

# FISHERIES OF THE WEST COAST OF INDIA

*Published on the occasion of the opening of the new building  
of the Central Marine Fisheries Research Sub-Station at  
Calicut by Shri. M. V. Krishnappa, Union Deputy  
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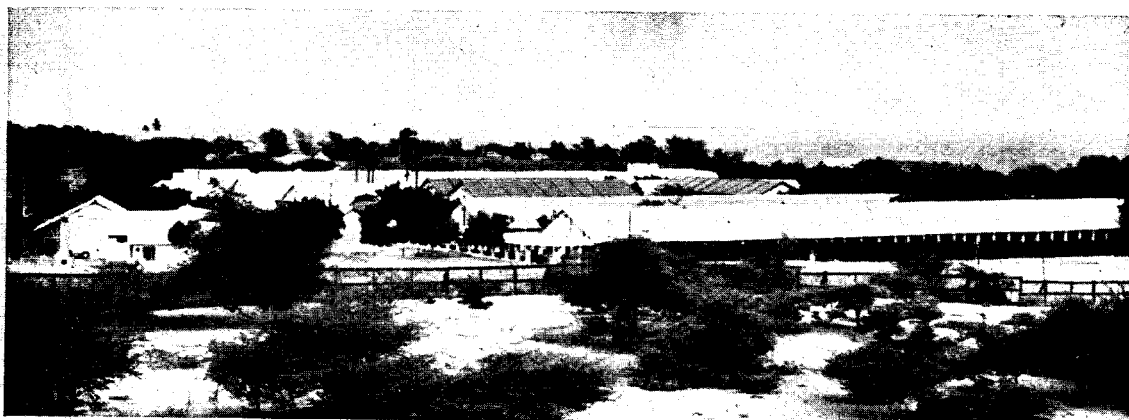
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# PROGRESS OF MARINE FISHERIES RESEARCH

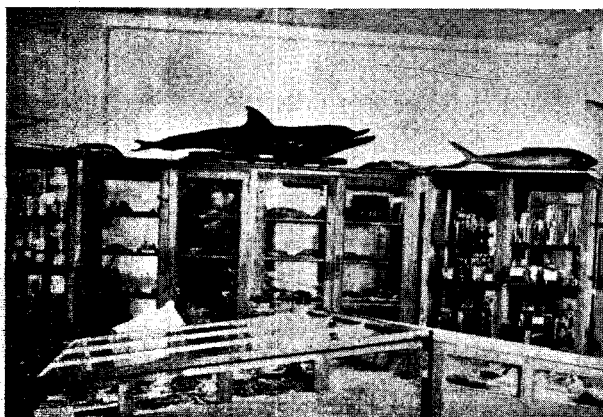
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FISHERIES Research is a comparatively recent development in the scientific research activities of the Nation. The need to take up research as a responsibility of the Centre so that the fishing industry could be fostered and developed along modern lines was realised as recently as during the Second World War when the whole country suffered very acute shortage of food. Fisheries had all along been a transferred subject and except for the enactment of the "Indian Fisheries Act" in 1897 very little direct interest was displayed by the Government of India for the next half a century for the development of fisheries. The various fisheries departments that came into existence in one form or other since the beginning of this century in the then existing provinces and native states were, with rare exceptions rather revenue minded than conservation minded, though a few of them evinced interest in the improvement of the socio-economic condition of the fishing communities. Instead of considering research as a long-term premium towards the creation of a sound industry vital to the nation, the administrators were generally inclined to view it as a commercial investment. The spadework of such pioneers as Hamilton Buchanan, Francis Day and H. S. Thomas, remained apparently ineffective until the zealous efforts of Sir Frederick Nicholson culminated in the creation in 1907 of a Fisheries Department in Madras, the province which then had the longest coast line in India. This Department had as its main objective the development of the pearl and chank fisheries of the east coast and the Sardine and Mackerel fisheries of the west coast. A Marine Experimental Station was established at Ennore in 1908 (subsequently shifted to Tanur in 1911), Madras Aquarium in 1909, the Experimental Marine Fish Farm near Tuticorin in 1914, the Marine Biological Station at Calicut in 1921 and field collecting station at Krusadai in 1928. The Marine Biological Station at Calicut near which the Central Marine Fisheries Sub-station is located was established for investigations on Sardines and Mackerel which constitute the main fisheries of the area.



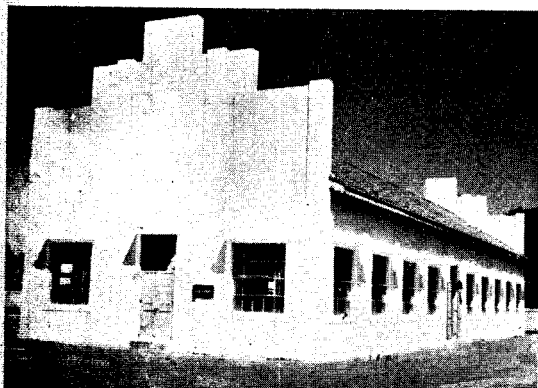
A distant view of the Headquarters Buildings of the Central Marine Fisheries Research Station at Mandapam Camp (with the Gulf of Mannar in the background)



A portion of the Reference Museum at Headquarters



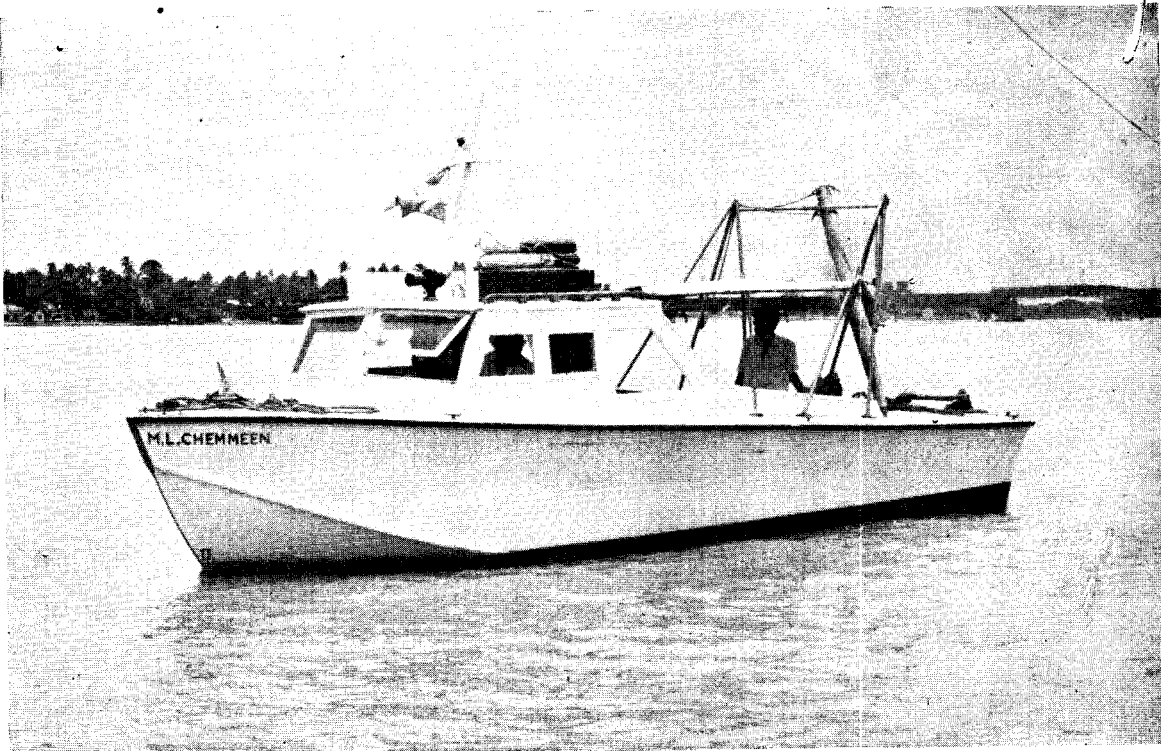
A portion of the Library of the Headquarters Station, Mandapam Camp



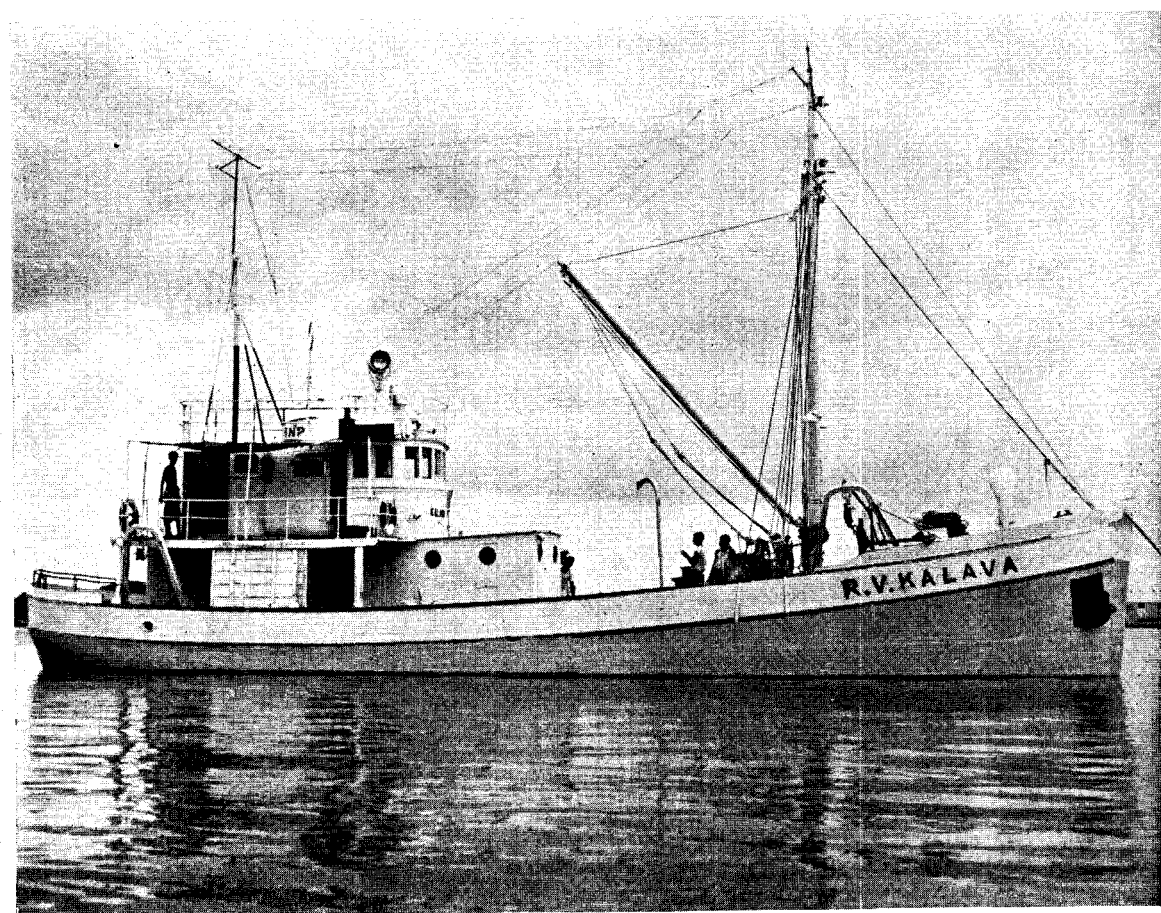
The Aquarium Building at Mandapam Camp



Ponds of the Marine Fish-Farm, Mandapam Camp



M. L. "Chemmeen" of the Central Marine Fisheries Research Station, at Ernakulam



Research Vessel "Kalava" of the Indo-Norwegian Project, placed at the disposal of the Central Marine Fisheries Research Station

in the course of the faunistic studies conducted by the Zoological Survey of India and by the surgeon naturalists attached to the Marine Survey of India, considerable information, especially on the systematics of fishes and on animal life associated with them was being added from time to time in the *Records of the Indian Museum*, *Memoirs of the Indian Museum* and in the *Investigator Reports*. Other contributions of special interest in marine ecology and fisheries are the *Reports on the Pearl Oyster Fishery of Ceylon* (1903-06) edited by Sir William Herdman, *The Report on the Zoology of Okhamandal* (1916) by James Hornell and the series of *Bulletins* published by the Madras Government Museum.

In the Report of the Industrial Commission of 1916-18 it was recommended that scientific officers should be attached to the Zoological Survey of India, to give advice on fisheries to the local governments and other bodies evidently with the object of making the above institution the centre of fisheries research and development in the country. In the meanwhile a number of State Fisheries Departments and Universities had initiated research on fish and fisheries. Some of the work had necessarily to be of a desultory character in view of the practical difficulties encountered by technical personnel involved. The establishment of the Department of Marine Biology and Fisheries in the University of Travancore (now Kerala) in 1938 within a year of inception of the University itself is significant in that this helped to establish a place for fisheries study and research in the activities of Indian Universities. Other Universities like Madras, Calcutta and Bombay had their own Zoology Departments where post-graduate work was carried out on fish and fishery subjects also. Investigations relating to fisheries and other cognate subjects have been in progress in recent years in the Fisheries Departments of Bombay and Kerala States and in the Institute of Science, Bombay. During the war and since then the Indian Council of Agricultural Research has also sponsored a number of research schemes relating to fish and fisheries.

As indicated already, the Second World War poignantly brought to light the extent of our dependance for foodstuffs on external sources and the need for a scientific approach for the judicious exploitation of our own resources. The memorandum on the post-war development of Indian Fisheries submitted by Dr. Baini Prasad in 1943 gave the initial momentum for the formation of fishery research institutes under the Government of India and the Fish Sub-Committee of Policy Committee on Agriculture, Forestry and Fisheries endorsed in its report in 1945 the proposals contained therein. It was decided by the Government of India to organise *ab initio* and build up Central

Fisheries Research Institutes for marine and inland fisheries investigations on the lines recommended by Lt.-Col. Dr. R. B. Seymour Sewell in 1946. The Central Marine Fisheries Research Station came into existence in 1947 with its temporary headquarters at Madras and the Central Inland Fisheries Research Station at Calcutta.

The eleven years period between now and the inception of the Central Marine Fisheries Research Station in 1947 in two rooms of the Madras University Zoological Laboratory at Madras has witnessed the development of the institution into a stable organization dealing on scientific lines with various problems of marine fisheries which had remained in comparative neglect for a long time although fisheries rank high in our national wealth. The Institution was declared permanent with effect from the 13th October 1953 and the development programmes implemented by the Government of India under the First and Second Five-Year Plans have enabled this Research Station to have a certain amount of expansion.

The work of the Institution has a region-wise and subject-wise distribution and consequently the activities are largely decentralised being carried out in the various Substations, Units and Centres *pari passu* with the progressive establishment of out-stations indicated elsewhere (see page facing contents).

The principal function of the Institute is centred on fishery biological studies. This is because the successful development and conservation of the fisheries of the country require, as an essential preliminary, the collection of detailed information on the distribution, abundance, habits, life-histories, food, rate of growth, age, migrations, etc., of fish in general and the important food fishes in particular. Availability of exact information on these aspects alone would make it possible to develop the fisheries in such a manner as to obtain the maximum sustainable yield from them and at the same time conserve the stocks at optimum level. In any fishery investigation the fish concerned has to be studied in relation to its environment and in view of lack of essential information on the various environmental factors, a certain amount of attention had also to be paid during the initial stages on getting this basic information.

Of the estimated total landings of marine fish in India, which in 1957 reached a record of nearly 900,000 tons, about 80% is landed along the west coast. The most important among the west coast fishes are the sardines, mackerel and prawns and as such, even from the start special attention had to be paid to the study of their biology and fisheries. The programme of

investigations was progressively expanded during the First and Second Five-Year Plans particularly on the mackerel, the sardines and prawns. Investigations on offshore fisheries, on the fishery resources of the Laccadive area and on the pelagic fisheries of our seas have also been envisaged and are under implementation.

The Indian Mackerel constitutes the most important pelagic fishery in India, contributing about ~~45~~ 10% of the total marine fish landed on our coasts. Though present both on the west coast and east coast it forms a major fishery only along the coast of Kerala and Mysore. Valuable information on the concerned species, viz., *Rastrelliger canagurta* has been collected both at Karwar and at Kozhikode. The state of maturity of this fish in different months of the year is known now and the food and feeding habits of mackerel entering commercial catches have been studied. Studies on fecundity, age, growth, spawning periodicity, etc., are in progress. Racial studies on mackerel have been initiated and in addition to the samples received from different parts of India, specimens from Siam, Malaya, Philippines and Indonesia are also being examined at Mandapam. These and other studies are being continued (i) with the aim of ascertaining the areas where commercially successful fishery for the species could be set up, (ii) for obtaining information for predicting the natural fluctuations in its fishery and (iii) to devise ways and means for regulating the fishing operations and stabilizing the fishery.

Among the clupeoid fishes which contribute the bulk of the marine fish production of the country, the oil-sardine of the west coast, viz., *Sardinella longiceps*, ranks as the most important commercial species. It is much esteemed as a valuable food fish and is used extensively for the manufacture of oil, guano and meal. The fishery for this fish has been erratic for several decades past. For a proper understanding of the basic prime factors influencing the fluctuations in its fishery, detailed information relating to the food and feeding habits, sex composition, seasonal changes in the gonads, maturation, life-history, age and rate of growth, etc., has been collected. These studies have brought to light that fluctuations in the availability of certain food organisms in the area has been partly responsible for the extreme annual fluctuations in its fishery. The programme of work has recently been expanded to include recruitment studies also and cover more centres. Similar investigations on other important sardines of the west and east coasts are in progress.

Prawns constitute the third group of commercially important fishes (*sensu lato*). The main investigations are on the biology of the Penaeid

prawns that constitute the economically important species. Valuable data have been collected on all the species which make up the bulk of the commercial catches along the south-west coast. A species selected for more intensive study is *Metapenaeus dobsoni* which is common along both the eastern and western coasts of India and is the most abundant species in the backwaters of Kerala. The above studies point to the possibility of shoals of prawns occurring in waters deeper than those at present exploited by fishermen. Experiments in prawn farming have been carried out first at Narakkal near Ernakulam (in Kerala) and they are now conducted at Vaikom, further south. Various aspects of the biology of prawns are under study at Ernakulam, Calicut, Mangalore and Bombay.

Data relating to shark fishing grounds, fishing seasons, details of different kinds of craft and tackle, distribution of species, constitution of catches, sex-ratio, breeding grounds and general biology, composition of catch as a whole and in different areas, disposal of sharks, etc., have been collected.

Economic biology of oysters and edible clams of the east coast has been studied and data collected on the reproduction of the oyster and the rate of growth. The biology of three other clams, *Katalysia*, *Meretrix* and *Donax* has also been studied. The squid fishery of the Ramnad District has been investigated.

To mention a few among other items of fishery biological work carried out, the Bombay-duck fishery at Bombay and factors affecting the fishery have been studied. The ribbon-fish fishery of the Madras Coast has been studied similarly and valuable data gathered. A preliminary study of fish populations of the Malabar Coast (Calicut) has been carried out. The work has brought out the importance of the Malabar Sole (*Cynoglossus semifasciatus*) fishery and the factors probably controlling inshore fishery populations. The silver-belly fishery and the seer-fish fishery which are very important around the Rameswaram Island have been investigated in detail. The tuna fishery, especially of the Laccadive Archipelago, is under investigation.

Marine biological studies play an important role in marine fisheries research. This is because, apart from the study of the fish themselves, full knowledge of their environment, i.e., the *milieu* in which they live, their food, predators, etc., is very essential as they constitute important factors contributing towards the success or failure of a fishery. But, these latter form a very complex problem as will be clear from what is stated below. Plankton organisms (minute plant and animal organisms floating in the sea) constitute the sole food of the larval fish and a large number of adult fishes too. But



the types of plankton that occur in a particular area and their seasonal abundance or otherwise is determined by a large number of other factors like the nutrient salts present, temperature, salinity, upwelling, ocean currents, etc. Therefore a thorough knowledge of the water masses and the plankton productivity of an area is of great importance in the development of fisheries.

Qualitative and quantitative studies on the plankton occurring in the inshore waters in the Gulf of Mannar and Palk Bay at Mandapam have been in progress and some very interesting and informative results have been obtained from there and from similar studies at Calicut. Plankton studies on a small scale have also been in progress in Karwar and Bombay. With increasing facilities, these studies will be extended to other centres and over the offshore waters. Fish eggs and larvæ occurring in the plankton collections at Mandapam have been studied and the results published.

The hydrological and related investigations are mainly directed towards the study of the chemical composition of seawater, its variations from place to place and season to season and the manner in which variations affect the fisheries of a particular area. The main emphasis is on the study of the distribution and seasonal variations of the inorganic nutrient salts such as phosphates and nitrates which influence the fertility of a particular marine environment. The nutrient salts control the growth and reproduction of the minute floating plants, which form the food of the smaller animals. The fish feed on these small animals and thus link up the food cycle in the sea. The inorganic nutrient salts, therefore, are responsible for primary productivity and are able to affect indirectly through the elaborate 'food chain,' the seasonal abundance or otherwise of fisheries. Records of the occurrence and distribution of these nutrient salts from place to place and from season to season maintained over a number of years will be essential for predicting the relative abundance or scarcity of fisheries in different localities and in different seasons.

Another important aspect is the study of water movements with the help of a knowledge of salt content and temperature variations. Ocean currents play an important role not only in the distribution of the nutrient elements but also in distribution of various marine elements including fish eggs and larvæ. Thus the appearance of a particular fishery in a particular region could be ascribed not only to the biological conditions governed by the presence of the nutrient salts, etc., but also to the incursion of a new body of water into the environment. Some very useful data along these lines have already been collected and studied at Madras, Mandapam, Bombay, Kozhikode and Karwar.

The extreme paucity of fisheries statistics in India and the great need for their collection and interpretation have been pointed out by several experts and committees in the past. Survey of fishery resources is most essential since any well-planned programme of fisheries conservation, development and exploitation will have to depend on a proper assessment of the actual yield, extent of fisheries exploited and their potentialities. For this, accurate statistical data should be maintained over a long period of time on the seasonal and regional variations and the principal species constituting the catches as also of the yield per unit of effort. The Fishery Survey Assistants and Field Assistants who have been given necessary preliminary training are in charge of the different zones and centres into which the entire coastline of India has been divided. The data collected by these Assistants are analysed and studied at the Headquarters Station.

A complete census of the marine fishing villages was first carried out in 1948 and the number of boats, nets, etc., employed in the fishing industry has been computed. Resurvey and re-enumeration are being carried out periodically to keep the figures up-to-date as far as possible. For the past eight years the total annual marine fish landings in India have been estimated on the basis of sampling techniques developed at the Research Station. This work is being continued and extended to cover various aspects of the problem.

There is every reason to believe that an appreciable part of our sea fisheries resources lies in the offshore areas but these remain to be explored and exploited. Well-established and flourishing sea fishing industry exists in Europe and America and also in Japan in the east. The idea of setting up a self-supporting offshore fishing industry in India had long been entertained. But the trawling experiments carried out sporadically during the past half a century or more by the State Governments of Bengal, Madras and Bombay had not given encouraging results as a commercially successful enterprise and had therefore to be given up. In 1946 the Government of India set up the Deep Sea Fishing Station at Bombay for carrying out exploratory fishing operations and for charting of fishing grounds. These activities have now been extended to Cochin and the question of setting up similar deep sea fishing units at other selected centres is now under consideration. Encouraged by the results of these experimental operations the Government of West Bengal have set up a power fishing unit at Calcutta for carrying out deep sea fishing operations at the head of the Bay of Bengal. Some commercial enterprises like the New India Fisheries at Bombay have also now ventured into the power fishing industry.

The Offshore Fisheries Research Unit of the Central Marine Fisheries Research Station was set up at Bombay in 1953. This Unit has already collected and studied, in collaboration with the Deep Sea Fishing Station, very valuable data relating to the areas of operation of the power fishing vessels and the catches made by them. The biological and oceanographical data relating to power fishing operations at Cochin are handled by the Offshore fisheries staff of this Research Station who are stationed there and similar work at Calcutta by the Research Unit at that Centre. Based on these studies the pattern of distribution of fish in the various fishing grounds is being charted and revised charts to indicate the fishing grounds are being printed. It is hoped that when the full complement of scientific staff sanctioned for offshore fisheries studies is recruited, it would be possible to intensify and expand the investigations to other centres and also into the oceanic waters which now remain unexplored and unexploited. Offshore fisheries work is being carried out in very close collaboration, not only with the Deep Sea Fishing Station on whose exploratory fishing vessels our staff carry out their work, but also with the Fisheries Technological Research Station, now being set up, where gear and tackle suitable for the different species of fish and their environment will be devised, as also appropriate techniques for the processing, preservation and utilisation of the increasing catches that are likely to be obtained.

The significant role technological studies play in fisheries development needs no emphasis. Fish is a highly perishable commodity more especially in a tropical country like India. Its preservation from the time of catch to the time of consumption presents several problems. What are the bacteriological and chemical changes taking place in the fish flesh between the time of catch and arrival at ports? How best could these changes be prevented? What are the economically feasible optimum conditions under which the material could subsequently be stored till it reaches the consumer? How best could the natural flavour, texture and nutritive value be maintained during freezing and storage? These are a few of the several problems requiring investigation. They are receiving attention in the Fisheries Technological Division of the Central Marine Fisheries Research Station and some interesting results have been obtained.

The modern trend is to have as many ice factories and freezing and cold storage plants as possible. All the same in India problems of preservation, transport and marketing still remain to be solved and the fish not utilized in the fresh condition are preserved by adopting the indigenous methods of dry-salting, wet-salting, pit-curing, etc., to meet the demands of inland

markets. Basic problems like the keeping quality of products obtained from each of these processes, quality and levels of salt to be used in each case and during different seasons, indices for correct assessment of spoilage, etc., are therefore some of the important technological aspects now receiving attention in this Research Station.

Recent investigations have shown that high quality fish protein could be prepared from fish waste. The new technique recently evolved at this Institute for preparation of odourless fish flour from the flesh of fish which are not ordinarily looked upon as food fish, indicates the possibilities of making available to our people, whose basic diet is deficient in protein, a product with rich protein content. There are several byproducts of economic importance that could be obtained from fish such as the vitamin-rich liver oil, fish body-oil, etc. The economic utilization of seaweeds is another aspect on which a considerable amount of work has been carried out in this Research Station and some results of practical value have already been obtained.

One way of increasing fish production on our coastal regions, and more particularly to obtain supplies during what is reckoned as the off-season for fisheries, is the development of marine fish farms along coastal regions utilizing the extensive swampy areas which are at present unused. Large-scale fish farms of this type have existed for long in Italy and southern France in Europe and in Indonesia, the Philippines and Hawaii in the East. In principle the work consists in conversion of swampy areas into marine fish ponds with permanent connections with the sea controlled by sluice gates and by bunding the fish ponds into various sections for nursery, stocking and maturing purposes. As a pilot venture, an experimental marine fish farm has been constructed at Mandapam where observations are under way. A considerable amount of research work has also been done on the physiology of adaptation in *Chanos* or milkfish as it is more commonly known, as also on the prawn *Metapenaeus*. Owing to their exceptional powers of adaptation these forms together with the mullets are likely to prove very useful in the development of marine fish farms on our coasts.

In conclusion it may be stated that the Institution actively collaborated with various international and national bodies like the Indo-Pacific Fisheries Council, the Central Board of Geophysics, etc. The co-operation and help extended by the authorities of the Indo-Norwegian Project, Quilon, by placing one of their vessels at our disposal for research purposes has enabled the Research Station to conduct cruises in various areas on the West Coast for fishery biological and oceanographic studies. A special scheme sanctioned

by the Ministry of Scientific Research and Cultural Affairs and funds provided by them have enabled the collection of seawater samples and oceanographic data from different parts of the Arabian Sea and the Bay of Bengal and their study. Research training and facilities for research work have been given to a number of Indian and foreign research workers.

The old saying that Rome was not built in a day is particularly applicable to fisheries development. Fishery Research is highly complex; its problems are many-faceted but closely inter-linked. It is essentially a long-range activity. The opening of the new Substation at Calicut is yet another milestone, marking a new step forward in the progress of marine fisheries research in India.