointed out, moreover, that whilst the intake to the fisheries Institute may be low to begin with, it should be possible for the teaching staff to accept a larger number of trainees after the first few years, when experience shall have been gained. It will of course be noted that whilst the chief function of the Institute will be to train the District Fishery Development Officers, there will be a large volume of teaching and practical work in connection with the various ancillary training courses proposed by the Committee and described in Chapter VII.

6.7. Duration of the Course

From the curriculum and time table given in Section 6.5, it will be seen that full teaching, laboratory work and connected demonstrations and work in the field cannot be accomplished in anything less than two years. In fact, quite a few fisheries experts and educationists with whom the Committee discussed these proposals advocated a longer period of study, viz., three years. The Committee realises that on purely academic grounds, a longer course of instruction would be more beneficial to the trainees and would turn out much better Development Officers than would be possible by a two year course. As against this should be weighed the economic factors which may prevent many prospective trainees, who will have already obtained the Bachelor's degree, from joining a course of study lasting three years in a branch of activity which is new, and considering the existing employment prospects and service conditions, unencouraging. With full utilisation of the time apportioned between theory, laboratory work and actual field work, the Committee feels that a fairly complete course in fisheries could be given in two years.

Of the two years of study proposed, it is the Committee's opinion that approximately one year should be devoted principally to lectures, practical work in the laboratories and short-term field work essentially connected with the lectures, seminars and demonstrations, while during the remaining year the students will be principally engaged in practical work, which should consist of specified periods of duty in fishing vessels, shore installations, fish farms, fish processing laboratories, research and statistical organisations. A strict demarcation between theoretical and practical training spells is not intended.

6.8. Qualifications required for admission to the Course

Prescribing of initial qualifications for joining the course has been a difficult question for the Committee. For the interim course, the Committee has recommended that graduates in any science subject or in Economics may be admitted. While making this recommendation, the Committee had in mind the desirability of prior training in a larger diversity of subjects than the customary but narrow field of Zoology. In inland fisheries, Chemistry and Botany play almost as important a role as Zoology, particularly in pond fish culture and farm management. In the field of marine fisheries, the close impact of marine biology and oceanography places equal emphasis on Chemistry and Biology. In the fish processing industries, there is greater need for knowledge of Chemistry and Food Technology than of the biological sciences. In the overall assessment of resource utilisation, economic development, marketing programmes and related fields, a good knowledge of statistical methods and adequate background in economics would be more appropriate than any specialised knowledge in the biological sciences. Apart from all these considerations, the Committee had to keep in view the fact that the first few batches of trainees will be mostly from among those already employed in the State Fisheries Departments.

In prescribing the initial qualifications for the more permanent course of training in fisheries envisaged at the new institute and which is phased with the existing University studies as a post-graduate course, the Committee has made a re-examination of this question. While the Committee has not found the need to change the above line of thinking that fisheries training should be open to all graduates in Science and in Economics, it realises that practical difficulties and existing University procedures might militate against such a broad-based selection of trainees. This view has been strongly expressed to the Committee by some of the Vice-Chancellors of Universities and many fishery experts. Some of them have advocated that the new training should be exclusively for graduates in

Zoology, a point of view with which the Committee is not in agreement. It recognises, however, that training in Zoology at least as a subsidiary subject or as one of the principal subjects learnt in the Degree course would be an essential qualification for fisheries training. This situation, considered along with the present grouping of subjects in the old Inter Science and in the new pre-University course, would make it difficult to admit students who have only had training in Economics or other subjects under the humanities for this course of study. The Committee would further add that the course should be open to persons without the practical qualifications in Zoology which are indicated above, if they have obtained sufficient professional experience in a Fisheries Department for a period not less than five years.

Taking note of the medium of instruction in Universities of India, the availability of text books and the language proficiency of the available teaching staff, the Committee assumes that the medium of instruction at the new Institute will be English for the present.

As regards the age of trainees to be admitted, the Committee recommends the same age group as is normally admitted to the University Post-Graduate studies, *viz.*, between 18 and 25. Being a new course of study, it will not be desirable to enforce any strict age limits because we expect that for quite a few years a large number of trainees will be drawn from the existing staffs of the State Governments. The Committee considers it desirable, however, to indicate that preference should be given to trainees belonging to lower groups in view of the rather strenuous nature of the course which includes duties on ships at sea or on remote fish farms all involving considerable physical hardship. As far as possible, the trainees should be below 30 years of age.

The trainees should be given stipends during the period of training and also provided with adequate travel grants. The Committee recommends a stipend of Rs. 200 per month. Employees of Central/State Governments should be paid full salary and allowances and if the total emolument is less than the stipend, they should be given additional allowance up to the prescribed stipend.

6.9. Proposed field of Research for the new Institute

No institute of higher learning can maintain high standards of education unless an adequate research climate is created. The teaching staff must be able to draw inspiration from the composite field of fisheries sciences with a particular eye to development. The institute, if rightly handled, can become a common meeting ground for all sciences bearing on fisheries and it may, in addition, provide facilities and staff for certain research activities which so far have not been taken up in India. Provision of research facilities for the staff of the Institute in their own special fields will also be essential to maintain the creative quality of the teachers so necessary in a centre of learning.

From the economic point of view the Institute may provide facilities for scientific analysis of development programmes and for reviewing progress in the execution of the plans as they proceed. This will provide the administrators in the Centre and in the States the necessary basis for comprehensive adjustments in the plans. In the economic field, studies may also be made in the working of cooperatives, in marketing, in the proper design of accounting systems for fishery development units, in naval economics, in cost accounting, etc. Last but not least, the Institute may carry out research with respect to the sociological impact of fisheries development upon the communities concerned and analyse from time to time at a scientific level the methods used and progress made by the fisheries extension service.

The relationship between the new Institute and the existing research institutions should be based on the common objective; successful achievement of fisheries development in the most economical manner. All these institutions put together will, in the Committee's opinion, constitute the scientific environment in the broad sense from which the teaching staff and their students will draw encouragement and inspiration. It is actually expected that some of the permanent teachers at the Institute will be drawn from the existing research institutions and it is to be hoped that these institutions

will also be able to spare some of their workers so that from time to time they could come to the new Institute as guest lecturers in their special fields of competence.

6.10. Physical facilities required for the Central Institute of Fisheries Education

The Committee considers it useful to give below a brief account of the facilities which the proposed new Institute would require. This need not be taken as exhaustive and is mainly intended to assist in the preparation of detailed plans. It is realised that working out full details is intimately connected with the site selected for the location of the Institute. This account is drawn up on the assumption that the average number of trainees for the basic course admitted each year will be about thirty.

(1) Sufficient land for the Institute buildings, workshop, hostel and residential accommodation for staff will be required. The area of the land should not be less than five acres, excepting in places where multi-storied buildings can be put up. It would, however, be desirable to have a large area so as to provide for future expansion of the Institute.

(2) The Institute buildings should have the following:—

(i) *Office and Lecture Rooms*—3 Lecture rooms, one to accommodate about 100 trainees and two smaller lecture rooms each to accommodate about 30 trainees. Two Administrative Office rooms for the Director and the Administrative staff, three professors' rooms, three staff rooms for Assistant Professors and another one large staff common room also to be used for Seminars. There should be also a large Hall which could be developed as a Fisheries Teaching Museum.

(ii) *Laboratories*—

(a) One Biological Laboratory to accommodate 30 trainees for practical work.

(b) One Chemical Laboratory with chemical benches and equipment for practical class of 15 trainees at a time. The Chemical Laboratory should have adjuncts like balance room, chemical stores and gas and water supply.

(c) One Statistical Laboratory with calculating machines and other equipment for statistical work. Laboratory accommodation may be provided for 30 persons.

(iii) *Laboratory Equipment*—Essential glassware and apparatus. At least 15 calculating machines should be available. 15 student pattern ordinary microscopes, 15 dissecting binocular microscopes, two research microscopes, 40 hand lenses, one epidiascope and one 35 mm. strip projector and 16 mm. film projector with necessary accessories.

(b) Separate botanical laboratory is not necessary but adequate herbarium and plant collections should be available at the Biological Laboratory. (c) Demonstration equipment for Oceanography, navigation, fishing, fish finding, etc. (d) Technological Laboratory with pilot plants, testing units and other demonstration equipment, small ice and refrigeration plant and one culture room.

(iv) *Library*—The institute should have a good library which should include standard works on economics, commerce, statistics, zoology, chemistry, botany (especially algology) fishery biology, oceanography and limnology and world fisheries, Indian fisheries in various aspects (including administrative reports), fishing boat and fishing gear, fish processing industries and food technology. We recognise that building up a good library will take some time, but substantial provisions should be available for purchase of books and modern periodicals. The library will require a large hall to be used as a stack room, a room for library staff and a reading room. Microfilms and microfilm readers should be available for literature not available in book form.

(v) *Workshop*—A good workshop for servicing and maintenance of machinery and equipment of the institute is an essential requirement. There should also be facilities in the workshop for attending to at least minor repairs to fishing vessels and fishing equipment. The heavy

machinery and auxiliary equipment of the technological section could also be housed in the workshop.

- (vi) *Hostel Accommodation*—Hostel accommodation for about 35 trainees may be provided to begin with, but it should be capable of expansion. The hostel should have in addition a few rooms for guest lecturers who may visit the Institute. The hostel should be so designed as to provide independent rooms for the trainees and should be furnished on a reasonable scale. The guest room should be attached with baths and well-furnished. In addition to the common dining room and essential amenities, the hostel should have a good common room. The question of hostel accommodation should be reviewed in the light of the decision on the location of the Institute.
- (vii) *Residential Accommodation for the Staff*—If the Institute is near a city or town where private residences can be obtained on hire, only very essential residential accommodation need be provided at the Institute. The Director of the Institute should, in any case stay at the premises as also the Registrar and one or two junior staff. In a place where suitable private accommodation is not easily available, residential accommodation should be provided for all members of the staff either in the premises itself or in a nearby locality.

(3) *Training Ships*—The Institute should have two Training Ships, one a large exploratory fishing vessel with accommodation for trainees and about 80—90 ft. long and the other a smaller vessel of 35—40 ft. These vessels should have berthing and servicing facilities reasonably near the Institute. The vessels, when not engaged in training duties, can be available for exploratory fishing in conjunction with other schemes of the Government. Both the vessels should be very well equipped with modern gear for different types of fishing and electronic instruments. Specifications of the vessels are given in Appendix IX(a) and (b). Both the vessels should be staffed by competent personnel. It is likely that the services of a Skipper and a senior Engineer for the larger vessel will have to be obtained from abroad under some technical assistance programme for an initial period of three years.

(4) *General*—The Institute should be located in a place where protected water supply is available as also electric supply, both in normal and power lines. Transport facilities for taking the trainees to centres of fishing activity nearby should be available. This should include one omnibus type vehicle to accommodate about 30 persons, a station wagon and a staff car.

(5) *Facilities required for the Sub-Centre*—As facilities for the practical demonstrations and field work on fish culture will not be available in the likely Centres chosen for the location of the Institute, the Committee feels that this deficiency must be made good by a Sub-Centre of training where the trainees could spend sometime to learn practical aspects of Inland Fisheries. The Centre would function as a field station of the Institute and will be administratively part of the Central Institute. It should be in an area where fish cultural practices are well developed and a sufficiently large number of fish farms should be available for comparative studies of different methods of nursery, stocking, fishing, etc. The need for hostel accommodation is likely to be the most essential requirement at the Sub-Centre. A hostel for about 30 trainees and five visiting members of the staff will be required. It is likely that a small care-taker staff may have to be permanently attached to the Sub-Centre and residential accommodation for that staff provided. On the laboratory side some essential installations and equipment should be provided.

This Sub-Centre will also require two smaller fishing boats (20—25 ft.) and gear, for demonstration of fishing. Facilities should also be available for demonstrating artificial spawning of carps and collection, packaging and transport of fish, fry and fingerlings.

6.11. Location of the Institute

In the Interim Report submitted by the Committee, the criteria to be considered in selecting a site for a fishery training centre were stipulated and some explanatory notes to each of these criteria

were appended. In view of the importance that the Committee attaches to the criteria and the explanatory notes, these are given below:

- (a) *Access to Fishery Industries*—This must be the paramount consideration for a permanent centre. The trainees should live in a “Fishery” atmosphere and have abundant opportunity to observe a variety of fishery operations in detail. There should be access to marine fishing, inland fishing, fish culture, fishing ports, fish markets, fish processing establishments, etc.
- (b) *Space and Facilities*—The centre will require its own buildings and to be able to house in them various kinds of equipment. For this a suitable site of, say, at least 5 acres should be available. Electricity and water supply should be ample. Docking facilities for the training vessels must be available.
- (c) *Access to Ancillary Industries*—The trainees should be able to visit boat building yards, manufacturing centres of nets and ropes, engine supply and repair shops, ship’s chandlers and other establishments.
- (d) *Proximity to Institutions*—The Centre might need to have the use of institutional libraries, lecture rooms and laboratories but it is assumed that a permanent centre would be endowed with these. Professional contact between the staff of the Centre and the staffs of universities and research and educational institutions would be important for the professional health of the Centre. Some teaching assistance might be drawn from nearby universities and other educational institutions, but it must be stressed that since fisheries science is one of the applied sciences, recruitment of training staff should be rather from fishery research institutions and from among practising fishery scientists than from academic circle.
- (e) *Domestic Accommodation, Transport and Communications*—The Committee has reviewed these criteria in the light of the course of study and curriculum for training Fisheries Development Officers. The Committee visited a large number of centres in India in the course of their work and during these visits it paid special attention to finding a suitable site for the proposed Central Institute of Fisheries Education. The only consideration with the Committee has been that the location of the Institute should be pre-eminently suitable from a purely technical point of view, for giving the best fishery training and experience of the kind envisaged by it. The importance of an atmosphere of a well developed fishing and other fishery industries and of port facilities restrict the choice to some coastal area.

The Committee has considered in detail the following places for the permanent location of the Institute:—

1. Calcutta
2. Cuttack
3. Waltair (Visakhapatnam)
4. Kakinada
5. Madras
6. Porto Novo
7. Mandapam
8. Cochin
9. Kozhikode (Calicut)
10. Mangalore
11. Bombay

CALCUTTA is an important university centre and, in addition, the Central Inland Fisheries Research Station is located at Barrackpore, 17 miles from the city. There is a 10 months' certificate course for training in inland fisheries at Barrackpore. Calcutta is a very large consuming centre for fresh fish, but its fishing industry is not of much consequence. The distance between Calcutta and the nearest marine fish landing place is about 50 miles. Experimental Deep Sea Fishing operations in the Bay of Bengal, with a few trawlers based at Calcutta, have been in progress for some years, but these have not yet resulted in the establishment of a marine fishing industry. No indigenous marine fishing operations exist near Calcutta. On the other hand, inland fishery activities are highly developed in West Bengal, but these would provide only a part of the required training facilities. There is no fish processing industry of any standing in or near the city.

CUTTACK, likewise, has no marine fishing industry. The Committee feels, however, that the organised development of fish cultural practices in Orissa State should be taken full advantage of in any proposed fishery training scheme. It has been impressed by the facilities available at the Kausalyaganga Fish Farm near Bhubaneswar and recommends that a sub-centre of the Institute for training in inland fisheries, be established at this place. It is understood that land can easily be obtained near the existing State fishery laboratory at Kausalyaganga, in close vicinity of the fish farm. The fact that Bhubaneswar is easily accessible by rail, road and air would also be advantageous.

WALT AIR is the headquarters of the Andhra University, with well established Science Departments of direct interest to fisheries. Waltair is very close to Visakhapatnam where good port facilities are available. The Central Government is shortly opening an Exploratory Off-shore Fishing Station there. The existing fishing industry in the area is, however, extremely meagre and the place is, in fact, far away from any important area of large-scale fishing. There is also no fish processing industry at or near Waltair.

KAKINADA, about 100 miles south of Waltair has a relatively better organised fishing and boat building industry and is the seat of the Polytechnic Institute, where training in fisheries is also given. The State Fisheries Department is maintaining a training centre for fishermen in mechanised fishing. The Committee has stated elsewhere that the course of training in fisheries at the Polytechnic Institute is not serving any useful purpose. Harbour facilities at Kakinada are inadequate and there is no fish processing industry of any consequence in the area. Kakinada is also somewhat cut off from the main air or rail routes.

MADRAS is an important centre of biological studies and the headquarters of one of the oldest Universities and State Fisheries Departments. The fish landings at Madras are relatively small. There is no mechanised fishing industry nor any modern fish processing industry. The Committee does not see the prospects of any large-scale expansion of fishing from Madras or its vicinity in the near future owing to the very congested nature of the existing harbour.

PORTO NOVO, where the new Marine Biological Station of the Annamalai University is situated is again another centre associated with a University but there are no harbour facilities, fish processing or large-scale fishing.

MANDAPAM, where the Central Marine Fisheries Research Station is situated, has good laboratories and library facilities. But like other centres dealt with above, the fishery industry in this area is not of much consequence. The locality is somewhat remote.

COCHIN is a centre of considerable fishing activity and is situated in an area where the fishing industry is important and landings are heavy. There are large-scale fishing operations with a variety of indigenous craft and gear and mechanised fishing has been recently introduced at Azhikode, ten miles north of Cochin. A massive fish curing industry has been in existence in the area for a very long time and Cochin has been the centre of dried prawn and fish export trade for very many years. Recently some processing plants for freezing and canning of prawns and other marine

products have been set up and a small, but rapidly growing and lucrative industry for the export of these commodities to the U. S.A. and other countries has been established.

One of the Central Off-Shore Fishing Stations and a part of the Indo-Norwegian Fisheries Project are located at Cochin. The exploratory fishing carried out by the vessels of these organisations and the nearness of rich fishing grounds hold out much promise for the establishment of large-scale commercial off-shore fishing operations in the area.

Cochin is also an important centre of fisheries research, experimental and training work. Both the craft and gear and the processing wings of the Central Fisheries Technological Research Station are located at Cochin, as also the Sub-Station of the Central Marine Fisheries Research Station for work on prawns. The State Fisheries Department maintains a Fishermen's Training Centre, Estuarine Fish Farm and other establishments. An Oceanography laboratory of the Defence Services Organisation has been established at Cochin and the Committee understands that the University of Kerala is also establishing an Oceanography laboratory at this place, with assistance from the University Grants Commission. Some oceanographic research is also being carried out by the vessels of the Indo-Norwegian Project based at Cochin. There is a very good harbour at Cochin, which can accommodate vessels of all tonnage. The harbour, though busy at all times of the year, is still far from congested. Cochin is also a centre of a substantial boat-building industry. There are a number of private and Government boat building yards where newly designed, mechanised fishing boats are being constructed.

The backwater fisheries are well developed, both in capture and culture operations, around Cochin. There are, however, no fresh water fisheries of any consequence in the area.

The Committee understands that land, in or near the harbour area, suitable for the buildings, workshops, hostels, etc. of the Institute can be obtained at Cochin without much difficulty and at reasonable rates. Facilities for berthing, servicing, dry-docking and repairing the Institute's vessels, can also be easily provided and it may even be possible to get a site, where the Institute could have its own jetty. The Committee also understands that both in capital cost and in recurring expenditure, it will be cheaper to locate the Institute at Cochin than in any of the large cities like Bombay or Calcutta.

Cochin is not an important educational centre, although there are two degree colleges at Ernakulam.

Access to Cochin through feeder air routes is easy though train connections with a large part of the country, especially in the north, are far from convenient.

KOZHIKODE (CALICUT) is an important centre of fishing industry and accounts for heavy landings of sea fish. There are research and development departments of the State Government at Kozhikode as also the Sub-Station of the Central Marine Fisheries Station. Fish curing industry is extensive and well developed and freezing of prawns is also being undertaken on a small scale. Fish oil industry is well developed. A State-owned fishmeal plant is under operation. The port, however, is not able to take in large vessels and even coastal traffic is suspended during the South West monsoon.

MANGALORE is also an important centre of fishing industry and has a long established trade in fish and fishery products. The Mangalore port, however, is not an all-weather port and for most parts of the year ships have to remain at a considerable distance from the shore. Fish processing industry, particularly for freezing of prawns, has been started in recent years. The State Fisheries Department has some organisations in Mangalore and has recently opened there a Fishermen's Training Centre and also a small boat building yard. There is no mechanised fishing at present. The development of mechanised fishing from Mangalore, with attendant harbour facilities, will take some years.

BOMBAY is an important centre of fishery activities and has been in the forefront of marine fishery development for many years. The largest number of mechanised boats is in the Bombay State and the rate at which mechanisation is taking place is much faster there than in any other State in India. Most of the catches of the mechanised boats converge to Bombay through various trade channels. The Deep Sea Fishing Station of the Government of India is located in Bombay and has carried out extensive exploratory fishing north and north west of Bombay. One private fishing company for commercial trawling has been operating from Bombay for the last few years.

There is a substantial fish curing industry in places not very far off from Bombay and small quantities of fish meal are being manufactured in the vicinity of the City, although by somewhat crude and unhygienic methods. Some modern fish-processing establishments are being gradually set up in Bombay and there are several cold storage plants, including the large freezing and cold storage plant of the Government of India at the Sassoon Docks.

Marketing of fish is better organised in Bombay than, perhaps, in any other place in India. In addition to being a very large centre of fish consumption, Bombay handles a considerable volume of trade in fresh and cured fish and in fishery products with other towns and States in India and with some foreign countries.

Bombay is an important University Centre and the Institute of Science has been engaged in marine biological researches for many years. An off-shore Fisheries Research Unit of the Central Marine Fisheries Research Station is located at Bombay. The Nautical and Engineering College of the Government of India at Bombay provides certain facilities for the training of skippers and other officers for fishing vessels. The State Fisheries Department has its headquarters at Bombay, in addition to some other establishments, such as aquarium, research laboratories and technological laboratory, which specialises in work on sharkliver oil.

Bombay has a very good harbour, but it is badly congested at practically all times of the year and facilities for fishing boats are utterly inadequate. Port charges of various kinds are very heavy. Engineering and workshop facilities are available in Bombay, perhaps on a scale much better than that in any other part in India. The charge for dry-docking, repairs and overhauls, etc. are however, as high, as to be a disincentive for the expansion of commercial fishing. Bombay is favourably located from geographical point of view. It is on the main international air routes and is connected with most parts of India by train service.

There are no brackish water fisheries near Bombay, nor fresh water fisheries of any importance.

Bombay city is so congested that it will be extremely difficult to obtain a large enough site for the buildings of the Institute in the vicinity of the harbour where even the minimum facilities required for the training vessels of the Institute could be obtained. Extensive enquiries made in official and private circles have convinced the Committee that finding a suitable site for the location of the Institute in Bombay, is, at best, an extremely remote possibility. Even if a site more or less suitable for the immediate requirements of the Institute could be found, it will be at a prohibitive price. Capital cost of land and buildings and recurring expenditure of the Institute will also be heavy. It will not be possible to make adequate provision for possible future expansion and the Institute will always be cramped for space.

The Committee has also deeply gone into the possibility of locating the Institute in some suburb of Bombay. Through the courtesy of the Government of Bombay, it was able to inspect some possible sites, on or close to the sea front at Danda, Versova, Worli and one or two other places. Of all the sites visited, only one at Versova deserves serious consideration. This site is about a mile from Versova fishing village, belongs to the Bombay Government and is nearly $3\frac{1}{2}$ acres in area. The area is perhaps just large enough for the immediate requirements of the Institute, but it is understood that some private land adjoining this site can also be obtained, either by purchase or acquisition, without much difficulty. Municipal water supply and electricity are available.

Versova is a large fishing village about 21 miles from Bombay, with which it is connected by a fairly good road partly traversing some crowded parts of the city. A number of mechanised fishing boats operate from Versova and most of their catch is marketed in Bombay. The fishermen have organised themselves into a number of co-operative societies and there is an ice plant in the village.

Apart from its distance from the educational, research, processing and other industrial establishments in Bombay, the most glaring disadvantage of Versova as a possible choice for the location of the Institute is the inadequacy of its port. It is extremely unlikely that even after further development, the Versova Port will be suitable for vessels with a draft exceeding 8 feet.

An examination of the relative merits of the various sites which the Committee has considered shows that, in view of the importance it attaches to a fishery atmosphere, well-developed fishing and fishery industries and adequate port facilities, the choice will have to be between Cochin and Bombay. The advantages specially in favour of Bombay are its pre-eminent position in fishing industry in the field of mechanisation, its association with University centres, its recognised status in the fisheries cooperative movement and marketing and its geographical location. The disadvantages are the congested nature of the city, the extreme unlikelihood of a suitable site being available in the proximity of a well established fishery area like the Sassoon Docks, the difficulty of finding berthing and other facilities for vessels of the Institute when even facilities for fishing vessels now operating are so inadequate and the very high capital and recurring cost likely to be involved. Taking away the Centre to suburban Bombay will render nugatory many of the advantages listed in favour of Bombay. Whilst the Committee is impressed by the favourable features of Bombay, it has come to the conclusion that some of the disadvantages referred to are so considerable as to make it likely that operation of the Institute there would be attended by great practical difficulties.

In contrast, Cochin not only shares with Bombay many of the special advantages that the latter has but is also favourably placed with regard to the availability of land and berthing facilities right in the midst of flourishing fishing and fast expanding off-shore fishing and fishery industries. The proximity to the Indo-Norwegian Project which is establishing a repair yard and slipway at Cochin is another feature in favour of this place.

Allowing for such disabilities as Cochin undoubtedly has, the Committee is convinced that, on purely technical and practical considerations, the suitability of Cochin for the location of the Central Institute of Fisheries Education far exceeds that of Bombay. It accordingly recommends that the Institute be located at Cochin.

The Committee further recommends that a sub-centre of the Institute for training in inland fisheries be established at Kausalyaganga, near Bhubaneswar in Orissa State.

CHAPTER VII
Ancillary Training

Contents

	PAGES
7.0. Introduction	75
7.1. Training of Research and Technological Personnel	75—76
7.2. Assistant Fisheries Development Officers	76—78
7.3. Extension Specialists and Instructors	78
7.4. Fishery Statisticians	78
7.5. Fish Marketing Specialists	78
7.6. Fishery Co-operators	78—79
7.7. Fishery Engineers	79
7.8. Fishing Boat Personnel	79—80
7.9. Technical Shore Personnel	80
7.10. In-Service Training in Integrated Development Projects	80—81
7.11. Conclusion	81

CHAPTER VII

ANCILLARY TRAINING

7.0. Introduction

An attempt has been made in Chapter IV to assess the requirements of different categories of trained personnel and to indicate the types of institutional training that may be required for each of these categories. The question of establishing a Central Institute of Fisheries Education for training District Officers has been examined in detail in Chapter VI. Having completed this main assignment, the Committee proposes to examine in this Chapter as to how best the additional requirements of trained personnel could be provided for, through courses of training other than the basic two-year course at the Central Institute. Some of the more important of the additional training arrangements required are dealt with in this Chapter, but this is not intended as a complete study of all other training which is required or will in future be required in the large field of fisheries.

A correct appraisal of the training arrangements for fishery operatives is particularly difficult at this juncture. The Committee understands from its Chairman that there are certain proposals for the establishment of a Training Institute for Fisheries Operatives and that an expert team is likely to go into these proposals. It is the Committee's opinion that when such an Institute comes into being, it should be the focal point of all training activities intended for the fishermen and fishery industrial operatives.

7.1. Training of Research and Technological Personnel

The source of recruitment for lower research posts in the Central Fisheries Research Stations and in State Research Units has so far been the Universities. In several Universities, the Degree of M.Sc. is awarded on the basis of research, while in some other Universities this Degree is given partly by research and partly by examination. The practice, therefore, has been to select good candidates with M.Sc. or B.Sc. (Hons.) with research experience for manning the posts of Research Assistants and sometimes of Assistant Research Officers. For most part, these candidates are fairly well-versed in the methodology of biological research. On appointment, they have to be given in-service training in fisheries biological research and in course of time, say, in a year or two, they are able to undertake more or less independent research under the guidance of senior officers.

The pattern of education for Master's Degree is being radically changed and it is expected that very shortly the existing system of awarding the degree of B.Sc. (Hons.) and M.Sc. will be given up in practically all the Universities. It is understood that the B.Sc. (Hons.) Degree will be discontinued and, for the M.Sc. Degree, research will be given up. The latter Degree, will in future, be awarded by examination, possibly supplemented, in some Universities, by a dissertation in lieu of one paper. It is thus likely that the future candidates for research posts, although possessing Master's Degree in Zoology will not have any training in research or even in its methodology and will have to be initiated into fisheries research over a long period in the course of their employment as Research Assistants or Assistant Research Officers. This will naturally retard progress in fisheries research.

The Committee has given careful consideration to the question of future recruitment to fisheries research posts and has discussed this matter with a large number of University authorities, including Vice-Chancellors and Professors of Zoology. It has also consulted many fisheries experts in the country. The consensus of opinion is that, on account of the changed circumstances, there will be a real need for giving some training in methodology of fisheries biological research to candidates who have taken the M.Sc. Degree of Indian Universities before they can become useful research workers in the Central and State Fisheries Research Institutions. The best way of giving the training, in the Committee's opinion, will be to institute a short course of fisheries research at

the Central Institute of Fisheries Education or at the Central Fisheries Research Stations or even at some selected Universities. Candidates with Master's Degree in Zoology either before or after appointment as Research Assistants, should receive an intensive training in methodology of fisheries research for about six months before they are required to take up research.

A similar training in the methodology of fisheries technological research for fish processing should also be organized in cooperation with the Processing Wing of the Central Fisheries Technological Research Institute, Cochin, and the Central Food Technological Institute, Mysore. The authorities of the Mysore Institute, with whom this matter was discussed are willing to extend their full cooperation for a training of this kind.

7.2. Assistant Fisheries Development Officers

The posts of Junior Officers, such as Inspectors and Assistant Fisheries Development Officers in the States are at present filled in two ways: (a) either from graduates or those with the Master's Degree in Zoology are selected and given in-service training, or (b) suitable Sub-Inspectors, although of lower educational qualifications, are promoted as Inspectors after many years' service. In some States (Madras, Andhra Pradesh and Kerala), a number of Diploma holders in fisheries of Polytechnic Institutes are employed as Sub-Inspectors. On account of the low initial educational qualifications and unsatisfactory training at the Polytechnics, the Diploma holders of these institutes are sometimes unable to secure employment and, in any case, they seldom rise above the rank of Inspectors. As noted in Chapter V, the fishery course at the Polytechnic Institute in Kerala is being wound up and the Committee envisages that those in the Institutes in Madras and Andhra would also be discontinued before long. It has, therefore, been represented to the Committee that training at a level lower than that of the District Officer is also necessary in order to fill the lacuna that will be left by the discontinuance of fisheries training in the Polytechnics and to provide uniformly and properly trained personnel to man the posts of Inspectors (or Assistant Fisheries Development Officers). An appreciable number of District Officers will continue to be promoted from lower ranks. It seems to the Committee that in-service training alone will not equip such persons to discharge the onerous and responsible duties of District Fisheries Development Officers. It is, therefore, proposed that institutional training should be arranged for the initial training of lower level officers, some of whom may ultimately be promoted as District Officers.

As already stated, there is a training course in the Development and Administration of Inland Fisheries at the Central Inland Fisheries Research Station, Barrackpore. The Committee is of the opinion that this course at Barrackpore with suitable modifications, could be developed for training Assistant Fisheries Development Officers. For this purpose, the syllabus of the course should be thoroughly revised. The revised syllabus should have a strong bias for inland fisheries development work. The existing undue emphasis on biological aspects of fisheries should be greatly reduced and the course so designed as to give a thorough and comprehensive training of practical value. The main object should be to equip the trainees to undertake development of inland fisheries in their respective States.

There should be wholtime, qualified staff to undertake this training. There are at present only relatively junior officers for this work, a Superintendent of Training (Class II) and an Assistant Superintendent (Class III). There have also been frequent changes in the incumbents of these posts. Although they undertake some teaching, the major responsibility of instruction tends to fall on research personnel of the Central Inland Fisheries Research Station who have their own hands fully occupied with research problems. This is especially so with the research staff of the Cuttack Sub-Station, where the trainees are taken during the monsoon months for practical work in fry collection, rearing and distribution. This happens to be the time when the research staff are so fully engaged in their own field observations, that instruction becomes casual and secondary.

Physical facilities for giving this training should be expanded to admit at least 60 candidates every year, as against the present 25—30. The duration of the course should be increased to

12 months, as against the present 10 months. The qualifications for admission should remain as at present, *i.e.*, the possession of B.Sc. Degree in Science with Zoology as one of the subjects. Of the 12 months, at least 6 months should be earmarked for training in the field, for example, in fish farms, inland fishery projects, research stations, extension units, marketing organisations, etc. The training centre itself should have a series of fish ponds, demonstration equipment for fishing, laboratory facilities for instruction in testing quality of water and soil. There should also be demonstration facilities for weed control work, artificial spawning of carps, fish seed collection, distribution and transportation.

If the course has to be effective, there should be a substantial increase in the teaching staff because, in the Committee's opinion one of the greatest weaknesses of this course has been the utter inadequacy both in number and competence of staff. The minimum strength of wholetime staff for this course should consist of the following:—

1. A Superintendent of Training, who should be a Senior Class I Officer of considerable all-round fishery experience. Trainees nominated by the State Governments often include persons with several years of field experience in development work and it will not be appropriate or even desirable to have a junior and relatively inexperienced officer in charge of training.
2. Two Assistant Superintendents of Training who should be Class II Officers. One of these officers should have experience in fisheries extension work and the second should be a specialist in fish culture.
3. Three Demonstrators (Class III) one of whom should be a Chemist with experience in testing waters and soils from the point of view of fish culture and one must be a Botanist. Some of the specialist staff of the Central Institute of Fisheries Education will participate in training. The technical officers of other Research Institutes and State Fisheries Departments may also be called upon to give lectures in their specialised fields.

The Committee has not worked out a separate syllabus for the Barrackpore Course but this could be taken partly from the main Course proposed for the Central Institute of Fisheries Education and suitably adapted by giving adequate emphasis in practical and field work. Instruction should mainly cover :

1. Fish culture in freshwater, brackish waters and high altitude areas (this includes collection, rearing and transportation of fry and all cultural practices).
2. Inland capture fisheries.
3. Fisheries conservation practices.
4. Extension.
5. Marketing and Co-operation.
6. Preservation and transport of fish.
7. Fishing Methods and Technology.
8. Water and soil analysis.
9. Weed control.
10. Statistics.
11. Fishery Engineering.
12. Fish Pond Management.
13. Administration.

While the Committee believes that the course at Barrackpore if suitably modified, will meet the requirements of training of Assistant Fisheries Development Officers and of fish culturists for the

present, it is of the opinion that a more suitable location for this course would be the proposed sub-centre of training in inland fisheries at Kausalyaganga as a part of the Central Institute of Fisheries Education. It would probably take some time for adequate facilities to be developed at Kausalyaganga and the Committee recommends that the junior officers course be shifted from Barrackpore when facilities become available at Kausalyaganga.

When the Central Institute of Fisheries Education is established and facilities of the inland sub-centre sufficiently developed, the responsibility for this course also should be with the Head of the Central Institute, but until that time, however, the present arrangement of the Chief Research Officer, Central Inland Fisheries Research Station being in-charge of this training programme should continue.

7.3. Extension Specialists and Instructors

In the Committee's opinion, the best Extension Officer or Extension Instructor is a properly trained District Fisheries Development Officer. In addition to the comprehensive and intensive training at the Central Institute of Fisheries Education proposed by the Committee for the District Fisheries Development Officers, the Extension Instructor will, however, have to be given some special training in extension methods for some three months or so. The syllabus for the special training can be prepared in consultation with the Extension Directorate in the Ministry of Food and Agriculture and the Ministry of Community Development.

7.4. Fishery Statisticians

The need for training of fishery statisticians has been fully explained in Chapter IV. The candidates for this training can be selected from among graduates who have obtained Master's degree in Mathematics or Statistics and employees of the State and Central Governments engaged in statistical work. The period of training should be approximately 6 months. The training can be arranged at one or more of the following institutions:—

1. Central Institute of Fisheries Education.
2. The Statistical Division of the Central Marine Fisheries Research Station, Mandapam.
3. The Indian Statistical Institute, Calcutta.
4. Statistical Wing of the Indian Council of Agricultural Research, New Delhi.

7.5. Fish Marketing Specialists

The source of recruitment for this training will be from among the employees of the State and Central Governments engaged in marketing and fisheries work and those of the marketing co-operative societies. The duration of this course should be approximately 6 months. Training can be given at the Fisheries Training Institute and the centre or centres organised by the Agricultural Marketing Directorate of the Ministry of Food and Agriculture.

7.6. Fishery Co-operators

For giving training in Fishery Co-operation, the importance of which has been indicated in Chapter IV, candidates can be selected from among those employed in Fisheries or Cooperation Departments of the Central and State Governments. The employees of well-established fisheries cooperative societies should also be selected for this training.

The duration of this training course, which will mostly be of the nature of a briefing course, may be 4 to 6 months. Those of the trainees who are already trained in cooperation will have to be briefed in fisheries, while the employees of Fisheries Departments, will have to receive training in cooperation. The proposed training can be given at the Central Institute of Fisheries Education or in the Training Centres organised by the Department of Cooperation of the Ministry of Community Development.

In addition, there will also be need for organising some training, possibly on an *ad hoc* basis and at a relatively low level but at a number of places, for the fishermen in order to popularise cooperation among them and bring home to them the principles of cooperative movement. These training programmes should be arranged by the State Governments through their Fisheries and Cooperation Departments.

7.7. Fishery Engineers

The Committee does not propose the establishment of any new facilities for training the five types of Engineers discussed in Chapter IV. Persons who have completed an engineering course of study should be given opportunities for "on the job" training. There is likely to be a shortage of marine engineers, but the Ministry of Transport is giving training in marine engineering through their institutions in Bombay and Calcutta. The number of trainees admitted for this training should be increased, if the requirements of the fishing industry are to be fully met.

(1) *Engine Drivers*—The Committee, however, feels that some institutional arrangements for training Engine Drivers for medium sized mechanised boats should be made. While Certified Marine Engineers for large fishing vessels will probably be found from among those trained at the Institutes of the Ministry of Transport and engine drivers (uncertified) for small mechanised boats trained at the fishermen's training centres, the teaching of Certified Engine Drivers for medium boats, of whom about 100 will be needed, should be entrusted to the Fisheries Operatives Training Institute. It should be quite feasible to train 20 candidates per annum at this Institute. Pending the establishment of this Institute, the Polytechnics and the Institutes of Technology which are being established would be in a position to start such training.

(2) *Naval Architects and Boat Building Foremen*—The actual number of naval architects required for fisheries work is small, but such persons should, however, be of the highest calibre. The best arrangement for training fishery naval architects will be to appoint qualified under-studies to experts to enable them to acquire the requisite knowledge through practical experience. The course in Naval Architecture at the Kharagpur Institute would probably provide the required personnel for this work. For many years to come, overseas training may also be essential for persons selected from those in service.

Training for boat-building foremen should be organised at the Operatives Training Centre when this is established, but to begin with, *ad hoc* courses should be organised at the Fisheries Technological Station, Cochin. Persons who have carpentry and boat-building experience and educational qualifications, about the Matriculation standard, should be chosen from nominees of Government Departments and from the private industry. The course of training may be for a period of 6—9 months.

7.8. Fishing Boat Personnel

(1) *Fishermen*—In order to increase the number of fishermen capable of fishing from mechanised boats, the establishment of 50 fishermen's training centres has already been recommended in Chapter IV. The number of fishermen admitted at each centre should be carefully worked out because provision for mechanised boats and expansion of fishing taking place in any particular area should be tied in with the number of trainees taken up at these centres. It would be highly desirable to keep close watch on the training programme undertaken in that area. Suitable adjustments in the number of trainees may be necessary from year to year and from area to area.

(2) *Skippers, Master Fishermen, Mates, etc.*—As already discussed in Chapter IV, arrangements for training skippers, master fishermen, mates, etc., are an urgent necessity. In course of time, the responsibility for arranging this training will largely devolve on the Operatives Training Centre. There is already a large difference between the number of trained hands likely to be available and the number that may be required. This deficit is likely to be of the order of about 100 persons by the end of the Third Plan and it is likely that some of the existing arrangements may not give the expected number of trained hands. In view of the importance of training in this field, the Committee feels

that facilities for training promising young men abroad should be secured under technical assistance programmes. Persons with sea-going experience and minimum educational qualifications up to the Matriculation standard should be selected and sent for training in fishing vessels in U.K., Japan, U.S.A., Canada and Norway. The Committee considers that at least ten persons should be sent every year for training during the coming few years. This may narrow down the deficit of personnel substantially. An overseas training scheme should be worked out for fishing boat personnel and given effect to immediately. Those sent abroad under aid programmes should be selected from the crew of boats in India (fishing boats as well as merchant navy vessels) so that the period of training prior to obtaining certificates could be reduced.

The new fishing companies formed in India are generally required to train men in their vessels, but the Committee regrets to note that this programme has generally not been successful, mainly owing to lack of continuity in the employment of persons on privately owned vessels. Not only should this programme of training in private fishing vessels be improved, but, in addition, training of personnel in ships should be an essential part of agreements in foreign collaboration in the field of sea fishing.

7.9. Technical Shore Personnel

In Chapter IV, two types of technical shore personnel have been indicated as calling for special arrangements in training, namely, Master Mechanics and Food Processing Technicians.

(1) *Master Mechanics*—The candidates for training as Master Mechanics should be drawn from qualified hands from the Polytechnic Institutes and given special training which may last 6 to 9 months. It is also likely that the proposed special training could be replaced by in-service experience in the Integrated Fishery Development Centres. Eventually this training could also be brought within the activities of the Operatives Institute.

(2) *Food Processing Technicians*—Food Processing Technicians could be trained by specially organised courses at the Central Institute of Fisheries Education, or at the Central Food Technological Research Institute, Mysore, or at the Processing Wing of the Fisheries Technological Station. Candidates with a basic degree in Chemistry from Indian Universities can be selected for this Course and given a six months' training to equip them for fish processing work of various kinds. Personnel of this type will obviously have to be trained in a somewhat broad field, because the same Technicians may be expected to attend to the operation of ice and cold storage machinery and also supervise processing activities of various kinds. For this also, the Committee is in a position to suggest *ad hoc* courses for the present. The Government of India Quick Freezing and Cold Storage Plant at Bombay has planned *ad hoc* courses in ice and cold storage work relating to fisheries. In the opinion of the Committee, training in fish processing should also be a responsibility of the Operative Training Institute.

7.10. In-service Training in Integrated Development Projects

In different sections of this Report references have been made to the establishment of integrated development projects. A good example of such an institution is the Indo-Norwegian Fisheries Project. The main experience derived therefrom is that development in the field of fisheries would be effective if there is a simultaneous approach to various problems in one place or area where fishing will be modernised, methods of handling the catches improved, processing industries established, marketing projects developed and storage facilities set up. All these activities will be brought within the framework of a cooperative fishing community finding expression through groups of cooperative societies. Fleets of mechanised boats are likely to be based in Integrated Projects of this type and it is in such places that better transportation and harbour facilities are likely to be developed to cater to the increasing demands on these services by an expanding fishing industry. One of the most effective ways of imparting training is to give opportunities to technicians and fishery officers from

other places to secure experience of such projects. The Committee believes that such an in-service training in Integrated Projects should be fostered in an organised manner and that a beginning may even now be made with the provision of necessary facilities at the Indo-Norwegian Fisheries project.

7.11. Conclusion

The Committee has naturally not made a study of the various branches of 'operatives' training in the same detailed manner as the training of fisheries officers, which was its main assignment. For this purpose, its main recommendation is the establishment of a Central Institute of Fisheries Education and the reorientation of the Barrackpore Course. The additional training facilities dealt within this Chapter under the heading "Ancillary Training" would clearly indicate that organised training in the operatives field should be developed at an early date and that training of skippers, Master fishermen, Mates, Engine Drivers, boat and shore technicians of various kinds should be organised and brought within the framework of the training Institute for Fishery Operatives. Such an institute will be the linchpin of the fishermen's training centres already established during the Second Plan or to be established in future. The Committee would conclude its present study by urging the Government to take steps for initiating the operatives training project at the same time as the establishment of the Central Institute of Fisheries Education.

CHAPTER VIII

SUMMARY OF MAJOR CONCLUSIONS AND RECOMMENDATIONS

Manpower Deficiency

1. The Committee is convinced that progress in development of Indian fisheries has been hampered by acute shortage of suitably trained personnel. Shortages of operatives and lower level administrative staff have been partially overcome by training provided by Government but no training exists for high level developmental and managerial staff. Accelerated development during the Third and successive Plans will not be achieved without such trained staff. The Committee recommends that immediate steps be taken to establish facilities for this training.

2. Such training along with certain other ancillary training courses in fisheries should be organised by the Central Government (Ministry of Food and Agriculture) in an Institute which should be established for this purpose and not as an adjunct to any of the existing establishments or Universities.

Interim Arrangements

3. The Committee reiterates and recommends for adoption its proposal made in an Interim Report that pending the establishment of this Institute, immediate arrangements be made at Bombay for a provisional training course for District Fisheries Development Officers. The Committee recommends that this course should start in July, 1959.

Status of the Course

4. The provisional course of study prescribed for the District Fisheries Development Officers should develop into a regular professional training in Fisheries, which should be on a par with the Bachelor Degree Course in Agriculture, Forestry and other applied Sciences. Although starting as a diploma course, this should eventually become a Degree course in fisheries at Bachelor level.

Scope for Specialisation

5. Having fully examined whether separate training should be provided for marine and inland fisheries the Committee recommends that the proposed course at the Fisheries Training Institute should be common for both marine and inland fisheries. The course should, however, provide for specialisation in one of the following subjects or any other subject within the curriculum approved by the Institute:—

- (i) Inland Fisheries.
- (ii) Fish Handling and Processing technology.
- (iii) Fishing Gear Technology.
- (iv) Fishery Economics and Business Management.
- (v) Fish Marketing and Trade.

Qualification for Admission

6. Minimum educational qualification for admission to the training course for District Fishery Development Officers should be a Degree in Science with Zoology as one of the subjects. Preference should be given to those who have taken Chemistry, Botany, Statistics or Economics as an additional subject.

Duration of Training

7. The duration of the training course should be two years, of which nearly half should be spent in prescribed field work.

Number of Trainees

8. To meet the requirements of trained personnel in the Third Plan, the Committee's opinion is that at least 30 candidates should be trained at the Institute each year. If the Institute becomes a regional or an international training centre, steps should be taken to ensure that adequate number of seats are reserved for Indian trainees.

Selection of Trainees

9. The trainees should include nominees of Central and State Governments as well as private candidates. For the first two or three batches of trainees, it is expected that all seats will be taken up by Governmental nominees.

Nominations

10. The trainees nominated by the State Governments should include persons either already in service or selected against existing or anticipated posts.

Stipends

11. The trainees should be given stipends during the period of training and also provided with adequate travel grants. The Committee recommends a stipend of Rs. 200 per month. Employees of Central /State Governments should be paid full salary and allowances and if the total emolument is less than the stipend, they should be given additional allowance up to the prescribed stipend.

Location of the Institute

12. Having studied the various criteria necessary for the successful functioning of the Training Institute, the Committee feels that the Institute should be located at a centre where the fishery industry is well developed and where adequate port facilities are available for the ships of the Institute. Since the main centre of training must thus be a coastal city, the Committee recognises the need for a sub-centre at which to give field training in inland fish cultural practices.

13. On strictly technical grounds the Committee considers that Cochin is the most suitable place for the location of the Training Institute.

14. For the location of the Inland Fisheries Training Sub-Centre, the Kausalyaganga area near Bhubaneswar in Orissa offers the best facilities.

Physical Facilities

15. The Institute should have its own library, workshop, training ships, pilot processing plants, laboratories, lecture rooms and other essential facilities for a self-contained training establishment.

16. It is most essential to provide hostel facilities for the trainees, regardless of the location of the institute.

17. If the Institute is situated at some distance from the city, residential accommodation for all members of the staff should be provided in the vicinity of the Institute. In any case, it would be necessary to provide accommodation for the Director and a part of the staff in the premises of the Institute.

Training Vessels

18. The Training Institute should have two vessels—one capable of being used for different types of fishing, about 85 to 90 feet and the other, a smaller vessel of about 35 feet. These ships should have berthing and servicing facilities within a reasonable distance from the Institute. Both the vessels should be staffed by competent personnel and fully equipped for fishing with different kinds of gear, exploratory work and training. It is likely that the services of a skipper and a senior Engineer for the larger vessel will have to be obtained from abroad for a period of three years.

Staff

19. The Committee places great emphasis on the high professional standing of staff to be appointed for the Institute. It should have a Director, who will be in-charge of the whole organisation, assisted by a Registrar to help him in purely administrative matters. There should be one professor for each of the following Divisions:—

1. Fishery Biology.
2. Fishery Economics and Co-operation.
3. Fishery Technology.

20. There should be six Assistant Professors for the subjects indicated below:—

A. Division of Fishery Biology

1. Oceanography, Meteorology and Limnology.
2. Inland Fisheries.

B. Division of Fishery Economics

1. Statistics, Commerce and Business Administration.
2. Marketing and Co-operation.

C. Division of Fishery Technology

1. Fishing Technology & Naval Architecture.
2. Fish processing and related subjects.

21. In addition to the Assistant Professors, there should be demonstrators, field instructors, administrative personnel, secretarial staff, etc.

22. The Committee considers that it will be necessary to engage experts from abroad to occupy the senior posts at the Institute during its formative years. Suitable Indian counterparts should be appointed to work with the foreign experts and be trained by them to take over the responsibilities within a period of about five years.

23. In addition to the permanent staff of the Institute, the Committee envisages the need for visiting lecturers from India and abroad for giving special courses.

Placement of qualified Trainees

24. The trainees after successful completion of the course should normally be eligible for appointment as District Fisheries Development Officers. In some cases, it may be necessary for administrative reasons to appoint them initially to lower posts such as Inspectors, but there should be a reasonable prospect of their promotion as District Officers in 3 to 5 years.

25. To attract good trainees, fisheries positions in Government service should have adequate remuneration. The status and salaries of District Fisheries Development Officers should, by no means, be lower than those prescribed for corresponding position in Agriculture or Forestry. The Committee wishes to emphasise that in its view much of the purpose of the Institute would be nullified if candidates of the right kind do not come forward for training.

Training of Junior Fisheries Officers

26. To meet the requirements of staff at levels lower than that of the District Fisheries Development Officer in inland States and for inland areas in maritime States, the existing training course at Barrackpore should be suitably overhauled. For this purpose, additional staff will have to be provided and the syllabus revised to give more practical training in inland fisheries. When facilities become available at the proposed Sub-Centre of the Institute at Kausalyaganga, this course should be transferred to that place.

Operatives Training

27. The Committee is convinced that there is great need for training operatives at various levels of skill in fishing, navigation, boat-building, marine engineering, fish handling and processing, marketing, etc. Training in these skills should be separate from the training for Development Officers. For such vocational training, preference should be given to fishermen wherever possible.

28. The Committee recommends that in addition to the training for Fisheries Development Officers the Institute should conduct or arrange for certain courses in subjects ancillary to fisheries.

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BOMBAY ;

The 14th April, 1959.

ACKNOWLEDGEMENTS

The Committee is very grateful to various persons and Institutions who have helped in the formulation of the proposals contained in this Report and with whom detailed discussions have been held. They are too many to be mentioned here individually but the Committee would like to make special mention of the very valuable assistance they have received from Fisheries Officers of the Central and State Governments. To the FAO, the Committee is grateful not only for Dr. G.L. Kesteven's participation as one of its members but also for the exchange of views with Dr. D.B. Finn, the Director and other Specialists in the Fisheries Division. Dr. Finn has also very kindly allowed the inclusion of his note on Fisheries Education in South East Asia (Appendix X). Professor G.M. Gerhardsen participated in the work of the Committee through the kind offices of the Indo-Norwegian Fisheries Foundation at Oslo. The drawing and specifications of training vessels attached to this report have been prepared, at the request of Prof. Gerhardsen, by the reputed Naval Architect Mr. Zimmer to whom the Committee's grateful thanks are due. Prof. Y. Hiyama of the Tokyo University and Prof. R. Van Cleve, Dean of the Fisheries College, Seattle, Washington have helped the Committee by sending valuable material relating to Fisheries courses in Japan and the U.S.A. Fisheries Experts working in India under the Colombo Plan, Technical Cooperation Mission of the U.S.A., F.A.O. and the Indo-Norwegian Project have all helped the Committee by exchange of views at several stages of the Committee's work. The appended note on Fisheries Education in the United States was very kindly prepared by Mr. Charles Wade, who was formerly Fisheries Extension Expert under the T.C.M. attached to the Ministry of Food and Agriculture. Many Vice-Chancellors and Professors of Zoology of Indian Universities have materially helped the Committee by giving valuable information on the existing and past courses of study. Sarvashri Lancelot Thomas and P.D. Gupta worked for a short period as Technical Assistants to the Committee and did much useful compilation work particularly for the Appendices.

REPORT OF THE COMMITTEE ON FISHERIES EDUCATION

LIST OF APPENDICES

	PAGE
I Interim Report of the Committee on Fisheries Education	91—99
II Additional Notification constituting the Committee	99
III List of Places and Institutions visited by the Committee	99—101
IV Persons with whom the Committee held Discussions	101
V Letter to Vice-Chancellors of Universities	102
VI Structure of State Fisheries Administrations	103—120
VII Notes on Fisheries Training Programmes of selected countries with type curricula:—	
(a) Japan (b) Norway and (c) United States	121—132
VIII Type curricula of existing Fisheries Courses in Universities, Polytechnics and other Centres:—	
(a) Syllabus of the Barrackpore Course	132—133
(b) Syllabus of the Mandapam Course	134—135
(c) Syllabus for M. Sc. Course in Oceanography of the University of Kerala	135
(d) Syllabus for Marine Biology for the M. Sc. degree of Annamalai University	136
(e) Syllabus for M. Sc. degree in Biological Oceanography of the University of Andhra	136
(f) Syllabus for training of fishermen in the fishermen training centres. (one-year Revised syllabus as recommended by the Enquiry Committee on mechanised fishing vessels)	136—138
(g) Syllabus for the Licentiate in Fisheries Technology and Navigation courses at the Central Polytechnic, Kakinada	138—141
IX Specifications of training vessels required for the Fisheries Training Institute [(a) and (b)]	141—142
X A Note on Fisheries Training in South-East Asia	142—144

APPENDIX I

GOVERNMENT OF INDIA

MINISTRY OF FOOD & AGRICULTURE

INTERIM REPORT OF THE COMMITTEE ON FISHERIES EDUCATION

Introduction

It is generally recognised that the pace at which a backward industry can be developed depends in very large measure on the competence and numerical adequacy of the manpower available to the industry. The Fishery industry of India is undoubtedly backward, contributing a quantity of foodstuffs considerably smaller than what the resources could yield and the country's economy demands. Recognising this situation the Government has called for substantially greater production, which will require drastic changes in the capital equipment of the industry, which in turn obviously will call for changes in the competence and size of its manpower complement. Extensive and complex schemes of development have been put in train, but the time-table set by Government in the Second and Third Plans for increase in production makes the prosecution of programme of intensive training of fisheries personnel imperative and urgent.

Since time immemorial fishermen have learned their techniques and profession from their fathers, and both training and techniques have become traditionalised. In a natural order of events this has given a steady, albeit slow growth of the industry which, however, in recent decades has lagged seriously behind growth of population. Moreover, the magnitude of the increase in production now contemplated calls for substantial changes in the industry's operational techniques and a rate of change for which the traditional methods of training would be inadequate. Whilst these traditional methods which in modern terms are known as on-the-job training will certainly continue to be used, it is equally clear that whilst the industry must be assisted to assimilate non-indigenous methods of operation, the traditional methods of training must be supplemented by special training projects. The Government of India has recognised the implications of this situation and whilst various training activities are in progress under its sponsorship, it also has other schemes under consideration. On some of these schemes, their inter-relation and general implications the Government has asked this Committee to give advice.

1. Scope of Enquiry and proposed plan of work for the Committee

Whilst the general need for better trained personnel in the fishery industries is manifest, and whilst also it is clear that existing training facilities cannot meet the need, nevertheless if the Committee is to make any useful recommendations regarding training, it must have before it precise and particular information concerning the types of occupation to be filled for this industry, and the numbers of individuals required in each occupation.

The manpower complement of an industry falls into the four categories:—

1. fishermen, labourers and technicians of various levels of skill;
2. managers, accountants, etc., and their staff;
3. administrators with varying range of responsibilities; and
4. research workers in various applied disciplines,

and is distributed between private and public sectors of the industry. Whilst this breakdown may be sufficient in the overall approach to the requirements, these categories are to this Committee no more than main chapter headings for any study of the particular problems of an industry. From one industry to another differences will be found in the skills required, in the relations between categories, and in the distribution between private and public sectors, so that each industry has its own pattern of manpower. The pattern is determined by various forces within the industry, and by others bearing on it from outside, not least among which is governmental policy. Furthermore, the pattern is, of course, subject to change as the industry adjusts and develops itself in tune with technical and social trends of the country to which it belongs.

Thus, any planning with regard to the manpower requirement of an industry must be based on a consideration of:—

- (1) the particular skills required in each of the foregoing categories with particular regard to the circumstances under which the operations of each are to be performed;
- (2) the relation between the workers in each of the foregoing categories and those in the others;
- (3) the distribution of function between private and public sectors and any necessary overlap;
- (4) governmental policy; and
- (5) present condition of the industry and prospective change in it within the period for which plans are being prepared.

The Committee believes that although its terms of reference relate mainly to training of personnel in the administrative and managerial categories, its work would not be complete unless it also reviewed the entire field of training and

education in fisheries. For example, the number of workers in the first category very largely determine the number of persons required for management and administration. Moreover, much of the work of training personnel of the first category will fall on the personnel of the managerial and administrative categories. Again, results of research must become known to managers and administrators, an important part of whose work is to make use of these results and to transmit some part of them to the fishermen and technicians. It will thus be seen that the Committee takes a broad view of its responsibility and believes that to reach any conclusions concerning manpower in the managerial and administrative categories, it must have a complete view of the industry and of the prospective directions of development.

In order to discharge effectively the task given it, the Committee has made plans for the collection and analysis of information on the foregoing aspects of Indian fisheries and to obtain similar information with regard to fisheries of other countries in order to make and be guided by a comparison with the experience of such other countries. At the same time, enquiries will be pursued concerning existing training facilities in India and about the curricula of fishery institutions and training courses elsewhere.

However, the Committee recognises the urgency to initiate at least some part of training programme and has considered whether it can recommend some immediate action that might be taken by the Government. The Committee has approached its work with a fairly considerable knowledge of the fisheries of India and after its preliminary review of the situation and having had discussions with various officers in Delhi, Calcutta and Bombay, has been struck by the difficulties confronting both State and Central Governments in the implementation of developmental schemes and in the maintenance of normal administration because of the lack of properly trained staff.

The present stage of development in Indian fisheries is that there is already a large industry based on traditional methods employing nearly a million persons, but its organisation and orderly development on modern lines both for increased production and for the establishment of commercial and industrial activities based on that increased production of fish, will be possible only with governmental intervention. This accounts for the increasing activity in the fisheries field on the part of both the Central and State Administrations. It is particularly for State Governmental activities that considerable expansion of administrative agencies to help the fishing industry and fishermen will become necessary.

Of the various levels of administration at which State Fisheries Departments operate, the most important is that of the District. The gap between the administrative and research personnel on the one hand and the fishermen on the other is unfortunately a large one in India and Government effort should be directed to narrow this by the provision of appropriate field officers with the right type of training in the field of fisheries and with the requisite administrative competence. The Committee have, therefore, come to the conclusion that urgent attention should be paid to the training of District Fishery Officers and that, without waiting for full-fledged institutes to be established, training facilities should be instituted so that a pool of officers with sound training in fisheries administration will become available at least by the beginning of the Third Plan.

It is important to recognise the distinction between the training to be given to officers of this kind and that which is required by the fishermen who are to employ the new techniques of fishing. The latter are to be trained exclusively and to a high degree in fishing operations. The former, although they must have direct personal acquaintance with such operations will be trained in an entirely different range of techniques. This will become clearer from the account given in the following section of the duties that the District Fishery Officers might be called upon to perform, and the qualifications they would be required to possess in order to perform such duties.

2. The District Fishery Officer

Duties

The Committee envisages the District Fishery Officer as the senior Governmental Officer with responsibility for the administration of governmental services of the fishery industries of his district, for keeping his government fully informed of the status of the industries alongwith their need for and possibilities of development and with a special responsibility for the implementation of developmental programmes. His administrative duties would include the collection of statistical and general information concerning the industries; functions relating to financial assistance; general regulatory functions; organisation of marketing and distribution and assistance to the industry in obtaining its supply of equipment materials and commodities. His developmental responsibilities would also include the management of extension services and of schemes for the distribution of new equipment and supplies. A detailed job description for a District Fishery Officer is given in Appendix B of this report.

Qualifications and experience

In order to discharge the foregoing duties, the District Fishery Officer would have to be well-acquainted with the natural resources being exploited and with the natural setting of the industry. He would have to know the technical character of its capital equipment, *i.e.*, its craft and gear, its fish farming units, processing and transport equipment. He would also need to know the kinds of skill possessed by the manpower of the industry and the commercial and social structure of the industry. Governmental programmes and administrative techniques by which they are implemented would have to be at his fingertips and, especially, he would need to know the contribution that research work could make to fishery management and development.

Essentially, the District Fishery Officer would need to know the fisheries of his district in considerable detail and be able to identify and to form plans to deal with their problems. The Committee envisages that, at least eventually, the District Fishery Officer would have a team of technicians to deal with particular sectors of the industry and it would be his responsibility to ensure that this team functioned efficiently in accordance with the directives he will have received from Government. It would be expected that he himself would be possessed of certain technical abilities such as the identification and measurement of fishing units and the survey of situations where it is contemplated to establish fish farms. The range of such abilities that might be possessed by the District Fishery Officer is given in Appendix B referred to earlier. The Committee wishes to emphasise that it does not expect that every District Fishery Officer would be highly skilled in all of these, although it would expect him to be highly skilled in some and well-acquainted with the others.

Training

In order to acquire these qualifications and be able to do tasks of the kinds enumerated, the District Fishery Officer would have to be given special training in each of the many aspects of fisheries science, as shown in the curriculum given in Appendix C. It will be seen that training would be given in the general principles of fisheries science and in particular disciplines of biology, technology, economics and administration. The Committee wishes to emphasise that this training would be given from the very special viewpoint of the District Fishery Officer. Those who would be responsible for this training must, therefore, exercise considerable skill in selecting material which the District Fishery Officer should learn and the techniques that he should acquire. The Committee also wishes to place considerable emphasis on practical field experience in all branches of the industry. It is important that the District Fishery Officer should work from a practical acquaintance with the techniques and with sympathetic understanding of the problems of the industry.

In many Departments of fisheries it is not uncommon to find persons in responsible positions handling fisheries projects without the requisite practical experience, often to the detriment of development plans. Many fisheries officers show disinclination to go out on fishing vessels and to identify themselves with the fishing operations and the follow-up shore operations, tending more and more to become office administrators away from the realities of the situation.

3. Proposed Interim Plan

The Committee finds itself able to recommend that attention be given at once to the provision of high level training of officers to undertake administrative duties in fishery districts. It has described above (Section 2.1) the duties which it believes such officers should be able to perform and which the nature of current development plans dictates should be performed by Governmental services if the developmental targets are to be achieved. It recognises that provision does not yet exist in the establishment of all State Governments for posts with the duties described and requiring the prescribed qualifications, and it, therefore, believes that discussions with State Governments should be initiated to secure agreement to the general basis of this plan and lay down general principles to govern the relation between this post (which in some of the States would be entirely new) and other administrative posts and establishments.

The Committee has also described above (Section 2.2) and in Appendix C the qualifications which such officers would have to possess in order to be able to perform their duties. It has then directed its attention upon the practical problems of how the proposed qualifications could be acquired.

The training that would be required by these officers is briefly described above (Section 2.3) and is given in detail in Appendix B. A curriculum for such training is given in draft in Appendix C, but work should be initiated at once on expansion of this in detail. The Government may find it desirable to appoint an officer to have special responsibility for this task (who preferably would be a senior officer-elect of the staff of the proposed training centre).

A careful review has been made of the curriculum of the training course for inland fisheries given by the Central Inland Fisheries Station at Calcutta. It was thought that this course might perhaps serve as a basis on which the larger course contemplated here might be developed. However, the structure and orientation of the Calcutta course is such that to serve the fuller purpose it would have to be completely recast. On the other hand, the Calcutta course, with suitable changes, can be developed into a most effective course of study in inland fisheries for specialist personnel and the Committee will be examining this question in their final report.

The course to be given for fishery administrators must be a balanced combination of theoretical instruction, practical exercises in laboratory, and actual field experience in industry and in the performance of some of the technical operations of the administrative programmes. However, the Committee is convinced that the instruction to be given and experience to be gained would require the course to last at least two years, and it believes that, as a general principle, time should be shared almost equally between field experience and theoretical and practical training.

The level of the authority that the District Officer will be called upon to show and the degree of initiative he will have to exercise, will be such that the training must be at a high level. This means, in the opinion of this Committee, that entry to the proposed course should be open only to those who possess already a University degree in natural physical or social sciences.

Consideration has been given to the question of the location of this Centre. The Committee has prepared a schedule (Appendix D) of the criteria that should be considered in making a selection of a site for a permanent centre of higher

learning for fisheries, should such a centre be decided upon. It has applied these criteria in considering possible sites for a provisional centre, visiting Calcutta and Bombay for this purpose and making use of all information already in its possession and provided by officers of the Government. The Committee in its search for a provisional site has had to deviate from the order of priority which it would give the criteria in Appendix D. Notably, the Committee has given greatest weight in this interim plan to the availability of institutional facilities for the proposed training work, a criterion that would not have a high place in selecting a site for a permanent centre. The Committee wishes to stress heavily that its recommendations with regard to site of the provisional centre applies only and solely to the provisional centre and has no bearing on the choice of the site for a permanent centre. The Committee attaches considerable importance to the advantages to be derived by a centre of higher learning in fisheries from being in the atmosphere of a 'fishing port'.

Although the Committee recommends establishment of the provisional centre at Bombay, it believes that the programme of training should include sessions of both theoretical and practical work to be given at centres such as the Central Inland Fisheries Research Station at Calcutta (Barrackpore), the Central Marine Fisheries Station at Mandapam, the Fisheries Technological Institute in Cochin and the Food Technological Institute in Mysore. It, therefore, recommends that arrangements be made for such sessions at times which would be convenient to the training programme.

Considerable importance attaches to the practical side of the training to be given during this course. The Committee distinguishes between practical exercise in laboratories and practical work in the field. For the latter in inland fisheries, use could be made of experimental fish farms at centres such as Barrackpore and Cuttack. In marine fisheries it would be indispensable that the centre should have the use of one or more training vessels and suitable shore facilities. The Committee very strongly urges that such craft be made available expressly for this purpose and that arrangements be made to have these ships berthed in a place where convenient shore facilities are available.

Considering the nature of the instruction to be given and the intensity of the programme that must be followed, it is obvious that the centre must have its own permanent staff for teaching and for its administration. Use could of course be made of visiting and part-time local lecturers and demonstrators, and the Committee will endeavour to formulate some proposals along these lines in its final report. However, the centre should have, in addition to a Director, full-time teachers (Professors and Lecturers) in each of the major disciplines listed in the curriculum as outlined in Appendix D.

It is of the nature of situation, to remedy which recommendations are being made here, that there will be difficulty in finding within India all the special staff and certain items of special equipment required for the Centre. This is of course especially true with regard to the provisional centre. It is understood that several of the existing Technical Assistance programmes are keenly interested in the problems to which this report refers and they might perhaps be interested in assisting in the realisation of this plan. It may be worthwhile to bear in mind that a proposal has been made during discussions relating to the United Nations Special Projects Fund, that establishment of an international institute for higher learning in fisheries might be a suitable subject for a project of that Fund.

Finally, the Committee believes that it should at this point indicate some aspects of the relations of the provisional scheme with any permanent scheme, so that Government may be reassured that it will not find the Committee's final report recommending abandonment of the provisional scheme. Firstly, the Committee is convinced that the position of District Fishery Officer is described in this report must be, as it were, the linchpin of the administrative structure required for this industry. Consequently it believes that training of such officers will be a permanent feature of fisheries education and in fact will constitute the solid core of such training. In the Committee's view both lower and higher training would be developed out of the course given for these officers, and a fuller account of this will be given in the final report.

Secondly, the Committee believes that the provisional scheme will afford an opportunity for research into the problem of teaching fishery subjects. There are relatively few examples of such teaching in the world today. Fisheries science is new and it is doubtful whether the science, in its broadest conception, is taught anywhere in the world, in systematic and integrated fashion.

Thirdly, the Committee envisages that the staff and certain of the facilities of the provisional centre should form the nucleus of the permanent centre.

SUMMARY OF RECOMMENDATIONS

1. That action be taken at once to initiate the setting up of a provisional centre for the training of District Fishery Officers;
2. That the training should be of such kind as to qualify these Officers to perform the administrative and other duties described in Appendix B;
3. That the curriculum of the course should be approximately along the lines shown in Appendix C, but that work should be initiated without delay to determine the details of this curriculum and of the programme of studies;
4. That the time of the course should be almost equally shared between theoretical and practical laboratory work on the one hand and field work on the other;
5. That the duration of the course should be two years;
6. That the possession of a degree in Science or Economics should be a necessary requirement for entry to this course;
7. That the centre should provisionally be located in the city of Bombay;

8. That arrangements be made to take advantage of training facilities in inland fisheries available in Calcutta, and of training facilities in fisheries food technology at other similar centres at Cochin, Mysore and elsewhere;
9. That one or more training vessels should be commissioned for the use of the Centre;
10. That full-time staff should be appointed to be responsible for teaching at the Centre and for its administration; and
11. That the relations of this scheme with an eventual permanent scheme be kept constantly in view.

(Sd.) N.K. PANIKKAR
Fisheries Development Adviser to the
Government of India—CHAIRMAN

(Sd.) G.M. GERHARDSEN
Professor of Fishery Economics.
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NEW DELHI;
28th August, 1958.

APPENDIX I (a)

Appendix A (1)

(To be Published in Part I, Section I of the Gazette of India)

No. F. 7-15/57-FY (D)

GOVERNMENT OF INDIA
MINISTRY OF FOOD AND AGRICULTURE
(DEPT. OF AGRICULTURE)

New Delhi, the 4th June, 1958.

RESOLUTION

The Government of India have decided to set up a Committee on Fisheries Education to examine the question of existing training facilities in India and to consider the establishment of a higher training institute for supervisory personnel for fisheries. The Committee will consist of the following:—

- | | | |
|---|-------|----------|
| 1. Dr. N.K. Panikkar, Fisheries Development Adviser to the Government of India | .. .. | CHAIRMAN |
| 2. Dr. G. L. Kesteven, Chief, Fishery Biology Branch, Food and Agricultural Organisation,
United Nations, Rome | | MEMBER |

Two other members will be appointed to this Committee at a later date.

2. The terms of reference of the Committee will be as under:—

1. To review and assess the training requirements of fisheries personnel to man the administrative and executive positions in the fisheries development and research projects in India and for the growing needs of the industry.
2. To examine the need for higher or ancillary training facilities in the field of fisheries in the light of the present and future requirements of the Second and Third Plans and of the training courses now available.
3. To recommend the location, courses of study, the staff required and other practical details for the establishment of such training institute (institutes).

3. The Committee's headquarters will be in New Delhi and the members of the Committee may undertake such visits to the fisheries centres and other institutes as are necessary.

4. The report of the Committee should be submitted to the Government of India within three months after the constitution of the full Committee, but the Committee should at an early date make interim recommendations so that these may be examined and suitable administrative action initiated whenever necessary.

(Sd.) KRISHAN CHAND
Joint Secretary to the Govt. of India

APPENDIX I (b)

Appendix A(2)

(To be Published in the Gazette of India, Part I, Section I)

No. 7-15/57-FY (D)

GOVERNMENT OF INDIA
 MINISTRY OF FOOD AND AGRICULTURE
 (DEPT. OF AGRICULTURE)

New Delhi, the 20th August, 1958

NOTIFICATION

In continuation of Resolution of even number dated the 4th June, 1958, constituting the Committee on Fisheries Education, the Government of India is pleased to appoint Prof. G.M. Gerhardsen of the Norwegian School of Economics and Business Administration, Bergen, Norway, as a Member of the Committee.

(Sd.) KRISHAN CHAND
 Joint Secretary to the Govt. of India

APPENDIX I (c)

Appendix B

DISTRICT FISHERY OFFICER

The following job description is a generalised one. It is unlikely that any officer would have to perform all the different duties described in Section 2 within a particular district although in the course of his career he would most probably, at one time or another, perform them all. Similarly no officer would be expected to have complete knowledge of all the items listed, nor would he be expected to have a high degree of skill in all the activities. On the other hand, it would be expected that his knowledge would extend in some respects to the whole of India, so that he would undertake duties in any district and, moreover would have knowledge of fisheries of other countries so that he would have an imaginative approach to developmental problems.

Duties and Responsibilities

(1) To administer the fisheries office and sub-offices of his district according to the approved rules and regulations of the Government, dealing with all matters of staffing, accommodation and supplies pertaining to these offices.

(2) To supervise and administer with regard to the fishery industries of his district in accordance with departmental instructions, services of intelligence, administration and development. Examples of what these activities might embrace are given below:

- (i) *Intelligence*: activities directed toward maintaining up-to-date knowledge of the industry, comprising
- (a) collection of statistics with regard to fisheries, including the taking of inventories of manpower and equipment in fishing, processing, marketing and distribution; recording of operations in and resultant production from each phase; and recording the disposal of the products,
 - (b) ascertainment of financial characteristics of the industries, including valuation of capital, costing of operations and estimation of average prices at various stages,
 - (c) collection of information of factors affecting operations in each phase.
- (ii) *Administration*: activities directed towards the maintenance of law and order in the industry, comprising
- (a) assistance to the industry in obtaining its supplies of equipment, materials and commodities,
 - (b) administering the provision of loans, grants etc.,
 - (c) acting as intermediary between the fishery industries and other private and public interests, ensuring that full expression is given to the needs and views of industry so that these might be taken into consideration during planning and policy formation,
 - (d) issuing licenses, collecting fees, dues etc.,
 - (e) exercising such control over fishing operations as current law requires,
 - (f) inspecting boats and gear with regard to laws and regulations for conservation, safety-at-sea, and other matters,
 - (g) supervision of landing and marketing of fish with regard to conservational and other laws, hygiene, etc.,

- (h) settlement of disputes, including the conduct of enquiries, preparation of evidence and findings,
 - (i) publicising regulations for the control of fishing, processing and marketing operations, explaining the purposes of the regulations and seeking the cooperation of the operatives in observance of these regulations.
 - (j) detection and prosecution of contraventions through appropriate channels,
 - (k) management of State-owned installations, such as fish markets, and storage plant.
- (iii) *Development* : activities directed towards transformation and expansion of the industry, giving increases in production and efficiency, reduction in costs, and improvements in utilisation, comprising
- (a) proposing relevant development activities to be undertaken,
 - (b) extension services for transmission to operatives of technical information aimed at securing improvement in operations,
 - (c) detection of disabilities in operations and where necessary requesting research to identify the cause of the disability and to find a remedy for it,
 - (d) analysis as far as possible of the costs of production in all phases of the industry as a means to measurement of the efficiency of these operations,
 - (e) conduct of sales promotion programmes,
 - (f) promotion of cooperative or other forms of organisation by which the operations might be conducted with greater efficiency,
 - (g) administration of schemes for the distribution of equipment and supplies (with or without financial aid) required by developmental programmes,
 - (h) conduct of training centres for personnel of the industry,
 - (i) conduct of pilot schemes to test proposed modifications or extensions of operations.

(3) To report regularly, as circumstances may require, on the conduct of these services and to communicate their results in appropriate form; to formulate proposals relating to these services, especially proposals for activities that would assist economic development of fisheries; and to submit regularly an appraisal of the state of the industries within his district.

(4) To maintain liaison with other government services active within his district, such as Cooperatives, Maritime, Transport, Revenue and Community Development.

Qualifications and Experience

Knowledge of—

- (a) geographic, economic and other features of his district,
- (b) identifying characteristics, distribution, biology and behaviour of the species exploited (or likely to be exploited) by the fishery industries within his district,
- (c) identifying characteristics, materials, methods of construction and operation, particular uses, advantages and disadvantages of each of the types of fishing gear in use in his district,
- (d) characteristics of fish ponds and the methods employed in their construction,
- (e) general characteristics and seasonal and other patterns of fishing and fish-cultural operations in his district,
- (f) navigation of fishing craft and methods of searching for fish,
- (g) equipment and methods of processing fish in his district,
- (h) equipment and methods of handling, storing, transporting and selling fish, wholesale and retail,
- (i) economic, social, educational, health and other status of the operatives in his district,
- (j) general organisational features of the industry in his district (team etc. in primary industry; middlemen agents; cooperatives etc.),
- (k) fisheries laws and regulations.

Ability to—

- (a) identify and measure fish, and make elementary examination of them with regard to sexual condition, stomach content, freshness and other characteristics referred to in regulations;
- (b) identify units of fishing gear and prepare complete measurement and specifications of them, especially with regard to mesh size or other characteristics referred to in regulations; and to specify the kind of gear most suitable for the capture of a particular species of fish in a particular situation;
- (c) identify fishing boats and make such measurement and specification of them as may be required in determination of their conformity with regulations;
- (d) ascertain the general characteristics of a body of inland waters and propose plans for development, conservation and exploitation;
- (e) determine the appropriate location, size, form etc. of a fishpond for a particular situation and advise on details of its construction; to appraise the status of an existing pond, to advise on changes

needed in its construction; and to advise on stocking and management of these ponds, including the control of diseases and the prevention of losses;

- (f) identify processing units and prepare specifications of them including their capacity and their characteristics with regard to conformity to laws relating to hygiene and quality;
- (g) identify fish products and examine them with regard to standards of hygiene and quality;
- (h) analyse the costs of production and distribution of fish and fish products;
- (i) examine facilities and equipment for handling storage and transport of fish and fish products and assess their adequacy for the supplies required to be handled;
- (j) collect, compile and make preliminary analysis of statistics of fishery equipment, operations, productions, costs and returns;
- (k) perform all the necessary operations of accountancy, staff control, office management, reporting etc. required in the administration of an office and the conduct of the above services.

Experience—

- (a) At least three months as member of a fishing team,
- (b) One month of practical work on a fish farm,
- (c) Three months as a member of a team of statistical collectors,
- (d) One month as student-apprentice in a processing establishment,
- (e) Four months as technician attached to fisheries research institutes.

Appendix C

GENERAL SCOPE OF THE CURRICULUM FOR TRAINING OF FISHERIES ADMINISTRATORS

1. *Geography*: Physiographic, climatological, demographic.
2. *General Economics*: Role of fisheries in social structure. Government's fiscal and other systems.
3. *Fisheries Science*: General principles and subject.
4. *Fisheries Biology*: Identification, location, magnitude and behaviour of fishery resources, their response to exploitation and opportunities they offer for intervention.
5. *Fisheries Meteorology and Oceanography*.
6. *Fisheries Gear Technology*: Design, construction and operation of gear for the capture and cultivation of fish, maintenance of gear, materials of which constructed.
7. *Fish Culture*.
8. *Fisheries Naval Architecture*: Design, construction and equipping and operation of fishing boats, standing fishing gear (winches etc.), fish finding equipment; navigational aids.
9. *General Principles of Navigation*.
10. *Fisheries Food Technology*: Fish handling, storage and processing.
11. *Fisheries Economics*: Composition, structure, organisation and operation of fishery industries, cost and efficiency analysis.
12. *Fisheries Statistics*: Collection, compilation and analysis of inventorial and operational data.
13. *Fisheries Administration and its Institutions*.
14. *Laws and Regulations pertaining to Fisheries*.
15. *Business Management, including Principles of Cooperatives and Labour Relations*.

Appendix D

CRITERIA TO BE CONSIDERED IN SELECTING A SITE FOR A FISHERY TRAINING CENTRE

1. Access to fishery industries

This must be the paramount consideration for a permanent Centre. The trainees should live in a 'fishery' atmosphere and have abundant opportunity to observe all kinds of fishery operations. In detail, there should be access to marine fishing, inland fishing, fish culture, fishing ports, fish markets, fish processing establishments.

2. Space and Facilities

The centre will of course require its own buildings and to be able to house in them various kinds of equipment—Electricity and water supply should be ample. Docking facilities for the training vessels must be available.

3. Access to ancillary industries

The trainees should be able to visit ship-building yards, manufacturing of nets and ropes, engine factories and repair shops, ship's chandlers and other establishments.

4. Proximity to institutions

The Centre might need to have the use of institutional libraries, lecture rooms and laboratories, but it is assumed that a permanent Centre would be endowed with these. Professional contact between the staff of the Centre and the staffs of universities and research and educational institutions would be important for the professional health of the Centre. Some teaching assistance might be drawn from nearby universities and other educational institutions, but must be stressed that, in fact, since fishery science is one of the applied sciences, recruitment of teaching staff should be rather from fishery research institutions and from among practising fishery scientists than from academic circles.

5. Domestic accommodation, transport and communications

This point is, of course, self-evident; the particular requirements will be determined chiefly by the number of students to be trained.

APPENDIX II

No 7-15/57-FY(D)

GOVERNMENT OF INDIA

MINISTRY OF FOOD AND AGRICULTURE

(DEPARTMENT OF AGRICULTURE)

New Delhi, the 17th September, 1959

NOTIFICATION

In continuation of Notification of even number dated the 20th August, 1958, appointing Prof. G.M. Gerhardsen of the Norwegian School of Economics and Business Administration, Bergen, Norway, as a Member of the Committee on Fisheries Education constituted by the Government of India in their resolution No. 7-15/57-FY (D) dated the 4th June, 1958, the Government of India is pleased to appoint Dr. B.N. Chopra, retired Fisheries Development Adviser to the Government of India, as a member of the Committee.

(Sd). KRISHAN CHAND

*Joint Secretary to the Government
of India*

APPENDIX III

LIST OF PLACES AND INSTITUTIONS VISITED BY THE COMMITTEE

WEST BENGAL

Central Inland Fisheries Research Station, Calcutta and Barrackpore.
Central Inland Fisheries Training Centre, Barrackpore, Calcutta.
Calcutta University, Calcutta.
Calcutta University College of Science (Department of Zoology), Calcutta.
Directorate of Fisheries (West Bengal State), Calcutta.

BOMBAY STATE

Institute of Science, Bombay.
Directorate of Fisheries (Bombay State) and Taraporewala Aquarium, Bombay.
Deep Sea Fishing Station, Government of India, Bombay.
Ice and Cold Storage Plant, Government of India, Bombay.
Nautical & Engineering College of the Ministry of Transport, Bombay.
Sassoon Docks, Bombay.
Versova Fishing Village, Bombay.

Danda Fishing Village, (near) Bombay.
 Madh Fishing Village, (near) Bombay.
 Crawford Market, Bombay.
 State Fisheries Technological Station, Bombay.
 New India Fisheries Limited, Bombay.
 International Fisheries Private Ltd., Bombay.
 M.S. University (Department of Zoology), Baroda.

ORISSA STATE

Central Inland Fisheries Research Sub-Station, Cuttack.
 Directorate of Fisheries (Orissa State), Cuttack.
 Kausalyaganga Fish Farm, (near) Bhubaneswar.

ANDHRA STATE

Andhra University, Waltair.
 Department of Zoology and Oceanography, College of Natural Science, Andhra University, Waltair.
 Central Marine Fisheries Research Unit, Waltair.
 Fishermen Training Centre and Boat Building Yard, Kakinada.
 Andhra Poltechnic, Kakinada.
 Directorate of Animal Husbandry and Fisheries (Andhra State), Hyderabad.
 Osmania University, Department of Zoology, Hyderabad.
 Central Fisheries Extension Unit, Hyderabad.

MADRAS STATE

Madras University, Madras.
 Directorate of Fisheries (Madras State), Madras.
 Central Marine Fisheries Research Unit, Madras.
 Madras University Research Laboratories, Madras.
 Central Polytechnic, Madras.
 Annamalai University, Chidambaram.
 Marine Biological Station, Annamalai University, Porto Novo.
 Central Marine Fisheries Research Centre, Porto Novo.
 Central Marine Fisheries Research Station, Mandapam Camp.
 Central Fisheries Extension Unit, Mandapam Camp.

KERALA STATE

Directorate of Fisheries (Kerala State), Trivandrum.
 Department of Marine Biology and Fisheries and other Research Laboratories, Kerala University, Trivandrum.
 Central Fisheries Technological Research Station (Craft & Gear Wing and Processing Wing), Cochin.
 Central Off-Shore Fishing Station, Cochin.
 Central Marine Fisheries Research Sub-Station, Ernakulam.
 Indo-Marine Fisheries Agencies (Canning Plant), Cochin.
 Southern Fisheries & Company (Freezing Plant), Cochin.
 Bruntons' Boat Building Yard, Pulluruthy, Cochin.
 Cochin Company (Freezing Plant), Cochin.
 State Fishermen's Training Centre, Cochin.
 Indo-Norwegian Project, Quilon.
 Boat Building Yard of the Indo-Norwegian Project, Quilon.
 Ice & Cold Storage Plant of the Indo-Norwegian Project, Quilon.
 Fishermen's Training Centre, Indo-Norwegian Project, Quilon.

MYSORE STATE

Central Food Technological Research Station, Mysore City.
 Directorate of Fisheries (Mysore State), Bangalore.

Central College, Bangalore.
State Fisheries Station, Krishnarajasagar (near) Mysore.

DELHI STATE

University of Delhi.
University Grants Commission, New Delhi.
National Council of Applied Economics Research, New Delhi.

PUNJAB STATE

Punjab University, Chandigarh.

APPENDIX IV
PERSONS WITH WHOM THE COMMITTEE (OR INDIVIDUAL MEMBERS OF COMMITTEE) HELD DISCUSSIONS

The Committee has discussed the subject of Fisheries Education with a very large number of persons both official and non-official but it is obviously not possible to include a full list. An attempt is made here to indicate the important categories of persons with whom discussions have been held formally or informally.

1. Ministers, Secretaries, and technical officers of the Union Ministry of Food & Agriculture.
 2. Ministers in-charge of Fisheries in the State of Bengal, Orissa, Andhra Pradesh, Madras, Kerala and Bombay.
 3. Vice-Chancellors of the University of Calcutta, Andhra, Madras, Baroda and Punjab.
 4. Secretaries in-charge of Fisheries in the State of Bengal, Andhra Pradesh, Madras, Kerala, Mysore, Rajasthan and Bombay.
 5. Directors of Fisheries, Heads of Fisheries Departments and other Fisheries Officers of the States of Assam, Bengal, Orissa, Andhra Pradesh, Madras, Kerala, Mysore, Bombay, Madhya Pradesh, Uttar Pradesh, Bihar, Punjab, Kashmir and Himachal Pradesh.
 6. Deans of the Faculty of Science, Universities of Delhi, Andhra and Kerala.
 7. Professors of Zoology or Senior Zoologists in the Universities of Calcutta, Andhra, Osmania, Madras, Annamalai, Kerala, Mysore, Bombay, Delhi and Punjab.
 8. Director of Zoological Survey of India, Calcutta.
 9. Director or Heads of Departments of the Institute of Sciences, Bombay.
 10. The Secretary & Scientific Development Officer, University Grants Commission.
 11. The Chief Research Officer and Staff of the Central Marine Fisheries Research Station, Mandapam.
 12. The Chief Research Officer and Staff of the Central Inland Fisheries Research Station, Calcutta (Barrackpore).
 13. The Superintending Engineer and Staff of the Deep Sea Fishing Station, Bombay.
 14. Technical Officers of the Central Fisheries Technological Research Station and Offshore Fishing Unit, Cochin.
 15. Senior Officers of the Central Food Technological Research Station, Mysore.
 16. Director and other technical experts of the Indo-Norwegian Project, Quilon.
 17. Director of the Fisheries Division, Chief of the branch of Fisheries Economics (Fisheries Division) and other Fisheries Officers of the F.A.O.
 18. Fisheries Experts working in India under Expanded Technical Assistance Programme of F.A.O. (Fish Marketing; Craft & Gear Technology; Fleet Management; Naval Architecture and Fishery Engineering).
 19. Fisheries Experts working in India under Technical Cooperation Mission of U.S. Government (Master Fishermen; Fishery Engineering; Exploratory Fishing; Fisheries Extension).
 20. Fisheries Experts working in India under Colombo Plan (Master Fishermen; Shrimp Trawling, etc.).
 21. Principal of the Nautical and Engineering College, Bombay.
 22. Managing Directors or principal executives of New India Fisheries Ltd., Bombay; Cochin Company, Cochin Southern Fisheries Corporation, Cochin; International Fisheries Corporation, Bombay; & Cochin and Brunton & Co. Cochin.
 23. Secretary, Fishermens Cooperatives, Mangalore.
 24. Principal and Staff of the Polytechnic Institutes at Kakinada (Andhra Pradesh) and Madras (Madras State).
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APPENDIX V
LETTER ADDRESSED TO VICE-CHANCELLORS OF VARIOUS UNIVERSITIES

No. F. 7-15/58-FY(D)

GOVERNMENT OF INDIA

MINISTRY OF FOOD AND AGRICULTURE
(DEPARTMENT OF AGRICULTURE)

*Krishi Bhavan, New Delhi;
Dated 11th Sept., 1958*

FROM

N. K. Panikkar, M.A., D.Sc., F.A.Sc., F.N.I., Fisheries Development Adviser to the Government of India and Chairman, Committee on Fisheries Education.

TO

The Vice-Chancellor
University of (All Universities in India)

DEAR SIR,

The Government of India has constituted a Committee of specialists to examine the question of Fisheries Education in India with a view to studying the need for setting up a higher institute of Fisheries for training administrative and developmental personnel for Central and State Fisheries Departments and for the growing needs of the industry. This Committee has the following terms of reference.

1. To review and assess the training requirements for fisheries personnel to man the administrative and executive positions in the fisheries development and research projects in India and for the growing needs of the industry.
2. To examine the need for higher or ancillary training facilities in the light of the present and future requirements of the Second and Third Plans and of the training courses now available.
3. To recommend the location, courses of study, the staff required and of the practical details for the establishment of such training institute (institutes).

From the experience of fisheries work during the Second Plan, it has become apparent that shortage of qualified personnel at appropriate levels has been one of the major setbacks in the implementation of various development schemes. On the research side, we are aware that the Universities are training students in Master's degree in Zoology, who are absorbed for research work in the Central and State Fisheries Research Stations. In the field of developmental work, however, there is no organised agency for higher training unlike subjects like Animal Husbandry, Agriculture, Dairy Science and Forestry. While these branches have advanced considerably and have set up well-defined institutes for imparting training, we have so far not succeeded in establishing similar institutes in the field of fisheries, both at operational as well as at supervisory levels.

At the present time a ten months' course in Inland Fisheries is given to graduates at the Central Inland Fisheries Research Station, Calcutta, and these trainees have been absorbed in the subordinate services in the Fisheries Department of the various States. Some of the Polytechnics, notably the ones at Kakinada, Madras, Calicut and Kalamasseri have been giving training to Matriculates in certain aspects of fisheries work, but, owing to the low initial qualifications of the trainees, this training has generally been not successful and the trainees themselves have found difficulties in securing positions commensurate with the number of years spent in training. On the operational side, training Centres for fishermen have been started at Satpati, Mangalore, Calicut, Cochin, Tuticorin and Kakinada. It is likely that some more training centres of this kind will be set up during this and the next Plan period. But the emphasis on this training has been on actual fishing operations by the use of modern mechanised fishing craft and gear, which is somewhat different from the training necessary for administrative and supervisory posts in Fisheries.

Graduates in Zoology from Universities and those with post-graduate training in the field of Fish or Fisheries under subject group "Zoology" have been the main source of recruitment to positions in the Central and State services. Many of these trainees although possessing excellent basic qualifications, require several years of work before they are in a position to handle fishery operations, whereas they cannot readily be absorbed into the positions of research if they have not acquired post-graduate research training.

Fisheries as a discipline, require combined knowledge of various sciences (as much as Agriculture does) and it has become evident that knowledge of biological sciences alone will not be enough for a good fisheries officer. Some good grounding is most essential in other applied sciences, like statistics, economics, physics and chemistry, oceanography etc. This is necessary in order to deal properly with problems of cultural operations, storage, marketing, distribution, financing credit, and quite a few other practical problems in the day-to-day execution of fisheries developmental activities.

It is against the background of these requirements that this Committee is approaching its task. We also propose to visit a small number of educational centres which directly deal with fishery problems. In the meantime, the work of the Committee would be greatly facilitated if the views of your University on the question of organised courses in Fishery Sciences could be communicated as also details of any proposals for higher education in this particular field which the University may be considering. Apart from courses in Fisheries, we would also like to be informed of special subjects in the Master's degree which are of an allied character, like Marine Biology, Oceanography, Limnology and related subjects.

Yours faithfully,

(Sd). N.K. PANIKKAR

*Chairman, Committee on Fisheries Education,
Ministry of Food and Agriculture*

APPENDIX VI

ADMINISTRATIVE STRUCTURE OF FISHERIES DEPARTMENTS IN VARIOUS STATES

State	Category	Number	Designation	Function	Level	REMARKS
					State/ Division/ District/ Sub- division/ Tehsil	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
ANDHRA	Class I	1	Director of Animal Husbandry and Fisheries.	Head of the Department.	State	
		1	Deputy Director of Fisheries (Rs. 420-700).	Assist the Director of Animal Husbandry and Fisheries in technical matters, administration, planning and implementation of fisheries schemes in the State.	Do.	
	Class II	1	Assistant Director of Fisheries for Headquarters (Rs. 300-600).	Disposal of routine office work at Headquarters.	Do.	
		1	Biochemist (Rs. 250-400).	In charge of research work in Biochemical field.	Do.	
		1	Assistant Director of Fisheries (Research) (Rs. 250-450).	In charge of research work in Biological field.	Do.	
		10	Assistant Directors of Fisheries (Rs. 230-500).	For Development work.	District	Each in charge of one to three district according to work in the area.
		5	Assistant Fisheries Officers (Rs. 250-450).	Do.	Do.	
		1	Superintendent, Fishermen Training Centre (Rs. 230-500).	Training	State	
		1	Refrigeration Engineer (Rs. 230-500).	In charge of Ice-cum-Cold Storage plant.	State	At Visakhapatnam.
		5	Pisciculturists (Rs. 190-340).	Piscicultural activities in the region	Tehsil	
1	Assistant Research Biologist (Rs. 190-340).	Research in Biochemistry	State			

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ANDHRA— <i>contd.</i>	Class III	2	Research Assistants (Rs.120-220)	Research in Biology	State	
		40	Inspectors of Fisheries (Rs.120-220, Rs.140-300).	Attend to departmental fishing, seed collection, distribution, enforcement of conservancy, stocking of fishes.	Tehsil	
		49	Operators (Rs. 68- $\frac{1}{2}$ -116) Assistant Inspectors (Rs. 60-100).	Development and conservation work.	Do.	
		1	Photo-Artist (Rs.105-215).	Taking photographs of publicity value.	State	
		1	Cooperative Sub-Registrar (Rs.150-200).	In charge of fishery cooperatives.	Do.	
		5	Junior Inspectors of Cooperative Societies (Rs. 65-90).	Supervision of Cooperatives.	District	
		2	Mechanics (Rs. 90-140), (Rs. 60-100).	Maintenance of refrigerators and cold storage plant and its equipment.	State	
		1	Laboratory Assistant (Rs. 90-140).	At Bio-chemical Laboratory.	Do.	
		1	Laboratory Technician (Rs. 65-90).	To assist the Assistant Director (Research).	Do.	
ASSAM	I	1	Director of Agriculture as Director of Fisheries (with a special pay of Rs. 150).	Overall control of all schemes relating to Fisheries Administration.	State	Director of Agriculture is holding the charge of the Department in addition to his own duties.
		1	Deputy Director of Fisheries (Rs. 250-750).	Helping the Director in planning and implementing the Fisheries schemes of the State and supervision of these.	Do.	
	II	1	Welfare Officer (Rs. 200-500).	Organisation of Fishery Co-operatives and marketing	Do.	
	III	16	Fishery Officers (Rs.125-275).	Fisheries development work and technical guidance; and assistance to the private pisciculturists.	Sub-division.	

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ASSAM— <i>contd</i>		9	Assistant Fishery Officers (Rs. 75-125).	Incharge of Fish Farms in Sub-divisions where farms are opened.	Sub-division	
		58	Fishery Demonstrators (Rs. 60-100).	Carrying out of field work in their respective Tehsils or Circles.	Tehsil	
		19	Fishery Supervisors (Rs.60-100).	Carrying out of field work and in addition to check up illegal fishing in natural Fisheries.	Do.	
		1	Fishery Instructor (Rs. 150-350).	To assist in the training of class III personnel for field works and directly incharge of the trainees.	State	
		1	Research Assistant (Rs. 125-275).	Research work in field and laboratory.	Do.	
WEST BENGAL	..		Director of Fisheries Rs. (1000-1350).	Overall charge of the Directorate, responsible for advising Government in all technical matters on fish and fisheries inclusive of the deep sea fishing scheme.	State	
			Assistant Director of Fisheries (Rs. 250-750)	Responsible for routine administration of the Headquarters and Supervision of the progress of various schemes going on in the Districts and give necessary technical guidance to the executive staff.	Do.	The Class and number of the different officials is not furnished.
			Superintendent of Fisheries (Rs. 250-750).	Supervision of administrative matters of the staff.	Division	
			District Fishery Officers (Rs. 150-330).	Execution of the various development schemes and programmes.	District	
			Assistant Fishery Officers (Rs. 80-180).	Assisting the district Fishery Officer in the successful execution of the various development schemes and programmes in their subordinate offices.	Sub-division.	

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
WEST BENGAL— <i>contd.</i>			Fishery Sub-Overseers (Rs.70-150).	Work among the local public by giving advice and assistance for pisciculture.	Sub-Division	
BIHAR	Class I	1	Fisheries Development Officer (Rs. 350-1,000).	Direction and supervision of fisheries development programmes.	State	
	Class II	4	Assistant Fisheries Development Officers (Rs. 220-750).	Supervision of Fisheries Development work in the Division.	Division	
	Class II	1	Fisheries Biologist (Rs. 220-750).	Fisheries Research Laboratory, Patna.	State	
	Class III	17	Fishery Inspectors (Rs. 150-350).	Fishery development work in distt.	District	
		5	Fisheries Instructors (Rs. 100-190).	Education of fishermen.	District	
		2	Senior Research Assistants (Rs. 150-350).	Fisheries Research Laboratory, Patna.	Division	
		2	Junior Research Assistants (Rs. 100-190).	Do.	Do.	
		76	Fisheries Supervisors (Rs. 60-100).	Fisheries development work in the Sub-division.	Sub-division.	
			Carp Breeding and Fish Farm Supervisors (Rs. 75-140)	Fisheries Development work in the Sub-division.	Do.	
BOMBAY	Gazetted	1	Director of Fisheries (Rs. 1,000-1,400).	Head of the Department.	State	
		1	Officer on Special Duty (Rs. 600-900).		Do.	At Bombay
		1	Assistant Director of Fisheries (Rs. 350-1,100).		Do.	Do.
		1	Assistant Director of Fisheries (Rs. 350-1,100).			For Vidarbha & Marathwada (at Nagpur).
		1	Assistant Director of Fisheries (Tech. and Research) (Rs. 350-1,100).		Do.	At Bombay.
		1	Officer - in - charge (Mechanised Fishing, (Rs. 350-1,100).		Do.	For Saurashtra & Ratnagiri (at Rajkot).

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
BOMBAY— <i>contd.</i>		1	Research Officer (Rs. 350-1100).		State	At Bombay
	Non-gazetted	1	Superintendent of Fisheries (Rs. 220-650).		Do.	At Bombay
		1	Superintendent of Fisheries (Inland) (Rs. 220-650).		Do.	
		1	Superintendent of Fisheries (Coast) (Rs. 220-650).		Do.	At Ratnagiri
		1	Superintendent of Fisheries (Rs. 220-650).		Sub-division.	At Kolhapur for Kolhapur, South & North Satara.
		1	Superintendent of Fisheries (Rs. 220-650).		Do.	At Baroda
		1	Curator, Taraporewala Aquarium, Bombay (Rs. 220-650).		State	At Bombay
		1	Statistical Officer (Rs. 220-650).		Do.	At Bombay
		1	Marketing Officer (Rs. 220-650).	Marketing	Do.	At Bombay
		1	Fisheries Training Officer (Rs. 220-650).	Incharge of Fisheries Training School.	Do.	At Veraval
		1	Assistant Mechanical Engineer (Rs. 220-650).		Do.	At Veraval
		1	Harbour Engineer (Rs. 220-650).		Do.	At Porbunder
		1	Curator, Marine Biological Res. Station, Ratnagiri (Rs. 220-650).		Do.	At Ratnagiri
		8	Superintendent of Fisheries.		District	One each at Surat, Veraval, Jamnagar, Kutch, Nagpur, Bhandara, Chanda and Aurangabad.
JAMMU & KASHMIR ..	Gazetted	1	Director of Fisheries (Rs. 400-700).	Head of Station	State	All fishery waters in the State are classified as Trout waters, sanctuaries, reserve waters and protected waters in which fishing etc. is allowed and regulated under a statutory law <i>i.e.</i> The Jammu & Kashmir Fisheries Act of 1900.
		1	Headquarter Assistant (Rs. 150-300)		Do.	

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	
JAMMU & KASHMIR — <i>contd.</i>	Non-gazetted	2	Inspectors (Rs. 150-300).		District		
			Fish Ranger (Rs. 90-230).		Do.	All waters have been divided into beats and each beat is watched by a watcher or two.	
		3	Fishery Development Assistants (Rs. 100-175).		Do.	A group of contiguous beats in an area is supervised by a Head watcher or the keeper. The 'waters' have been divided into 21 blocks and each block is controlled and supervised by a Jamadar whose jurisdiction normally extends over a Tehsil unit excepting for farms and Hatcheries. Two Inspectors for Kashmir Province and one Fishery Ranger for Jammu Province are controlling the activities of subordinate staff. The main functions of the staff are watch and ward and supervision over the areas under their jurisdiction and to interfere in and to prevent offences under the Fisheries Regulations.	
		1	Statistical Assistant (Rs. 100-175).				
		3	Field Investigators (Rs. 70-130).		Sub-division.		
		1	Overseer (Rs. 100-175).		Do.		
KERALA	Gazetted	1	Director of Fisheries	Head of office		State	
		2	Deputy Directors of Fisheries		Division	One at the Headquarters (Trivandrum) and the other at Kozhikode.	
		3	Assistant Directors (Zonal)	Administration		District	One each at Quilon, at Kozhikode and at Ernakulam.
		1	Assistant Director	For Research		State	
		1	Assistant Director	For training		Do.	
		1	Assistant Director	For Co-operation		Do.	
		1	Superintendent, Fisheries Technological Station			Do.	At Kozhikode

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
KERALA— <i>contd.</i>		1	Refrigeration Engineer.			State
		1	Welfare Officer			Do. At Headquarters
	Non-Gazetted	1	Marketing Officer	Marketing		Do.
		1	Lime-shell Conservation Officer.	Conservation of the shell resources of the State.		Do.
		1	Extension Officer	Extension work		Do. At Panniveli-Chira
		1	Superintendent, Fishermen Training Centre.			Do. At Ernakulam
		1	Fish Cultural Officer.	Research		Do.
		1	Marine Survey Officer.		Do.	Do. At Vizhinjom
		1	Estuarine Research Officer.		Do.	Do. At Ernakulam
		1	Fresh Water Biologist.		Do.	Do. At Thiruvalla
Non-Gazetted	8	Research Assistants	Research		State	One each at Trivandrum, Vizhinjom, Ernakulam and Thiruvalla and 4 at Fisheries Technological Station, Kozhikode.
	1	Technical Assistant			Do.	
	2	Engineering Supervisors.			Do.	One under Refrigeration Engineer and the other at Freezing Plant, Kozhikode.
	1	Mechanical Inspector.			Do.	Under Superintendent, Fishermen Training Centre, Ernakulam.
	1	Junior Engineer			District	Under Inspector of Fisheries (Special) Beypore.
	1	Assistant Mechanic			Do.	Under Superintendent, Fisheries Technological Station, Kozhikode.
	1	Marine Surveyor			Do.	At Headquarters.
	1	Fish Farm Manager			Do.	At Ayiramthengu.

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	
KERALA— <i>concl.</i>		1	Co-operative Sub-Registrar.		District	Under Assistant Director (Cooperation).	
		2	Senior Co-operative Inspectors.		Do.	One under Welfare Officer and the other under Deputy Director.	
		7	Co-operative Inspectors.		Sub-Division	2 under Asstt. Director (Quilon); 2 under Asstt. Director (Cooperation); 2 under Asstt. Director (Kozhikode); and 1 under Asstt. Director (Ernakulam).	
		8	Inspectors of Fisheries.		Do.	One each at Alleppey, Quilon, Trivandrum, Tellicherry, Kozhikode, Ernakulam, Palghat, Malampuzha.	
		1	Inspector of Fisheries (Spl.)		Do.	At Beypore.	
		1	Inspector of Fisheries (Training).		Do.		
		40	Sub-Inspectors Fisheries.		Tehsil	35 for fish-curing yards and 5 for backwaters.	
		34	Petty-yard Officers.		Do.	Under Sub-Inspectors.	
		1	Assistant Fisheries Demonstrator.		District		
		1	Home Economist		Do.	Under Inspector of Fisheries, Palghat.	
		1	Manure Assistant		Do.	Under Superintendent, Fisheries Technological Station, Kozhikode.	
	MADHYA PRADESH	Class I	1	Fisheries Development Officer (Rs. 400-600).	Technical supervision, general guidance and formation of policy matters.	State	Headquarter at Rewa.
		Class II	4	Asstt. Fisheries Development Officers (Rs. 225-600).	Technical supervision and guidance to District Officers.	Division	Headquarter at Raipur, Jabalpur, Bilaspur and Bhopal.
		2	Superintendent of Fisheries (Rs. 200-350)		Do.	Do. Headquarter at Gwalior & Indore.	

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
MADHYA PRADESH — <i>contd.</i>	Class III	1	Fisheries Development Officer (Vindhya Pradesh region.)	Technical supervision and guidance to District Officers.	Division	Headquarter at Rewa.
		1	Fisheries Biologist (Rs. 175-350)	Research	Do.	Attached with Fisheries Development Officer, Rewa.
		2	Research Assistants (Rs. 120-220).	To assist Fisheries Biologist.	Do.	One to be appointed.
		1	Biochemist (Rs.150-250).	Do.	Do.	To be appointed.
		1	Statistical Assistant (Rs. 150-250).	Collection of statistics	Do.	Do.
		12	Assistant Fisheries Development Officers (Rs. 150-250).	Pisciculture and exploitation.	District	Posted at Madhya Pradesh Unit.
		6	Asstt. Fisheries Officers (Rs. 150-250).	Do.	Do.	Posted at Vindhya Pradesh Unit. NOTE: Nature of duties and scale of pay of Asstt. Development Officers at Madhya Bharat Unit, Assistant Fisheries Officer of Vindhya Pradesh, District Fishery Inspector of Bhopal Unit are the same.
		3	District Fishery Inspectors (Rs. 150-350).	Pisciculture and exploitation.	District	
MADRAS	Gazetted	1	Director of Fisheries (Rs. 800-1,000).	The Director of Fisheries is assisted by one personal assistant in administrative matters and two Deputy Directors in technical matters.	State	
		2	Deputy Directors (Rs. 420-700).	The State is divided into 6 regions for administration, each in the charge of an Assistant Director. The regions are:	Do.	
		6	Asstt. Directors for regional work (Rs. 230-500).	1. Chingleput, North and South Arcot Districts (H.Q. Vellore). 2. Tanjavor and Tiruchirapalli Districts (H. Q. at Tanjavor).	District	

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	
MADRAS— <i>contd.</i>	1	Assistant Director of TCM & FAO Assistance Programme (Rs. 230-500).	3. Madurai and Ramanathapuram Districts (H. Q. at Madurai)		State		
				4. Tirunelveli District (H. Q. at Tuticorin).			
	1	Assistant Director for Marketing and Inspection (Rs. 230-500).	5. Kanyakumari District (H. Q. at Nagercoil).		Do.		
	1	Assistant Director for Craft and Tackle (Rs. 230-500).	6. Salem, Coimbatore and Nilgiris Districts (H. Q. at Salem).		Do.		
	1	Assistant Director for distribution of nylon nets and other fishery requirements (Rs. 230-500).	The Regional Assistant Directors are assisted by Inspectors, Assistant Inspectors, Sub-Inspectors, Overseers, fieldmen, etc., who are in charge of smaller divisions like taluks or groups of fish farms and ponds, or demonstration units or fish curing yards etc. There are also Cooperative Sub-Registrars and Inspectors to assist the Assistant Directors in the management of fishermen cooperative societies and federations. There are also Assistant Directors in charge of special activities like Biological Research, Technological research, marketing and information, welfare work, craft and tackle, TCM and FAO assistance, training of fishermen and welfare work. Besides, there are engineers incharge of fishing harbour schemes, maintenance of mechanized boats and of refrigeration work. These				
	1	Assistant Director for Welfare work (Rs. 230-500).			Do.		
	1	Assistant Director for Fresh water and Biological research (Rs. 230-500).			Do.		
	1	Assistant Director for Technological Research (Rs. 230-500).			Do.		
	1	Assistant Director for Hydrological Research (Rs. 230-500).			Do.		
	2	Assistant Directors for Fishermen Training Centre (Rs. 230-500).			Do.		
	1	Assistant Engineer for Harbour schemes (Rs. 260-500).			Do.		
	1	Assistant Engineer (Mechanical) for maintenance of mechanised vessels (Rs. 260-500).			Do.		
	1	Assistant Engineer (Refrigeration) for Ice Plants and Cold Storage (Rs. 230-500).			Do.		

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	
MADRAS— <i>contd.</i>					officers are also assisted by Research Assistants, Inspectors, Statistical Assistants, Propaganda Assistants, Laboratory Assistants, Engineering Supervisors, Mechanics, Fieldmen, etc.		
	Non-gazetted	29	Inspectors (Rs. 120-220).				
		15	Research Assistants (Rs. 120-220).				
		1	Superintendent (Rs. 120-220).				
		1	Propaganda Assistant (Rs. 120-220).				
		1	Statistical Assistant (Rs. 120-220).				
		4	Co-operative Sub-Registrars (Rs. 150-200).				
		11	Co-operative Senior Inspectors (Rs. 90).				
		23	Co-operative Junior Inspectors (Rs. 65-90).				
		16	Sub-Inspectors (Rs. 60-100).				
		7	Assistant Fishery Demonstrators (Rs. 60-100).				
		1	Chank Fishery Supervisor (Rs. 60-100).				
		2	Engineering Supervisors (Rs. 125-275).				
		2	Mechanical Designer (Grade I, Rs. 70-90) (Grade II, Rs. 40-80).				
		2	Mechanics on Junior Engineer's grade (Rs. 150-250).				
	4	Mechanics (Rs. 60-90).					

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
MADRAS— <i>concl.</i>		3	Senior Superintendents (Rs. 190-240).			
		3	Junior Superintendents (Rs. 140-190).			
MYSORE	.. Class I	1	Director of Fisheries (Rs. 550-860).	Head of Department	State	
	Class II	1	Fisheries Officer, Bangalore (Rs. 225-500).	In charge of Organisation and execution of all Inland development schemes in the districts of Old Mysore and also Coorg and Raichur Districts.	Division	
		1	Asstt. Director of Fisheries, Mangalore (Rs. 225-500).	In charge of organisation and execution of inland development schemes in South Canara Districts.	Do.	
		1	Superintendent of Fisheries (Coast), Karwar (Rs. 225-500).	In charge of organisation and execution of inland development schemes in North Canara, Dharwar, Bijapur and Belgaum Districts.	Do.	
		1	Superintendent of Fisheries (Training), Mangalore (Rs. 225-500).	For Training Schemes	Do.	At Fisheries Training Centre, Mangalore.
		1	Assistant Director of Fisheries (Marketing) Rs. 225-500.	Marketing	State	At Head Quarters.
		1	Assistant Director of Fisheries (Engineer), Mangalore (Rs. 225-500).	Engineering	Division	
		1	Assistant Director of Fisheries (Engineer), Karwar (Rs. 250-500).	Engineering	Do.	
		1	Assistant Engineer (Rs. 250-600).	Do.	State	At H.Q. This post has since been held in abeyance.
		1	Headquarters Assistant to the Director of Fisheries (Rs. 225-500).	Office Administration.	Do.	At H.Q.

APPENDIX VI—contd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
MYSORE—contd. Class III	3	Research Assistants (Rs. 75-250).	Research		District	Persons with M.Sc. or B.Sc. (Hons.) I class will be appointed at Rs. 100 at Bangalore.
	18	Assistant Superintendents of Fisheries (or Inspectors of Fisheries) (Rs. 75-250).	For developmental Schemes.		Do.	11 at Bangalore, 3 at Mangalore and 4 at Karwar.
	10	Sub-Inspectors or Assistant Inspectors (Rs. 50-120).		Do.	Tehsil	At Mangalore.
	16	Fishery Assistants (Rs. 50-120).		Do.	Do.	At Mangalore
	1	Fishery Operator (Rs. 50-120).		Do.	Do.	At Bangalore
	1	Field Assistant (Rs. 50-120).		Do.	Do.	Do.
	1	Laboratory Man (Rs. 50-120).		Do.	Do.	Do.
	1	Master Curer (Rs. 50-120).	Fish curing		Do.	At Karwar
	5	Yard Officers (Rs. 50-120).			Do.	At Karwar
	1	Fishery Overseer (Rs. 50-100).			Do.	At Bangalore
	1	Assistant Superintendent (Engineer) (Rs. 75-250).			District	At Mangalore under Asstt. Director of Fisheries (Engineer).
	1	Supervisor (Mechanisation (Rs. 180-300).			Do.	Do.
	1	Gear Technician (Rs. 180-300).			Do.	Do.
	2	Carpenter Foremen (Rs. 100-250).			Do.	One each at Mangalore and Karwar.
	2	Mechanical Foremen (Rs. 100-250).			Do.	One each at Mangalore and Karwar.
	6	Mechanics (Rs. 50-120).			Do.	All at Mangalore under Assistant Director (Engineer).
	3	Statistical Assistants (Rs. 120-220).	For Fisheries statistics.		Do.	One each at Bangalore, Mangalore and Karwar.
	1	Co-operative Sub-Registrar (Rs. 80-200).	For Cooperatives		Do.	At Mangalore

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	
MYSORE—concl'd.		2	Senior Inspectors of Cooperative Societies (Rs. 80-200).	For Cooperatives	District	One each at Mangalore and Karwar.	
		2	Junior Inspectors of Cooperative Societies.	Do.	Do.	At Karwar	
		1	Assistant Superintendent (Training) (Rs. 150-250).		Do.	At Mangalore, under Superintendent of Fisheries (Training).	
		1	Mechanic Driver (Rs. 150-250).		Do.	Do.	
		2	Tindals (Rs. 120-250).		Do.	Do.	
		1	Master Fisherman (Rs. 70-150).		Do.	Do.	
		2	Refrigeration Mechanics (Rs. 100-150).		Do.	Under Assistant Director of Fisheries (Engineer) Karwar.	
		1	Headmaster, Fisheries High Schools (Rs. 200-400).	Teaching in Fisheries Schools.	Do.	Do.	
	ORISSA	.. Class I (Gaztd.)	1	Director of fisheries Rs. 1,300-50-1,500.	Administration, Research, etc.	State	At Cuttack
		Do.	1	Deputy Director of Fisheries. Rs. 690-30-780-EB-40-860.	Do.	Do.	Do.
Class II (Gaztd.)		7	Assistant Director of Fisheries. Rs. 200-15-260-25-435-EB-25-600-EB-30-700.	Administration, Fish Culture, Marketing Research.	District		
Class III (Gaztd.)		7	Superintendent of Fisheries Rs. 175-10-215-15-275-EB-305-EB-15-380.	Administration, Marketing, Conservation, etc.	Do.		
Class III (Non-Gaztd.)		7	Senior Research Assistant. Rs. 155-5-160-10-220-EB-10/2-250.	Research	State		
Do.		7	Junior Research Assistant. Rs. 120-5-155-EB-5-160-10-220-EB-10/2-250.	Do.	Do.		
Do.		10	District Fishery Officer Rs. 120-5-155-EB-5-160-10-220-EB-10/2-250.	Administration, Fish Culture, Marketing etc.	District		
Do.		109	Fishery Supervisors Rs. 50-2-60-EB-1-65.	Do.	Sub-Division		
Do.		20	Inspectors of Fisheries. Rs. 85-2-97-3-115-EB-4-155.	Do.	Do.		

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
ORISSA— <i>contd.</i>	Class III (Non-Gaztd.)	3	Mechanics Rs. 85-2-97-3-115	Repair of engines, boats, etc.	State	
	Do.	18	Pump & Launch Driver, Rs. 60-2-90.		Do.	
	Do.	1	Senior Operator Rs. 100/5-200-6-150.		Do.	
	Do.	1	Junior Operator Rs. 50-2-70.		Do.	
	Do.	1	Tindal Mechanic Rs. 50-2-70.		Do.	
PUNJAB	.. Class I	1	Director of Animal Husbandry as Honorary Warden of Fisheries.	To control and supervise the Fisheries activities.	State	The Director of Animal Husbandry, Punjab, is the Honorary Warden of Fisheries.
	Class II	2	Deputy Warden of Fisheries (Rs. 250—700)	Administration, supervision of research work in fisheries and putting up development plans.	Division	
	Class III	21	Assistant Wardens of Fisheries (Rs. 100-300)	Conservation of fisheries and development of inland fisheries.	District	
		1	Fisheries Research Assistant (Batala) (Rs. 100—300)	Location of spawning grounds in and around the three districts (Hoshiarpur, Gurdaspur and Amritsar) and rearing and transport of fish seed.	Do.	
RAJASTHAN	.. Class I	1	Director of Veterinary & Animal Husbandry as Warden of Fisheries. (Honorary)	Head of the Department.	State	At Jaipur
	Class II	1	Fisheries Development Officer (Rs. 250—700)	Head of the office	Do.	Do.
		3	Deputy Director of Veterinary as Deputy Warden of Fisheries (Honorary)		Division	
		1	Fisheries Research Officer (Rs. 200—600)	Research	Do.	At Udaipur.

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
RAJASTHAN— <i>contd.</i>	Class III	1	Fisheries Research Assistant (Rs. 150—300)	Research	District	
		3	Assistant Fisheries Development Officers (Rs. 150—350)	Marketing & fish culture.	Do.	
		19	District Veterinary Officers as Assistant Warden of Fisheries (Honorary)	General Supervision	Do.	Part-time only.
		1	Fisheries Assistant (Rs. 60—130)		Do.	
		1	Laboratory Assistant (Rs. 60—80)		Do.	
UTTAR PRADESH	Class I	1	Deputy Director of Fisheries (Rs. 500—1200)	Supervision of research, fish-culture, conservation and marketing etc.	State	
		Class II	1	Assistant Director of Fisheries (Rs. 250—850 plus Rs. 50 s.p.)	Supervision of Plan work in connection with fisheries.	Do.
	1		Assistant Fisheries Development Officer (Stocking) (Rs. 250—850)	Supervision of tank stocking and development work in U.P. viz. fish culture, conservation, marketing, etc.	Do.	
	5		Fish-marketing Officers (Rs. 250—600)	Fish culture, conservation and marketing Division.		
	Class III	5	Senior Fisheries Inspectors (Rs. 200—350)	To assist fish-marketing officers in each of the 5 circles in U. P.	Do.	
		4	Fisheries Wardens (Rs. 120—250)	Fish culture, conservation, marketing, etc.	District	
		23	Fisheries Inspectors (Rs. 120—250)	Fish-culture, conservation, marketing, etc.	Do.	
		33	Fisheries Development Supervisors (Rs. 75—120)	To assist Fisheries Wardens and Fish Marketing Officers.	Do.	
		9	Assistant Fisheries Wardens (Rs. 75—120)	Do.	Do.	

APPENDIX VI—*contd.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
UTTAR PRADESH— <i>contd.</i>		1	Chemical Assistant (Rs. 200—350)	Research—water and soil analysis and other work in connection with fisheries development work in the State involving chemical studies.		
		1	Technical Assistant (Rs. 200—350)	Research—Plankton and Biological studies in the State on Fisheries.		
		1	Botanist (Rs. 200—350)	Research—Botanical work in connection with fisheries in State.		At Fisheries Research Laboratory, Lucknow.
		1	Statistical Assistant (Rs. 200—350)	Compilation of data.		
		1	Overseer (Rs. 120—250)	Constructional work connected with the development of fisheries in the State.		
		2	Laboratory Assistants (Rs. 45—100)			
ANDAMAN & NICOBAR	Class II	1	Fisheries Development Officer (Rs. 275—800)	Development of fisheries mainly marine.		Territory
	Class III	1	Research Assistant (Rs. 160—330)	Do.		Do.
		1	Survey Assistant (Rs. 160—330)	Do.		Do.
DELHI	Class II	1	Deputy Warden of Fisheries (Rs. 250—750)	General administration, conservation fish-culture, marketing, etc.		State
	Class III	1	Assistant Warden of Fisheries (Okhla) (Rs. 100—300)	Assisting Deputy Warden on conservation and marketing.		District
		1	Assistant Warden of Fisheries (Delhi)	Assisting Deputy Warden on fish culture and administration.		Do.
HIMACHAL PRADESH	Class I	1	Chief Conservator of Forests (Rs. 1,700—2,000)	Head of the Department		State
	Class II	1	Deputy Warden of Fisheries (Rs. 250—750)	Controlling Officer		Do.
	Class III	5	Assistant Wardens of Fisheries (Rs. 80—150)	Conservation and fish-culture.		District

APPENDIX VI—concl'd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
HIMACHAL PRADESH— <i>contd.</i>		1	Fisheries Research Assistant (Rs. 100—300)	Mirror carp culture	State	
LACCADIVE & MINICOY	Class II	1	Fisheries Development Officer (Rs. 275—800)	Development of fisheries mainly marine.	Territory	
	Class III	2	Fishery Inspectors (Rs. 160—330)	Do.	Do.	
MANIPUR ..	Class III	1	Fishery Inspector (Rs. 150—250)	Fish-culture, propaganda and publicity.	State	
		1	Fish Farm Manager (Rs. 100—150)	Do.	Do.	
N.E.F.A. ..	Class I	1	Director of Agriculture and Community Development, NEFA	In charge of Fisheries Branch of NEFA.	Do.	
	Class III	1	Agricultural Inspector (Fisheries) (Rs. 150—300)	To exercise close supervision of fisheries activities in areas where there are developmental potentialities.	Division	Posted beyond the inner line.
TRIPURA ..	Class II	1	Fishery Development Officer (Rs. 250—750)	General supervision of development work.	State	
	Class III	3	Fishery Officers (Rs. 150—300)	Supervision of tanks and lakes under fish-culture and to implement the development schemes.	Division	
		3	Fishery Inspectors (Rs. 80—180)	Direct supervision and inspection of works, selection of tanks for fish-culture.	Division	
PONDICHERRY	Class II	1	Director of Fisheries (Rs. 230—500)	Head of Office	State	
	Class III	4	Inspectors of Fisheries (Rs. 120—220)	Both Inland Fish-culture and Marine fisheries.	Division	At the areas of Pondicherry, Karikal, Yanam and Mahe (one in each).
		3	Sub-Inspectors of Fisheries (Rs. 60—100)	In charge of Inland Fisheries, Seed collection, fish-culture, etc.	Do.	At areas in Pondicherry, Karikal and Yanam (one in each).

APPENDIX VII(a)

FISHERIES EDUCATION IN JAPAN*

1. *Introduction*—The need for increased fish production and the consequent demand for a large number of skilled fishery workers has prompted Japan to organise and maintain fisheries education on an extensive scale. The mechanisation and utilisation of Japanese fisheries commenced at the end of the 19th century, and soon there grew a demand for trained workers for the industry. Consequently, as early as 1895, some local fisheries schools were started, and thereafter the number of such schools increased rapidly. In 1897, the Fisheries Training Institute of the Ministry of Agriculture and Commerce was inaugurated; this was the origin of the Tokyo University of Fisheries. In 1907, a Department of Fisheries was established, in the Sapporo Agricultural School, which has developed into the present Fisheries Faculty of Hokkaido University. In 1908, a Department of Fisheries was instituted, in the Agricultural Faculty of Tokyo University.

2. *Higher Schools*—In the year 1953, Japan had altogether 56 High Schools in which fisheries courses were established. Out of those, 30 were Fisheries High Schools, imparting education in fisheries science only and 26 were High Schools, with fisheries courses. All these schools are located at fisheries centres and the boys passing from local middle schools are admitted to these high schools. These schools, in addition to the main course of fisheries subjects, give intensive practical training in fishing, for which most of them are provided with training boats of 100 tons and above. For processing, these schools have pilot canning plants and freezing rooms. Most of those who pass out from these schools become normally employed as medium grade technicians, in factories and fishing vessels. The curriculum of these fisheries schools comprises three sub-courses, *i.e.*, fishing propagation, culture and processing; though in some cases, the arrangements are different. All the fisheries high schools are public and mostly financed by respective prefectural governments.

The objective of fisheries education carried out in the high schools is to train the students in the technical knowledge and practical skill as well as the general education, so that they would become independent entrepreneurs or young technicians in the awakened consciousness and pride in their occupation.

The definite objectives include the following :—

- “1. To let the students understand correctly the role the fisheries play upon the development of the Japanese industrial economy and the improvement of the national living.
2. To let the students understand the geographical environment of Japan and the importance of the fisheries in such conditions, and make them realise how important it is to understand and protect the fisheries resources based upon scientific reasons.
3. To let the students acquire basic knowledge and practical skill in all the fields of fisheries industry.
4. To let them understand the legislation concerning fisheries, and cultivate in them the spirit of abiding by these laws.”

3. *Universities*—Candidates who have passed the high school can, after an entrance examination, be admitted to the graduate courses of the Universities. At present, there are 13 Universities in Japan, in which Faculties or Departments of Fisheries are established. A University may have one or all the departments namely—Fishing-Propagation, Processing, Engineering, High-Seas-Fishing, etc. All Universities together have a capacity of producing 1,185 graduates in fisheries per year. Training fishing vessels of not less than 500 G.T. are attached to Hokkaido University, Tokyo University of Fisheries, Kagoshima University and the college of Fisheries of the Ministry of Agriculture and Forestry. The students connected with navigation in those Universities are trained to satisfy the requirements provided by the Enforcement Regulation of the Ship's officer law.

Biological study has been the major object of the Department of Fisheries, established in the Faculty of Agriculture. There are more than 15 marine biological laboratories and similar facilities for training the students belonging to the Department of Faculty of Fisheries. Besides these, there are several marine laboratories and similar facilities attached to the Faculty of Science in some Universities.

Aquatic chemistry and practical processing of aquatic products are taught in the major universities. Aquatic chemistry or fisheries chemistry is deemed to be an independent field of fisheries science.

The students can take only one of the subjects and the fisheries students after completion of the four years' course can undergo one year's further training to obtain the "Mates-Certificate".

At present the Universities of Hokkaido, Tohoku, Tokyo, Kyoto and Kyushu, provide the facilities for fisheries education leading to Master's and Doctor's Degree.

*Collected from (a) Japanese Fisheries—their development and present status (b) Information gathered from Prof. Y. Hiyama.

4. *Tokyo Fisheries University* (curriculum)—The Tokyo Fisheries University is a national Institution for higher education and research in the field of fisheries. The aim of the University is to give a proper education in fisheries, both theoretical and practical and provide every facility to the students for research so that they can become leaders of this growing industry. Apart from a full training in fisheries, the University also emphasises the development of the intellectual, moral and practical abilities of each student so that they may be cultured and worthy citizens in a growing civilization.

Tokyo Fisheries University has three main departments. They are :

1. Fisheries.
2. Fisheries Technology.
3. Fish Culture.

These three main departments have sub-departments. They are :

1. *Fisheries*—
 - (a) Fishing Gear.
 - (b) Fishing Methods.
 - (c) Navigation.
2. *Fisheries Technology*—
 - (a) Fisheries chemistry.
 - (b) Fish preservation and processing.
3. *Fish Culture*—
 - (a) Fisheries resources.
 - (b) Fish culture.

Apart from the above mentioned courses, courses in fisheries education and fisheries management are also available at this University. The course in fisheries education is generally meant for those who on graduating, wish to become teachers in Fisheries High Schools or other high schools.

Syllabus

The duration of a course in fisheries at this University is 4 years. Practical classes are arranged in the University laboratories as well as apprenticeship in factories, fish farms, research stations etc.

For students who wish to do research or pursue their studies further, the following advanced courses for a duration of two years after graduation have been made available. The courses are :

- (1) Navigation of fishing vessels.
- (2) Fisheries.
- (3) Fisheries Technology.
- (4) Fish Culture.

Note:—Courses No. 2, 3 and 4, have sub-courses for specialisation.

They are the following :

- (2) *Fisheries*—
 - (a) Fishing Gear.
 - (b) Fishing Methods.
 - (c) Oceanography.
 - (d) Fishing grounds.
 - (e) Fishing vessels.
 - (f) Fisheries Machinery.
- (3) *Fisheries Technology*—
 - (a) Canning.
 - (b) Cold Storage and Freezing.
 - (c) Utilisation of fats and oils.
 - (d) Fish oils, fish fertiliser and fish-feed.
 - (e) Fisheries by-products.

(4) Fish Culture—

- (a) Marine Zoology.
- (b) Marine Botany.
- (c) Fisheries Resources.
- (d) Fresh water culture.
- (e) Salt-water culture.

Most of the personnel who receive fisheries education in Japan generally continue to serve the industry directly or indirectly by joining fishing or related companies, universities and other research organisations, societies and associations related to fisheries and by joining fisheries agencies and fisheries sections of the local governments.

5. Research Institutions—In 1929, the Ministry of Agriculture and Forestry separated the experiment branch of the Fisheries Training Centre and established Fisheries Experimental Station, the first independent research organ on fisheries in Japan. In 1949 to take its place, the following fisheries research institutes were established. All these are attached to the Fisheries Agency :

Hokkaido District Fisheries Research Institute—Yoichi, Hokkaido.
 Tohoku District Fisheries Research Institute—Shiogama.
 Tokai District Fisheries Research Institute—Tsukishima, Tokyo.
 Nankai District Fisheries Research Institute—Kochi.
 Seikai District Fisheries Research Institute—Nagasaki.
 Nippon Sea District Fisheries Research Institute—Niigata.
 Inland Sea Fisheries Research Institute—Hiroshima.
 Non-tidal water District Fisheries Research Institute—Hino, Tokyo.
 Pearl Research Institute—Ago Nic Pref.

These institutes have their own special field of research.

The Prefectural governments established the fisheries experimental stations and fisheries guidance centres in order to carry on the research closely related to the special conditions of the area and to give guidance to the local fisheries. Altogether there are 59 such centres.

The big fishing companies such as Taiyo, Gyogyo, Nippon Suisan, Nippon Reizo etc. have their own research Institutes.

Duration of the courses—

- (1) Bachelor's Degree course—four years.
- (2) Master's Degree—All the work for Master's Degree must be completed within a maximum period of three consecutive years from its inception.
- (3) Doctor of Philosophy—For students who have received Master's Degree, a minimum of three additional years of graduate work is required for Doctorate.

6. Outlines of Syllabus—Outline of Fisheries, Aquatic Vertebrates, Aquatic Invertebrates, Fishing Methods and Gears, Fish Population and Conservation, Aquaculture and Fish Propagation, Experiments in Fisheries Zoology, Oceanography, Experiments in Oceanography and Limnology, Aquatic Botany, Experiments in Aquatic Botany, Fisheries Micro-biology, Experiments in Microbiology, Utilisation of Marine Products, Outlines of Fisheries Chemistry, Food Chemistry of Marine Products, Experiment in Fisheries Chemistry, Fishing Boats, Fisheries Mechanics, Fishery Law, Experiment at Marine Biological Station and Graduation Thesis.

7. Special Field of Study—Pathology of Aquatic Animals and Plants, Histology and Embryology of Aquatic Animals, Physiology and Ecology of Aquatic Animals, Planktonology, Physiology and Ecology of Aquatic Plants, Limnology, Marine Meteorology, Navigation and Seamanship, Practical Fisheries Training, Genetics, Inorganic Chemistry, Organic Chemistry, Biochemistry, Physiological Chemistry of Aquatic Animals and Plants, Chemistry of Nutrition, Applied Mathematics, Agricultural Economics, Comparative Agriculture, Bio-Statistics, Dietetic Hygiene (included as part of Veterinary Public Health).

APPENDIX VII(b)

FISHERIES TRAINING IN NORWAY

Introduction

Like many other maritime countries the majority of Norwegian coastal population has fisheries as the main source of their income. This profession was adopted by these people thousands of years ago as proved by the finds from

excavations conducted in these areas. Such articles, as collected from excavations, lead to the conclusion beyond doubt that people in Norway had settlements along the coast as far back as six or seven thousand years. Weapons, fishing tackles, spearheads, arrow-heads, harpoons and fish-hooks etc. made of flint stone and bone have been found in the heaps of soils in the vicinity of caves of the ancient population which lived on hunting and fishing. Also available in these heaps are bones of fishes like Salmon, Cod and Halibut which indicates that they must have possessed boats capable of taking man to fairly distant fishing grounds and the fishing tackle which could be effective in deep waters.

So old is the fishery industry of Norway. Those days modern system of education was not existing. Pupils had to learn by memorising their lessons not by writing them to be utilised at a later date. Likewise students of fisheries science (children of fishermen) learnt the fishing techniques from their parents by practical experience since they were old enough to go with their fathers in a fishing boat. These fishing techniques in Norway have passed down from one generation to the other almost in the same manner as education and science in Indian and other countries during Puranic age. With the passage of time and accumulation of knowledge by experience, the fishermen of Norway had developed such a flourishing industry that Norwegian fishermen had been exporting fish to continental Europe centuries prior to the time Columbus discovered America.

History of Training Institutes

Fishermen of Norway, too, are very conservative like their counterparts in many other countries. The same way as Indian fishermen do, Norwegian fishermen opposed any suggestion offered to them for the development of the fishery industry and mocked at any demonstrations or introduction of anything new and unknown to them.

At the time of construction of first light-houses in the early nineteenth century, these fishermen violently opposed it on the ground that flashes scared away the spawning herring from the coast. Similarly during the second half of the last century when whaling with modern equipment was started in coastal waters that was opposed because as they said whales chased herrings to the coastal waters and if whales were scared away or captured there was nothing to drive the herrings to the coast. Likewise, the mechanisation of boats and evolution of the big sea-going trawlers was opposed by fishermen in Norway. The trawling was forbidden for a long time lest the efficiency of these big craft would cause unemployment among the fishermen.

We find the modern Norwegian fisherman rather employing all the modern equipment within his means and readily agreeable to undergo the training of any such science which is thought essential or rendered by his colleagues, the scientists and the Government servants. The conservatism of the fishermen was initially instrumental in the opposition of the earlier training programmes in Norway but tactful handling of the situation and proposition and demonstration of suitable and readily understandable training objects, authorities concerned with the training in Norway induced fishermen ready to undergo any such training.

Training Institutes in Norway

The history of training institutions in Norway is quite complicated due to the reasons indicated above. Many schools were started to impart knowledge of fisheries and fish processing etc. At present the following schools give training in the subject mentioned with them. A condensed course of the subjects taught in those schools, duration and other such details, follows the list of these institutions :—

1. State Fisheries schools.
2. District Fisheries school .
3. School for teaching, processing and handling of fresh fish.
4. Val School of Agriculture.
5. Norwegian University School of Economics and Business Administration.
6. Schools for shorter ambulatory courses in subjects related to fisheries :

- (a) Navigation (II Class).
- (b) Radio telephony
- (c) Book-keeping
- (d) Care of electric equipment on board fishing vessels
- (e) Fish processing
- (f) First Aid.

1. *State Fisheries Schools*—There are five such schools at Laksevåg, Flor, Aukra, Bodo and Honningsvåg. These schools offer training in three trades, viz., Fishing skipper course, motor course and cookery course. The number of courses available to trainees varies from one to all the three in these schools.

(a) *Fishing skipper course*—Duration 10 months. It leads to a first-class coastal skipper test and a test in fisheries.

Scope of the course

To increase the knowledge which the candidates possess from their own experience in the fisheries. Acquaintance with other fisheries, fishing grounds to enable trainees to readjust or increase their activities. Knowledge of the basic

natural history of the fisheries for a better understanding of the future possibilities of the industry. A thorough knowledge of navigation and of the function and care of motors.

Elementary subjects on the skipper side are : the reading and writing of Norwegian, mathematics, book-keeping, natural history, English, health and cooperation.

Navigational subjects.—Terrestrial and astronomical navigation, meteorology, care of motors, seamanship, signalling, radio-telephone operation, use and care of echo-sounders, radio-direction finders, and some other electronic methods of navigation.

Fishery subjects.—Practical fishery, fishing gear, processing of fish on board vessels, fishery biology and oceanography.

From the very beginning there was a tendency among the students to continue the study of this subject even after 2nd class skipper test which was practically never held and all the students continued up to the 1st class test.

(b) *Motor course.*—Duration five months. It leads to a motorman's test. There are two such courses every year; one in the autumn and one in the spring.

Scope of the course

Knowledge of how to run the engines of fishing vessels. Since fishing boats also have electrical equipments, the candidates are taught electricity and care of electrical equipment on board the fishing vessels.

The following subjects are also taught on the motor side : Reading and writing of Norwegian, mathematics, physics, chemistry, motors, electricity, materials, metal work and engine drawings.

(c) *Cookery course.*—Duration five months. Leads to cookery test. Two courses in a year like motor course.

Scope of the course

To train cooks for the fishing fleet. The practical training is most important. Some theory is, however, taught of the following subjects :

Norwegian reading and writing, English, Mathematics, Book-keeping, Food Composition and Sanitation.

The cookery students prepare all the food for the rest of the school, whilst paid assistance is provided for the cleaning.

2. *District fishery schools.*—Situated at Ryrksaeterora, near Trondheim, it provides courses in Navigation, motor and cookery.

(a) *Navigation courses.*—Duration five months, leading to 2nd class coastal skipper certificate. The special training course for 2nd class certificates usually lasts for only two or three months, but at this school more elementary subjects are taught on the navigation side.

Scope of training

Along with the training for the special 2nd class examination the training in cooperative and other fishermen organisations, statistics, book-keeping, hygiene and first aid is given to the students. In the special subjects are also included radio-telephony, use of echo-sounders and radio direction finders. The students visit fish processing plants and similar industrial establishments.

(b) *Motor course.*—Duration five months. Scope as that at the State fishery schools.

(c) *Cookery course.*—Duration three to four months. This course is less comprehensive than that at the State fishery school.

School for teaching, processing and handling of fresh fish

2. A regular fish processing plant at Vardo serves as a special school for fish processors. This school has four courses open for the students:

(a) Autumn course lasting for 3½ months.

(b) A combined winter and spring course lasting for 5½ months.

(c) A special course in the production of fish liver-oil, which lasts for 2½ months and is held twice a year, in the spring and in the autumn.

(d) Course for elderly processors who are unable to frequent the ordinary courses.

As far as space permits, these working students are given the opportunity to attend the lectures held and the practical work done in any of the courses.

Scope of the courses

To give the students an understanding of the basic natural facts on which the industry is founded and to tell them how fish is handled for various purposes. Knowledge of how fish is transported, stored and sold. Natural history including anatomy and biology of fish, harmful insects, fungi (especially moulds and yeast cells, bacteria, etc.).

4. *Fishermen's course at the Val School of Agriculture.*—This school is situated near Trondheim. At first there were two combined motor and navigation courses every year. The navigation part leads to a 2nd class coastal skipper test. Since 1951/52 the navigation course has been separated from the motor course. The motor course is now conducted along the same lines as that at the State fishery schools. Separate navigation courses leading to the 2nd class coastal skipper test have been given during summer seasons. However, during the last few years no such courses in navigation were held.

5. In the following subjects, ambulatory courses are arranged by the Directorate of Fisheries in cooperation with the county fishermen's associations in the fishery districts.

- (a) *Navigation.*—Duration 2½ months, leading to the test for 2nd class coastal skipper certificate which qualifies a holder of this certificate to common passenger ships of a maximum of 100 tons in coastal trade or ships of a maximum of 200 tons for fishing, whaling or sealing expeditions north of N 30°.
- (b) *Radio telephony.*—Duration 2 weeks, leading to radio telephone certificate. This course can be combined with instruction in radio bearings and will then last for 3 weeks.
- (c) *Book-keeping.*—Has almost same standard as that in the State fishery schools.
- (d) *Care of electric equipment.*—This course lasts for about one week. It can also be combined with the radio telephone course.
- (e) *Echo-sounders.*—It requires one week.
- (f) *Fish processing.*—These courses are of different lengths, a course in filleting fish, e.g., will require about two weeks.

6. *Norwegian University School of Economics and Business Administration, Bergen.*—One of the objectives of this institution is to educate young men and women for executive positions in business and Government. This school offers training in subjects like Business Administration, Economics, Personnel Administration, Economic Geography, Economic Law, Economic History, Languages, Taxation, Bank Management, Auditing, etc.

Two degrees are awarded to students, "Handelskandidat" (candidate of commerce) and "Laerer Kandidat" (Teachers degree). Duration of the course leading to the tests for these degrees is three years (4 years for teachers for business colleges).

Economics, as usual with other subjects, deals with many special fields including Fishery Economics which covers all the aspects of the fishery industry. In the winter of 1955-56, a group of Indian Fishery Officers had gone to this school for training under the direction of Prof. G. M. Gerhardsen. A brief of the main subject-matters taken up during this training is given below.

I. *General Introduction to Norway.*—Including social structure, Geography (Nature, Agriculture and Forestry; Mining and Water power; Cities and urban industries; ways of life in the Norwegian countryside; A cross-section of Northern Norway); Norway in relation to International Law; Historical views of Norway in the International picture.

II. *Natural Setting for Norwegian Fisheries.*—Introduction to the Natural History of Norwegian fisheries; Norwegian Herring Investigations; fishery management—catch and the stock; physiology of marine fishes; physical oceanography; natural history of North European commercial fishes; zooplankton; fresh-water fishes and fisheries; phytoplankton.

III. *Fishing Methods.*—Description of Norwegian craft and their equipment; Old Norwegian Fishing Craft; making feasible craft design; marine engines; systematics of fishing gear; description of common gear used; gear manufacturing industries; economic impacts of technological changes; fishing gear experiments; history of Norwegian fisheries; Norwegian whaling; seals and seal hunting; accounting problems in fishing operations; fishing harbour establishments.

IV. *Fish Marketing.*—General observations on supply and demand; survey of fishermen's sales organisation detailed study of Hordaland Fiskesalslag; Noregs Sildesalslag; winter Herring Fishermen's Sales Organisation; designing new marketing schemes; general considerations of fish marketing problems; fishermen's cooperative processing association; economics of fish processing and wholesale trade; business administration in fish processing and wholesale trade; general retail marketing problems; retail marketing of fish in Norway.

V. *Fish Processing.*—Technology in fisheries; composition of the raw material; decomposition of the raw material; organisation of fish processing industries in Norway; planning fish converting establishments; fresh, frozen and canned products; dried, salted and other cured products; converted products, meals and body-oils; liver oils; general survey of the role of refrigeration in the fisheries of Norway; the services of refrigeration to the fisheries; supply of bait and ice; refrigeration in fish preservation, cooling and freezing; the fish freezing plants; refrigeration in fish transportation and distribution; fish handling and processing research in Norway.

VI. *Public Fisheries Administration and Legislation.*—Functional organisation; fisheries legislation.

VII. *Statistical Services*.—General survey of available statistical information about Norwegian fisheries; details of current statistical service; statistical aspects of cost investigation; craft statistics.

VIII. *Financing and Insurance*.—Financing; insurance.

IX. *General fisheries development problems*.—Fish as food; fisheries education in Norway; fishermen's school.

There are some other things worth mentioning in the set-up of fishery education in Norway. These play an important role in the smooth running of various courses open to students and also the high standard of proficiency in the trade obtained by the students during their scholarship in various fishery schools.

All the students at the schools are young fishermen between 17—30 or sometime above. This means a student in fisheries schools in Norway need not be trained to become a fisherman but the only thing done is to add to his already acquired knowledge of the subject by his experience. The students in the fisheries schools start going on board the vessels with their fathers ever since they are old enough to undertake such voyages.

All the students have been through a seven-year elementary schooling which is compulsory for all children in Norway. Many of them attend "youth schools" to refresh up their knowledge and to learn more.

Notwithstanding whether a candidate comes from a poor or a rich family, all the students are given free travel to and from schools, free teaching including lodging and boarding. However, at most of the schools students must keep their own bed-clothes and buy their own books.

APPENDIX VII(c)

FISHERY EDUCATION IN THE UNITED STATES*

The relative unimportance of fish as a basic food in the diet of the people of the United States, and the manner in which the fishing industry was developed in a new and expanding economy has greatly influenced the growth of fishery education in that country. It has only been during the past several decades that the problems arising from an ever increasing exploitation of the fisheries resources has focussed public attention upon the industry and its needs.

The United States is new among the nations of the world and in its natural state endowed with large and varied natural resources. The lack of population pressures and an abundant supply of both renewable and non-renewable natural resources permitted the almost unrestricted development of the fishing industry, particularly in the early days of the nation. However, at the beginning of the twentieth century increasing population pressures brought about by territorial limitations which prevented further expansion or migration to unexploited areas began to create greater drains upon the natural resources of the nation. Both increasing internal consumption and an expanding world market hastened the expansion of the industry with a resulting increased drain on the fish stocks.

These factors coupled with rapid growth of fishery technology and mechanisation created considerable difficulty in maintaining the various fisheries at the point of maximum sustained yield. Eventually as production increased in response to the demands many fishermen were catching fish beyond the capacity of the stocks to maintain themselves and as a consequence the fisheries declined. It was generally at this point that the industry began to appeal for help in determining the cause of the decline and for solution that would aid them in maintaining as profitable operation as possible. These appeals made to the Government resulted in first the establishment of a Federal Fishery Commission, which was later expanded and called the Bureau of Fisheries and now known as the U.S. Fish and Wild Life Service. The various states, particularly the maritime states, also responded to the request of the fishing industry and set up organisations designed to control and regulate the fishing industry through scientific management techniques. Parallel to the development of a commercial fishing industry, there has developed a large group of many millions of sports fishermen who have successfully demanded the maintenance of good fishing for pleasure. These increasingly heavy demands by both the commercial fishing industry and the sportsmen has created more and more demand for highly trained fishery scientists and technologists to administer and manage the resources.

In the early stages of the development of the fishing industry, the fishery administrators, research men and technologists were for the most part drawn from various universities and colleges. These men were generally widely recognised naturalists who were particularly interested in fisheries. The field of fishery science was unknown and the training and experience of these men was generally academic in nature. Each man ran his organisation as he felt it should be run and consequently there was a wide divergence of aims and policy. Young men attracted by the prominence of these leaders entered the organisation and gained training and experience under their guidance. These young men formed the core of the organisation and later became the top officials. In the meantime, the knowledge of fishery

*From material supplied by Charles Wade, Fisheries Extension Adviser.

biology was increasing through the efforts of research workers around the world and the study of fisheries as a science was slowly evolving. Certain universities and colleges such as Stanford, University of Illinois, University of Wisconsin, Cornell and Harvard through the pre-eminence of some of their staff members in one of the various fields of limnology, hydrobiology, ecology, ichthyology etc. attracted numbers of students who, after graduation, entered the fishery field. Through the gradual accumulation of knowledge, better training became available but it still failed to meet the demands of the industry and sportsmen for better production in conjunction with the proper management of the resources. There was an increasing need for specialised training in fishery science to meet these demands.

The first step in this direction was taken in 1919 when the University of Washington established a school of fisheries. The emphasis at first was on the practical aspects of commercial fishing and technology as applied to the vast salmon resources of the Pacific North West. However, during the forty years of its growth and development, the courses of instruction have evolved into three well rounded curricula: (1) fresh water fishery management; (2) marine fishery management; and (3) technology. Interest in fisheries education has continued to grow in the United States and today some twenty five or more Universities and colleges offer biological training in fishery science. However, only six specialise in one or more phases of this field, the remaining institutions fall into two groups: those which give partial training but are developing and expanding facilities which may eventually provide specialised training and those which offer fishery courses incidental to studies in general biology or wildlife management.

The University of Washington (Seattle, Washington) is the only school offering highly specialised training in all the aspects of fishery science. Instruction and research is carried on many phases of fisheries at the University by the College of Fisheries, Oceanography Laboratory, the Fishery Research Institute and the applied Fisheries Research Laboratory. Students are able to obtain wide and more specialised fishery training here than perhaps any other institution in the world. Undergraduate and graduate training, the latter leading to a doctor of philosophy degree, may be taken in fishery biology or technology. The College of Fisheries offers three options for a degree: marine fishery biology, freshwater fishery biology and fishery technology. In conjunction with various departments of the College of Arts and Sciences, and the Oceanographic Laboratories, instruction and advanced research is offered in the various aspects of marine biology and oceanography.

Other universities and colleges offering fishery training include, the University of Michigan (Ann Arbor), University of Hawaii (Honolulu), Alabama Polytechnic Institute (Auburn), Scrips Institution of Oceanography (La Jolla, Cal.) Agricultural College of Texas (College Station), University of Massachusetts (Amherst), Oregon State College (Corvallis), Massachusetts Institute of Technology (Cambridge) and the University of Miami (Miami, Florida).

The Department of Fisheries in the School of Natural Resources handles the instruction and research in fisheries at the University of Michigan. Teaching is in biology and centres about the improvement of fish production in inland waters through fishery management. The curriculum leads to the degrees of B. S., M.S. and Ph. D. The Department of Fisheries maintains a biological station and cooperates in the research and investigations carried out by the Institute of Fishery Research of the Michigan Department of Conservation which has its headquarters on the campus.

The University of Hawaii offers biological training in fishery science leading to a B.S., M.S. or Ph.D. degree. Particular attention is paid to problems connected with the biological management of commercial fisheries. The Department also undertakes research working closely with the Division of Fish and Game of the State of Hawaii and the U.S. Fish and Wildlife Service (POFD). A marine laboratory is maintained where the department conducts much of its research and teaching.

The Alabama Polytechnic Institute (Auburn) in the Department of Zoology-Entomology of the School of Agriculture offers training in fishery management, leading to the three degrees. The academic work is principally concerned with students entering fresh water fishery research and management including pond fish culture. Facilities of the Alabama Agricultural Research Station are available to the students for research projects. The Scrips Institution of Oceanography is a part of the University of California. Although the Institution was first established for research in physical and chemical oceanography, the biological aspects, the sea bottom topography and sedimentation, it is now actively engaged in training oceanographers. An extensive curriculum is available in many of the aspects of oceanography. The institution carries a heavy research programme in conjunction with the research problems of many outside agencies. The Agricultural and Mechanical College of Texas also offers a degree training in Oceanography as well as the University of Washington. Both schools offer both lower and advanced degrees in many of the specialised branches of this science.

The University of Massachusetts and the Massachusetts Institute of Technology are concerned with providing scientific and applied training in the principles concerned with the processing, preservation and packaging of food products. Included in the curricula are courses in the preservation and handling of fishery products. The Department of Food Technology of Oregon State College also offers instruction in the utilisation of fish and other marine products. Studies include freezing and canning with considerable emphasis given on the vitamin oils.

Some eighteen other universities and colleges either offer partial training in fishery biology or give fishery courses incidental to studies in general biology or wildlife management. These are partially, Cornell University, Indiana University, Miami University, Michigan State College, Oregon State College, University of Minnesota, Stanford University and A and M College of Texas. Many private and government sponsored institutions in the U. S. are also engaged in marine and fresh water research. Many of these carry on fishery research in conjunction with other activities. There

is also a small group of institutions which do research which has a direct application to fishery problems. The types of institutions include universities and colleges or organisations sponsored by them, privately endowed laboratories and governmental sponsored institutes. Included among such institutions are the following :

Bingham Oceanographic Laboratory of Yale University.
California Academy of Science (San Francisco).
University of Miami Marine Laboratory (Coral Gables, Florida).
Woods Hole Biological Laboratory (Massachusetts) and many others.

Fishery education in the United States has developed entirely at the scientific and technical level. Since education in the U. S. is free through high school (10th Standard), there has been no need to develop, as in many other countries, fishery high schools for the education of fishermen children. Fishermen in the U. S. are educated literate and well able to compete in a technological civilisation. Until recently, recruits for fishing came about from either immigration from abroad or the children following in the footsteps of the father. Within the past several years, there has been some indication that the number of fishermen needed to fulfil the requirements of the industry was not being met. Younger people were seeking jobs in other areas of work which offered greater economic opportunity and were not going into commercial fishing. This project is quite new and its ultimate success is not known.

THE COURSES FOR FISHERIES DEGREES OF THE COLLEGE OF FISHERIES

University of Washington (1958—60)

This college offers the following degrees in fisheries :

Bachelor of Science, Bachelor of Science in Fisheries, Master of Science and Doctor of Philosophy.

Three areas of undergraduate study are offered by the college :

Marine fishery biology, Freshwater fishery biology and Fisheries Technology.

Further specialisation in these areas may be undertaken in graduate studies as preparation for careers in teaching and research.

A. For all Bachelors' degrees the following courses are required and will normally be taken during the first two years :

1. *Chemistry*.—Elementary inorganic and organic chemistry including volumetric and gravimetric analysis.
2. *Mathematics*.—Elementary Mathematics.
3. *Zoology*.—Physical basis of life, structure, function, development, inheritance, evolution and ecology of animals.

Invertebrate phyla through molluscs. Annelids through chordates.

B. Curriculum for the B.Sc. in Fisheries :

I. With option of Marine Fishery Biology : (a) Required courses in addition to A above.

1. *Fisheries*.—Fundamental principles of fisheries science regarding fishery biology and technology. Basic techniques of field observation and methods of solution of typical problems in fisheries. Survey of the system of fish classification, distribution of fishes. Economically important mollusca, their classification, life histories, distribution, methods of cultivation. Classifications, life histories, distribution, method of capture and economic importance of crabs, shrimps, lobsters, crayfish and the smaller crustacea which are fished commercially or are important as food for fishes, or other vertebrates. Migration and races of fishes; marking and other methods of determining migrations of fishes and homogeneity of fish populations; implications of these factors in the management of both fresh water and marine fisheries. Early life history of marine fishes, reproduction and larval and post larval life of economically important marine fishes; dispersion and survival rates; implications of these factors in the management of food fisheries; research methods in this. Ecology of marine fishes, effect of variation in hydrographic conditions, availability of food, geographic location, and other environmental conditions on distribution of fishes; their variation in abundance and availability to the fisheries; research techniques in the field. Introduction to fisheries literature, training in searching bibliographic source.

2. *Oceanography*.—Introduction to Oceanography, a comprehensive description of the oceans and their relation to man; physical, chemical, biological and geological aspects of the sea, a real distribution and seasonal cycles of properties, currents; factors affecting populations. Demonstration and some classes aboard ships and in laboratories.

OR

General Oceanography, comprehensive treatment of physical, chemical, biological and geological aspects of the oceans.

3. *Zoology*.—Phylogeny of the chordates and evolution of organ systems. Structural modifications are correlated with function on Vertebrate Embryology, description and comparative study of development of chordates.

(b) *Recommended courses.*

1. *Biology*.—Genetics, the principles underlying inheritance in animals and plants.
2. *Limnology*.—Biological, physical and chemical features of lakes and other inland waters.
3. *Elementary Botany*.—Structure and relationship of the major plant groups.
4. *Chemistry*.—Elements of organic chemistry.
5. *Fisheries*.—Introduction to research methods and techniques of ichthyological systematics; Aquatic Invertebrates of minor economic importance, classification, life histories, occurrence, and utilisation of sponges, corals, annelid worms, echinoderms, and other aquatic invertebrates fished or cultivated on a commercial scale. Communicable diseases of fishes, organisms causing diseases in fishes; prevention and known treatments of fish diseases (Prerequisite knowledge of microbiology). Introduction to commercial fishing industry, commercial fishing operations, marketing, processing, reduction, organisation and labour relations.
6. *Mathematics*.—Elementary mathematics; Elements of sampling, confidence limits; simple tests of statistical hypotheses; analysis of variance and applications to biological problems.
7. *Microbiology*.—Micro-organisms and their activities. A survey course for students of pharmacy, nursing, home economics, education and others with minimum training in chemistry.
8. *Oceanography*.—Biological oceanography of the plankton, floating plant and animal life of the sea; factors controlling population and production; regional distribution; methods of sampling, identification and analysis; nuisance forms; Plankton Ecology, problems and methods of marine plankton investigations.
9. *Physics*.—General physics; mechanics and sound. Electricity and magnetism. Heat, light and modern physics.

Concurrent registration in these laboratories recommended.

10. *Zoology*.—Natural History of marine invertebrates. A field and laboratory course emphasising the habits, habits identification, and inter-relationships of marine animals. Introductory course in vertebrate physiology; critical evaluation of each step in microslide preparation. General physiology; cell environment, metabolism and growth, irritability, general phenomena of organ function. Invertebrate Zoology; Morphology and phylogeny of invertebrates exclusive of terrestrial arthropods.

II. *With Option of Fresh water Fisheries Biology :*

(a) *Required courses (in addition to A above)*

1. *Biology*.—Limnology; Biological, physical and chemical features of lakes and other inland waters.
2. *Fisheries*.—Fundamental principles of Fisheries Science; orientation in fisheries biology and technology; basic techniques of field observation and methods—of solution of typical problems in fisheries. Comparative anatomy and physiology of fishes; survey of morphology and bodily functions of fishes; survey of the system of fish classification; distribution of fishes.

One of the two to be taken up Economically important mollusca; classification, life histories; distribution, methods of cultivation and economic importance of oysters, clams, scallops, abalones, cephalopods and other mollusca.

Or

Economically important crustacea, classifications, life histories, distribution, methods of capture, and economic importance of crabs, shrimps, lobsters, crayfish and the smaller crustacea, which are fished commercially or are important as food for fishes and other vertebrates.

Propagation of Salmonoid fishes; Natural propagation, methods of hatching and rearing, collection and incubation of Salmon eggs; design, structure and maintenance of hatcheries, pond systems and aquaria. Nutrition of fishes; feeding and efficiency of diets; food costs and supplies; basic nutritional requirements of fish, nutritional diseases of fish. Freshwater fisheries management (biological). Creel census methods; stocking policies, lake poisoning, pond fish propagation; determination of the productive capacities of streams, lakes and ponds and their suitability for particular kinds of fishes.

One of the two to be offered Water management and fish resources; stream flows and mechanics of fresh water environment and other problems such as natural propagation; water flow measurement in streams and pipes; use of weirs; hatchery water requirements; screening of water diversions for protection of down-stream migrants, nomenclature, water rights and protective laws.

Or

Water management and fish resources; Design of fish protective facilities and actual use of hydraulic turbines and spillways at dams, calibration of nets, etc.

Introduction to fisheries literature. Directed training in searching bibliographic sources.

3. *Microbiology*.—General microbiology—Micro-organisms and their activities. A survey course for students of pharmacy, nursing, home economics, education and others with minimal training in Chemistry.

4. *Zoology*.—Comparative anatomy of chordates, phylogeny of the chordates and evolution of their organ systems. Structural modifications or correlation with function.

Or

Vertebrate Embryology. A descriptive and comparative study of development of chordates.

(b) *Recommended courses:*

1. *Biochemistry*.—Basic principles of Biochemistry, including the structure and metabolism of biologically important compounds.

2. *Biology*.—Genetics; the principles underlying inheritance in animals and plants. Principles of Ecology; Population biology, competition, predation, symbiosis, sociality and relationship of community environment.

3. *Botany*.—Elementary Botany.

4. *Chemistry*.—Elementary chemistry.

5. *Fisheries*.—Identification of fishes; introduction to research methods and techniques of ichthyological systematics; Communicable diseases of fishes; organisms causing diseases in fishes; prevention and known treatments of fish diseases.

6. *Mathematics*.—Elementary mathematics. Elements of sampling; confidence limits; simple tests of statistical hypotheses, analysis of variance and applications to biological problems.

7. *Zoology*.—Vertebrate physiology; critical evaluation of each step in microslide preparation. General physiology; cell environment, metabolism and growth, irritability, general phenomena of organ function, Morphology and phylogeny of invertebrates exclusive of terrestrial arthropods.

III. *With the option of Fisheries Technology :*

(a) *Required courses*

1. *Biochemistry*.—Basic principles of biochemistry, including the structure and metabolism of biologically important compounds.

2. *Chemistry*.—Elements of organic chemistry.

3. *Fisheries*.—Fundamental principles of fisheries science; orientation in fisheries biology and technology. Basic techniques of field observation and methods of solution of typical problems in fisheries.

Comparative anatomy and physiology of fishes; survey of morphology and bodily functions of fishes.

Economically important mollusca; classification, life histories, distribution, methods of cultivation, and economic importance of oysters, clams, scallops, abalones, cephalopods and other mollusca.

Or

Economically important crustacea; classification, life histories, distribution, methods of capture, and economic importance of crabs, shrimps, lobster, crayfish and the smaller crustacea, which are fished commercially or are important as food for fishes and other vertebrates. Introduction to commercial fishing industry, commercial fishing operations, marketing, processing, reduction, organisation and labour relations. Analysis of fishery products by chemical colorimetric, spectrophotometric and micro-biological techniques. Processing of edible fisheries products; principles, methods and practices in canning, freezing, drying and curing edible fisheries products. Fish by-products and spoilage; utilisation of fishwaste in preparation of industrial oils, meals, pharmaceutical and miscellaneous products; study of microbiological, enzymatic and chemical spoilage of fish and fishery products. Research problems in fisheries; technology; Group and individual problems in the development of new processes and products; plant design and layout; packing, sanitation. Introduction to fisheries literature for searching bibliographic sources.

4. *Mathematics*.—Analytic Geometry and calculus; Equations of straight lines and simple curves. Differentiation of algebraic functions, applications. Differentials, indefinite integrals.

Elements of statistical methods; Numerical and machine computation, graphical and tabular presentation of data, averages; measures of scatter and other statistics; scatter diagram, least-square lines, regression and correlation; elements of sampling.

5. *Mechanical Engineering*.—Knowledge of heat engines; refrigeration.

6. *Microbiology*.—General microbiology; micro-organisms and their activities.

(b) Recommended courses :

1. *General Business*.—Introduction to business. The nature of business problems; various types of ownership; physical factors in location of business; personnel aspects; market problems devices for long and short-term financing; managerial controls such as accounting, statistics and budgets and the relation of business to Government.

2. *Marketing*.—Principles of marketing. Analytical survey of institutions, functions, problems and policies in the distribution of goods from producer to consumer; pricing costs and governmental regulations.

3. *Chemistry*.—Elements of physical chemistry.

4. *General Engineering*.—Engineering problems; training in methods of analysing and solving simple engineering problems, principally dynamics and energy problems; introduction to the slide rule; coaching in proper method of work and study including training in systematic arrangement and clear workmanship.

5. *Mathematics*.—Statistical inference in Applied Research; Elements of probability; discrete and continuous distribution; binomial, poisson and normal distributions. Elements of sampling; confidence limits; simple tests of statistical hypotheses, analysis of variance and applications to biological problems.

 APPENDIX VIII (a)

 SYLLABUS OF THE TRAINING IN INLAND FISHERIES DEVELOPMENT AND ADMINISTRATION
 PROVIDED AT THE CENTRAL INLAND FISHERIES STATION, CALCUTTA (BARRACKPORE)

I. Classification of fishes

Principles of Ichthyology and classification of fishes; General morphology and anatomy of Elasmobranch and Teleostean fishes; Identification of the commercially important fishes and shell fishes with special reference to those of inland waters.

II. Fisheries wealth and fishing industry in India.
III. Fundamentals of fishery biology

(a) Objectives of biological research on commercial species of fish.

(b) Methods of studying biology of fishes.

Food and feeding; Maturity, fecundity and reproduction; Age and growth and related aspects; Migration; Predators, enemies and parasites.

(c) Methods of studying commercial fisheries:

Racial investigations; Census of populations; Mortality, survival and recruitment; Fluctuations in abundance; optimum catch, overfishing and depletion.

(d) Destructive methods of fishing.

(e) Conservation of fisheries—Objectives.

Common conservation measures—Fishery legislation.

IV. Ecology of Inland waters

(a) Types of Inland waters and conditions of existence in them.

(b) General methods of ecological investigations.

Topographical survey; Elementary methods of water analysis; Elementary methods of soil analysis; Study of biota.

V. Principal types of fisheries (i.e. Riverine, Lacustrine and Estuarine), their characteristics, problems and development.
VI. Inland fish farming

Fish farming in India and other Indo-Pacific countries. Fish culture in fresh water ponds, sewage-fed ponds, paddy fields and brackish waters. Selection of site for and construction of fish farms. Preparation of Nursery, rearing and stocking ponds. Species suitable for culture in different types of waters. Identification of eggs, fry and

fingerlings of common fishes suitable for culture. Control of weeds and algal blooms. Seed resources, methods of collection, conditioning, acclimatisation and transport. Shortcomings of existing practices and scope for improvement.

VII. Fish diseases, mortality and remedial measures

- (a) Parasitic diseases, important parasites and their life histories—ecological relationships—pathological effects and control.
- (b) Non-parasitic diseases—causes, symptoms and control.
- (c) Environmental conditions causing fish mortality—remedial measures.

VIII. Fishery Statistics

Elementary statistical methods—numerical description of data—frequency distributions—biological variations and their measurement : normal curves, mode, mean, standard deviation, standard error, probable error.

- (2) Nature of statistical data required for fisheries development :
 - (a) Trade statistics—enumeration of manpower, equipment for production, processing and distribution, prices of fish at various stages of marketing.
 - (b) Biological statistics—Estimation of total catch and catch per-unit-of-effort, sampling, methods.

IX. Fishery Technology

- (1) *Craft and tackle*.—Classification of fishing craft and tackle—craft and tackle suitable for different types of waters; Mechanised fishing in inland waters; Preservation and maintenance of craft and tackle.
- (2) *Fish processing, preservation and by-products*.—Chemical composition and nutritive value of fish and shell-fish; Fish spoilage—physical and chemical characteristics of spoiled fish; Principles of fish preservation and common methods in vogue in India—scope for improvement; Refrigeration, freezing, cold storage, canning and smoking.
- (3) Bye-product industries—fish oil—liver and body oils—fish meal—fish manure—other bye-products.

X. Fish marketing

- (1) Problems peculiar to the marketing of fish.
- (2) Fish marketing practices in India fresh and processed fish—other fishery products.
- (3) Improvements necessary in the marketing of fish—preservation—landing facilities—communication and transport—Handling—Distribution—Wholesale and retail markets.

XI. Socio-economics

- (1) Fishermen communities in India and their socio-economic status—middlemen—indebtedness of fishermen.
- (2) Cooperative movement among fishermen and handling of trade through cooperatives—credit societies—Multi-purpose societies and cooperative unions.
- (3) General education and vocational training of fishermen.
- (4) Fishermen's community development projects.

XII. Fisheries administration

- (1) Objectives of fisheries administration and the organisation of fishery administration (research and development) agencies.
- (2) Review of fisheries administration in India—Administrative machinery at the Centre and in the States.
- (3) Extension Service in relation to Fishery development.
- (4) Utilization of resource statistics and trade statistics for fishery administration.
- (5) Administration of fisheries in under-developed countries—technological improvements and trade control.
- (6) Organisation of fishery conservation and management.
- (7) Organisation of fishermen's socio-economic development programmes—fishery education—information and propaganda.
- (8) Intra and international cooperation in fisheries administration.

APPENDIX VIII(b)

SYLLABUS OF THE TRAINING IN MARINE FISHERIES IMPARTED AT THE CENTRAL MARINE FISHERIES RESEARCH STATION, MANDAPAM CAMP (NOT FUNCTIONING NOW)

PART A—*Oceanography (Fisheries Science)*

1. GENERAL OCEANOGRAPHY

Definition—Scope—History of Oceanography or Fishery Science. Distribution of land and water, continental shelf and slope, form of ocean floor, depth of oceans (Bay of Bengal and Arabian Sea in particular), sea bottom deposits—those of the Bay of Bengal and Arabian Sea. Physics and Chemistry of sea water. Tidal rise and fall, spring and neap tides—oceanic currents—currents in the Arabian Sea and the Bay of Bengal—trade winds and monsoons.

2. MARINE FISHERIES (with particular reference to Madras Presidency)

Productivity of the sea—Factors limiting productivity of the seas—Total production and value of the sea fisheries of the world. The relative importance of fisheries in the different countries of the world. Fishing grounds of the world.

3. FISHERY BIOLOGY

Plankton, Nekton and Benthos: Animals and plants of economic importance in sea and fresh water and their general classification and characteristics, Diatoms, weeds, sponges, corals, crustacea; Molluscs, sea-cucumbers, fishes, turtles, tortoises and sea mammals.

4. PEARL AND CHANK FISHERIES

Pearl—yielding Molluscs and Pearl Fisheries in South India. Pearl and Chank beds in the Gulf of Mannar and Palk Bay: Method of inspection of Pearl and Chank beds. Details of how the Tuticorin Pearl and Chank Fisheries are organised and worked. Diving labour, divers, manducks, sammatties, Tindals, etc., nationalities, methods of recruiting, their agreements with the department, system of Government loans to divers and boat owners. Differences between natural, cultural and artificial pearls. The habits, early stages and life history of chank and pearl oysters.

5. SOCIO ECONOMICS

- (1) Fish statistical forms and manner of collecting data relating to catches, fishing classes, boats, nets, etc.
- (2) Fishery Elementary Schools—Rules and Regulations—Syllabus of lessons.

PART B—*Inland Pisciculture*

A. Conservancy Operations

Prohibition of fishing in the Bhavani and the Moyar rivers and in the Cauvery (Mettur reservoir and Hogainakal areas). Seasonal Prohibition of Fishing. "Close seasons" on the Nilgiris. Restrictions in methods of fishing. Fixed engines, Mesh of nets. Dynamiting and poisoning.

B. Cultural Operations

The design and construction of fish farms; Fresh-water weeds and other pond life of importance in the culture and rearing of fish; Collection of fry for stocking operations in fish farms and from natural resources; Cultural practices of exotic or indigenous fish: Rainbow trout, Carp, Tench, Gourami, Etroplus, Catla, Labeo, Mahseer, Megalops, Chanos and Mullet. The diseases of fish as far as known and their remedies.

C. Anti-Malarial Operations

Mosquito larvicides (foreign and indigenous) their general characters, mosquito breeding grounds.

PART C—*Fisheries Technology*

1. FISHING METHODS

A. Craft

Various types of craft. Different parts of a sailing boat and rig.

B. Tackle

Classification of fishing tackles. The use of dynamite and poison in catching fish. Manufacture and preservation of nets. The nature, use and economic importance of the chief kinds of fishing tackle on the East and West Coasts of the Presidency and in inland waters.

2. ELEMENTARY NAVIGATION AND SEAMANSHIP

3. FISHERY FOOD PRODUCTS

Chemical composition of fish and its value as food. Causes and signs of decomposition. Testing fish in the market. Principles and practice of fish preservation.

4. FISH PROCESSING

Refrigeration and cold-storage,—Principles. Canning—Principles, Curing:

- (a) Salting.
- (b) Sun drying.
- (c) Other methods of dehydration.
- (d) Pickling.
- (e) Smoking.
- (f) Use of preservatives.

Manufacture of fish oil, fish meal, beche-de-mer, Bonito etc. Vitamin contents of fish oils. South Indian fish oils of high vitamin A potency.

5. FISHERY BYE-PRODUCTS

Fish-guano, Isinglass, Fish-glue, ambergris, Cuttle-fish bones, leather from sharks, porpoises, dolphins, shagreen, Seaweed, Agar-agar, Kelp, Pearl essence, Pearl and mother of Pearl, Coral, Sponge, Iodine, Bromine and Potash Aceton, Algin and Oyster grit.

APPENDIX VIII(c)

SYLLABUS FOR THE M.SC. COURSE IN OCEANOGRAPHY OF THE UNIVERSITY OF KERALA

I. History of the growth of the science.

II. *Marine Geology*.—The Distribution of the oceans and the continental land masses. Changes of sea level at different periods of the Earth's history. Continental shelves and slopes, the causative agents that have produced the slopes. Configuration of the ocean floors—use of charts; the mid-Atlantic and mid-Indian ridges; wire sonic and supersonic sounding; gravity observations and seismological investigation of the sea bottom, the geological composition of basis rocks. Nature, distribution and mode of formation of the bottom muds and oozes.

III. Principles of maritime meteorology.

IV. *Physical and chemical studies*.—Sea as a biological environment. Physical properties of sea water and their relationship with each other and with salinity. Salinity and temperature of surface-water in different regions; Isotherms, Isohalines, Isochimes; influence of rainfall and rivers. Degree of penetration of light; methods of measurement; the Euphotic zone. Chemical constituents of sea water. The principal ingredients of sea water and their biological role. Physical, chemical and biological characters of deeper water; water masses; the effect of wind and the rotation of the earth on the water masses; the surface currents, Convergence and divergence zones; ocean currents; their mode of formation and rate of travel. Standard oceanographic methods and instruments.

V. *Marine Biology*—Principles of classification of the more important groups of marine organisms, including bacteria. Plankton studies; Plankton and fisheries. Coral reefs and Atolls. Marine fishes and fisheries. Marine products of economic value (other than fishes); weeds, shells, corals, sponges, etc. and salt and other chemical elements from sea water.

VI. *Statistics*.—Statistics and inductive inference, population and samples, measures of Central tendency, dispersion and correlation. Tests of significance, chisquares and F-Tests. Statistical technique in the study of biological growth, design experiments.

APPENDIX VIII(d)

SYLLABUS FOR MARINE BIOLOGY FOR THE M.S.C. DEGREE OF ANNAMALAI UNIVERSITY

PART A

Scope of marine biology, marine biological stations. Geography of the seas, distribution of seas and estuaries and their physical features, their characteristics. Oceanographic instruments; methods of investigation and collection of data in marine biology. Physical properties of sea and estuarine waters. Composition of sea water; dissolved gases, carbondioxide system red-ox potentials, etc. Hydrobiological studies. Factors affecting the distribution of the chemicals in sea water. Sea and estuary as biological environments; animal and plant population of the sea.

PART B

Plankton : methods of collection—study—qualitative and quantitative analysis of plankton. Phytoplankton in relation to physical and chemical environments. Zooplankton—phytoplankton and zooplankton relations. Assessment of productivity of waters. Plankton and fisheries biology. Fundamentals of Fisheries Biology : Life histories; migration and behaviour of fish. Hydrology and fisheries. Study of animal numbers : fluctuations in numbers, estimation of population size; factors affecting population size. Age and growth of fish; length weight relationships. Fundamentals of fisheries statistics. Outlines of marine and estuarine ecology osmoregulation, ionic regulations (active transport)—biochemical adaptations of marine and estuarine organisms.

APPENDIX VIII(e)

SYLLABUS FOR M.S.C. DEGREE IN BIOLOGICAL OCEANOGRAPHY OF THE UNIVERSITY OF ANDHRA

History of Biological Oceanographic expeditions. Distribution of the oceans and continental land masses. Topography of the ocean floor. The sea as a biological environment.

Physical Properties of Sea water.

Chemical Properties of Sea water.

General characters of water masses, plant and animal life in the sea. Plants and animals in relation to physical and chemical properties of sea water. Chemical composition of marine organisms. Biology of the major groups of planktonic, Nektonic and Benthic populations in the sea. Inter-relationship of marine organisms. Animal colouration and its significance. Bioluminescence. Vertical migration of animals. Zoogeography of the sea. Phytoplankton production—Factors influencing productivity of the sea. Food-cycle and role of Bacteria in the sea. Training in the use of instruments used in measuring the physical and chemical properties of sea water. World sea-fisheries, classification and biology of the more important food fishes of India. Fisheries in relation to marine environment. Craft and tackle. Exploitation and conservation of fisheries. Shell fisheries and marine products of commerce.

APPENDIX VIII(f)

SYLLABUS FOR TRAINING OF FISHERMEN IN THE FISHERMEN TRAINING CENTRES

SUBJECT:—

- (1) Fishing methods.
- (2) Gear Technology.
- (3) Elementary principles of navigation.
- (4) Running and maintenance of internal combustion engines.

I. Fishing methods

- A. *Fish*.—Its nature, habits, behaviour, movements.
- B. *Fishing Areas*.—Oceans; continental shelf; bays and gulfs; nature of the bottom; currents, drifts and tides; depths of fishing areas; distance.
- C. *Gear material*.—Cotton hemp, coir, synthetic fibres, floats, sinkers, anchor buoys; their preservation.
- D. *Gear operation*.—General methods and capture of fish.
- E. *Fishermen as a Group*.—Their contribution to food and export—increasing effort, economics of fishing; collection of data, management and accounts, group discussions.
- F. *Practical*.—Operation of gill nets, drift nets, trawls, long lines, R. C. lines, trolling lines.

II. Gear Technology

A. Hook & Line Fishing :

Inducement of fish to take the bait; movements, snoods, hooks, holding the fish; toothed types; twisters; snatchers.
Fishing area; bottom; pelagic.
Hand lines.
Long lines
Trolling lines.

B. Nets :

- (1) *Stationary*.—Tidal gears; bag nets; gill nets; entangling nets.
Gill-nets.—Principle, gear, operations; general set up of gear; fishing height; tension; direction of set; assembly of gear; dahu buoy tide floats.
Entangling nets.—Principle, gear; general set up and assembly of trammels.
- (2) *Dynamic*.—Encircling nets; *Seines*.—ring nets; lampara; purse-seines.
Dragnets or trawls.—Beam trawl; otter trawl; V. D. Trawl; bull-trawl; pareja- trawl; sarsen trawl; principles of gear and operation.
Danish seine.—principle, gear; tide, bottom, winches, coilers, buoy and anchor.

C. *Observations*.—Association of fish and other animals; bottom; fish; weather; gear; logs; detection of fish in surface and bottom; depth recorders.

D. Preservation of gear and gear material; of fish from handling to marketing; deterioration; spoilage; ice; chilled fish room; containers; salting etc.

E. Group discussions and films.

F. *Practical*.—Net braiding; study of meshes; fashioning; assembly; net mending; knots, spliges, stitches and bends, Dahu buoys, barrel buoys, preparation of sinkers and anchors, study of buoyance.

III. Elementary Principles of Navigation

A. *Geography*.—Solar system; sun and planets, Earth, Moon, longitudes and latitudes.

B. *Navigation*.—Position; Compass; bearings and position; depths of the sea; distance, meteorology, weather, tides, wind, rain, clouds, steering courses.

C. *Rules of the Road*.—Course, knowledge of light signals, port buoys, channel markings, beacons, courses to be followed; marking of fishing gear system buoyage.

D. *Admiralty charts*.—Reading; fixing positions; taking courses; locating fishing grounds.

E. *General*.—Sailing vessels; anchor; weather warnings; life saving appliances, first aid, fire protection.

F. *Practical*.—Use of compass; position at sea; four point bearing; sailing courses; charts.

IV. Running and maintenance of internal combustion engines

A. *General definitions and Explanations*.—*Definitions*.—2 cycle, 4 cycle—solid injection, semi-diesel engine, tuning diesel engines, cylinder head valves, starting air valves—Lubricating oil consumption—Clearance volume—Conditions of actual combustion—setting fuel pump—consumption per I.H.P. and B.H.P.—consumption at various loads—proportion of air to fuel—Efficiencies—Wear of cylinder liners.

B. *Various types of Marine Diesel oil engines*.—Classification of Engines—4 cycle S. A. engine Single—acting 2—cycle engine—semi-diesel engine—Paraffin engines—High Speed Diesel Engines.

C. *Internal combustion Engines, Fuel Pumps & Injectors*.—Explosion system 2 cycle, 4 cycle—vaporiser—Fuel Pump with special reference to 'Bosch' system of fuel injection—Atomisation of Fuel in Semi-Diesel and H. S. Diesel Engines—Advantages of Compression—Scavenging principle—crank shaft—Cylinder and Liner—piston—connection rod—Main Bearing—Inlet and Exhaust valve—crank shaft rocker arms—Governor—Reduction Gear—Direct Drive—Reverse Gears.

D. *Fuel Oils, and Lubricating Oils etc.*—Lubricating oil consumption—methods of lubricating various engine parts viz. main bearing, crank pins, pistons rings, liners—using the right type of lubricating oils—importance of lubricating oils—Importance of lubricating oil filters and coolers. Source of Diesel fuels and lubricating oils, Refining process fuel oils for marine diesel engines—Physical Properties of Diesel Fuel oils—Flash points of various fuels; petrol, kerosene, high speed diesel oil—firing points—combustion temperatures—pressure of air prior to combustion and temperature thereof—Tests for water in oil.

E. *General notes on Magnetism and Electricity*.—Definitions—Magnetism—Batteries—Accumulators—Dynamos Armature—Commulator—switch board—volt ampere meters switches—motors and starters—elementary knowledge of storage batteries and the maintenance of batteries—elementary knowledge of electricity theory as applied to Electric Motors and Battery-Charging Generators.

F. Practical operation of Machinery.—Practical operations—starting preparation—normal conditions—manoeuvring and stopping—spares etc. Repair—General precautions—systematic and periodic overhaul—Handling of various tools—servicing of engines—Dismantling and Assembling marine diesel engines—duty of engineers and drivers.

G. Precautions Against Fire.—Precautions against Fire—Fire Extinguishing Apparatus—Phomene System Pyrene Foam system—Pyrene Foam system—Petroform fire extinguisher.

H. Practical.—Handling engines in power boats.

APPENDIX VIII (g)

SYLLABUS FOR THE LICENTIATE IN FISHERIES TECHNOLOGY AND NAVIGATION COURSES AT THE CENTRAL POLYTECHNIC, KAKINADA

FIRST YEAR (FISHERIES)

Fisheries Biology.—Planktons, Nekton, and Benthos, Animals and plants of economic importance in sea and fresh water and their general classification and characteristics; diatoms, weeds, sponges, corals, crustacea, molluscs, sea-cucumbers, fishes, turtles, tortoises and sea mammals.

Practical exercise in the case of tags and labels, preservation of specimens, classification of animals, plants fish eggs and larvae in plankton, examination of stomach contents, gonads, etc., by dissection and identification of fish and other aquatic animals and plants of economic importance.

Indian Pisciculture

A. Conservancy Operations—

1. Prohibition of fishing in the Bhavani and the Moyar rivers and the Cauvery (Mettur reservoir and Hogaeniakal areas).
2. Seasonal prohibition of fishing “close seasons” on the ‘Nilgiris’.
3. Restrictions in methods of fishing —Fixed engines, Mesh of nets, Dynamiting and poisoning.

B. Cultural operations—

1. The design and construction of fish farming.
2. Fresh water weeds and other pond life of importance in the culture and rearing of fish.
3. Collection of fry for stocking operations in fish farms and from natural resources.
4. Methods of stocking with exotic or indigenous fish: Rainbow trout, tench, Gourami, Etroplus, catla, labco, Mahseer, megalops, chanos and mullet.
5. Their natural food and artificial feeding.
6. The breeding habits of Gourami and Etroplus; methods of breeding Gourami and Etroplus in ponds, provision of artificial facilities for their breeding.
7. The breeding habits of Rainbow trout, collection of trout eggs and methods of hatching and rearing of fry.
8. Breeding habits of Murrel, early stages of different species, methods of rearing murrel in ponds and swamps.
9. Breeding habits of Hilsa, collection of eggs and their artificial fertilisation, Macdonald Hatching jars and the Hilsa Hatchery fittings and details of the working of the Hilsa hatchery.
10. Breeding habits and larvae of chanos and their culture.
11. Enemies of fish and methods of eliminating them.
12. The diseases of fish as far as-known and their remedies.

C. Anti-Malarial operations—

Mosquito larvicides (foreign and indigenous), their general characters, mosquito breeding grounds.

D. Fishery Legislation—

1. Indian Fisheries Act IV of 1927 and amended act, Madras Act II of 1929.
2. The latest Nilgiris Fishing Rules.
3. Rules relating to fishing auctions and leases; G.O. No. 339, Development, dated 24-2-1938.

4. Rules prohibiting fixed engines and prescribing fishing seasons and mesh of nets.
5. Rules relating to the licensing of stake net fishing for prawns on the West Coast.

Navigation

Navigation and Seamanship—Definition of terms used in Navigation—Mariner's compass, latitude by meridian, altitude—solar system, use of tidal tables and reduction to Soundings—error and corrections of compass from the true amplitude of the sun—Practical Navigation—Sextant—Measuring angles—use of Azimuth mirror—Station pointer.

Chartwork—Chart readings—Mercator's chart—Plotting courses and measuring distances—Bearings by compass—deviations and variations—plotting courses allowing for a given current—current courses.

Meteorology—Knowledge of the law of storms in Indian Waters and of the prevailing winds and currents—Marine, Mercureal and aneroid barometer and the thermometer.

Marine Engineering—Introduction: Marine engineering covering steam and diesel machinery, fuels, combustion, boilers, reciprocating engines, turbines, auxiliary machinery and steam power plant lay-outs—diesel and oil engines—motorship and auxiliaries—types of engines, fuel injection and combustion, valve gears, supper charging, oil engine fuel, and diesel electric drive.

Special topics on dynamics and stress analysis. The dynamics of the crank connecting rod mechanism—stresses in connection rods—the balance of rotating and reciprocating machines—elementary vibration theory—Torsional vibration in internal combustion engine and marine reduction gears—vibration of ships—dynamics of governors and fly wheels—mechanical similitudes and other related topics.

Brief review of nozzle and blade design—Important dimensions of several turbines and their principal features—effects of superheat increased pressure, vacuum—types of auxiliary drive and heat balance of the marine steam plant—critical speed, blade, strength, design of reduction gears and pump laws.

Elementary idea of Naval Architecture—General theory of geometry of ship—principles of floatation, displacement, stability and trim—buoyancy and stability in the damaged condition, sub-division for safety at sea—theory of waves—longitudinal strength.

SECOND YEAR

Fisheries Technology

Oceanography—Definition—scope—history of oceanography or fisheries science—distribution of land and water; continental shelf and slope, form of ocean floor, depth of oceans (Bay of Bengal and Arabian sea in particular), seabottom deposits those of the Bay of Bengal and Arabian Sea—Physics and chemistry of sea water. Temperature and density of the Bay of Bengal and Arabian Sea. Composition of the sea salt, determination of salinity hydrogention concentration (pH), tidal rise and fall, spring and neap tides, oceanic currents, currents in the Arabian Sea and the Bay of Bengal. Trade winds and monsoons.

Use and manipulation of oceanographical and meteorological instruments. Study of the standardised hydrographical and meteorological registers of the department.

Pearl and Chank Fisheries

1. Pearl yielding molluscs and pearl fisheries in South India.
2. Historical review—a crown monopoly.
3. Pearl and chank beds in the gulf of Manar and Palk Bay, method of inspection of pearl and chank beds.
4. Details of how the Tuticorin pearl and chank fisheries are organised and worked.
5. Diving labour, divers, manducks, sammattis, tindals, etc., nationalities, methods of recruiting, their agreements with the department—system of Government loans to divers and boat owners.
6. Differences between natural, cultural and artificial pearls.
7. Different kinds of chanks, 'Valampuri,' 'Jadi,' 'Patti', etc., gauging of chanks—sorting of shells as wormed and undersized.
8. The habits, early stages and life history of chanks and pearl oysters.
9. Various uses of chanks.
10. Standardised registers and forms relating to pearl and chank fisheries.
11. *Fishery Legislation*.—Rules relating to pearl and chank fisheries published in Notification No. 192, dated the 22nd May, 1931 (pages 711-714 of Part I of Fort St. George Gazette, dated the 2nd June, 1931), Rules for licensing of fishing with submerged trees (G.O. No. 743. Rev., dated 31st March, 1916).

Practical Test.—Identification of pearl bearing molluscs, chank egg capsules, Pearl oyster spat, false spat, early stages of chank and pearl oysters, artificial, cultured and natural pearls. A knowledge of the routine duties connected

with pearl and chank fisheries. Locating pearl and chank beds by crossbearings and survey and inspection of those banks, the marking measuring and sorting of chanks.

Use and maintenance of registers and forms relating to pearl and chank fisheries.

Socio-Economics—Fish statistical forms and manner of collecting data relating to catches, fishing classes, boats, nets etc.

Navigation

Signals—Semaphore—Morse flashing—International code of signals.

Seamanship.—Types of ships, purchases, strength of ropes, masts and devices—boats—anchors and cables—deck appliances and apparatus—rules of the road—ships lights—distress.

Fog and Pilot Signals.—Notices to mariners—rock at apparatus—use of lead and log lines—patent sounding machine and patent log—action of rudder—screw race—ship handling—anchor work—life boats.

Marine Engineering (contd.).—Comparison of fuels and the various types of steam and diesel propelling machinery for different types of ships and trade routes—economical operations of propelling machinery and auxiliaries at sea in port—Boiler main engines—auxiliaries and auxiliary systems—The economic aspects of marine engineering in general.

Elements of design—machine parts in the drafting room—main propelling units for a steam ship—sizes of auxiliaries, machinery lay out, diagrammatic arrangements of principal piping systems.

Elementary idea of Naval Architecture (contd.).—Tonnage and free board—rolling—hitching hearing, yawning steering and manoeuvring—propulsion and propellers—launching—grounding and docking.

Ship Construction.—Structural design of steel cargo boats and their equipment—details of steel construction, such as, shell plating, framing systems, decks, bulk heads double bottom tanks and methods of fabrication and erection.

THIRD YEAR

(Fisheries Technology)

Marine Fisheries

A. *Productivity of the Sea*.—Factors limiting the productivity of the seas—total production and value of the sea fisheries of the world. The relative importance of the fisheries in the different countries of the world, fishing grounds of the world.

B. *In the Madras Presidency*.—As an important source of food supply as a means of livelihood for a large population, as a means of developing the aptitude of the people for overseas—trade and maritime power as a source of various products of great economic value (other than food) such as manure, oil, pearl, chank, leather, medicinal products, etc. The total sea fishing grounds of the Presidency—The area now exploited by fishermen—statistics of landings of fish of the Presidency—census of fishermen, boats and nets.

Fishing Methods

A. *Crafts*.—Rafts (Catamarans), canoes, boats (Ratnagiri drifters)—large and small Rampani fishing boat, masula boats fishing boats of Palk Bay and Gulf of Mannar, sea-going shoe dhonies of the Godavari District, Motor boats smacks, cutters, cables, schooners, steam drifters and trawlers. The different parts of sailing boat and rig.

B. *Tackle*.—Fish traps, harpoons, pop-guns, lines, fishing rod and tackle, drift nets, wall nets, seine nets, trawl, nets, drag nets, cast nets, hand nets, china nets, trammel nets, stake nets, purse nets. The use of dynamite and poison in catching fish. Manufacture and preservation of nets. The nature, use and economic importance of the chief kinds of fishing tackle used on the east and west coasts of the Presidency and in Inland waters.

Fishery Food Products

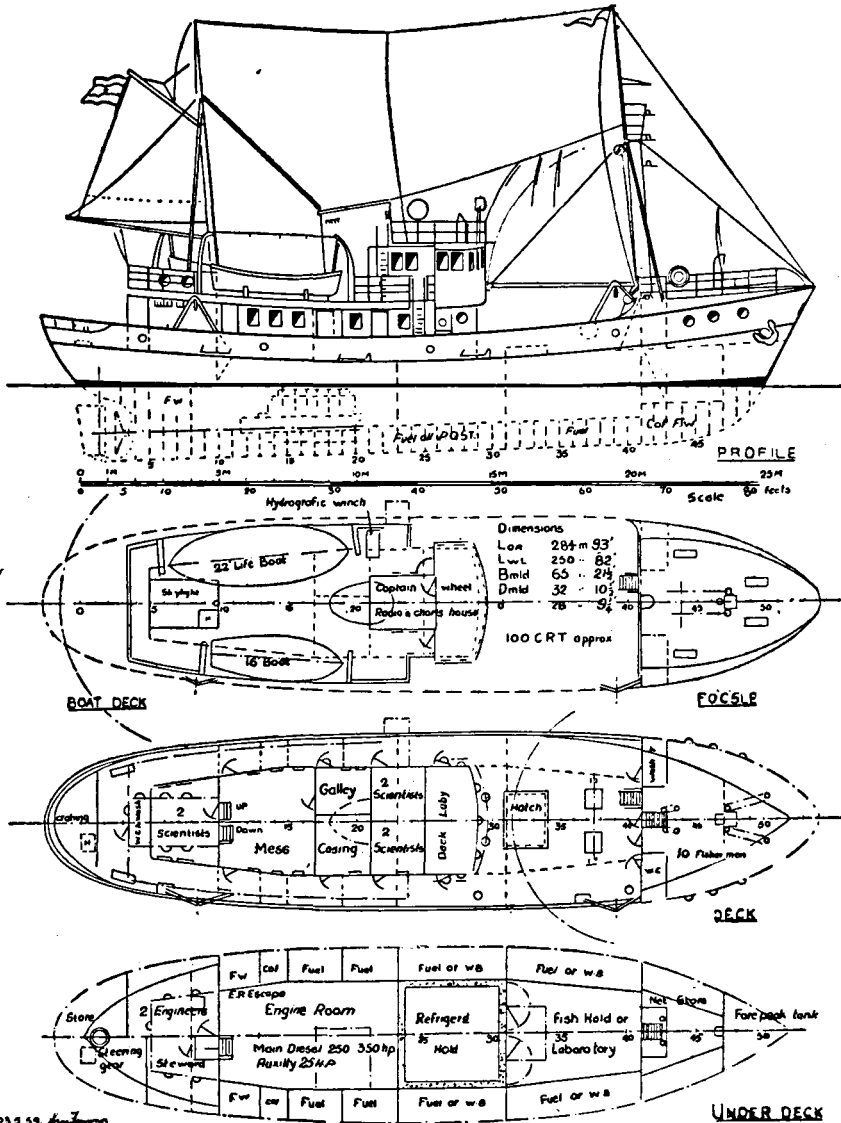
1. Chemical composition of fish and its value as food.
2. Causes and signs of decomposition.
3. Testing fish in the market.
4. Principles and practice of fish preservation—refrigeration and cold storage principles—canning principles.

Curing.—Salting, Sun drying other methods of dehydrations, pickling, smoking, use of preservatives.

Manufacture of fish oil, fish meal, beche-de-mer, masmean from Bonito, etc., vitamin contents of fish oils, South India fish oils of high vitamin A potency.

Fish Bye-Products.—Fish guano. Isinglass, fish glue, ambergris, cuttle fish bones, leather from sharks, porpoises, dolphins, shagreen, sea weed, agar agar, kelp, pearl essence, pearl and mother of pearl, coral, sponge, iodine, Bromine and potash, algin and oyster grit.

Proposed Fishing and Research Vessel



Preliminary Arrangement for
Fishing and Research Vessel

Hank & Zimmer, B.S.
P Box 139, Bergen, New Jersey

NO. 1064

DATE	1954
SCALE	1:100
DESIGNED BY	HANK & ZIMMER
CHECKED BY	HANK & ZIMMER
DATE	1954

Navigation

Practical Seamanship.—Boat pulling—knots and splices—canvas sewing—models—practical rule of the road with models—handling boats under oars and sails—boat lowering.

General.—Indian Merchant Shipping Act

Sickness on board, fire and boat drill, life saving appliances, elementary ships business—bills of lading etc., reports, International system of buoyage.

Ship Operations.—Engineering and economic aspects of ship operation, a study of the various items making up the operating disbursements of incomes—calculation for operating expenses and profits in various routes, comparison of different types of files and machinery for different sizes of ship and various lengths of voyages—Influence of the size on the ship and speed on operating cost—turnaround and port expenses—cubic and dead weight ships—tonnage measurements, fuel consumption—repairs and maintenance—factors influencing freight rates—coastwise inland water transportation and inter-relation of land and marine transportation—problems relating to cargo and passenger ship operations.

Ship Construction.—Riveted and welded construction—dock auxiliaries, life boat equipment, cargo handling gear, arrangements of quarters, ventilation and hull piping systems. Joiner work and fire proof and fire resisting construction of passenger ships

APPENDIX IX (a)

PROPOSED FISHERY TRAINING VESSEL FOR THE CENTRAL INSTITUTE OF FISHERIES EDUCATION, INDIA, DRAWN UP BY HANS K. ZIMMER, NAVAL ARCHITECT.

Outline Specification

Based on drawing No. 1064, dated 23rd May, 1959

		Dimensions			
Length overall	.. .. .	28.4	m	abt.	93 ft.
Length in w.l.	.. .. .	25.0	"		82 "
Length between pp.	.. .. .	24.3	"		80 "
Breadth moulded	.. .. .	6.5	"		21 " 6 Ins.
Depth moulded	.. .. .	3.2	"		10 " 6 "
Draught max.	.. .. .	2.8	"		9 " 3 "
Height of deckhouse	.. .. .	2.2	"		7 " 3 "
Height of wheelhouse	.. .. .	2.1	"		7 " 0 "
Camber of beam	.. .. .	0.15	"		0 " 6 "
Framespacing	.. .. .	0.50	"		1 " 8 "

General description:

The vessel is intended for fishing and fishery educational purposes off the India West Coast.

Fishing.—To be arranged for otter—and other trawl types, purse seine nets, Danish seine, longlines, handlines and other conventional fishing gear.

Research facilities will consist of two laboratories, one of which is under deck and its equipment portable; so the space may be utilised as fish hold when fishing. Further a hydrographic hydraulic winch on boat deck to handle water-samples etc., to the port side of the deck lab. Accommodation for 6 scientists and a crew of 14. Range of trips abt. 30 days with abt. 40 tons fuel and abt. 15 tons f.w.

For *education* the vessel will serve as a training ship for fisheries students with a crew of six (captain, mate, 2 engineers, steward and cook), 2 fisheries instructors and abt. 10 students on longer trips, when sleeping accommodation is necessary.

The vessel to be built of welded steel with one continuous deck, a turtleback forecastle, deckhouses and boatdeck aft as per preliminary drawing No. 1064. 5 transverse bulkheads of which 4 to be watertight, 2 longitudinal bulkheads from frames Nos. 8-41 with 5 sidetanks and one cofferdam both sides. 3 doublebottom tanks in forepart, with cofferdam betw. fw. tank and fuel oil tank. Peak tanks to be arranged for carrying fw. on long trips.

Class of Certificates:

The vessel to be built to the requirements and under the survey of Lloyds Reg. of Shipping class "+100 A.I. Trawler" or similar agreed classification society.

Main Engine: Abt. 300 hp. Diesel engine driving

(a) through hydraulic operated clutch, variable pitch propeller at abt. 350 rpm.

Auxiliary engines.—Two, 4 cycle Diesel engines of Lister FRM3A or similar make of abt. 25 hp. to drive generators.

APPENDIX IX (b)

PROPOSED 40 FEET FISHERIES TRAINING VESSEL FOR THE CENTRAL INSTITUTE OF FISHERIES
EDUCATION, INDIA

(DRAWN UP BY HANS K. ZIMMER)

GENERAL DESCRIPTION

See Sketch No. 1065

This 40 feet vessel is intended for the training of fisheries students on shorter trips off the Indian Coast and for general fishing when not used for training.

The arrangement differs from a usual, harbour-operated Shrimp trawler by having a large wheel house to give room for the students during operation and when demonstrating the instruments like the fishfinder.

When fishing the vessel will trawl over the stern, but there will be facilities for bringing the cod-end alongside and over the side amidships. The vessel will also be suited for trolling, longlining, purse-seining and for fishing with hand-lines, without having special trolling girdies, linehauler etc.

The hull is proposed to be built of teak, or other suitable hardwood (but may of course be of steel or other material). There is one deck extending forward of amidships into a low forecastle. The fish-hold under deck amidships and aft of amidships with a low hatchcoaming, insulated shifting boards and the usual tarpaulins. Partitions for fishcases etc., in the hold of varnished hardwood.

In the stern room for tanks and fishing gear with access from the fish-hold through doors in the bulkhead.

Engine room with access through the forward cabin, through the W.C. (handpump-flushed) on the port side and through the after bulkhead, the middle of which is made portable to unship the engine during major overhauls. As there is no standing height in the engine room, the deck inside the wheelhouse is made portable.

Proposed 40' Fisheries Training Vessels.

Cabin forward with simple cooking facilities and berths for 4 persons (may be six). Access through starboard side of the wheelhouse.

The wheelhouse to have sliding doors to deck both sides 5 front windows and 6 side windows, of which 2 in the doors. Steering wheel compass and engine instruments panel in front. Radio-station on starboard side aft and other instrument on the bulkhead to engine casing.

The engine to be about 80 bhp. *i.e.* not less than 60 and not more than 150 bhp. 4-cycle diesel engine, electrically started and with one kw., 24 volts dynamo and 300 amp. hours lead acid accumulator battery, 1½" bilge and deckwash pump and power-take off for the hydraulic winch-pump.

The engine, preferably to be Indian made, when marinised types like "Perkins SM6" or "Mercedes Benz M 204 B" will be acceptable. If made outside India, the engine to be a high speed marine Diesel like Lister, Ruston, or similar with hydraulically operated reverse and reduction gear to give a max. propeller speed of 700 r.p.m. The engine to be completely wheelhouse-controlled. A powerful electric blower to ventilate the engine room.

Inflatable 20 person rubber raft, belts and buoys for lifesaving equipment like anchors, cables, ropes, sails, instruments, fire-extinguishers etc., as per detailed specifications.

The vessel to be delivered from the builders fully equipped and ready to go to sea, inclusive of coppersheathed bottom and other items necessary for sailing in tropical waters.

APPENDIX X

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS

FISHERIES EDUCATION IN SOUTH ASIA.

The need for an increase in the consumption of animal protein in South Asia has been well documented as has the role that fisheries might play in relieving this deficiency. It has been calculated that of an annual consumption in the Far East as gross supplies of animal protein foods of about 35 kg. per head (as contrasted to 175 kg. for Europe and 502 kg. for North America and Oceania) about 7 kg. is fish. These data were compiled almost ten years ago but it is felt that they are approximately true at the present time.

The most recent statistics on the production of fish, crustaceans and molluscs indicates that in 1957 the world figure was about 30 million metric tons of which South Eastern, South Central and South Western Asia produced 3.6 million or about 12%. The above areas today contain upwards of 800 million people who will be increasing at an annual rate of approximately 2% in the next decade.

Dimensions:

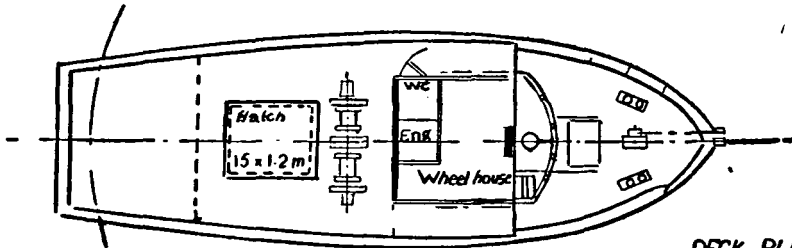
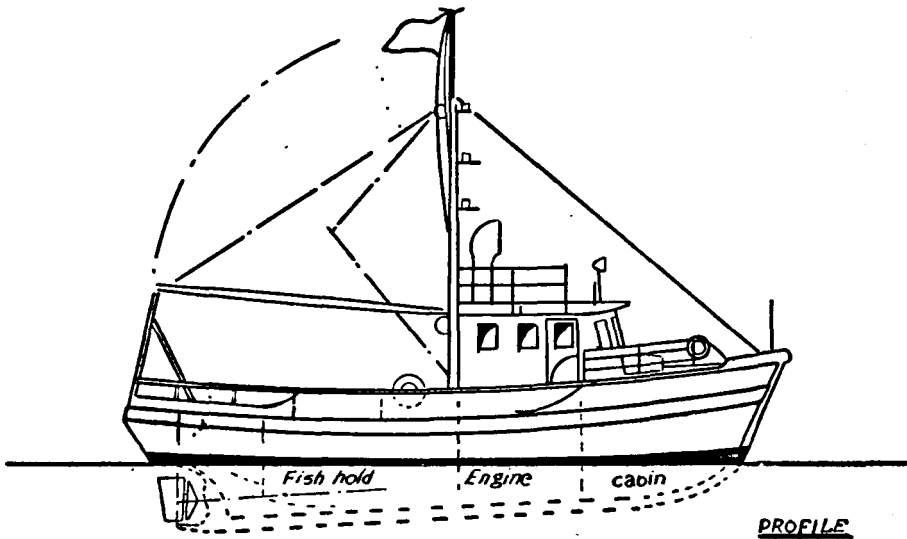
Length o.a. 12,2 m abt. 40'

Length w.l. 10,9 m .. 36'

Breadth mid. 3,95 m .. 13'

Depth mid. 1,65 m " 5' 6"

Max 12 Gross Reg. Tons.



Diesel Engine abt 80 bhp

Electric Light 24 volts

Hydraulic winch 1 to 2 tons

Radio telephone and direction finder

Fish Finder

<u>Proposed Fisheries Training Vessel</u> <u>For the Indian Coast</u>	<u>Scale</u> <u>1:100</u>	
	<u>NO. 1065</u>	
<u>Hans K. Zimmer, B.Sc.,</u> <u>Bergen, Norway</u>		

It is known that in these areas the production of fish per fisherman is very low though exact data is lacking. For India the annual production per fisherman is from 3 to 4 metric tons whereas for Canada the figure is from 13 to 15 metric tons; the U.K. 25 metric tons; Japan 83 metric tons. These figures are not exact but the ratios are considered to be valid, if not understated.

Though these differences are partially attributable to the difference in the richness of fishing grounds, low production in Southern Asia is mainly due to lack of development of the industry and of the individual.

Such backwardness is not entirely due to lack of capital, paying enterprises will attract capital—but finds its cause in the failure to apply technology, improved methods of distribution and marketing, scarcity of managerial skills as well as the inadequacy of the institutional approach.

It may be expected that over the years in the presence of an atmosphere of progress and development of agriculture and other industrial enterprises, the fish industry would also develop of its own initiative but this is not likely to occur quickly. The reform would not be rapid enough to cope with the vital needs of nutrition that are manifest. Therefore, if the rate of progress is to be increased Governments must intervene by creating a proper infra-structure and the employment of proper administrative methods founded upon wise legislation as well as providing conditions for the growth of an industry capable of taking advantage of the opportunities offered.

One of the principal limitations in accelerating reform is the scarcity of people properly trained in basic fisheries matters who are available to Government and the industry.

The lack of educational effort and institutions in this field is a block to the production of these trained individuals. Educational institutions of this character are only beginning to emerge in the better developed countries and even there, they are still very few in number and could not possibly accommodate the needs. However, it is essential that such institutions be located in the environment which gives rise to the need for them, because though the curricula may have some universality of application and be generally true of many situations, in other parts of the world, practice and theory must be adjusted to the existing resource, the social structure and the characteristics of the indigenous people. The training required should be aimed at producing a "generalist" with breadth of view and not towards the production of technicians in a narrow field. It should seek to produce an individual who knows the nature of the resource and its occurrence, its catchability, the methods used and kind of equipment necessary, the principles of its conservation, the nature of the various things that can be done to turn it into a commodity and the qualities and characteristics of those commodities, their storage, the handling and the possibility for distribution and marketing in domestic and foreign trade.

He should know the function and responsibilities of Governments towards the development of the fisheries resource. He should be able to recognise the complementary needs of the industry such as transportation, communication and harbour facilities and the like.

He should know also about the responsibilities and duty of those who indulge in the fisheries activity towards the State, be acquainted with its relationship to such matters as nutrition and public health and know something of the role that might be played in this sector. He should be acquainted with the elements of taxation and the effect of the incidence of various kinds of it upon the industrial activity as well as many other things which involve a reciprocal responsibility to the community which makes possible the action.

He should know, or at least be acquainted with, the means at the disposal of Governments which may be used to give effect to the exercise of its duties, the nature of the basic fisheries law permitted by a particular political philosophy and how these various principles can be put into effect by regulation—the technique of control that the Government has at hand. This would include a knowledge of institutional structure such as "Cooperatives", "government companies" or state enterprises, systems of price support, credit facilities, and the theory of subsidies and the role of private enterprises.

He should be acquainted with the principles embodied in various treaties, conventions and agreements affecting fisheries and conservation that have been established amongst nations and with the evolution of international law in this respect.

He should be able to recognise unsolved problems in the biological, technological, economic and social spheres as they affect fisheries and know something about the national and international means that are available to secure study of these problems.

In short he should be in a position of a diagnostician with respect to fisheries problems to know what type of reform is necessary and what type of specialist to bring in if solutions are to be achieved and in the light of this knowledge plus experience, which will come later, be equipped to devise and advise upon sound administration. These qualities will be of use not only in Government services but also to business as it evolves and those who take part in the institutional structure.

These should be among the aims of this new type of educational institution. It is admitted that it would be difficult to fulfil the ideal set forth above immediately because orientation of thought and the adaptation of skills in some of the subject matters is still wanting. Rather it is expected that the ideal described will have to be approached through a process of evolution on the part of those who instruct.

It can be readily seen that one of the difficulties to be overcome is a shortage of teachers and instructors. This would make it very unlikely that every country within a particular region would be able to start an institution of its

own, even though ample funds were available. But funds are not readily available and in the light of these other scarcities it would seem that the establishment of a regional institution to serve countries where conditions and circumstances are somewhat similar would be the sensible thing to advocate.

The newly created Special Fund administered by the Economic and Social Council may support the creation of such an institution for a period of years provided the participating countries would eventually assume responsibility for it. Perhaps a sum of about 2 million dollars expended over a period of say, four years, might be necessary to initiate the project. The initial grant would cover buildings, but subsequent expenditures would be less. But before even an approach can be made to the Special Fund there would have to be some unanimity of support from the Governments of countries who wish to participate and it is the purpose of this note to introduce discussion and thought upon these matters with a view to finding out whether it would be worthwhile to formulate the details of a proposal which could be used as a basis for a request upon resources of the Special Fund.

D. B. FINN
Director

ROME :
6th February, 1959.

Fisheries Division

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