

**40 YEARS
OF
RESEARCH AND DEVELOPMENT
IN
MARINE FISHERIES IN INDIA**



**A Souvenir issued at the National Symposium on
Research and Development in Marine Fisheries
held at Mandapam Camp, 16 - 18 September 1987, to mark
the 40th Anniversary of
Central Marine Fisheries Research Institute, Cochin
(Indian Council of Agricultural Research)
P. B. No. 2704, E. R. G. Road, Cochin-682 031**



President's Secretariat
Rashtrapati Bhavan
New Delhi-110004

August 18, 1987

The President of India is glad to learn that the Central Marine Fisheries Research Institute, Cochin, has completed forty years of useful existence and to mark the occasion, a National Symposium on Research and Development in Marine Fisheries is being organised at Mandapam Regional Centre in Tamil Nadu from September 16-18, 1987. The President sends his greetings to all those associated with the Institute on the occasion and best wishes for the success of the Symposium.

Sd/-

K. Suryanarayana
Press Secretary to the President



Prime Minister's Office
NEW DELHI 110011

March 25, 1987

The Prime Minister sends his good wishes to the Central Marine Fisheries Research Institute on the occasion of its 40th anniversary being celebrated in September, 1987 at Mandapam Regional Centre in Tamil Nadu.

Sd/-

Pulok Chatterji
DEPUTY SECRETARY



Minister of Agriculture
Government of India New Delhi-110001

March 27, 1987

The Central Marine Fisheries Research Institute of ICAR, which was established in 1947, is creditably celebrating the completion of its 40 years of dedicated service to the Nation. All along the period, this premier National Research Institute has provided research support for the development and management of marine fisheries in India. Having estimated the potential resource of our Exclusive Economic Zone (EEZ) of 4.5 million tons, the scientists of the Institute have been continuously engaged in periodic stock assessment of the multi species fish resource and in the process have been of considerable service to the growth of marine fishery industry. The contributions of the Institute in the development of technologies for controlled culture and production of various marine organisms have been significant. Prawn farming, marine fish farming, oyster and mussel culture, sea weed culture and pearl culture are some of the areas in which the Institute has done pioneering work.

Today the Institute has not lagged behind in giving an appropriate thrust on certain priority areas so that the technologies ready for adoption are projected with operational details for the benefit of entrepreneurs. During the remaining part of the 20th Century, the role of Central Marine Fisheries Research Institute is expected to be more important particularly in the field of developing strategies for the management of our near shore and offshore fisheries. The Institute has also a challenging task of co-ordinating R & D efforts in the marine fisheries sector with other sister Institutes in the country and remain a guiding force for team spirit at the national level.

I hope that 40 years of history of Central Marine Fisheries Research Institute would be considered by the scientists of the Institute in right spirit and through inspirations drawn from the ambitious programmes of our Prime Minister, the scientists of the Institute would rise to the demand of the time. I wish the scientists of the Institute all success in their endeavour.

Sd/-
G. S. Dhillon

Foreword

The Central Marine Fisheries Research Institute, founded in 1947, has completed 40 years of service to the Nation, conducting research on marine capture and culture fisheries and providing necessary advice to the development departments and fishing industry for enhancing marine fish production through rational exploitation, management and conservation of the resources. On this occasion of the 40th Anniversary of the Institute a National Symposium on Marine Fisheries Research and Development has been organised to be held from 16th to 18th September, 1987, at the Regional Centre of the Institute at Mandapam Camp.

Besides this Institute, several other national institutes, organisations and Universities have also been conducting marine research for the past several years and, as a result, a wealth of information has been generated. Over the years, all these institutions have grown in size and stature and developed extensive facilities for research, development, education, training and extension in the field of marine fisheries. It is therefore considered appropriate to highlight and bring together the objectives, functions, facilities and achievements of these institutions involved in marine fisheries research and development in a souvenir at this juncture, when we are also celebrating the 40th Anniversary of our nation's Independence. It is hoped that, through this publication, the country's effort into marine fisheries research and development during the 40 years could be made known to all those who are interested in the subject.

Besides the information from CMFRI, the souvenir has information received from Central Institute of Fisheries Technology; Central Institute of Fisheries Education; Fisheries Colleges of universities like University of Agricultural Sciences, Kerala Agricultural University, Tamil Nadu Agricultural University and Govind Ballabh Pant University of Agriculture; technology and development departments like Fishery Survey of India, Central Institute of Fisheries Nautical and Engineering Training, Integrated Fisheries Project and the Marine Products Export Development Authority; the De-

partment of Ocean Development; the Department of Fisheries, Lakshadweep; and the Tamil Nadu Fisheries Development Corporation. The souvenir, however, does not include the fisheries development programmes of the maritime states as these articles have not reached us as we go to the press.

I am personally grateful to all the above institutions, organisations, universities and development departments who have kindly cooperated by responding to my request to provide information about their organisations.

P. S. B. R. JAMES
Director
Central Marine Fisheries
Research Institute

Central Institute of Fisheries Technology

ESTABLISHMENT AND DEVELOPMENT

In the year 1954 the Ministry of Food and Agriculture, Govt. of India appointed a high power committee to consider steps to be taken for achieving overall development of fisheries industry in the country. Following the recommendations of the Committee, the Institute came into existence at Cochin in December 1957 under the Department of Agriculture, Ministry of Food and Agriculture, as Central Fisheries Technological Research Station, with a small nucleus of staff for research in fishing craft and gear. The processing technology research cell which was initially a part of CMFRI was transplanted from there in the year 1958 into this newly created organisation to form the processing wing of the Institute. The Institute acquired its present name in the year 1962.

Since the time of its inception, the Institute has undergone notable progress and made considerable expansion of its staff and facilities. The headquarters of the Institute is housed at Cochin with the following divisions:

1. Fishing Craft Division
2. Fishing Gear Division
3. Fish Processing Division
4. Fish Biochemistry & Nutrition Division
5. Fish Microbiology Division
6. Engineering & Instrumentation Division
7. Extension, Information & Statistics Division

It also established sub-stations and units in representative localities in different parts of the country to cater to the specific regional needs. Substations were set up at Veraval (Gujarat) in 1962, Kakinada (Andhra Pradesh) in 1962 and Burla (Orissa) in 1963 and Units at Bombay (Maharashtra)

in 1958, Calicut (Kerala) in 1962, Nangal (Punjab) in 1964, Panaji (Goa) in 1965 and Madras (Tamil Nadu) in 1972. The Unit at Nangal, having successfully completed the work assigned to it, was closed down in 1970. The Madras Unit was also wound up after having existed two years.

The Administrative control of the Institute was transferred to the Indian Council of Agricultural Research in October 1967. The Institute moved into its permanent building at Willingdon Island, Cochin, in June 1976 on its formal inauguration by the then Union Minister of Agriculture, Shri Jagjeevan Ram. The Institute is presently the only National Centre in the country where research investigations in all the disciplines of fishing and fish processing technology are undertaken.

AIMS AND FUNCTIONS

The activities of the Institute are oriented towards fulfilment of the following objectives:

1. Research and development work for increased marine and inland fish production by evolving suitable designs of fishing craft and gear and fish-catching techniques, optimum utilisation of fish catch and waste products, introduction of substitutes for imported machines and equipments needed for the fishing industry and its ancillaries.
2. Training of personnel required by the fishing industry.
3. Extension of useful research findings to the actual users throughout the country.
4. Extending facilities for post-graduate research leading to higher degrees.



**CIFT
Headquarters
Cochin**

ACHIEVEMENTS

Since its inception, the Institute has taken up and successfully concluded studies on many important aspects of fishing and fish processing industry. Some of the significant results are given below.

FISHING BOATS

Twelve designs of fishing boats in the size range 7.67 m to 15.24 m have been released. More than two-thirds of the mechanised fishing fleet in the country are built to these designs. Haldu and mango wood were found to be cheap and significant substitutes for the conventional and costly timbers like Teak and Aini in the construction of fishing boats. Copper oxide paints were adjudged to be 30% cheaper than corresponding commercial paints for use against marine corrosion and fouling in fishing boats. Ferrocement has been found to be an economical substitute for steel in the construction of medium and small-sized vessels. Marine grade aluminium has been found satisfactory to replace costly copper for sheathing wooden hulls of fishing boats. Chemical wood preservatives like creoscor, copper creosote and arsenical creosote were

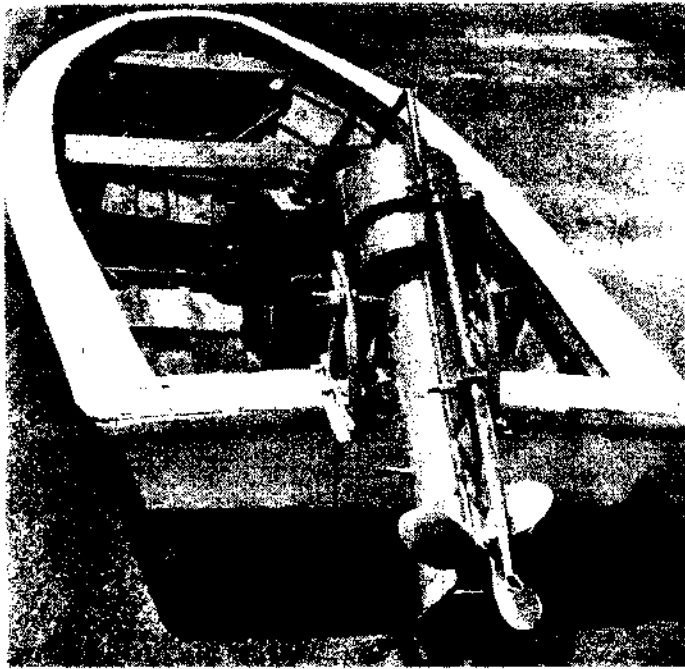
found to be effective in protection of indigenous fishing craft. A galvanic anode free from mercury has been developed for use in cathodic protection of fishing boats and metallic marine structures. The life of these anodes is 3 times that of the conventional zinc anodes.

FISHING GEAR

Synthetic twines have replaced cotton twines for fabrication of trawls. A number of improved designs of fishing gear like bulged belly, long wing, parallel twin body trawl, etc and new methods of fishing like double rig and twin rig shrimp trawling have been found to yield higher catches than the conventional ones. Introduction of the mini purse seine for operation from country craft has offered a welcome change from the traditional gear mainly used for catch of pelagic shoaling fishes. The new lobster trap developed at the Institute has longer life and a double fold catching efficiency when compared to the traditional traps used at present for lobster fishing.

FISH PROCESSING

Methods have been developed for freezing and canning of different varieties of fish and shell fish, preparation of good quality cured fish and shell fish, production of byproducts like chitin, chitosan from prawn shell waste and fish ensilage,



**Indigenous boat
fitted with inboard engines
having outboard drive**



**Better quality lobster traps
to replace the less efficient
conventional ones**

poultry feed and fish feed from filleting wastes, extraction of shark fin rays, and specially products like fish soup powder, fish wafers, fish pickles, edible fish powder, etc from miscellaneous fish and shell fish. Other achievements include conversion of mussel shell wastes into good quality quicklime, process for dehydration of jelly fish, a hitherto unutilised marine species, conversion of fish collagen into good quality surgical sutures, development of deodorant and antiseptic ointment for use in the processing laboratory and development of the chlorine level indicator paper for instant reading of chlorine level in water supplies.

FISH BIOCHEMISTRY AND NUTRITION

The fatty acid composition of many of the important fishes have been determined as also the changes in major protein fractions of commercially important fish during storage in ice and in frozen condition. Biochemical composition and nutritive value of edible portions of major food fishes were worked out. Red meat of scombroid fishes was found to be richer in fat, sugars and minerals. Studies conducted on albino rats showed that fishoil rich in poly unsaturated fatty acids could bring down the cholesterol level significantly.

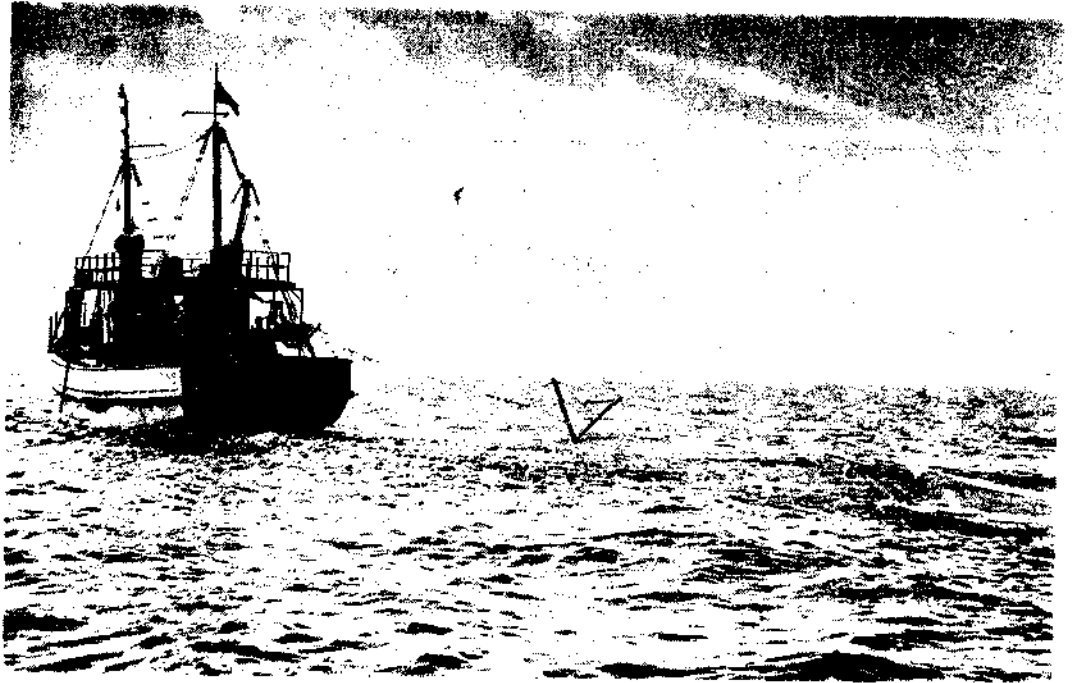
FISH MICROBIOLOGY

Studies have been carried out on the quantitative and qualitative aspects of the bacterial flora in fish and shell fish. Studies on the use of antibiotics in preservation of fish have revealed its definite advantages where fish have to be stored for more than a week in ice. An improved method has also been evolved for isolation of salmonella organisms from seafoods.

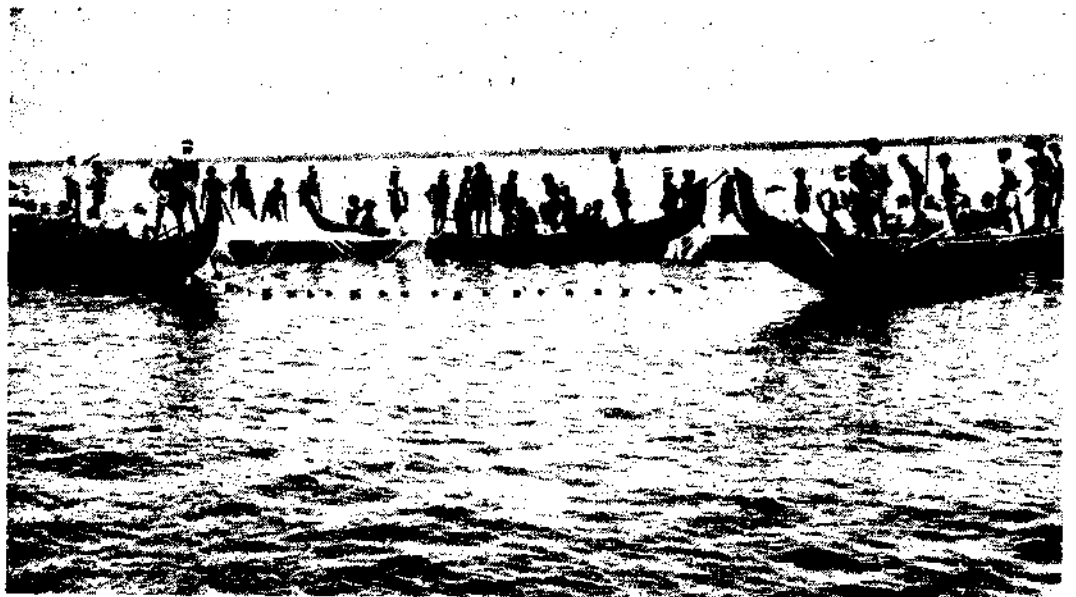
ENGINEERING AND INSTRUMENTATION IN FISHING TECHNOLOGY

Designs have been developed for fishing accessories like winches, gurdy, jockey-pulley, line hauler, fish dryers like tunnel dryer, rotary drum dryer and solar dryer, and other machineries like deepfreezer, refrigerated seawater plant, automatic grading machine, etc. Also deserving mention is the inboard/outboard drive for propulsion of country craft, pro-

12.5 metre
combination vessel
for trawling



Mini purseseine
operating from
traditional craft



One-tonne
tunnel dryer

peller cover for effecting decrease in fuel consumption, the electro-thermal smoke kiln, a modern hearth for boiling clams involving less fuel and less time when compared to the conventional method, and an electric apparatus for painless killing of frogs.

More than 30 electronic instruments have been developed for use in fishing operations, fishing-gear testing and standardisation and in fish processing industry. Some of them are the salinity temperature depth meter, digital current meter, fish activity recorder, electronic warp load meter, trawl depth meter, mesh distortion telemeter, angle of attack meter, net flow meter, multisignal data acquisition system, brine concentration meter, automatic brine dispenser, moisture meter, universal marine telemeter, etc.

FISHERIES EXTENSION AND STATISTICS

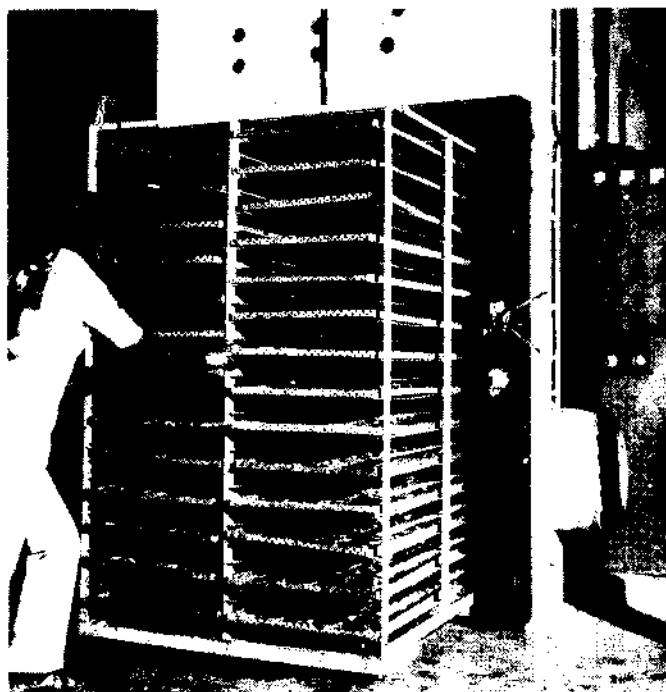
Studies have been conducted on the economics of operation of CIFT-design fishing vessels, extent of wastage occurring at different stages of processing and rates of turnover of work at various stages of production, idle capacity of fish processing plants in India, optimum number of trawlers for Kerala coast, and sampling plan for pre-packed fishery products.

As part of its extension activities, the Institute has answered so far more than 10000 technical queries received from all over the world and given training to more than 300 technical personnel in various aspects of fishing and fish processing. It has also conducted a number of demonstrations, exhibitions and film shows and tested a large number of raw materials and fishery products. It brings out a quarterly entitled 'Fish Technology Newsletter', apart from publishing the Annual Report, Special Bulletins and pamphlets in English, Hindi and other regional languages.

FUTURE PROGRAMMES

Programme envisaged for coming years includes:

Studies on behaviours of potentially important boat-building materials like plastic composites, vulcanized rein-



forced rubber, cupro-nickel, etc. More emphasis on protection of indigenous marine fishing craft by improved wood preservatives. Development of suitable gear and methods for exploitation of hitherto unexploited deepsea resources. Greater emphasis on evolution of gear suitable for exploitation of inland water resources. Diversification of products to cater to needs of the rural poor and sophisticated urban population.

Intensified work on post-harvest technology pertaining to freshwater and brackishwater fish and improvement in preservation and storage of dried fish. Production of intermediate moisture foods and development of suitable food grade lacquers for fish cans. Comparative studies on nutritional qualities of different fish and shell fish and various fishery products and isolation of biologically active extractives like insulin from fishes. Studies on viruses and mycotoxins in seafoods and on characterisation of bacterial isolates from marine, brackish and freshwater fish in relation to spoilage and safety. Process control to improve quality of seafoods, improvement in quality and shelf life of frozen products and incidence and sources of contamination of fishery products with *V. cholerae*.



**Creoscor and copper and arsenic
Creosotes do well as wood
preservatives on country craft**

Development of suitable packagings for various fishery products and cheaper containers including flexible pouches and aluminium containers in place of conventional tin cans. Application of cryogenics in freezing and transportation of fish and use of non-conventional energy sources for the fish processing industry. Designing and operation of pilot plants of processed fish products to study their commercial feasibility. Prototype construction of various electronic instruments and their field testing. More emphasis on extension of various activities/technologies developed to rural areas and fishing villages by organising village level training. Studies on consumer acceptability of the different products developed. Studies on the quantity, season and centres of supply of different economically unimportant raw materials with a view to offering advice on commercial production of products based on these raw materials.



**Sharkfin rays are
a promising product**

Communicated by Shri M. R. Nair, Director, CIFT, Matsyapuri P.O., Cochin 682029.

Central Marine Fisheries Research Institute

The Central Marine Fisheries Research Institute was established in February 1947 under the Union Ministry of Food and Agriculture. In October 1967 the administrative control of the Institute was transferred to the Indian Council of Agricultural Research.

OBJECTIVES

The main objectives of the Institute as redefined under the VII Plan are:

1. To conduct research for assessing and monitoring the exploited marine fisheries resources leading to rational exploitation and conservation
2. To assess the underexploited and unexploited marine fisheries resources of the Exclusive Economic Zone
3. To understand the fluctuations in abundance of marine fisheries resources in relation to changes in the environment by conducting vessel based programmes
4. To develop suitable mariculture technologies for finfish and shellfish in open sea to supplement marine fish production
5. To conduct transfer of technology and post-graduate and specialised short-term training programmes

RESEARCH FACILITIES

After shifting the headquarters from Mandapam Camp to Cochin, the Institute maintains a Regional Centre at Mandapam Camp, and 11 Research Centres: at Veraval, Bombay, Karwar, Mangalore, Calicut and Vizhinjam on the west coast,

Tuticorin, Madras, Kakinada and Waltair on the east coast and Minicoy in Lakshadweep. Besides the Research Centres, smaller establishments known as Field Centres function at 28 locations along the coasts of India.

The Institute's headquarters at Cochin have its own permanent four-storeyed laboratory-cum-administrative building with a plinth area of 8865 sq.m. In addition, the Institute has rented accommodation at the Fisheries Harbour premises for wet laboratory work and another on the Foreshore Road for ship-stores and Vessel Management Cell.

The headquarters at Cochin has well-equipped laboratories of different Divisions handling various research problems in capture fisheries, mariculture and related subjects. Common facilities include a 'Hitachi' H 600 Transmission-Electron Microscope with H. 6010 scanning system. This microscope, the only one of its kind in the country, is capable of magnifying objects 300,000 times in analytical system and 800,000 in ultra high resolution system. Atomic Absorption Spectro-photometer, Amino Acid Analyser, and a fully equipped Radio Isotope Laboratory are also available. The establishment of an ECIL micro-32 computer facility with a memory capacity of 512 Kilobytes expandable to 16 Megabytes and necessary periferal is underway.

The Regional Centre of the Institute at Mandapam Camp functions in the old headquarters campus with its laboratories and residential accommodation for the staff. The Centre has also a fish farm for experimental finfish culture, a guest house, vehicles and mechanised boats for inshore fisheries research work.

The Research Centres of the Institute at Calicut and Karwar are located in permanent buildings with essential laboratory and other infrastructure facilities. The Research Centre at Tuticorin has its own facilities for laboratories and hatcheries for edible oyster and pearl oyster. The Centre has also got transport and boat facilities in addition to a saltwater fish farm. The Research Centre at Madras, apart from the main laboratory, has two field laboratories at Muttukad and



Headquarters
at Cochin

Kovalam. The Centre maintains a 13.4 m boat for inshore work.

RESEARCH VESSELS

The Institute owns seven 13.4 m long R. V. CADALMIN series of vessels, equipped for inshore fishery work and they are based at headquarters and the different research centres. In addition, R.V. SKIPJACK (OAL: 32.6m) was acquired in 1982. This vessel is capable of bottom and midwater trawling and oceanographic work over the shelf and adjacent waters. In December, 1984, the Department of Ocean Development, Government of India, placed the FORV SAGAR SAMPADA (OAL: 71.5 m) at the disposal of Indian Council of Agricultural Research, as a national facility to be used by Institutions involved in marine sciences research work. The Central Marine Fisheries Research Institute has been identified as a nodal organisation by the ICAR to manage the scientific programme of the vessel. FORV SAGAR SAMPADA is equipped with sophisticated acoustic and analytical instruments for conducting fish resources survey, oceanographic work and meteorological studies.

MOBILE LABORATORY

A well equipped mobile laboratory installed in a Leyland bus carries out spot investigations as required from time to time in coastal areas for pollution and mariculture work.

LIBRARY

The headquarters library at Cochin and the library at the Regional Centre at Mandapam Camp have a large collection of reference books, periodicals, expedition reports, reprints etc. The current holding is of the order of 50,000 volumes and the Institute is receiving 350 titles of periodicals regularly.

MANPOWER

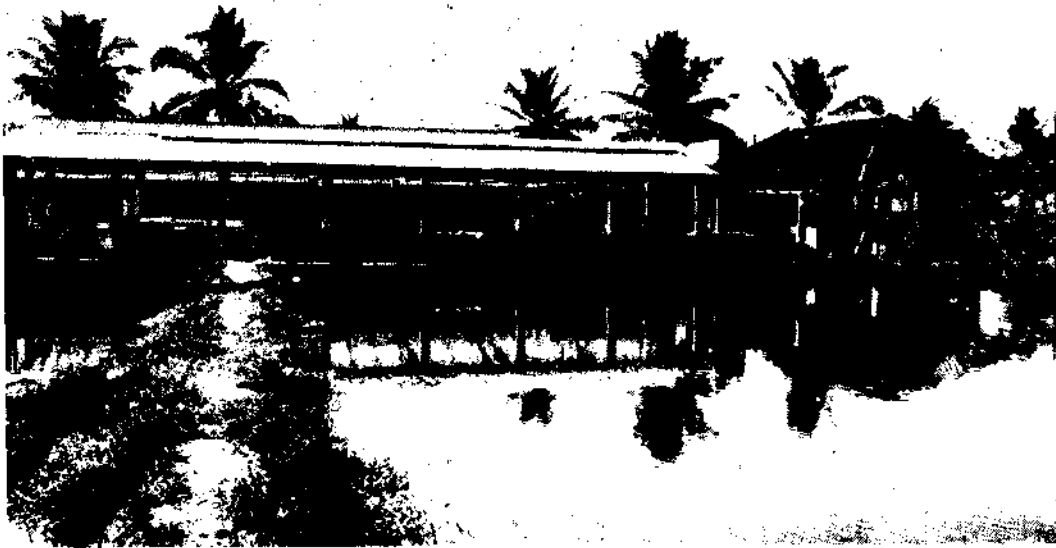
As at the end of VI Plan, the sanctioned staff strength of the Institute includes 238 Scientists, 458 Technical staff, 176 Ministerial staff, 291 Supporting staff, and 16 Auxilliary staff.

SCIENTIFIC DIVISIONS AND RESPONSIBILITIES

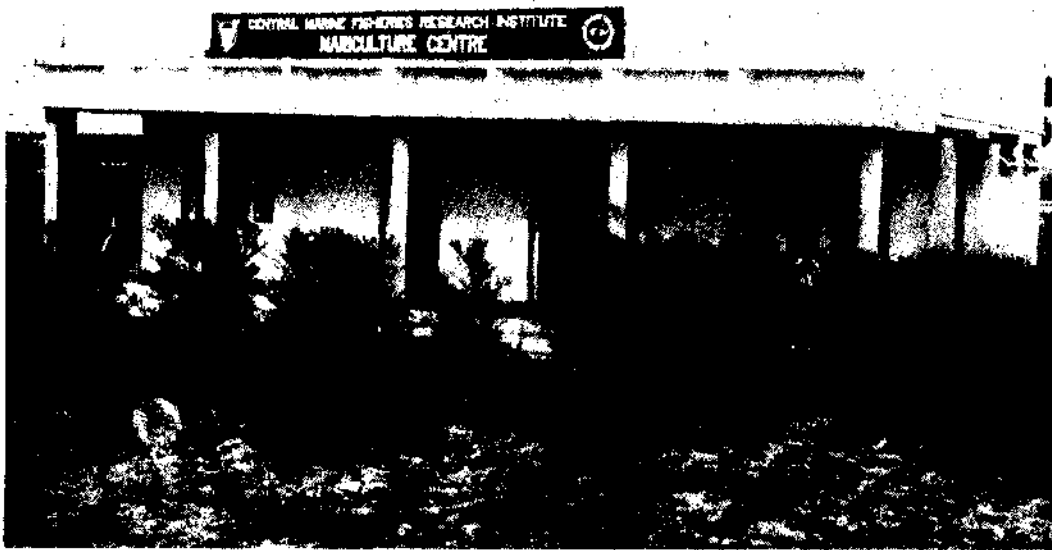
The Institute has 9 scientific Divisions functioning under respective Division heads. The main functions of the various divisions are as follows.

The major technical programmes of the FISHERY RESOURCES ASSESSMENT DIVISION are Survey and stock assessment of fishery resources and collection, analysis and dissemination of fishery statistics. Relevant economic aspects of marine

Narakkal

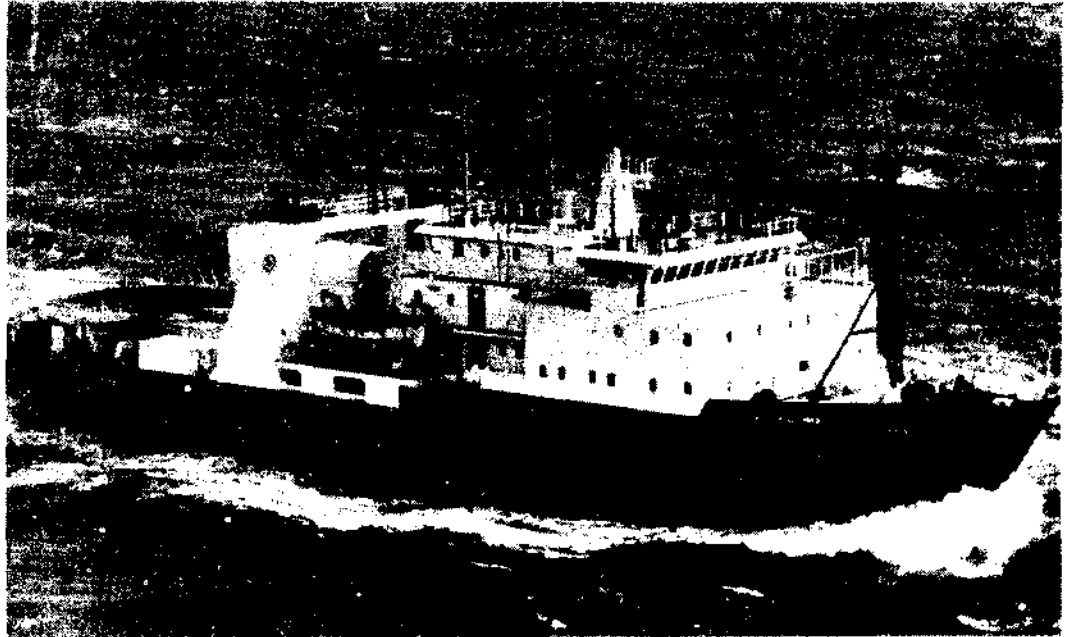


Muttukad



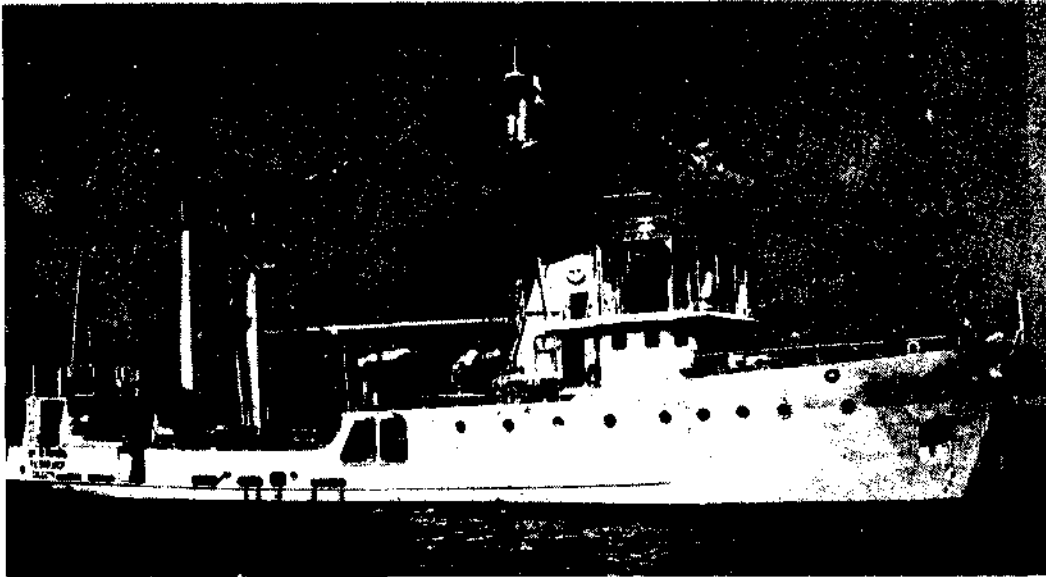
Field laboratories at Narakkal, Tuticorin, Kovalam and Muttukad, with new equipments and hatchery systems, have facilitated many breakthroughs in mariculture, including induced breeding and completion of lifecycles under controlled conditions, of prawns, pearl oyster and edible oyster, lobsters etc.

FORV Sagar Sampada



MFV Cadalmin

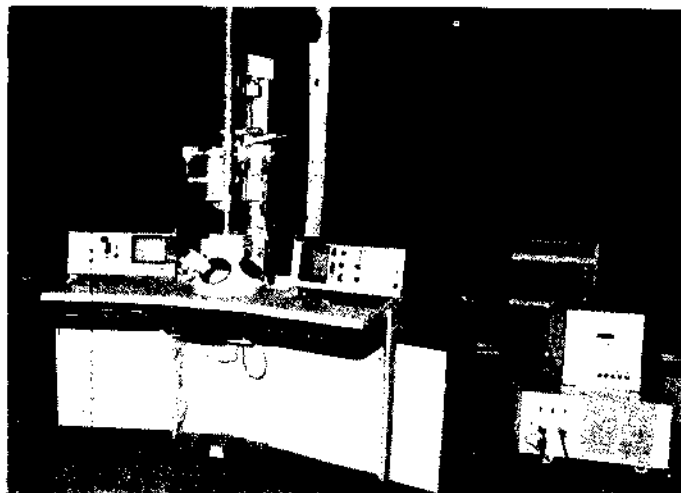




RV Skipjack



The well-equipped mobile laboratory carries out on-the-spot pollution studies in coastal mariculture



Electron microscope
with H 6010 scanning system

capture fisheries and mariculture, socio-economic impact studies and all aspects of marine fisheries extension are tackled by the FISHERY ECONOMICS AND EXTENSION DIVISION. The major functions of the Divisions of PELAGIC FISHERIES, DEMERSAL FISHERIES, CRUSTACEAN FISHERIES and MOLLUSCAN FISHERIES are to monitor the characteristics of the respective commercially exploited resources, their stock assessment, management and conservation measures and the mariculture of finfishes and shellfishes. The FISHERY ENVIRONMENT AND MANAGEMENT DIVISION is concerned with fishery oceanography, environment studies, remote sensing, marine pollution, seaweed resources and culture and farm engineering. Multidisciplinary researches on physiology, nutrition and pathology on finfishes and shellfishes are implemented by the PHYSIOLOGY, NUTRITION AND PATHOLOGY DIVISION. The LIBRARY AND DOCUMENTATION DIVISION is responsible for book and journal procurement, reference service, reprography and printing of Indian Journal of Fisheries and other publications.

OVERALL ACHIEVEMENTS

The major emphasis of the Institute's research effort is on capture fisheries, which account for the bulk of the marine fish production in the country. The significant achievements in capture fisheries are mentioned below.

ASSESSMENT OF FISHERY RESOURCES

The Institute has developed a multi-stage stratified random sampling design for the estimation of marine fish landings in the country at national and state levels. The design developed by the Institute has been recommended by the FAO for adoption by other developing countries. Resource-wise and region-wise production estimates are made available to national and international organisations. Dissemination of these data on the exploited resources is carried out through the National Marine Living Resources Data Centre (NMLRDC) which is recognised by the Planning Commission as the repository of all fishery resources data.

Information on fishermen population, gear, craft, employment details, educational standards and infrastructure facilities available in the marine fisheries sector have been collected periodically through frame surveys. This census data are widely used by the State and Central agencies for planning and development purposes.

For application of stock assessment models and proper interpretation of results, training courses for personnel engaged in fisheries research and teaching has been taken up periodically. A very recent significant achievement has been the development of management advice for each maritime state based on analysis of data collected on the exploited marine fisheries resource for the 10-year period (1975-1984).

PELAGIC FISHERIES

The rate and pattern of exploitation of pelagic fish resources of the west and east coasts of India have been studied by monitoring the landings from the artisanal, drift net and purse seine fisheries. Studies on the stocks of oil sardine (*Sardinella longiceps*) on the west coast of India indicated high potential (annual average stock size of 400,000 tonnes) and possibilities of increasing catches by stepping up fishing effort in the offshore grounds, employing efficient fishing methods like purse-seining.

The stock assessment studies on Indian mackerel (*Rastrelliger kanagurta*) have revealed an average annual stock

level of 265,000 tonnes off the south west coast of India (7° - 17° N) and about one third of this stock is found beyond 25 m depth. Studies on the exploited resources indicate that any further increase in the catches should come from the off-shore stocks or by increasing the age at capture by increasing mesh size.

Studies on the stock assessment of bombayduck, *Harpodon nehereus*, revealed that at Nowabunder, Saurashtra coast, the present level of exploitation is close to the maximum sustainable yield and that any further expansion in the fishery would result in the over-exploitation of the stocks. However, higher sustainable yield is possible by increasing the size at capture.

Stock assessment studies on anchovies, tunas, seerfishes, horse-mackerel and ribbon fishes have indicated high potential and possibilities of increasing production from their stocks.

DEMERSAL FISHERIES

By frequently participating in the exploratory surveys conducted by the Government of India vessels, the Institute has charted out productive fishing grounds for sciaenids off Kutch, Dwaraka and Porbunder, for eels off Bombay and Cambay, for prawns, nemipterids and perches off the south west coast, for silverbellies off southeast coast and for catfishes off northeast coast. Similarly the resource characteristics of catfishes, nemipterids and their stocks have also been assessed.

Investigations on the presently exploited demersal resources have shown that with the rapid development of the mechanised trawling in recent years many of the inshore fisheries are under heavy pressure and damage to stock can be avoided only with a decrease in fishing effort or increasing the mesh size of gear used. This has great relevance to future development plans on marine fishery resources.

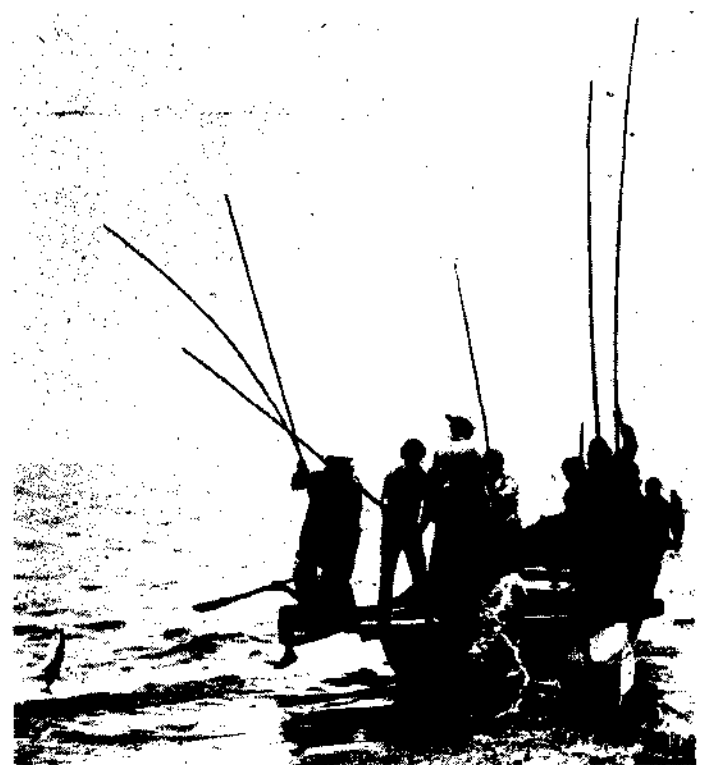
CRUSTACEAN FISHERIES

The rapid expansion of the export market for prawns and the consequent introduction of a large number of small



Periodical monitoring of coastal demersal resources using MFV Cadalmin

Pole-and-line fishing at Minicoy





Oceanic
Cuttlefish

mechanised boats for prawn fishing necessitated a concerted effort by the Institute to study the prawn fisheries on an all India basis. A wealth of information was collected on the distribution and abundance of the prawn species in space and time, growth, feeding habits, fecundity, sex ratio, and movements. Life cycles and juvenile phase of prawns in brackishwater environment have been studied in detail.

The deep sea lobster (*Puerulus sewelli*) and the deep sea prawn resources of the southwest coast of India were studied in detail. Relatively high concentration of prawn exists on the "Quilon Bank" at 301-375 m depth zone and in slightly deeper areas off Ponnani, on the upper continental slope.

Realising the fact there has been some economic over-fishing for prawns in certain sectors of our coast, detailed stock assessment studies of important prawn species have been made. Using the data on catches and fishing effort collected over a period of ten years the magnitude of the prawn resources, the maximum sustainable yield and corresponding optimum fishing effort were estimated. The estimates showed that increasing the fishing effort beyond the present level is not likely to increase the prawn yield.

Intensive tagging programme coupled with drift bottle studies showed that the white prawns, *Penaeus indicus*, migrated from Cochin on the south-west coast to Tuticorin on the east coast following the coastal currents. Apart from the studies on the prawn resources of the country, the other crustacean resources such as rock lobsters, crabs and stomatopods have also been the subject of study.

MOLLUSCAN FISHERIES

An inventory of the molluscan resources such as clams, oysters and mussels has been made covering the entire mainland coast as well as the Andaman and Nicobar Islands.

The clam resources of the estuaries in Karnataka and Kerala have been investigated in detail in the context of the recent spurt in export of calms including baby calms. Such resource surveys have also been carried out on green mussel

and brown mussel along the west coast. Underwater surveys of the pearl banks of the Gulf of Mannar using SCUBA equipments and assessment of the population of pearl oysters and chanks in the natural beds were made. These surveys helped in predicting the pearl and chanks fisheries in the region.

Vast potential resources of oceanic squid *Symplectoteuthis ovalaniensis* in EEZ of India have been indicated based on the exploratory survey results of FORV Sagar Sampada. Resources characteristics and stock assessment of most of the commercially important species of *Loligo* and *Sepia* have been made.



Baitfish fishing

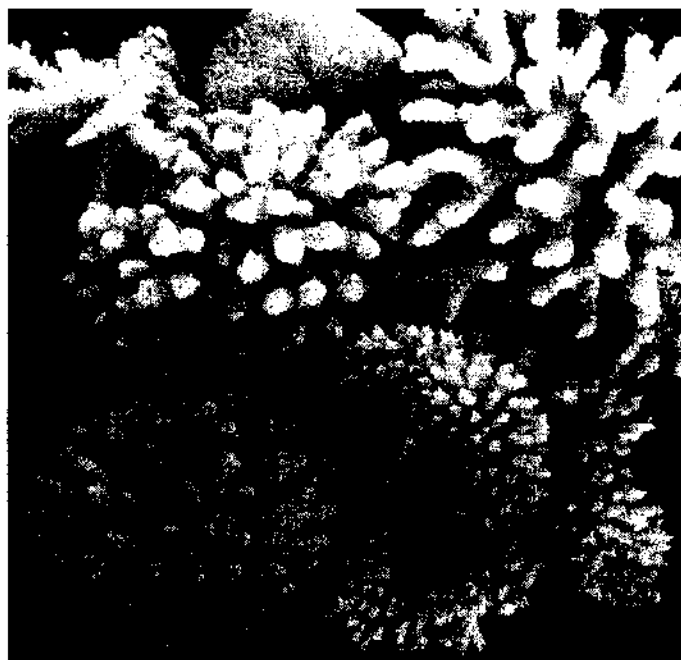
FISHERY ENVIRONMENT MANAGEMENT

The study of fishery related environmental factors which received considerable attention were initially confined to the coastal belt. Since late fifties, facilities of the Indo-Norwegian Project's vessels have been availed to study the oceanographic features of the entire shelf and the Lakshadweep. Better understanding of the seasonal phenomenon of upwelling and dynamics of mudbank formation was obtained from these studies.

Estimates of the fish resources were made for the first time in the country on the basis of primary productivity studies using C14 technique.

Studies on marine mammals and turtles were taken up from a conservation angle with repeated seasonal observations on the 'Aribada', the mass nesting of turtles at Gahirmatha beach in Orissa. Surveys and ecological studies in connection with establishment of a marine national park in the Gulf of Mannar were completed. Studies on ancillary resources like corals, sponges, echinoderms and seaweeds contributed to development of resource data on these. Studies on marine pollution and bioactive agents in marine organisms received attention in the programmes of the Division.

Recently the Institute collaborated with Space Application Centre, Ahmedabad, and National Remote Sensing Agency, Hyderabad, in joint experiments for the utilisation



Lakshadweep corals



Pearl oyster
with cultured
pearl in situ

of satellite data to locate areas of high productivity in the EEZ.

FISHERY ECONOMICS AND EXTENSION

With increasing emphasis on the utilisation of the resources of Exclusive Economic Zone and the formulation of integrated rural development programmes in mariculture, a whole range of economics of operations of both capture and culture fisheries and also socio-economics of fisherfolk have gained considerable importance.

Through a number of case studies, the socio-economic aspects of fishermen families in Kerala, Maharashtra and Gujarat have been investigated and the attention of institutional agencies was drawn to play more dynamic role as credit agencies to the fishermen, so as to save them from the harassment of middlemen. The Institute has also conducted studies on the economics of different types of fishing units, especially the traditional craft fitted with outboard motor, marketing aspects such as price spread at various levels, and also the role of women in small-scale fisheries activities.

PHYSIOLOGY, NUTRITION AND PATHOLOGY

Since 1982, the Institute took up appropriate multi-disciplinary programmes on physiology, nutrition and pathology of fish and shellfish, which formed either complement-

ary or supplementary effort to the major ongoing research programmes in mariculture. The current programmes concentrate on problem-oriented research such as ecophysiology and respiratory physiology of fishes and shellfishes, protein variation and nutritional requirements of prawns; reproductive physiology of grey mullets; nutritional needs of milkfish and survey of finfish and shellfish diseases and pathology of soft prawns.

MARICULTURE

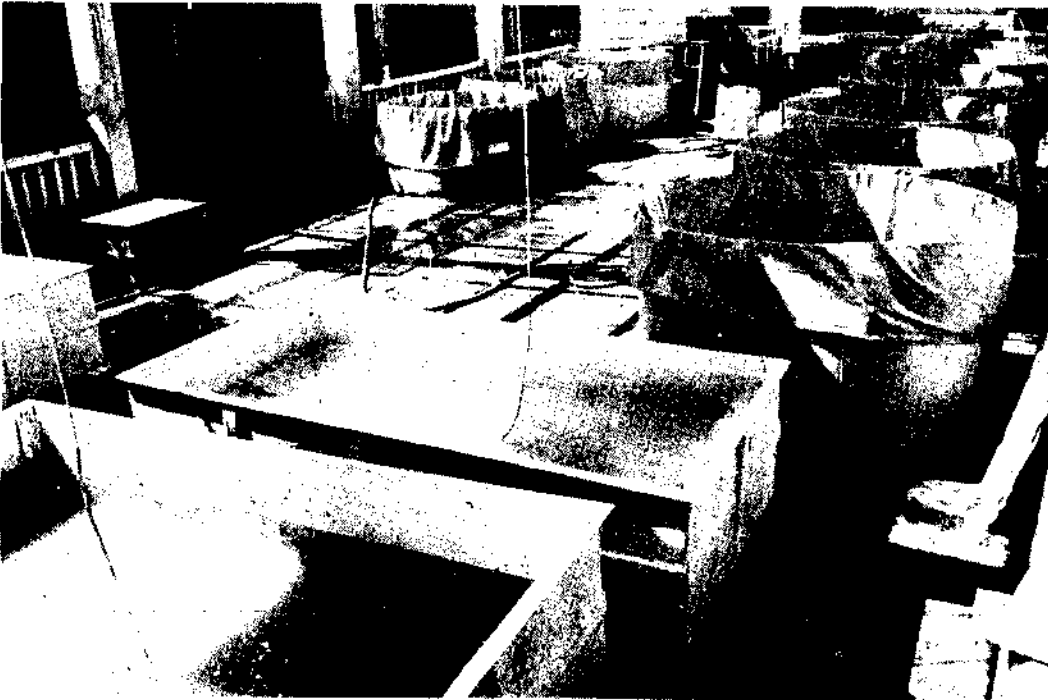
PRAWN CULTURE

The Institute took up experimental studies on various aspects of prawn culture since 1975 and all the commercially important species of penaeid prawns such as *Penaeus indicus*, *P. monodon*, *Metapenaeus dobsoni*, *M. monoceros*, *M. affinis* and *Parapenaeopsis styliifera* have been made to spawn in the laboratory and their larvae reared up to the post-larval stage under controlled conditions. To feed the prawn larvae, indigenous methods for culturing live feed organisms such as diatoms, rotifers and cladocerans on a large scale were developed. The larval rearing technique was improved and simplified. The Institute has by now evolved a totally indigenous, low cost technology for the hatchery production of penaeid prawn seed specially suited to the Indian conditions. The Institute provides technical assistance to prawn farmers and development agencies for accelerating the programmes in prawn culture. At present the Institute is assisting technically various State Governments and MPEDA to establish hatcheries for production of seed.

A technique of artificial insemination of *Penaeus indicus* and *P. monodon* has been developed. This is a significant achievement that is basic to all future work on selective breeding of prawns for improving production in culture systems.



Fish farm
at Mandapam



A hatchery system

CULTURE OF OTHER SHELLFISHES

A significant breakthrough was achieved in developing indigenously the technique of pearl culture, which led to the establishment of a commercial pearl culture project in India for the first time. Cultural pearls are produced through raft culture with a production rate of 60-70% in nucleus-implanted oysters in 3 to 24 months.

Another major achievement has been the development of techniques for oyster seed production in hatcheries. Following the initial breakthrough in technology for pearl oyster seed production, the edible oyster seed are also produced on large scale in experimental hatchery. Similarly, mussel has been brought under the hatchery technology development programmes.

Open-sea mussel farming techniques developed at the Institute have given high production rate (10-15 kg of mussel per metre length of rope, equal to 60-70 tonnes/ha). Edible oyster farming technology has been established to produce 150 tonnes/ha/annum.

FINFISH CULTURE

Experimental finfish culture had been part of the Institute's programme from the early years at Mandapam. The culture programme was intensified and extended to other centres like Tuticorin, Madras, Calicut and Narakkal by mono- and poly-culture-techniques in ponds, cages and pens. Milkfish and mullet have been reared successfully in ponds and pens. Induced breeding experiments conducted on *Mugil cephalus* with H.C.G. hormone along with pituitary-gland extract have yielded encouraging results.

SEAWEED CULTURE

Experimental field cultivation of the agarophytes, *Gracilaria edulis* and *Gelidiella acerosa*, in the Gulf of Mannar showed that *Gracilaria edulis* grow to harvestable size within 60 days yielding 3 kg/sq.m. *Gelidiella acerosa* attained the same rate of production in 75 days. This yield is about 3 times the rate of natural production.

SPECIAL SURVEYS IN LAKSHADWEEP GROUP OF ISLANDS

A series of special surveys were planned and implemented since January 1987, aimed at an overall assessment

of various types of fishery and ancillary living resources and their potentials. During the surveys, it was found that considerable damage had taken place to the coral reefs around Minicoy and certain other islands owing to dredging, silting and sand mining.

Skipjack (*Katsunonus pelamis*) and young yellowfin tuna (*Thunnus albacares*) constitute the major tuna resources exploited by the islanders by live-bait pole and line fishery. There seemed to be no scarcity for live baits in the islands surveyed except in Amini and Kiltan. Over 45 species of live baits were observed during the survey. *Spatelloides delicatulus* and *S. japonicus* dominated among them.

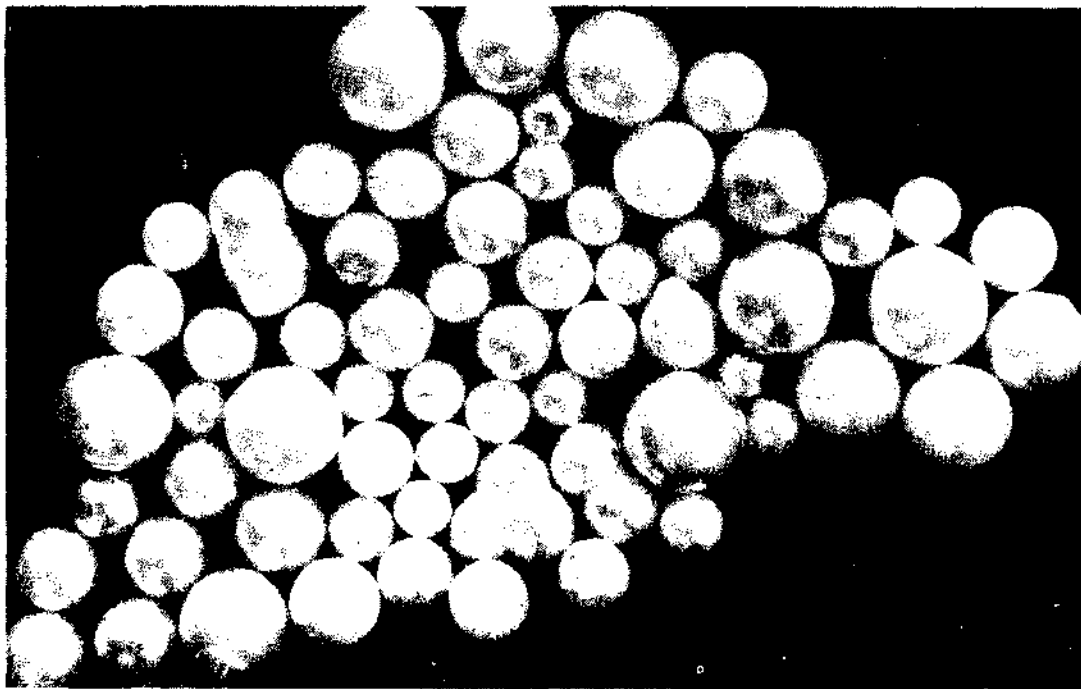
The survey results also indicate that over 70 species of ornamental fishes occur in these islands, of which 30 are exportable. The survey teams collected information on seaweeds, sponges, echinoderms, crustacean resources, and other invertebrates and gathered interesting data on marine mammals and sea birds and locations which could be developed as marine parks.

FORV SAGAR SAMPADA

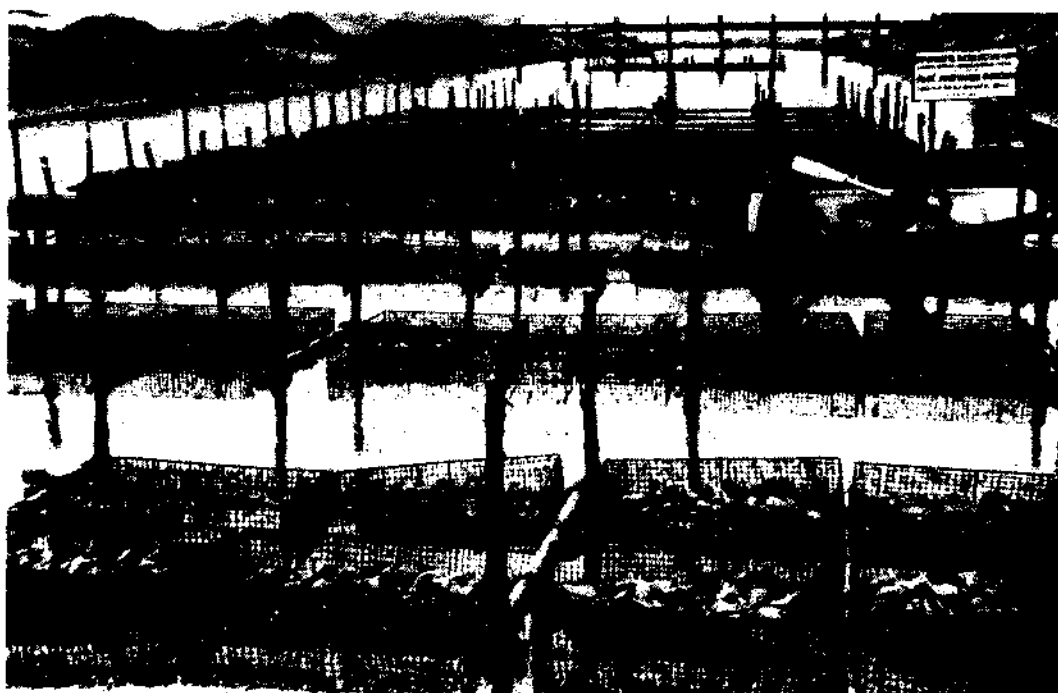
The vessel commenced its regular cruises from January 1985 and completed 29 cruises up to May 1987 spending 533 days at sea and covering a track distance of 1,49,580 line km. The EEZ of the country including Laccadive archipelago and Andaman sea have been surveyed by the vessel. The equatorial waters were surveyed for the oceanic resources.

The highlights of the results are as follows:

For the first time an authentic record of the occurrence of the large deep sea prawn, *Plesiopenaeus edwardsianus*, in 870 m depth grounds off Trivandrum was made. The vessel has located the spawning grounds of several species of fishes over the Angria Bank. Extensive swarms of oceanic crabs along the southwest coast during the southwest monsoon period have been observed and large tuna shoals have been



Cultured pearls



Cage culture of
edible oyster

Raft for culture
of pearl oyster



Opensea
rope culture
of mussels



located during post-monsoon time off central west coast. A variety of juvenile fishes, especially tunas, in the Lakshadweep area were observed in December-January and July-August periods and dominant oceanic squid component in July-August periods. The vessel has been able to locate large concentration of threadfin-bream, cuttlefish and squids in the Wadge Bank in August-September period.

EDUCATION, TRAINING, TRANSFER OF TECHNOLOGY

POST-GRADUATE AND PH.D. COURSES

A Centre of Advanced Studies in Mariculture (presently named Post-Graduate Education and Research Programme in Mariculture) was established at the Institute as a project sponsored by the ICAR/FAO/UNDP in June 1979. The Centre has regular semester courses for M.Sc. in Mariculture and Ph.D. programmes on many specialised aspects relating to mariculture. In the M.Sc. mariculture programme 48 candidates have been conferred the degree between 1980 and 1987. Eighteen candidates are now undergoing semester courses. In the Ph.D. programme 22 scholars have completed the research work and 5 have been awarded Ph.D. degree of the Cochin University of Science and Technology.

SUMMER INSTITUTES

Between 1974 and June 1987, the Institute conducted 5 Summer Institutes on different subjects such as coastal aquaculture, breeding and rearing of marine prawns, culture of edible molluscs, hatchery production of prawn seed and culture of marine prawns and finfish and shellfish nutrition.

TRANSFER OF TECHNOLOGY

One of the objectives of the Institute is to effect transfer of technology through various practical training programmes organised regularly at the Institute. Under this programme training is imparted in marine prawn culture, pearl culture, edible oyster culture, fishery resources assessment, under-

water diving and use of acoustics in fishery exploratory surveys. During the past five years more than 200 personnel from Universities, State Government Departments, MPEDA and from abroad have been trained under the different programmes.

KRISHI VIGYAN KENDRA

The Krishi Vigyan Kendra of CMFRI was established at Narakkal in 1976 and has since been engaged in giving intensive short term practical training in prawn and fish farming and related aspects. The KVK disseminates technologies developed at the Institute on the culture of marine prawns, fishes and molluscs, ensuring a steady flow of scientific and technical knowledge from the laboratory to the farms. The Kendra has trained so far 5143 persons consisted of 2498 men and 2645 women.

TRAINERS' TRAINING CENTRE

The Trainer's Training Centre was sanctioned for the Institute in October 1983. The TTC organised training courses on hatchery production of penaeid prawn seed, prawn farming, hatchery production of edible oyster seed, farming of edible oysters and seaweed culture for senior level officers of the maritime States.

LAB-TO-LAND PROGRAMMES

As part of the Golden Jubilee Celebrations of the ICAR, Lab-to-Land Programmes were organised by the Institute during 1979-80. Under this programme the proven technologies developed at the Institute on various aspects of mariculture were transferred to fishermen and small farmers in the coastal areas. About 300 families distributed in the coastal districts of Kerala, Karnataka and Tamil Nadu were benefited by the Scheme.

BLENDING OF SEA FARMING

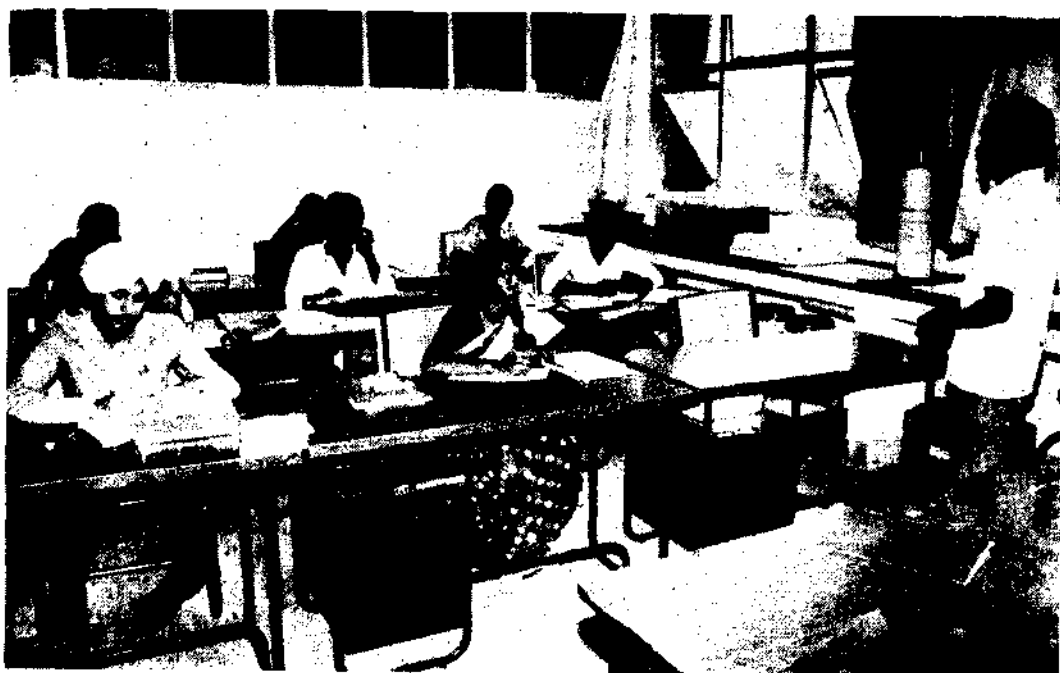
WITH TRADITIONAL CAPTURE FISHERIES

In order to benefit fishermen and their family members, whose labour potential has not been fully utilised, an Opera-

Cultured
agarophyte
Gracilaria



M.Sc. Class



tional Research Project on blending sea farming with capture fisheries was undertaken since 1979 at Kovalam near Madras. Under this project 975 families were trained in the methods of mariculture of fishes, prawns and molluscs.

LIBRARY, DOCUMENTATION AND PUBLICATION

The Institute has built up steadily one of the excellent library facilities with a holding of more than 50,000 books and 350 titles of periodicals.

The sustained research and development activities of the Institute over the past 3 decades have resulted in building up a strong information base at the Institute through various publications as detailed below:

1. Indian Journal of Fisheries (quarterly) (34 volumes)
2. CMFRI Bulletins (occasional) (40 Numbers)
3. CMFRI Special Publications (occasional) (39 Numbers)
4. CMFRI Newsletters (monthly) (34)
5. Marine Fisheries Information Service (monthly) (70)
6. R & D Series for Marine Fisheries Management (Handouts) (Nos. 1 to 10)
7. Annual Scientific Reports (up to 1985-86)
8. Research Highlights (up to 1985-86)

BUDGET OF THE INSTITUTE

During the VI Five Year Plan period (1980-85) the actual expenditure was Rs. 680.6 lakhs under the Non-

Plan and Rs. 722.5 lakhs under the Plan. The total outlay for the VII Plan period is Rs. 443.25 lakhs, and in the first two years (1985-87) an expenditure of Rs. 569.44 lakhs under Non-Plan and Rs. 284.2 lakhs under Plan has been made.

FUTURE PROGRAMMES

The immediate objectives of the Institute would be to utilise fully the infrastructural facilities available with the Institute at Headquarters and other research centres for collecting, monitoring and analysis of information on exploited inshore marine fisheries resources and environmental parameters leading to their rational exploitation and conservation. Assessment of the resources of underexploited and unexploited marine fisheries resources of the EEZ by vessel-borne programmes will receive high priority. Efforts in upgrading mariculture technologies for finfish and shellfish production in open sea and transfer of technology programmes and the post-graduate education, research and training programmes will continue.

The Institute is planning to implement mission-oriented projects with the help of funding agencies such as MPEDA, Department of Environment, Department of Science and Technology and the ICAR on specific subjects such as fish/prawn genetic resources, seaweed resources, edible oyster production, beche-de-mer resources, ornamental fish resources survey, establishment of marine parks etc. From the conservation point of view, the Institute proposed to have schemes for the conservation of the marine mammals, turtles, dugongs, corals and coral reef resources. The Institute will be rendering advice to maritime States on management of marine fishery resources, and setting up of prawn hatcheries.

Communicated by Dr. P. S. B. R. James, Director, CMFRI Institute, E.R.G. Road, Cochin 682031.

Department of Ocean Development

A new regime of oceans has come into being since December, 1982, when, at Jamaica, more than 100 countries affixed their signatures to a new convention to govern the wealth and uses of seas. The laws that have been framed hold an immense promise of development particularly for the developing nations, inasmuch as their rights of sharing ocean wealth are protected.

In such an important situation, India has naturally a new role to play and a responsibility to meet for both exploration and exploitation of the vast ocean located at its door step. As a first measure in this direction, a new DEPARTMENT OF OCEAN DEVELOPMENT was created on 24 July, 1981. Since then, this department has played a key role in effectively projecting India's role in all international meetings, in seabed research, survey or polymetallic nodules and in the organization of successful expeditions to Antarctica.

Its responsibilities cover the following areas of work:

1. Matters relating to the ocean not specifically allocated to any other Department/Ministry.
2. Policy formulation, coordination, regulatory measures and developments relating to the ocean and covering:
 - research (including fundamental research) and development of uses relatable thereto
 - technology development
 - surveys to map and locate non-living and living resources
 - preservation, conservation and protection of the environment and marine resources
 - development of appropriate skills and manpower
 - collaboration, including technical collaboration laws relatable to the above

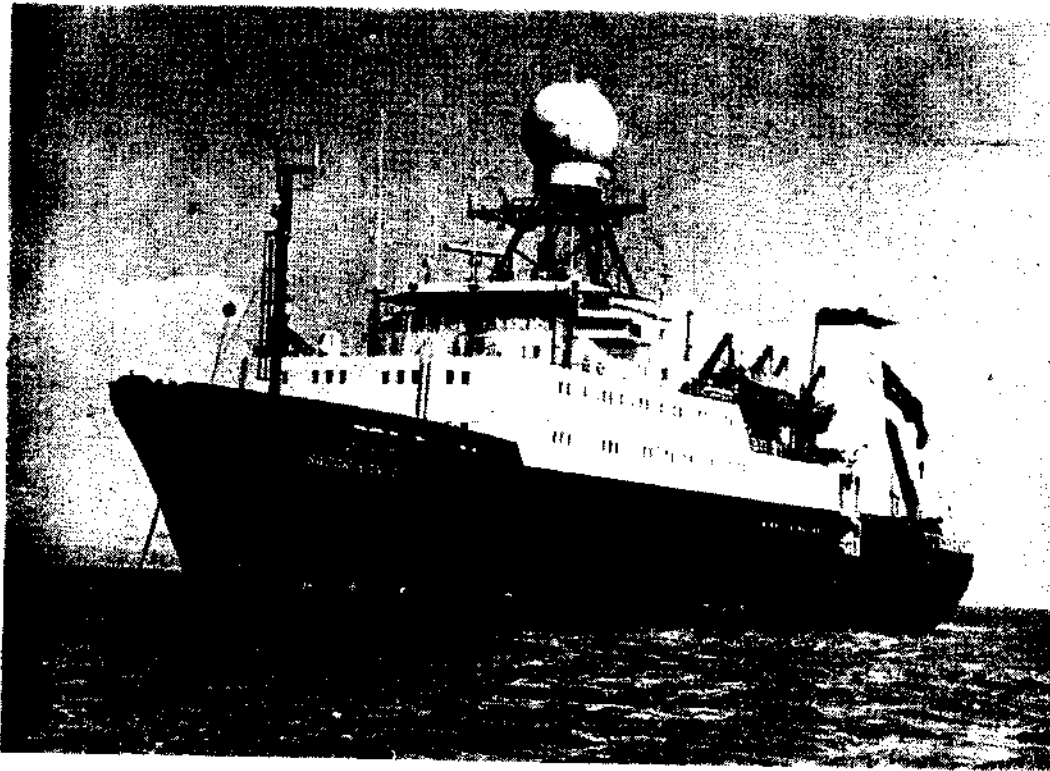


Ship moored close to ice shelf with helicopter on board for transport of men and material to the Antarctic continent

ANTARCTIC PROGRAMME

The Antarctic landmass and the adjacent waters are not only of immense scientific interest but also of much economic value. It is now well known that conditions in Antarctic significantly influence the weather patterns and circulations in Indian Ocean, which in turn affecting the yield of living resources. Thus, India was prompted to carry out a modest but vigorous research programme by launching expeditions to Antarctica, the first of which landed on the continent on 9 January, 1982. India has so far sponsored 6 expeditions to the continent. The seventh is to start in November 1987. A well-equipped permanent station was established in Antarctica during the third expedition, which has been named "Dakshin Gangotri" (latitude 70° 05'S and longitude 12° 00'E). The expeditions initiated studies on different scientific disciplines which include meteorology, glaciology, geology, geophysics, geomagnetism, oceanography, radio-wave propagation, chemistry, physics, biology, etc.

The Antarctic research programme is being pursued in a systematic manner. Organisation of the expeditions, running of permanent research station, operation of the supply vessels, enhancing research facilities and participating in International Antarctic research programmes and sharing the data are some of the main components of the Indian Antarctic pro-



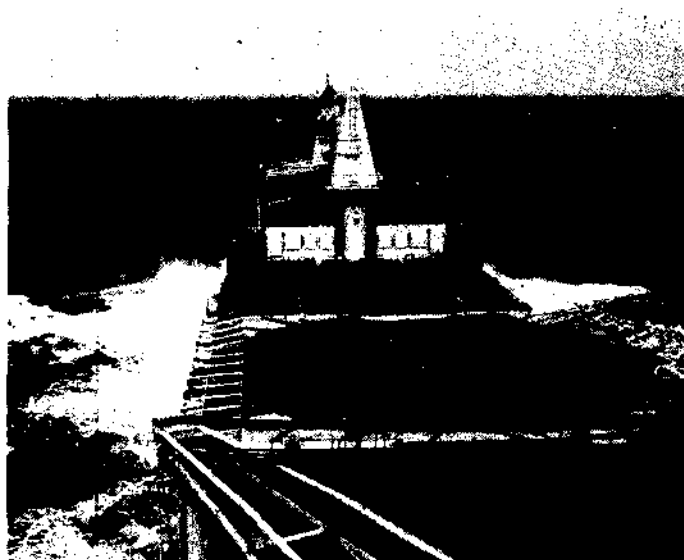
gramme. India has already acceded to the Antarctic Treaty in August, 1983, joining thereby the earlier signatory countries of the Treaty. In September 1983, India was admitted as a Consultative party to the Treaty. After joining the Treaty, India is able to fully share and exchange the scientific information on Antarctica and thus promote its own Antarctic research.

NON-LIVING RESOURCES

Oceans have enormous potentials for mineral resources. Ilmenite, zircon, monazite, rutile, garnet and magnetite are some of the stable minerals found along the coast and most of these are being exploited at present.

As a future oceanic resource, the polymetallic nodules have exciting possibilities. Lying carpetted on the deep ocean floor over thousands of square kilometres, the nodules are potatoes shaped, largely porous lumps 3 to 5 cm in diameter. These nodules are of much economic importance because,

besides much manganese and iron, they contain nickel, copper, cobalt, lead, molybdenum, cadmium, vanadium, titanium and other metals. The economic potential of some of these metals is known to be enormous. Occurring though in minor fractions, some of them unmixed and some of them in combination, they can easily be extracted. The nodules are mostly deposited in depths ranging from 3500 m to 6000 m over a very large area. About 15 million sq. km of the Indian Ocean has nodules, which are of different size and quality. The total resource of nodules in the world oceans have been estimated at several trillion tonnes. After a very intensive survey, India has identified two sites of nodule deposit suitable for mining. Further detailed surveys in these areas are in progress. As a result of a massive effort put in, involving a very sizeable expenditure, India has been given the status of "Pioneer Investor" by the Third U.N. Conference on the Law of the Sea in 1982. India is now the only developing country to acquire this status. It shares this privilege with 3 developed countries — France, USSR and Japan — and 4 multi-national consortia. India has applied to the Prepara-



UNDERWATER TECHNOLOGY

To know more and more about the deeper parts of the ocean man is trying for long, devising better and better methods of making observations. Submersibles, diving systems and sophisticated instrumentation devices have been developed for exploring and studying the seabed and the deeper layers of the water mass. India proposes to acquire the know-how and technology needed to design, build and operate such underwater vehicles.

ACQUISITION OF NEW RESEARCH VESSELS AND SHIP MANAGEMENT

FORV SAGAR KANYA has been recognised as one of the most modern oceanographic research vessels in the world. Equipped to carry out geological, geophysical, meteorological, biological, physical and chemical oceanography, she can operate in all the parts of Indian Ocean. She has a very modern design and is equipped with most sophisticated equipments. Since her arrival, she has completed a series of cruises in the Indian Ocean. She is also being used for the survey of polymetallic nodules.

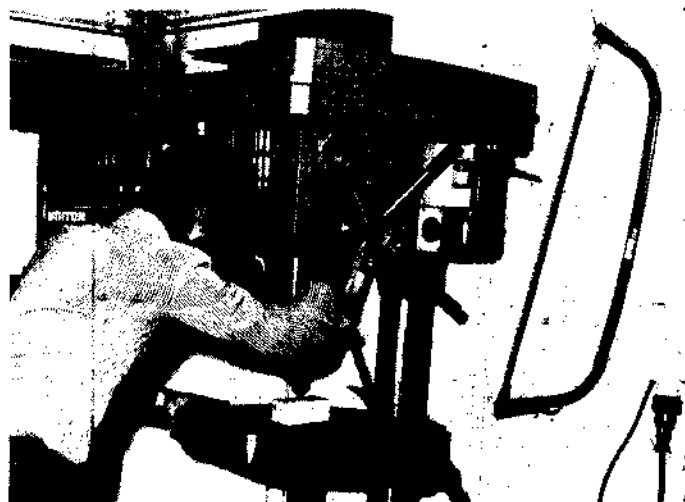
Another new fishery-and-oceanographic vessel FORV SAGAR SAMPADA has joined the Indian fleet recently. Being ice-strengthened, the vessel can do fishing in Antarctic waters.

The Department had also chartered ice breakers, such as "POLAR CIRCLE" and "FINNPOLARIS" for the Antarctic expeditions and M. V. FARNELLA and M. V. SKANDI SURVEYOR for the survey of polymetallic nodules.

MARINE POLLUTION

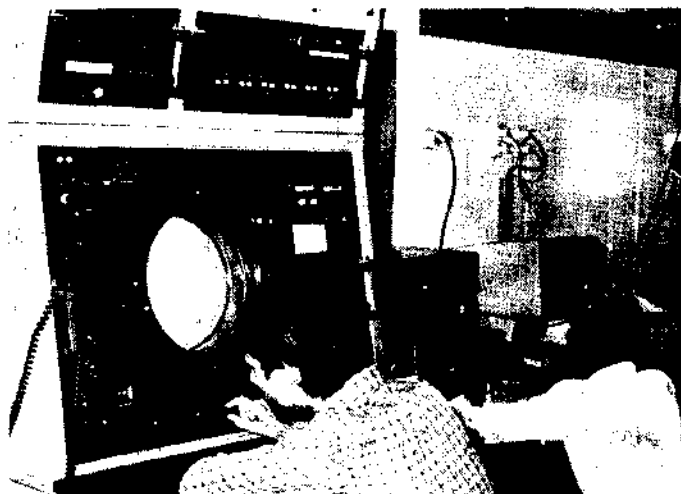
The Department has an active programme on monitoring pollution, keeping close contact with all organisations and agencies involved in the protection of the sea.

Drilling machine at the seismic shop



tory Commission of the International Seabed Authority for registration of a mining site in the Indian Ocean.*

* The news has come while the article is in press that India has been assigned the exclusive rights over 1.5 lakh sq. kilometers of the ocean with immediate effect — Ed.



Wind/weather
recorder

this area include large-scale seaweed cultivation along the coast, using various indigenous methods for giving a much needed boost to the young seaweed industry in India.

MANPOWER DEVELOPMENT

During the next 5 to 7 years about 1,000 additional scientists, engineers and technicians will be required to man the ocean development programmes. This need is expected to be met by strengthening the existing courses in the universities and Indian Institutes of Technology (IITs), introduction of new need-based syllabi in the educational institutions, organizing in-house training, and by providing fellowships, associateships and new positions in universities and technical institutions. Organizations such as the Council for Scientific and Industrial Research, the Indian Council of Agricultural Research, The Bhabha Atomic Research Centre, the IITs, the University Grants Commission, the Geological Survey of India, Universities and many other training institutes are participating in the effort to build up an adequate manpower of scientists and engineers for the fast developing programme in the ocean sector.

COLLECTION AND MANAGEMENT OF OCEANOGRAPHIC DATA

Data pertaining to the Indian Ocean collected by many national agencies engaged in ocean sciences, as also those available outside the country, will have to be obtained and stored at one place from where they can be disseminated. Such a responsibility has been entrusted to the Indian National Oceanographic Data Centre set up as a national facility for oceanographic data and information management at the National Institute of Oceanography (NIO), Goa. Sensitivity of the oceanographic data will be examined by a committee before these are released for dissemination.

REMOTE SENSING

Remote sensing of oceans, using aircrafts and satellites, has been recognised as a potentially powerful tool in oceanography, particularly for coastal-zone management. From a more practical point of view, maritime activities such as shipping, offshore mining, and oil drilling require effective short-term as well as long-term forecasting systems. Such forecasts had been greatly hampered because of the paucity of data over large stretches of the ocean. With the advent of remote sensing it has now become possible to collect high-density and high-frequency data on a synoptic and global scale. The Department is likely to undertake a comprehensive programme during the Seventh Plan to suit many important and urgent needs.

LIVING RESOURCES

Fish, shellfish and seaweeds form the major living resources of the sea. Exploration and monitoring by the research vessels SAGAR KANYA and SAGAR SAMPADA are hoped to yield a wealth of information for extending fishing activity to deeper waters, from where the yield is expected to add substantially to our annual production. Seaweeds form another source of food and fertilizer and also raw material for certain chemicals and pharmaceuticals. Programmes in



Krill of Antarctica
the largest single species resource
in the world

exploitation, there is need for legislation besides developing expertise in the various facets of international law. In view of the complexities of the problems, the Department is building a competent group on the new emerging regime of the oceans and Antarctica.

MARINE RESEARCH AND DEVELOPMENT FUND

A marine research and development fund (MRDF) has been created in the Department as a part of its effort to encourage meaningful ocean-related activities in different institutions including private bodies in the country. Assistance provided includes grants for the purchase of equipment for holding exhibitions, symposia, conferences, workshops, etc. and for bringing out publications.

Subjects considered for the support under the fund include physical and chemical oceanography, marine biology, marine geology, marine geophysics, ocean engineering, marine ecology, meteorology, marine instrumentation, etc. Besides purely scientific projects, assistance is also extended to projects which have politico-geographic or social dimensions of the Indian Ocean and Antarctica.

ENERGY FROM THE SEA

Oceans are known to be a source of immense energy. The Department of Ocean Development has an active programme on (a) wave energy and (b) ocean thermal energy conversion (OTEC). India has an excellent OTEC potential and some of the most promising sites are known to be located in the islands of Lakshadweep and Andaman and Nicobar.

DESALINATION OF SEAWATER

Various types of desalination techniques are available in the country, namely distillation using solar power, flash distillation, electrodialysis and reverse osmosis. Desalination technology has an important role to play both in coastal cities and in rural areas where brackish water is available and the supply of good quality water is an important objective of the national programme. The Department is promoting desalination programme using the technology developed by several organisations in the country.

LEGAL REGIME

For conserving marine resources and protecting the country's interest in the field of ocean exploration and ex-

Adopted from DOD's publication *Activities of the Department of Ocean Development in the field of Ocean Science & Technology*.

Fishery Survey of India

The fishery scene in India till the end of World War II was almost entirely artisanal both in the inland and marine sectors. Since then conscientious efforts have been made by the governments at the Centre as well as States for the development of the apparently large resources with which the country is endowed. Many major lines of development in marine fisheries were initiated in the late 1940s. One such was the setting up of the Deep Sea Fishing Station (DSFS) at Bombay in 1946 with the aim of augmenting food supply through development of deepsea fishing. This station, to start with, was conceived as an integrated fisheries project with facilities for fishing, fish preservation, fish marketing, cold storage, ice plant etc. The specific functions, however, were charting of fishing grounds and training of deepsea fishing personnel.

GROWTH

The organisation, undergoing a metamorphosis through the stages of Offshore Fishing Stations (OFS) and Exploratory Fisheries Project (EFP), has at last come of age in the name and shape of Fishery Survey of India with Headquarters at Bombay and six (proposed) Zonal Bases at different sectors along the coastline as well as Andaman Islands. Four Zonal Bases are already functional. The present emphasis is on a scientific orientation and a systematic assessment of stocks of the different fishery resources in the offshore and deepsea areas.

The activities of DSFS started with a mine sweeper-converted stern trawler — S. T. MEENA. Progressively, many fishing vessels of assorted sizes were added to the fleet for survey, training and increased production of fish. Whereas small wooden vessels were the mainstay of the organisation in the 1950s and early 1960s, the picture changed with the acquisition of steel trawlers of modern designs. A new gene-

ration of steel trawlers of 17.5 m length were added in the 1970s. The organisation attained the status of the largest fleet operators of deepsea fishing vessels, which were 28 in all by 1982. Relatively larger vessels of over 30 m OAL are the backbone of the present fleet of 17 fishery survey vessels, consisting of combination trawlers, purse-seiners and longliners. This is perhaps a unique fisheries organisation in the whole world having resources survey as its main objective.

AIMS AND OBJECTIVES

The aims and objectives of the organisation have been modified over the years to suit the emerging situation and challenges in the field of marine resources. Presently, the following charter of work has been assigned to the Fishery Survey of India.

1. Survey of the fishery resources and charting of fishing grounds within the Indian Exclusive Economic Zone.
2. Assessment of suitability of different types of craft and gear for deepsea and oceanic fishing.
3. Monitoring of the deepsea fish resources for purpose of regulation and management.
4. Training of deepsea fishing operatives by providing in-vessel training to CIFNET trainees.
5. Survey of inland fishery resources.
6. Dissemination of information on fishery resources through various media including fishery chart to the industry and others concerned.
7. Consultancy work on these aspects for Industry and others interested on the specific clearance from the Ministry.
8. Such other objectives which the Central Govt. may assign relating to the management of marine and inland fishery resources.

Combination
Trawler



ACHIEVEMENTS

Over the years, the Fishery Survey of India has accumulated a mass of fairly reliable data on the fishery resources of the continental shelf up to 40 fm and has made significant breakthroughs in the deeper waters. It is presently engaged in the completion of demersal resources survey up to a depth of 300 m. The pelagic and oceanic resources are also being surveyed. Some of the major achievements and contributions of the Fishery Survey of India are the following.

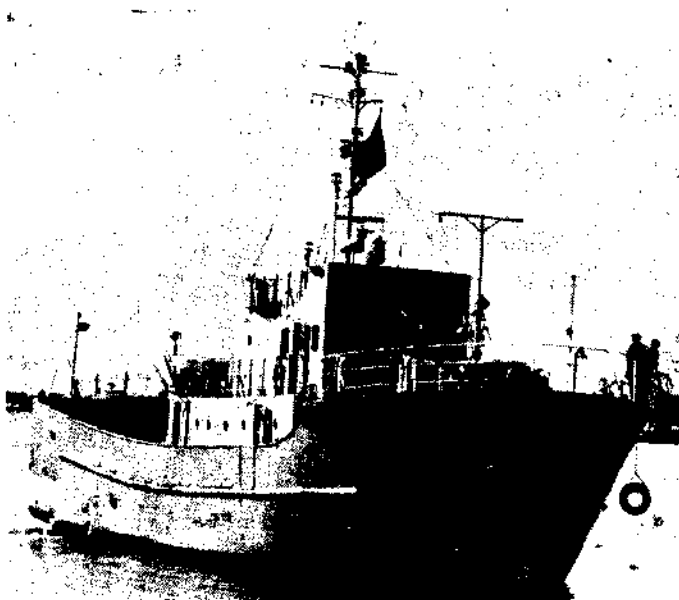
- the introduction of bottom trawling in India through experimental/exploratory fishing with a variety of fishing vessels and fishing gears.
- location of rich prawn fishing grounds off Sandheads off West Bengal and off Andhra/Orissa coasts.
- development of tuna fisheries through experimental fishing by PRATAP during 1962-67 and extensive exploratory tuna long lining.



Stern trawler



Trawler cum
purseseiner



Tuna longliner

- introduction of midwater/pelagic trawling along north-west coast and along upper east coast with remarkable results. However, the Industry has not taken up pelagic trawling because of accent on shrimp fishing.
- introduction of purse-seining along both east and west coasts. Purse-seining by mechanised boats has already come to stay along Karnataka and Kerala coasts.
- confirmation of the abundance of tuna resources off Karnataka and indication of these resources along the east coast and Andamans.

TASKS AHEAD

An objective assessment and introspection about the activities and achievements of the Fishery Survey of India indicates that what remains to be done is much more than what has already been done. The tasks ahead are indeed

challenging, but with the proper appreciation from the fishing industry and the policy makers and above all the support being extended by the Government of India, the future appears to be full of promise.

FUTURE

The results of the surveys conducted by FSI have been published from time to time providing the necessary information support for the formulation of Government policies as well as commercial projects. All the same, it is to be admitted that a lot remains to be done in the field of marine fisheries exploration to get a comprehensive and clearer picture of the resources both qualitatively and quantitatively to enable planning and decision making.

Demersal fishery resources survey has been completed up to 75 m, all along the Indian coast and up to 300 m along southwest coast. The areas of abundance of demersal resources in this zone is very clear excepting certain stretches off the coast line. The resources picture beyond this depth contour is not so clear. Hence greater efforts would have to be put in completing the survey in the deeper waters within a time frame of five years or so.

Pelagic resources survey has been carried out only in certain areas and as such a lot remains to be done particularly in terms of purse-seining and midwater trawling. The efforts which are now on would have to be intensified and programmes drawn up to get a synoptic picture of the resources within as short a time as possible.

Survey for oceanic species such as the tuna, sail fish, marlin etc have got off to a fine start in the last couple of years and offers great promise for the development of the deepsea fishing industry. More specialised fishing vessels for the exploitation of the resources, stock assessment and commercial feasibility studies have to be acquired immediately to complete the task. Tuna longliners, tuna purse-seiners and



Blackruff



Bullseye



Indian drift fish



Deepsea lobster

pole-and-line fishing vessels are an immediate necessity. Though jigging has been a conventional method for exploiting the cephalopod resources, in recent years breakthroughs have been made elsewhere in the world, utilising midwater trawling for squids and cuttlefishes. There is immediate need to upgrade the technical capabilities of our fisheries operative in some of these lines.

The FSI has adopted the swept area method for assessment of demersal stocks. It is, however, well known that this method invariably leads to an underestimate of the available stocks. The assessed potential through the direct survey technique would have to be complemented by other methods of resources survey for a more precise picture to emerge. With the completion of the resources assessment of demersal fish in our continental shelf area, which is likely within the next few years, efforts have got to be intensified for monitoring of the resources with the sole aim of working out the total allowable catches at least in respect of some important resources such as prawns, pomfrets, sciaenids etc.

Remote sensing for natural resources in recent years has opened up exciting possibilities. The FSI would do well to adopt this technique for speedy assessment particularly in terms of pelagic stocks and oceanic resources within our extensive EEZ.

The acid test for the effectiveness of resources research will ultimately lie in our capacity to advise the industry in advance of a particular season regarding the likely behaviour of the fishery so that the industry can suitably plan their commercial exploitation programmes. This would naturally lead to the concept of fishery forecasting, which, in the long run, should be our objective. However, the resources of the FSI alone are not sufficient to take up this challenging task. It is imperative that we have an effective programme of collaboration and cooperation with institutes and organisations conducting research on environmental parameters, biological cycles of fish species etc. Simultaneously efforts should be made to evolve and test improved gear with the sole aim



Deapsea prawn

of effective management of fishery resources through suitable regulations on the input of effort into the fishery and other related matters. The future holds a challenge to the FSI to make effective contribution in the areas mentioned above.

Survey of our inland fishery resources has been added to the charter of FSI, but a serious beginning in the assessment of the resources in the large inland water bodies is yet to be made. Preliminary work in terms of planning such a programme for the first time in India would pose considerable problems which have to be tackled with the assistance of various institutes and organisations having expertise in the area of inland fisheries. The large water bodies available in the country, as is well known, offer great scope for the development of capture as well as culture fisheries. The immediate task of FSI would be to assess the potential of the capture fishery resources in these water bodies. Though the new activities in this regard have been approved by the Govt. of India for implementation in the VII Plan it is not likely that any significant activity would take place before the end of this plan period. The work would have to be geared up to the needs of the situation during the VIII Plan period.



Oceanic squid

*Communicated by Dr. D. Sudarsan,
Dy. Director General (FY).*

Integrated Fisheries Project

The Integrated Fisheries Project, formerly known as Indo-Norwegian Project, came into being in 1952 as a result of the tripartite agreement signed between the Governments of Norway and India and the United Nations Organisation. The Project started as an area development programme in the Sakthikulangara-Neendakara region with certain specific objectives. It has established organised facilities for hygienic handling, processing and marketing of fish.

In 1963, the Project shifted its headquarters from Sakthikulangara-Neendakara to Cochin. The administration of the Project was taken over by the Government of India. The activities of the Project thereafter expanded. Integrated Fishery Complexes were started not only at Cochin, but also at Cannanore and in the nearby States of Tamilnadu and Karnataka. Boatbuilding and berthing facilities were also established. In 1972, the agreement with the Govt. of Norway was terminated and the Indo-Norwegian Project at Cochin was renamed as Integrated Fisheries Project and the administration was completely taken over by the Government of India. All the three sub-stations of the Project were handed over to the respective State Fisheries Departments.

OBJECTIVES

(1) To study the operational efficiency/commercial feasibility of different types of fishing craft and gear, (2) Demonstration of fishing methods by employing suitable craft and gear for the benefit of the industry, (3) propagation of diversified fishing methods for the optimum exploitation of known fishery resources, (4) introduction and popularisation of diversified fishery products for rural and urban markets, to study the reaction of consumers and to create an awareness on the part of the processors and consumers to utilise the hitherto unexploited and unconventional items of fishes and other marine life, (5) training of personnel in diversified fishing methods, processing technology and also

refrigeration techniques and (6) to provide technical consultancy services in the field of fishing, fish processing and marketing.

ACTIVITIES AND FACILITIES

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

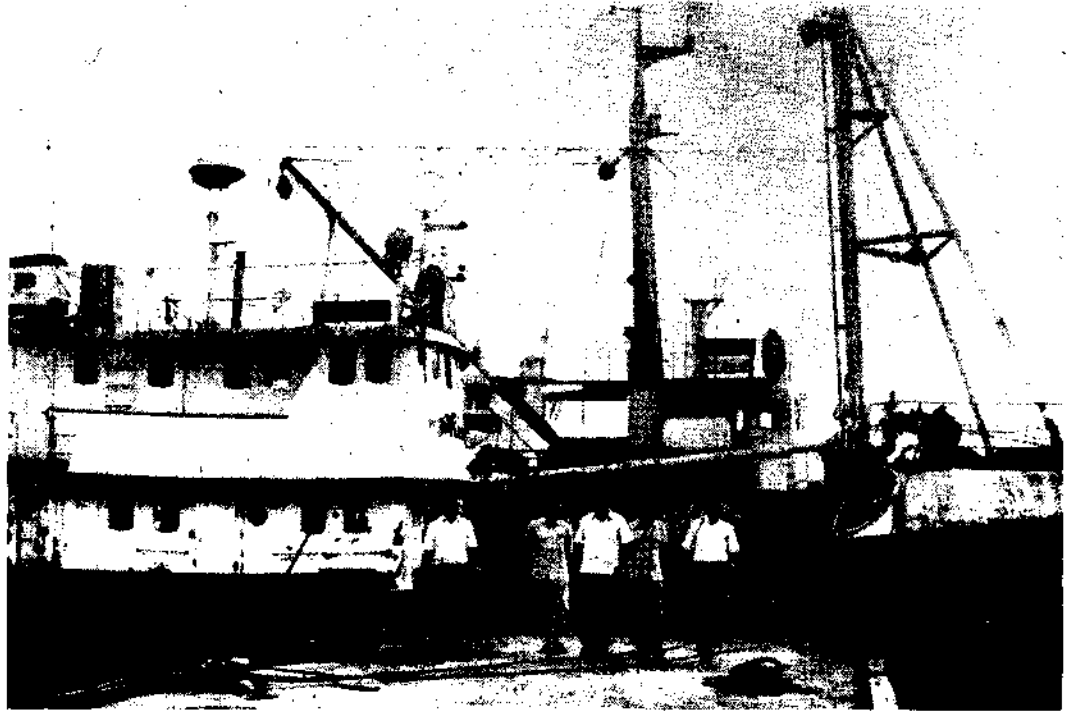
The Project conducts experimental/commercial fishing operations with a fleet of 5 vessels ranging in size from 17.5 m to 28 m. The operational efficiency of the different types of boats and gear, different vessel-gear combinations and diversification of fishing operations to study the economics and commercial feasibility of such operations form part of the objectives of the Project.

The gear section carries out all types of repairs and maintenance of nets of the different vessels. Design and fabrication of different types of nets for different vessels of the Project to carry out experimental and diversified fishing and servicing of self-inflatable life rafts are also done by the section. Supply of design of fishing gear to fishermen is another developmental plan of this Project.

The ice plant complex commissioned in 1965 has a production capacity of 25 tonnes of ice per day in three shifts and an ice storage capacity of 25 tonnes. The capacity of the tunnel freezer is 8-10 tonnes while that of the contact freezer is 4 tonnes. Frozen storage capacity of 125 tonnes is also provided besides a chilled room of 25 tonnes capacity.

The Project has set up a modern processing section with different machineries for production of diversified fish products. The important equipment are the mincing machine, skinning machine, filleting machine, slicing machine, smoking unit, an artificial drying unit and a most modern and

IFP Jetty



Slipway





Kalava traps

sophisticated canning line where aluminium cans are used instead of the conventional tin cans. The various machinery and equipment serve as a model for adaptation by the industry to develop diversified marine products.

With these facilities over the years, the Project had developed necessary technology for product diversification, ventured on pilot production, entered in internal and external markets to study consumer reaction and established acceptance of the newly developed products, so that the industry may take it up.

During the past two decades more than hundred different fishery products were developed and introduced by the Project for domestic as well as for export market.

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

In addition to the routine marketing of various fish and fish products through the established channels it was found necessary to conduct special seafood drives in cities and towns to popularise fish and fishery products. Publicity through newspapers forms part of the special seafood drives. This approach creates an awareness among the consumers in a given locality comprising a cross section of fish-consuming public and others. It was planned to implement this programme in the major cities of north India.

The Project workshop and slipway serve as servicing centre for all the vessels of the Project and other sister organisations and private entrepreneurs around Cochin. The workshop is provided with modern equipment, machineries and tools to take up repairs of wooden and steel fishing vessels up to 250 tonnes displacement.

Repairs and maintenance of sophisticated electronic equipment fitted on board the vessels are carried out through a modern electronic workshop forming part of the servicing facilities meant for fishing vessel repairs. The Electronic workshop is provided with modern equipment like oscilloscope, oscillators, automatic coil winding machine etc.

Making available data on the economics of operation of vessels, fish resources at different grounds, efficiency of different fishing gear, suitability etc. of different equipment for processing, fishing etc. and collecting biological and statistical data are attended to by the Scientific and Statistical sections which also attend to consultancy services for the fishing industry.

The Project conducts training courses for the manpower requirement of the fisheries and fishing industry in refrigeration, processing, invessel training for fishing second hands and engine drivers.

ACHIEVEMENTS

Located rich fishing grounds and new potential resources like deepsea lobsters, prawn, kalava, velameen, pink

perch, crabs, squids etc. as the result of extensive exploratory and experimental fishing operations carried out along the continental shelf and continental slope up to 250 fathoms on the south-west and south-east coasts.

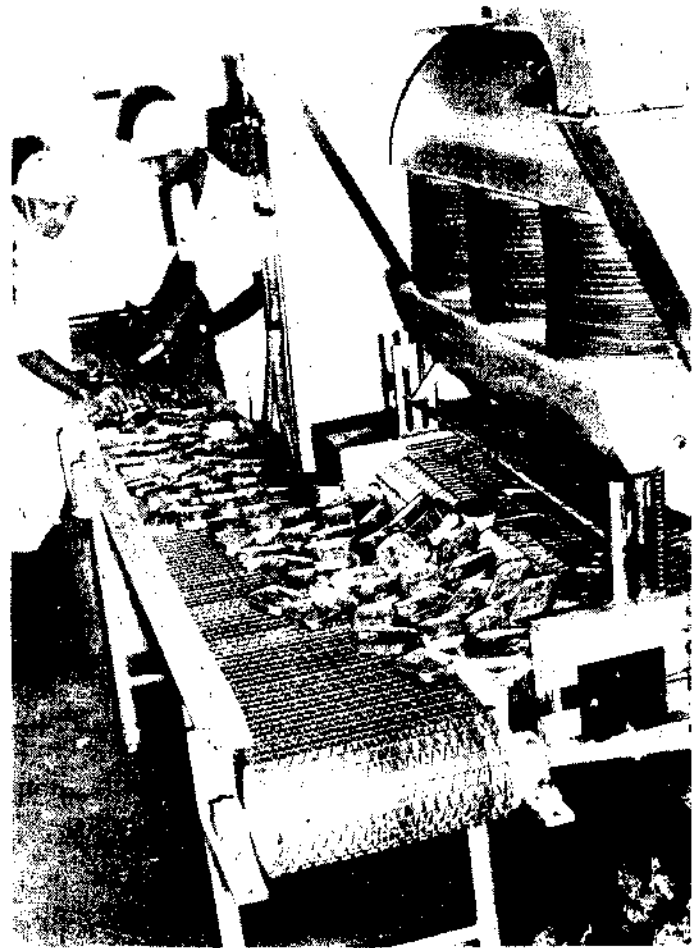
Developed different types of fishing gear like trawls, purse-seines, handlines and traps for different types of vessels.

Introduced diversified fishing techniques like single boat and two-boat midwater trawling, purse seining, handlining, longlining, light attracted purse seining and trap fishing.

Conducted practical workshops in the States of Karnataka, Kerala, Tamilnadu and Pondicherry to help the fishermen to take up these new types of fishing methods and a seminar on fish canning industry in India at Cochin. As a result, a number of purse-seiners were introduced in the fishing fleet of Karnataka and Kerala.

Imparted training to deck and engineside apprentices of fishing vessels, service mechanics, master fishermen in purse-seining, fishing boat designers, refrigeration technicians, processing technicians etc.

Developed diversified marine products like deepsea prawns, frozen deepsea lobster tails, lobster meat, cuttle fish and squid, fillets, fish fillets, slices, kheema, fish fritters, different types of dried products and canned products like sardine, mackerel, tuna, marlin, oysters, smoked oysters in different packing media of vegetable oil, tomato sauce and curry and fish spreads of anchovies and sardine which are excellent for making sandwiches. Aluminium as a packing material had been introduced for the first time in India for seafood canning and this had led to the development of Aluminium Alloy indigenously. Commissioned a 125 tonne frozen storage to expand the processing and marketing activities.



Cleaning filled fish cans

FUTURE PLANS

(a) Evolving newly designed fishing gear and employing new methodologies for effective exploitation of new resources



Many very distinguished visitors
like President of the Republic
of Maldives (below) and Prime
Minister of Vanuatu Island
visited the Project

(pelagic, midwater and demersal) within the extended area of EEZ.

(b) Introduce semi-commercial fishing for domestic marketing and feasibility study on commercial fishing.

(c) Develop exploitation methods for squid resources.

(d) Conduct deep water and slope trawling.

(e) Conduct market surveys for diversified products in major cities of India, develop rural markets for diversified products and also organise an integrated fish marketing system in India.

(f) Operate full-fledged canning line for utilisation of pelagic resources.

(g) Introduce I.Q.F. products

(h) Expand workshop and slipway facilities.

(i) Canning of non-conventional varieties of fish.

(j) Chalk out and implement programmes as approved in the Plan from time to time for the development of Indian fishing industry.

(k) Opening a new unit of the Project in the east coast.

Communicated by Shri R. Sathiarajan, Director, IFP.

The Marine Products Export Development Authority

The Marine Products Export Development Authority (MPEDA), established by the Govt. of India as a statutory body in September 1972, is vested with the responsibility for the development of seafood industry in India with special reference to exports. The Authority functions under the administrative control of the Ministry of Commerce and has offices in all the major centres of seafood production and export in India, a Trade Promotion Office at New Delhi and overseas Trade Promotion Offices in Tokyo (Japan) and New York (USA).

The MPEDA has on its Board official nominees representing the Ministries of Commerce, Agriculture, Finance, Industrial Development, Shipping and Transport as well as the two houses of Parliament, the maritime State Governments, the seafood export industry and fishery research institutions.

OBJECTIVES

- * Regulating marine products export
- * Laying down standards and specifications
- * Rendering financial assistance to processors and exporters
- * Helping the industry in relation to market intelligence, export promotion, trade enquiries and the import of essential items
- * Providing training in different aspects of the marine products industry, with special reference to quality control, processing and marketing
- * Promotion of prawn farming for export production

In discharge of its functions, the MPEDA has launched a number of programmes and projects for stepping up ex-

ports, diversification of export products and diversification of markets. These programmes are aimed at increasing export production through promotion of commercial prawn farming and deepsea fishing; modernisation of export processing sector and trade promotion activities in major markets overseas.

SHRIMP/PRAWN FARMING

Frozen shrimp constitutes over 80% of our marine products export earnings. However, shrimp production for the last several years has been stagnating. As scope for increasing production from natural resources is limited, scientific aquaculture has been suggested as a viable alternative.

MPEDA has been, till recently, concerned almost exclusively with promoting the export marketing of marine products. However, of late, realising that the major constraint of export has been production, MPEDA has also launched certain schemes for promoting export production, particularly shrimp through brackishwater shrimp farming. The promotional role of MPEDA in this area is very limited since the primary responsibility is vested with the Ministry of Agriculture and State Fisheries Departments. The major initiative of MPEDA has been mainly in taking steps for setting up two large commercial shrimp hatcheries with technical collaboration of reputed French and American companies in the eastern coastal areas for the production and supply of shrimp larvae in view of the critical importance of assured supply of seed for the development of shrimp farming in the country. Scheme for providing technical and financial assistance for the development of shrimp farming, which MPEDA has taken up in the recent past, are also aimed at complementing the efforts of the State Governments and private enterprises to develop shrimp farming in the country.



Conducting biennial Indian Seafood Trade Fair within the country is a major international trade programme of MPEDA
Shri P. Shiv Sankar,
Union Minister of Commerce,
lighting the ceremonial lamp,
inaugurating the 7th Fair
at Madras in February, 1987

MODERNIZATION OF EXPORT PROCESSING SECTOR

The MPEDA is administering a number of schemes for modernising seafood processing facilities and for improving the quality of products exported from India. These schemes include several subsidy assistance programmes aimed at improving seafood processing facilities, modernisation of machinery and equipment and for setting up quality control testing laboratories with necessary technical personnel.

ASSISTANCE FOR UPGRADING PEELING SHEDS

Pre-processing of shrimp is mainly done at peeling sheds, manned and managed mainly by the weaker sections of the society. For enabling the peelingshed operators to improve their facilities conforming to the standards prescribed by MPEDA, financial assistance up to Rs.10,000 per unit was provided by MPEDA. Under this scheme, introduced in 1980-81, an amount of Rs.63 lakh was disbursed to 880 peeling sheds which improved their standards and facilities as per the MPEDA norms. As the objective has been achieved, the operation of this scheme has been suspended.

As a further measure for maintaining the standards of hygiene of these peeling sheds, MPEDA has introduced a scheme for providing maintenance grant up to Rs.15000 per unit.

SUBSIDY FOR OUTBOARD MOTORS

With a view to helping the fishermen operating traditional country craft, MPEDA has introduced a scheme from 1984-85 to provide subsidy assistance for procuring out-board motors to fit on the country craft. The assistance per countrycraft is limited to Rs.5000 and the scheme is administered through the Fisheries Departments of the State Governments.

ASSISTANCE FOR SETTING UP

COMMUNITY PEELING CENTRES

Consequent on the introduction of MPEDA's programme of compulsory registration of peeling sheds, a scheme was

Another important trade promotion programme is participation in specialized Food Fairs in overseas seafood markets.

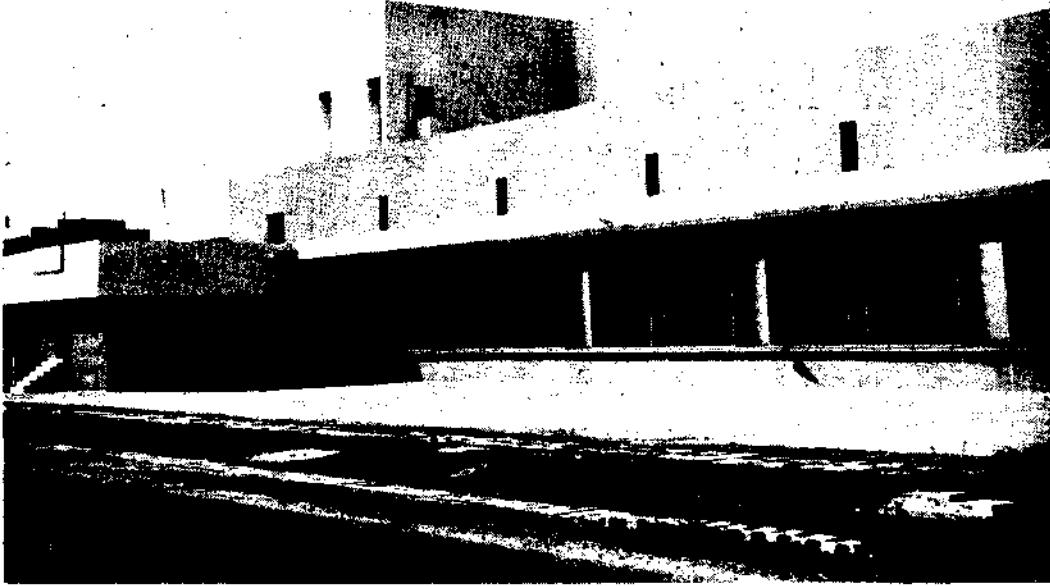
MPEDA's stand in the Anuga Food Fair at Cologne (FRG)



Refrigerated trucks for long-distance transportation of frozen seafoods for export



**500-tonne frozen storage
set up at Cochin Port**



introduced for community peeling centre for rehabilitating peeling workers who were hitherto engaged in way-side peeling in and around landing centres. Under this scheme, administered through State Governments, MPEDA provides capital cost of the community peeling centre, provided the land required for same is made available by the State Government. A couple of community peeling centres have been set up in Kerala.

**SUBSIDY FOR AUTOMATIC
FLAKE/CHIP ICE MAKING MACHINE**

For assisting the small scale seafood processors in installing machines for production of quality ice for inplant use, MPEDA provides financial assistance up to 25% of the cost of the machines, subject to a maximum of Rs.1 lakh per plant.

SUBSIDY FOR GENERATOR SETS

Uninterrupted power supply is essential for maintaining the quality of frozen seafoods. For assisting the seafood processing units to have captive power as a stand-by arrangement for use in situations like power cut and power failures, MPEDA provides financial assistance up to Rs. 40,000 for procurement of generator sets.

**SUBSIDY FOR INSTALLATION OF
IMPROVED PLATE FREEZERS**

Most of the seafood processing plants in India are rather old and the plate freezers used for freezing shrimp takes more than 2½ hours for freezing. Reducing freezing time is desirable to produce good quality products. For assisting the seafood operators in upgrading the efficiency of the freezing machinery to freeze the products in 90 minutes, MPEDA provides a subsidy up to Rs. 1 lakh per unit.

SUBSIDY FOR TRUCK REFRIGERATION UNITS

Frozen seafoods, being highly perishable, are often transported by insulated trucks. This is not a satisfactory arrangement, particularly for long distance transportation of frozen seafoods. Refrigerated truck is the ideal transport for preservation of freshness in long distance transportation. With a view to enable the seafood processors in the small-scale sector to acquire refrigerated trucks, MPEDA provides a subsidy of 33.3% of cost of the refrigeration unit subject to a maximum of Rs. 45000.

ASSISTANCE FOR UPGRADATION OF COLD STORAGES

For cold storages which are deficient in maintaining optimum temperature, MPEDA provides financial assistance up

to Rs. 75000 per unit for upgrading the efficiency of such storages.

PRODUCTION OF VALUE-ADDED ITEMS

India's exports of frozen shrimp are being traditionally made in institutional packs of 2 kg/5 lbs. blocks. These packs are reprocessed in the importing countries for production of consumer products, which fetch higher prices in international markets. As a measure of encouragement to seafood processors for changing over to production of value-added /consumer items like Individually Quick Frozen (IQF) shrimp etc., MPEDA provides subsidy up to Rs. 15 lakh per unit, for procuring machinery/equipment required for the plants.

As a further pioneering effort in this line, MPEDA has a programme for equity participation in companies being set up for production and export of value-added new items.

MINI LABORATORIES IN PROCESSING PLANTS

Frequent check of quality and freshness of the raw material at various stages of processing and production is essential for ensuring the high quality of products. With a view to assist the seafood processing units to set up mini laboratories for quality check at various stages of processing, MPEDA provides assistance up to Rs. 50,000 per unit towards cost of laboratory equipment and chemicals.

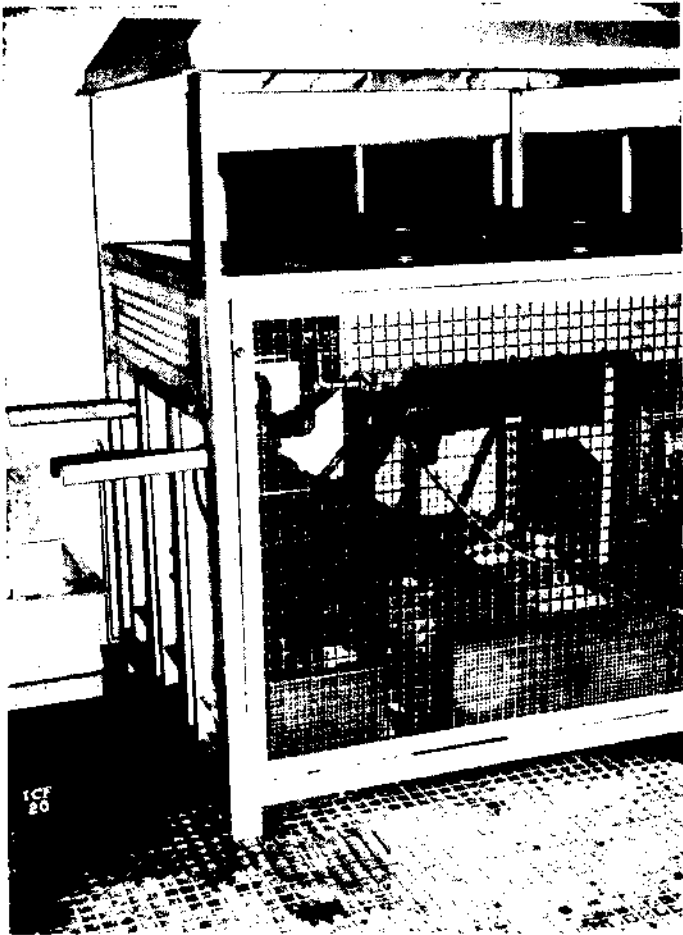
MPEDA had also made it mandatory that all plants should have their own laboratories by December 1986, failing which the export units were likely to be deregistered.

EMPLOYMENT OF QUALITY CONTROL PERSONNEL

Seafood processing units having their own quality control laboratories and approved under the Modified In-Process Quality Control (MIPOC) scheme assistance is provided from MPEDA for employing qualified technologists in the laboratories. Assistance up to Rs. 1500 per mensem towards salary of the technologist is being provided by the MPEDA.



**Quality control
laboratory at Cochin**



A flake/chip ice
making machine

MARKET INTELLIGENCE

MPEDA obtains latest ruling prices in major markets through the overseas Trade Promotion Offices in Tokyo and New York as well as Indian missions in other major trading centres. Latest price trends are passed on to the trade in India through the Authority's weekly price bulletin **PRIME**. This information is also made available to the trade over phone/telex. MPEDA also functions as the national liaison office in India for the **INFOFISH**, market information service of the FAO in Kuala Lumpur.

PARTICIPATION IN INTERNATIONAL TRADE FAIRS

One of the major market promotional programmes being undertaken by the Authority is participation in specialised Food Fairs and other International Trade Fairs. Every year, the Authority participates in about half a dozen specialised Food Fairs in different parts of the world. Participation in the Food and Trade Fairs has helped in creating a better awareness of Indian seafoods abroad and in highlighting India's status as one of the leading fishing nations with very rich potential for further development.

ORGANISATION OF INDIAN SEAFOOD TRADE FAIR

The biennial Indian Seafood Trade Fair organised by the MPEDA since 1973 has been established as a major trade event of significance to the seafood export industry in India. The Fair provides a unique forum for buyers and sellers to meet and discuss problems of common interest for

further consolidation of trade relationship and also for exploring possible areas of collaboration for trade development. The usefulness of the Fair has been widely appreciated by the seafood export community in India as well as importers from all parts of the world. Seven such Fairs have so far been held.

TRADE DELEGATIONS

The Authority sponsors visits of delegations consisting of senior officials of the Government and representatives of the trade to various markets for high level discussions and for development of personal contacts with buyers and officials in importing countries. Apart from delegations and sales teams sponsored and funded by the Authority, individual sales teams of exporters are also sent abroad with financial support under the Market Development Assistance (MDA) scheme.

Selected teams of leading buyers as well as important officials and technical experts from major seafood importing countries are periodically invited to India as guests of the MPEDA for personally witnessing the production standards and developmental efforts in fish production and export.

PUBLICATIONS

MPEDA brings out a monthly journal 'Indian Seafoods' which is mailed regularly on complimentary basis to seafood buyers and Indian trade missions overseas. The journal brings out the day-to-day development of Indian seafood industry so as to keep the importers and concerned aware of what is happening in India. For the benefit of trade in India,



A mini laboratory set up with subsidy assistance from MPEDA, which according to the present provisions extends up to Rs. 50,000 per plant

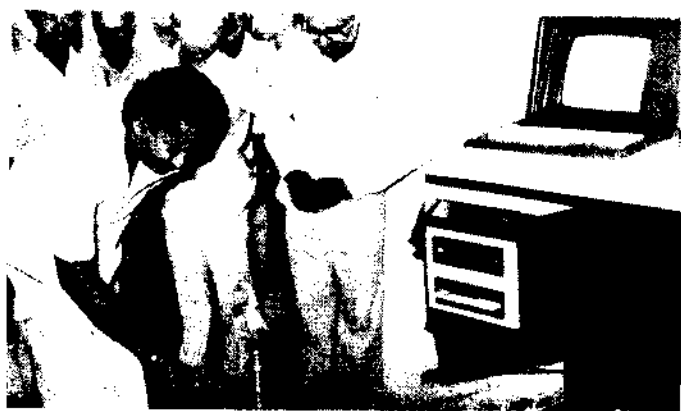


Squid jigging, for the development of which MPEDA had made available the services of Japanese experts under a scheme launched with the technical collaboration of CIFT



Formal handing over of prawn seed to a farmer in Orissa as part of the prawn seed distribution programme of MPEDA for the benefit of farmers

A Computerised Trade Information Centre was formally inaugurated by Shri C. Cherian, President, Seafood Exporters Association



MPEDA brings out a fortnightly 'Seafood Newsletter', circulation of which is restricted mainly to persons and organisations within the country. Apart from the above periodicals, the Authority has brought out several important publications like Directories of Exporters/Importers and Reports containing recommendations of delegations and sales teams, Market Study Reports, seminar proceedings, extension literature as well as trade information of interest to seafood industry in India and overseas.

EXTERNAL PRESS ADVERTISEMENTS

MPEDA releases attractively designed press advertisements in selected food/trade journals in the existing major markets as well as other potential areas. The press advertisement programme covers mainly Japan, USA, UK/Continent, West Asian and South East Asian countries.

PROMOTION OF DEESEA FISHING

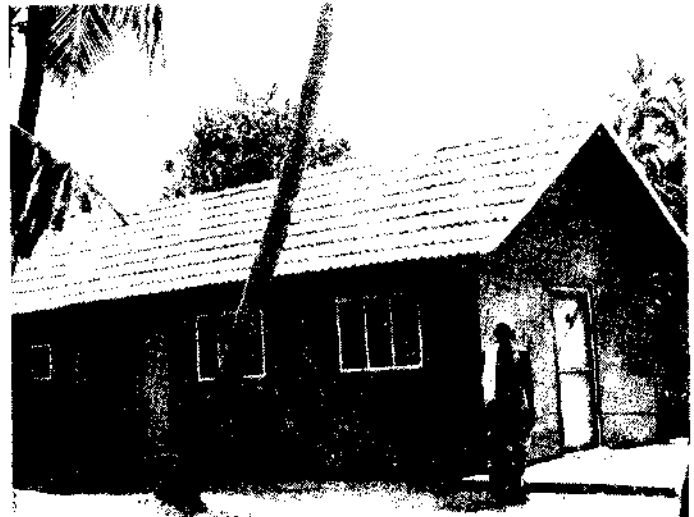
Under the new policy aimed at optimum exploitation of deepsea fishery resources of India, the Commerce Ministry is the nodal agency for promotion of joint ventures in deep-sea fishing. The Commerce Ministry has nominated MPEDA as the field agency for receiving and processing applications for joint ventures. The MPEDA has thus been assigned an important role in the national efforts for the development of deepsea fishing in the Indian waters.



A training in processing of fish products by foreign technical expert under Indo-EEC trade promotion programme

*Communicated by the Director,
MPEDA, Cochin.*

A peeling shed set up with MPEDA's financial assistance, the financial assistance is at the rate of Rs. 10,000 per shed. So far Rs. 63 lakhs were distributed for upgrading 880 peeling sheds



Department of Fisheries, Lakshadweep

AN OVERVIEW

The Directorate of Fisheries Lakshadweep took its origin in 1959 as a small organisation headed by a Fisheries Officer and assisted by a couple of fisheries inspectors, making a significant turn in the history of fisheries development in the islands. The exploitation and proper management of fisheries resources to improve the economic condition of local inhabitants was the primary objective. Geographically scattered nature and remoteness of the islands turned out to be real hurdles in the implementation of fishery development schemes. During the sixties, fishing had been by primitive methods of harpooning, confined to the lagoon and reef areas. Tuna was not caught in any island except Minicoy and the fish catch was insufficient even for domestic consumption. Inhabitants were illiterate and with poor socio-economic set up.

The various fisheries developmental schemes implemented by the Dept. of Fisheries during the course of last 25 years have brought out drastic changes in the fisheries sector. Introduction of mechanised boats, training of local men in the modern fishing method and handling of boats, setting up of infrastructural facilities, experimental and demonstration fishing, issue of fishery requisites on subsidy, establishment of fish processing plants, etc were the important scheme launched. Pole-and-line fishing prevalent in Minicoy with rowing boats was mechanised and was popularised in other islands. New designs of fishing craft to suit the area and different types of fishing were experimented and the most ideal type was identified and introduced to the industry with remarkable success, all during the course of last two decades. The policy adopted was a practice-oriented approach to provide the maximum benefit to the fishermen with minimum input.

The fisheries developmental activities thus undertaken by the department have made significant impact on the socio-economic conditions of the people. From a meagre 500 tonnes in 1960 the fish catch had risen to 6000 tonnes by 1986. The value of export of dried fish rose from Rs. 11.2

lakhs in 1972 to Rs. 1.5 crores in 1985. In the place of small conventional country craft, there are now more than 300 mechanised boats doing fishing. Emergence of 4 islands hitherto new to the trade as potential pole-and-line fishing centres is indeed a remarkable achievement. The average catch of a pole-and-line fishing boat is 70 tonnes, worth Rs. 2.7 lakhs in a year of 6 months fishing. The income per fisherman works out to Rs. 15,000/-. The establishment of ancillary industries such as boatbuilding yards, canning factory, workshops, etc have provided additional source of employment with lucrative income. The low-cost diversified fishing methods such as troll line, long line and gill nets introduced are being profitably employed in islands like Andrott and Amini where there is no scope for pole-and-line fishing.

FUNCTIONS OF THE DEPARTMENT

- 1) Construction and issue of mechanised boats to fishermen
- 2) Management of two boatbuilding yards
- 3) Management of one canning factory
- 4) Management of 11 workshops
- 5) Management of marine aquarium and museum
- 6) Management of fishermen training centre
- 7) Experimental and demonstration fishing
- 8) Supply of fishery requisites, diesel oil and spare parts
- 9) Collection and processing of fishlandings data
- 10) Studies on the improvement of craft and gear
- 11) Marketing of tuna cans
- 12) Diversification in fishing

The skipjack of
Lakshadweep





The island women have been trained on more effective methods of filleting tuna under hygienic conditions

POLE AND LINE FISHING

Pole-and-line is the important commercial fishing gear for the surface fishery for tuna. In the Indian ocean this is being employed in Lakshadweep, Maldives, Sri Lanka, northern Madagascar and southeast of Australia.

At present a fleet of 120 Nos. of 7.62 metres long mechanised boats fitted with 14-16 HP inboard diesel engines are under regular pole-and-line fishing operation in Lakshadweep, landing 5000 tonnes of tuna annually. The boat carries live bait, which is an integral part of pole-and-line fishing. The gear is simple, consisting of a straight and strong bamboo pole about 4 metres long with a diameter of about 3 cm at the base. A line equivalent to the length of the pole is tied at the tip of the pole. The end of the line carries a barbless hook. The success of the fishery depends on various factors, viz availability of live baits, skill of the fishermen, knowledge of the behaviour pattern of tunas, etc. Live bait chumming and water spraying are the two techniques employed for aggregating tuna shoals around the fishing boat.

As soon as fish shoals are around the stern, the hook on the pole is put in the water. When the weight of the fish is felt on the pole, the fish is lifted above the boat and, with a jerk on the pole, the fish is dropped on board. If the fishermen are skilled and tuna shoals are in good biting mood the fishing could be so fast that it would make a spectacular sight.

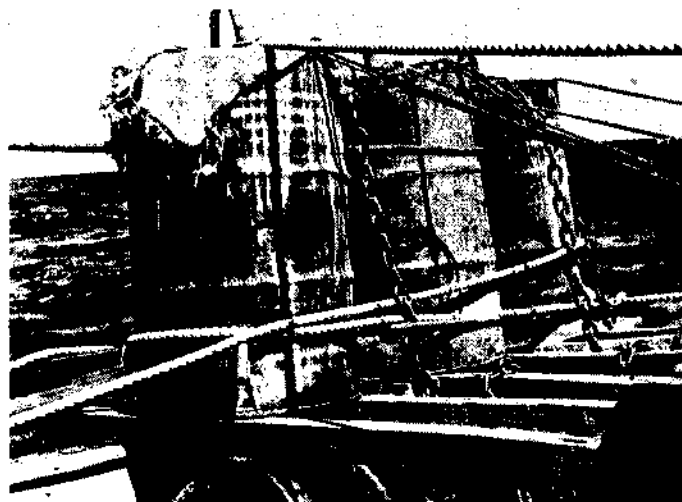
DEVELOPMENT OF TUNA FISHING

Currently, the tuna fishery in India is limited to the small-scale fishery sector of a few coastal states and Union Territory of Lakshadweep. Lakshadweep, a group of coral islands in the Arabian sea, has got the distinction of being the only region in India where an organised tuna fishery is in vogue. Lakshadweep waters support a fishable stock of one lakh tonnes of tuna. Against this, the present exploitation is 5000 tonnes annually, forming 75% of its total marine fish catch and 16% of the total tuna catch of India. Pole and line is the principal gear employed. The craft used consist of 7.62 meters pabo boats fitted with 12-16 HP inboard engines. Out of the four pole-and-line fishing centres, Agatti island is the most important, contributing 46% of the total tuna landed in Lakshadweep. The annual CPUE in 1986 for Agatti was 483 kg. The main species contributing to the fishery is skipjack (75%) followed by yellowfin (10%).

INTRODUCTION OF 'PAYAW'

A fish aggregating device known as 'Payaw', fabricated and installed by the Dept. during 1981, proved very good in Lakshadweep waters. The FAD is made by welding 200-litre capacity empty oil drums in a metal frame. The bottom portion is rigged with coconut leaves and the whole structure is anchored in selected spots in the sea with the aid of barrels filled with rock and cement. Two such aggregators were set up, one at south of Kavaratti and the other at southwest of Agatti. The installation sites were selected after a

thorough echo sounding survey. Both the payaws aggregate fish shoals and the spots serve the fishermen as ready source for fish catch. The fish caught off the payaws include not only tuna but also rainbow runner, dolphin fish, etc. The device is quite attractive to fishermen as they do not have to waste time and to spend expensive fuel searching fish shoals.



BOATBUILDING

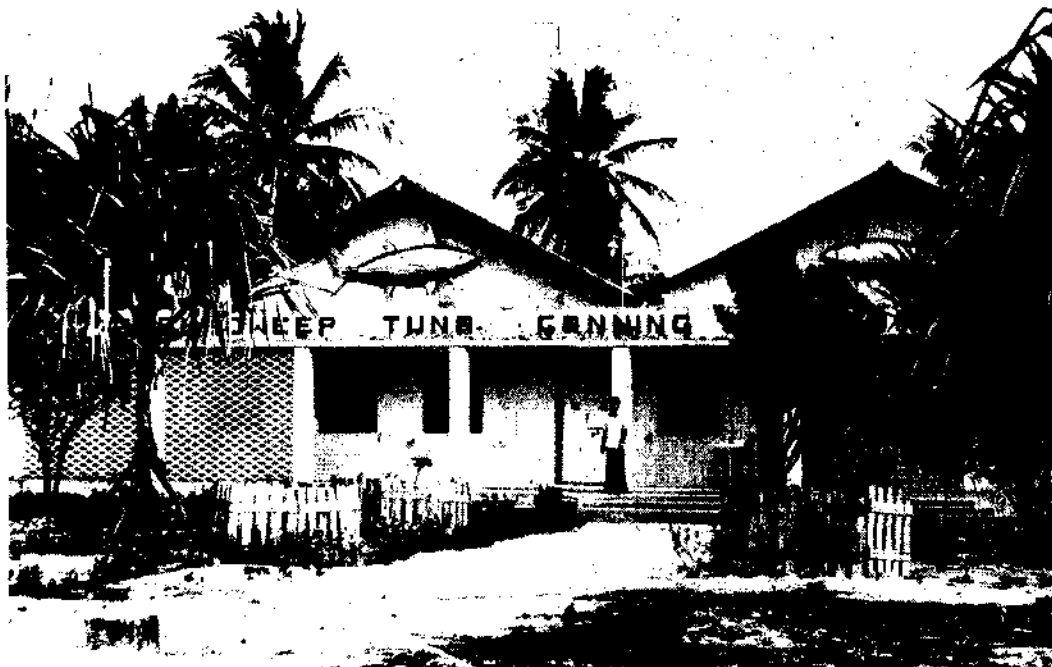
The programme of mechanisation was launched by the Dept. in order to step up fish production by the exploitation of the rich fishery wealth of the islands waters, especially tuna and shark. Two boatbuilding yards set up, one at Kavaratti and the other at Chetlat, could successfully meet the entire requirement of mechanised boats needed for Lakshadweep fishing industry. In addition to fishing boats, boats required for shipping works and tourism are also constructed and supplied by these yards. Boats of sizes 7.62 metres, 9.14 metres and 11.6 metres are being constructed in these yards. During the last two decades 247 Nos of boats have been launched from these two yards. During the year 1977 the yards supplied pole-and-line fishing boats to Andaman and Nicobar islands also.



TUNA CANNING

Setting up a canning factory in Minicoy in 1969 was a milestone in the development of Lakshadweep. Till 1969 the entire tuna caught in Lakshadweep was being processed into a traditional product called 'mas', which nevertheless has a shelf life of about a year. The establishment of the canning factory

Payaw, an ingenious device made out of empty oil drums and coconut leaves, was erected one at Kavaratti and one at Agatti



Lakshadweep
tuna canning factory

in Minicoy made possible the introduction of a sophisticated product out of tuna acceptable both at home and at foreign market. To the fishermen of Minicoy, the factory serves as a centre for ready disposal of their catch. The installed capacity of the factory is 10000 cans per day. It is also attached with an ice factory of 5 tonnes capacity and a cold storage of 20 tonnes capacity. Four varieties of cans are produced here, viz, Tuna solid pack in oil, Tuna solid pack in brine, Tuna flakes in oil and Tuna flakes in brine. The present production is around 1 lakh cans annually. The factory provides employment to 50 persons. In spite of various constraints, the factory was able to achieve the production target every year.

east coasts of India and Sree Lanka. The annual production of mas in Lakshadweep is 500 tonnes, worth Rs. 1.5 crores.

MECHANICAL SPRAYER FOR POLE-AND-LINE FISHING

The mechanical water spraying system developed and introduced by the department in 1984 replaces handspraying in pole-and-line fishing. The experiment with this device in 1984 was a great success. Besides saving labour costs, this has improved the efficiency of the gear considerably. Now pole-and-line fishermen at Agatti are clamouring for mechanical sprayer.

SHARK RESOURCES

Lakshadweep waters support a rich and sustained fishery for shark, with 8% average hooking rate. The average weight of one shark is 54 kg, making shark fishing highly profitable. In recent years longline fishery for shark has become a fast growing enterprise.

'MAS'

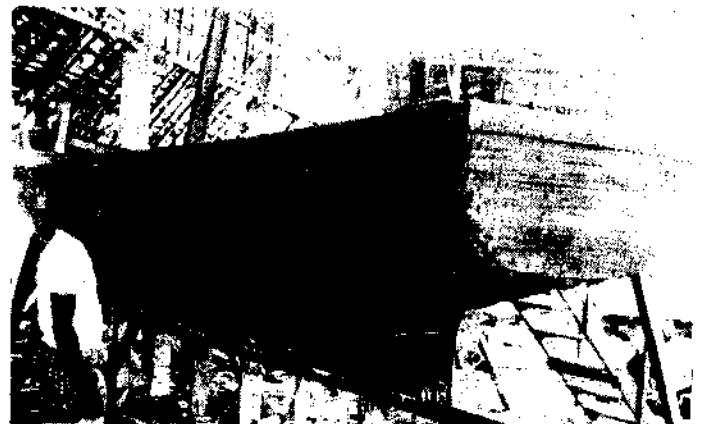
'Mas' is the most popular product made out of tuna in Lakshadweep, 90% of the tuna caught in islands are processed into this traditional product. This product resembling the Katswobhushi of Japan has a shelf life of about a year and excellent taste and is popular in southwest and south-



A Lakshadweep
boatbuilding yard

PEARL OYSTER CULTURE

Culture of pearl oysters on experimental basis was started in Lakshadweep in the year 1981. The spat required for the culture were collected from the reefs during lowtide. Since they are rare in the island, the pearl oysters were brought from the Tuticorin centre of CMFRI. The oysters are being reared in plastic baskets suspended from rafts moored in the lagoon at Bangaram island. The technology for the culture and production of pearl was obtained from CMFRI. The first nucleus implantation operation was carried out successfully in 1983. So far four cultured pearls of size 4 mm to 7 mm have been produced. Experiments are being carried out to make it a viable venture.



A boat under
completion

MARINE AQUARIUM AND MUSEUM

The marine museum and aquarium set up at Kavaratti island in 1983 is one of the outstanding of its kind in India and houses approximately 1500 organisms in preserved and live forms. The complex environment natural to the coral

islands gives rise to an equally complex fauna, quite different from that of mainland. An excellent display of these fascinating fauna has made the museum swanky. Tropical coral fishes reared in 12 aquaria tanks form the most spectacular exhibit. The visitor would feel as if taken to an aquatic world where the forms of life are mysterious and lovely. Chaetodontidae, Scorpinidae, Acanthuridae, Pomacanthidae, Ostracodontidae and Tetraodontidae are the important families representing in the aquaria. Preserved specimens, models of craft and gear, underwater paintings, etc are other exhibits adding to the spectacle. This establishment has now become the major centre of attraction in Lakshadweep, offering for tourism, education and research. Every year, lots of students are brought to the museum from mainland as part of their curriculum. The museum stands as an index of the dedicated efforts and professional competence of the department of fisheries Lakshadweep.



Pearlculture raft
in Bangaram island

FUTURE PROGRAMMES

Tuna fishing is the mainstay of the islands. Efforts taken by the Dept. to improve the efficiency of pole-and-line gear has given fruitful results. The small-scale tuna fishing now existing in the islands can be further developed by increasing the strength of the boats and by making improvements in craft and gear, post-harvest technology and marketing. It is proposed to operate a mother vessel to enhance the range of operation of smaller boats.

COMMERCIAL EXPLOITATIONS OF TUNA

In order to exploit the bulk of the tuna resources left untapped beyond the operational range of the smaller boats, it is proposed to operate larger purse seiner and pole-and-line vessels on collaborative terms with other countries. Proposal for establishment of a Lakshadweep Fisheries Development Corporation in this regard has been submitted to the Ministry.

Communicated by Shri George Varghese, Director of Fisheries, UT Lakshadweep.

Department of Fisheries, Tamil Nadu

Tamil Nadu is endowed with rich and varied potential for development of marine fisheries. It has a long coastline of 1000 kilometers and a continental shelf area of about 41412 sq. km. The estimates of potential annual catch from the EEZ of Tamil Nadu vary from 4 to 8.6 lakh tonnes. The population of marine fishermen is about 4.64 lakhs, out of which about 1 lakh marine fishermen are actively engaged in the fishing profession. At present there are 2432 wooden mechanised boats and 82 FRP boats engaged in fishing off Tamil Nadu coast. In addition, 985 catamarans have been fitted with outboard motors and 802 country canoes with inboard engines. As far as non-mechanised boats are concerned there are 28,132 catamarans and 8439 country craft operating in Tamil Nadu.

As a result of effective implementation of successive Five Year Plans, the marine fish production of the state has increased five fold from 45700 tonnes in 1951-52 to 249576 tonnes in 1986-87. Tamil Nadu accounts for about 15 percent of the total marine fish production in the country. The share of Tamil Nadu in the country's export in marine products is about Rs. 68.43 crores (1986-87).

OBJECTIVES

- (i) to increase fish production through suitable upgradation of technology;
- (ii) to raise the standard of living of the fishermen by increasing their income which will help their socio-economic conditions;
- (iii) to raise the nutritional status of the consumers;
- (iv) to generate additional employment opportunities;

- (v) to increase foreign exchange earnings of the State.

FUNCTIONS AND ACHIEVEMENTS

Regarding the development of marine fisheries, attention is now concentrated on distribution of fibreglass boats, small beach-landing craft and to motorise the existing traditional craft like country boats and catamarans with inboard and outboard engines by providing subsidy.

In order to meet the needs of the fishing fleet, with the assistance of the Government of India, major fishing harbours and minor landing centres have been provided in 9 places. Similar facilities are now being developed in 4 more places. Infrastructure facilities like roads, community halls, fish auction hall, processing facilities, servicing, water supply, power etc. are being provided at 5 places. To enable the fishermen to navigate their craft to shore safely during night time and to avoid rocky obstructions in the sea, the Department has installed guide lights at important landing centres.

The Department is implementing several welfare schemes for the upliftment of fishermen community such as provision of free houses, provision of roads in fishing villages, group insurance scheme, saving-cum-relief scheme etc., and strengthening of the Fishermen Cooperatives.

The following strategies are being adopted for achieving the objectives of the Department in the VII Five Year Plan aiming at an annual marine fish production of 3.1 lakh tonnes by 1989-90.

- i) Introducing improved craft such as beach-landing craft to supplement the traditional craft in increasing fish production by providing subsidy assistance to the fishermen to procure FRP boats;

- ii) Improving the operational efficiency of traditional craft of the small-scale fishermen by providing subsidy to procure inboard/outboard motors to enable them to increase their landings and earnings;
- iii) Providing necessary infrastructure facilities such as fishing harbours, landing jetties, processing plants, auction and packing halls, etc., at all important landing centres;
- iv) Intensifying the efforts of the Fisheries Development Corporation to conduct deep sea fishing operations for effective exploitation of the EEZ;
- v) Strengthening the Fishermen Cooperative Societies to enable them to take up fishing, fish marketing and other related programmes;
- vi) Providing basic amenities to the fishermen hamlets such as housing, link roads, water-supply and other public amenities.

*Communicated by Shri K. C. Joseph, Jt. Director,
Fisheries, Government of Tamil Nadu, Madras - 600006.*

Tamilnadu Fisheries Development Corporation Limited

The Tamilnadu Fisheries Development Corporation Ltd. was established in the year 1974 as a Private Limited Company, under the Companies Act, 1974. It became a Public Limited Company with effect from 1-10-1977. Its authorised Share Capital is Rs. 50 million and the paid-up share is Rs. 29.257 million.

The main objective is to promote, establish, organise, administer, maintain, improve, develop, assist, finance both directly and indirectly and aid in India or elsewhere in the business of:

- (a) Operation of trawlers and other vessels and mechanisation of fishing boats etc. for deepsea fishing
- (b) Culture and harvesting of inland fisheries
- (c) Procurement, purchase, sales (wholesale and retail), import and export of frozen and cured fish, shrimp, etc
- (d) Providing services and assistance of all kinds with regard to fish culture and fishing for the benefit of fishermen community in particular and fishing industries in general.

SHRIMPING OPERATION

The Corporation is running three processing plants and trawlers viz. 'THANJAI' and 'NELLAI' with Vizag as base for shrimp fishing.

PROCESSING PLANTS

The Corporation is running three processing plants and 4 ice plant-cum-cold storages for the benefit of fishermen and exporters for preservation of fish and prawns till they are marketed.

DIESEL OIL OUTLET

The Corporation is operating 4 diesel oil/retail outlets in fishing harbour complexes at Royapuram (Madras), Mallipattinam (Thanjavur District) and Tuticorin I & III (V.O. Chidambaranar District) for the benefit of mechanised fishing operators, who can now draw diesel supply at the fishing harbour premises itself.

FISH MARKETING

The Corporation commenced retail fish marketing activities in Madras city during December 1976 and gradually expanded in stages the fish marketing activities to the districts like Madurai, Coimbatore, Trichy, Periyar and North Arcot. There is a daily offtake of about 2 ton of fish.

DRY FISH GODOWN

The Marine Products Export Development Authority constructed a dry fish godown at a total cost of Rs. 12.41 lakhs inside the Fishing Harbour Complex at Tuticorin and the same is being operated by the Tamilnadu Fisheries Development Corporation Ltd. There are 12 berths in this and they have been hired out to dry-fish exporters for storing their merchandise before export.

FISH NET MAKING FACTORY

A fish net making factory with a production capacity of 54 tonne per annum has been installed at Madras. Its machinery has been received from Japan under Japanese grant-in-aid.

BRACKISH WATER FARMING

Under centrally sponsored scheme, a prawn hatchery is being established at Neelamkarai near Madras. The Corporation has also proposed to establish a Brackishwater Fish Farm in an area of 50 hectares in Thondiakadu in Thanjavur District.

SCHEMES UNDER JOINT VENTURE

TAMIL NADU PEARLS (P) LTD.

In collaboration with M/s. Southern Petro Chemical Industries Corporation (SPIC) Ltd., Tuticorin, a Joint Sector Project, i.e. Tamil Nadu Pearls (P) Ltd., has been established to undertake culture of pearls for commercial purpose. The Canara Bank has sanctioned necessary term loan under Re-

finance assistance from NABARD for the implementation of this scheme. The company is having its pearl oyster farms at Mandapam and Kurusadai Island in Ramnad District. About 8.0 kg of culture pearls were produced from these operations.

TAMIL NADU MARINE PLAST LTD.

A Joint Sector Project, viz. Tamil Nadu Marine Plast Ltd., was established during August 1985 for the construction and marketing of fibreglass beach-landing craft in collaboration with M/s. Marine Plasts, Ferro Islands, Denmark, Industrialisation Development Fund (I.F.U.) and with two private industrialists in Tamilnadu. The estimated cost of the project is Rs. 50.00 lakhs. This firm is having its boatyard at Madras and will be producing 19', 20' and 22' fibreglass fishing vessels. The boats will be marketed in Tamil Nadu, Kerala and other places and also abroad.

FUTURE PROGRAMME OF THE CORPORATION

The Corporation has proposed to set up a 100 tonne cold storage, 100 t ice plant and 300 t frozen storage inside the Fishing Harbour Complex at Madras for preservation of fish catches and frozen products to benefit the fishermen and exporters. The cost of the project is Rs. 62 lakhs. The United Commercial Bank agreed to sanction a term loan of Rs. 41.12 lakhs under refinance assistance from NABARD and the Government of Tamilnadu has sanctioned Rs. 20.00 lakhs towards Share Capital for the implementation of this project.

The Corporation has already initiated steps to acquire more Deep Sea Fishing vessels for squid jigging, tuna fishing and to exploit the Wadge Bank.

*Communicated by
Managing Director, Tamil Nadu Fisheries
Development Corporation Ltd., Madras - 600024.*

Central Institute of Fisheries Education

ESTABLISHMENT AND FACILITIES

The Central Institute of Fisheries Education (CIFE) is the pioneering Institute in the field of post-graduate Fisheries Education in the country. The Institute was established at Bombay in the year 1961 under the Ministry of Agriculture, Government of India. The administrative control of the Institute has been transferred to the Indian Council of Agricultural Research (ICAR) with effect from 1st April, 1979. The Institute with its Headquarters at Bombay has training centres at Barrackpore (West Bengal), Kakinada (Andhra Pradesh) and Chinhet (Uttar Pradesh).

Besides the training centres, CIFE has a 7.5 ha fresh-water fish farm at Balabhadrapuram and an 8.0 ha brackish-water fish farm at Kakinada, both in Andhra Pradesh. At Powarkheda of Madhya Pradesh, CIFE has a 44 ha fresh-water fish farm. These fish farms serve as field training centres for the students and trainees, 36.57 metre M. V. SARASWATI, a deepsea going sophisticated research-cum-fishing vessel, and two other trawlers NARMADA AND SUNDARBANS, offer facilities for onboard training and research programmes. The Institute has a well-equipped workshop and a rich library — one of the richest so far as collection of books on fisheries and its allied subjects are concerned.

In view of the international character of oceans and common interest of neighbouring countries, CIFE was shaped to become an area of excellence in higher education in fisheries for the Afro-Asia Region. The FAO of the United Nations actively collaborated with the Govt. of India in organising and developing this Institute for a period of 4½ years from September 1964 to March 1969, providing sophisticated modern equipments for effective instruction in all branches of fisheries science and also expertise of high standard.

OBJECTIVES

The major objectives of the Institute are:

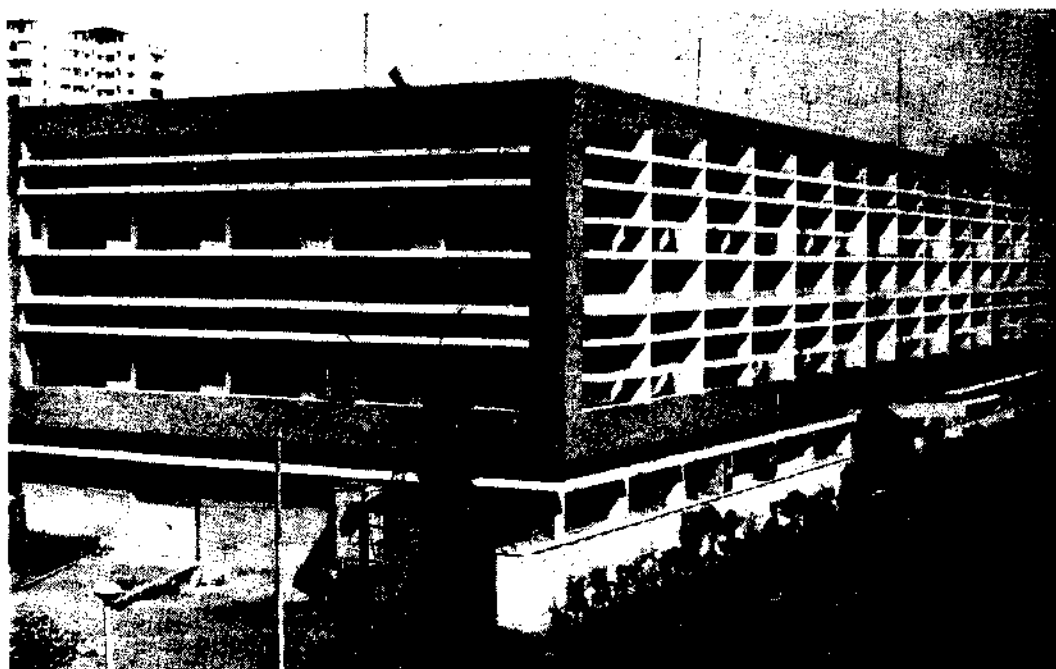
- (a) To conduct under-graduate, post-graduate and doctoral degree programmes and certificate course in fishery science
- (b) To conduct research in basic disciplines, viz. genetics, nutrition, ichthyopathology, reproduction, physiology etc.
- (c) To conduct short-term and long-term training courses in different specialised disciplines of fisheries sciences
- (d) To demonstrate on a limited scale the proven technologies developed by the ICAR fisheries institutes

FUNCTIONS

The Institute conducts specialised courses on all aspects of fisheries besides research and extension. These courses relate mainly to training of personnel of State fisheries departments and fisheries organisations and some sponsored private trainees. The Institute has started a new academic course of 2 years M.Sc. (Fisheries Management) from the academic year 1984-85. The course is affiliated to the University of Bombay. The first course started with 12 students who passed out in 1986, 11 of them securing first class.

REGULAR COURSES DEGREES/DIPLOMAS

	Ann- ual ad- mission	Candi- dates passed	Time of ad- mission
1. 2 years Post graduate diploma in Fisheries Science (D.F.Sc) at CIFE, Bombay Headquarters.	40	693	July



**CIFE
Bombay**

- | | | | |
|--|----|-----|------|
| 2. One-year post graduate certificate course in Inland Fisheries Development & Administration at Inland Fisheries Training Unit, Barrackpore, West Bengal. | 40 | 985 | June |
| 3. 10 months post graduate certificate course in Fisheries Extension at Kakinada, Andhra Pradesh. | 25 | 20 | June |
| 4. 9 months certificate course in Inland Fisheries Operatives at Chinhat, Lucknow, U.P. | 40 | 734 | June |
| 5. M.Sc. (Fisheries Management) 2 years, at CIFE, Bombay, under affiliation to Bombay University. | 12 | | |

ICAR has agreed in principle to grant a "Deemed University Status" to CIFE. The proposal in this regard is under active consideration of the University Grants Commission, New Delhi.

The Institute organise workshops/seminars/colloquia on the aspects of marine fisheries and its development. So far as extension activities on marine fisheries are concerned, the Institute organise and participate in national exhibitions in a big way sometimes in collaboration with its sister concerns D.O.D., CMFRI, CIFT, MPEDA etc.

ACHIEVEMENTS

EDUCATION AND TRAINING

The Institute has so far trained 2,619 candidates under various courses including 76 candidates sponsored from neighbouring developing countries of Africa and Asia regions.

More than 500 dissertations on different research/developmental aspects including aspects of marine fisheries have been prepared by the trainees towards partial fulfilment of their courses at Bombay, Barrackpore and Hyderabad.

The Institute is recognised by many Indian universities as a study centre for Masters and Doctorate degrees by research in applied Zoology and Bio-chemistry.

Since her inception, the Institute remained engaged primarily in education. However, after it joined to ICAR in 1979 research and extension became two more important aspects of activities of the Institute. Some of the recent research works in the field of marine fisheries are as follows:

COASTAL ZONE MONITORING OF POLLUTION

Keeping in view the pollution problems, studies on the intertidal macrobenthic fauna of deteriorated mangrove ecosystem off Seven Bungalows, Bombay, were taken up to assess the degree of pollution.

Macrobenthic fauna of mangroove swamps were chiefly consisted of foraminiferans, polychaetes, crabs, pelecypeds and gastropods. Maximum population density 39,685 was of *Potanudes cubgykutys* in the vicinity of mangroove swamps associated with sandy substratum. Percentage of organic matter was more with fine sand.

STOCK ASSESSMENT OF MARINE FISHERIES OF WEST COAST

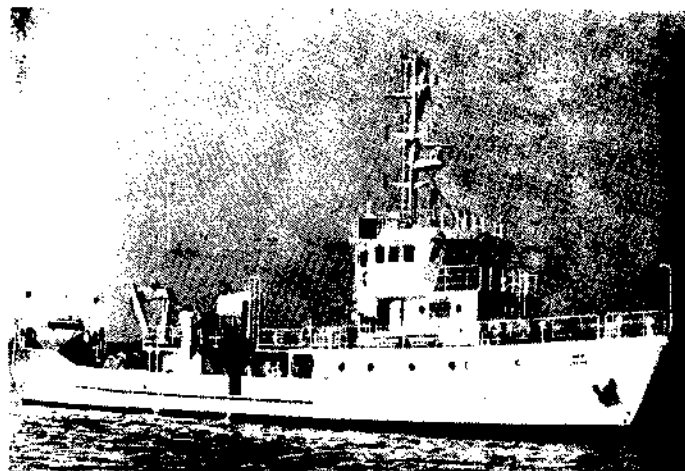
A study of Gonadosomatic Index of *Otolithus argenteus* revealed that the fish has three spawning spouts. The first minor spawning in December-January, the main spawning in May-July and another minor spawning in September-October.

The major forage of *Johnius carutta* has been found to be *Acetes* sp., maximum attainable theoretical weight of 317 g. It grows at an annual rate corresponding to K value of 9.91.

Metapenaeus dobsoni breeds almost throughout the year resulting in almost uniform recruitment into the fishable stock throughout the year.

Average sustainable yield of this prawn is estimated to be 945 tonnes off Quilon during the southwest monsoon period. Effort required is estimated to be 334 trawlers operating 8 hours per day during the monsoon season.

Coilia dussumieri attains theoretical maximum length of 285 mm and weight of 30 g. This stock is found to suffer a natural mortality of 1.3 (M) and fishing mortality of 1.7 (F) and the yield (weight) per recruit is only 3.1 g.



M.V. Saraswathi



Training in
fish processing



Oceanographic training on board
M.V. Saraswathi



Prawn hatchery development training

MELANOSIS OF PRAWN

Black-spotted prawns caused by the action of the enzyme poly-phenalase oxidase (PPO), called "Melanosis", are frequently encountered in prawn landings of Bombay during monsoon.

The Institute has worked out PPO enzymes in Penaeid prawns like *M. affinis*, *M. brevicornis*, *P. monodon*, *P. hardiwicki* and *Solenocera crassicornis* and non-penaeid prawns like *Acetes indicus* and *Poleomon tenuis*. Measures for prevention of Melanosis have been suggested.

LIVE AND FORMULATED FEED FOR PRAWN LARVAE

Intensive culture of zooplankton viz. *Moina*, *Brachionus*, *Daphnia*, *Fabrea salina* (not reported earlier from India) and *Artemia* were undertaken and their efficacy as live feed have been tested. Cheap and efficient method for culture of these organisms utilising commonly available animal waste have been evolved. Biology, ecology and optimum conditions required for raising the crop of *Artemia* have been intensively studied and a system has been developed to maintain a continuous mass culture of the animal to feed prawn larvae in the hatchery system.

Side by side a number of cheap feed viz. *Acetes* suspension, squilla and egg custard have been tried and formulated from abundantly available cheap raw material.

SOCIO-ECONOMICS STUDY OF

ROLE AND STATUS OF FISHERWOMEN

The socio-economic conditions of fisherwomen of Versova village with special reference to their role and status were studied. The study revealed that the fisherwomen of Versova assist their family members, earn income through fish sales, participate in decision making and take care of their families. Majority of women were satisfied with their present role in the family and did not like to disturb their role of a happy housewife by taking a more active part in income generation.

SHOREWARD MOVEMENT OF LOW OXYGEN LAYERS

Data collected at fish landing centres of Bombay indicated that high catch of marine prawns, *P. merguensis*, *P.*

indicus, *Solenocera indica* and *Acetes* spp. are landed during monsoon. Hydrobiological studies by M.F.V. SARASWATI had confirmed the high catch due to the effect of monsoon season. Associated with this oceanographic phenomenon, the prawn populations migrate inshore and yield high catches.

This finding adds new dimension to the management of prawn catch from coastal areas and hence calls for a review of policy for coastal fishing during South West monsoon months in the Maharashtra coastal region and a major research project for indepth study of the problem.

DEEP SEA FISHING

The results of exploratory fishing of M.F.V. SARASWATI have indicated that the fish abundance during monsoon and post-monsoon months off Maharashtra coast in the deeper waters of 100-250 m depth is low due to low oxygen.

NEW BUOYANCY TESTING METHOD

CIFE has introduced a simple method of calculation of buoyancy of floats for the demonstration of the system to the trainees. This facility is now being used as a teaching aid.

HIGH OPENING TRAWL FOR FISHING SHRIMP

The Fishery Technology Division of CIEF has initiated a project on high opening trawls. Three new designs of high opening trawls were fabricated and put to test by comparative fishing along with 21 m traditional shrimp trawl from 38 feet vessel M.F.V. NARMADA.

Among the three designs, 20.70 m high opening two seam shrimp trawls has given better results during comparative fishing experiments. 20.70 m high opening trawl landed 1.82 times more catch than the traditional 21 m.

COMPUTERISING MARINE RESOURCES AND OCEANOGRAPHIC DATA

Software for data documentation and analysis has been developed for fisheries resources survey data. The exploratory survey by deep sea going research-cum-training vessel SARASWATI is generating scientific data on fish catch and environment. This basic raw data is quality-checked, processed

and documented, using a Microcomputer HCL-WORKHORSE LEVEL-3B in four standard schedules covering haul-wise catch, species composition, environmental data and length/weight sampling of catch. The detailed processed data provides information on fisheries resources of a selected area in the EEZ. Normally processing of raw fishing data used to take about a year or more for dissemination. With computerisation it is now done within a fortnight after the completion of cruises which is very helpful for investment planning in marine fisheries by the fishing industry and for formulating joint ventures.

PRODUCTIVE UTILISATION OF COASTAL SANDY BEACHES

Soils of beaches around metropolitan cities are rich in organic contents. In Bombay cultivation of Methi (*Trigonella foenum-graecum*) which is a green vegetable, prevails. Beach soil is sandy with 1-3% organic matter and is suitable for methi cultivation of short duration. Poor families of the working classes have been cultivating Methi all along the beaches for their livelihood. The crop gets ready within 7 days. A family earns Rs. 150-200 per day from this short duration crop.

EXPLORATORY FISHING/TRAINING/RESEARCH ON BOARD VESSEL M.F.V. SARASWATI

Till the end of 1986, M.F.V. SARASWATI the deep sea going 36.5 meter research cum training vessel of CIFE has conducted 50 cruises, spread over 385 days on training demonstration and research programmes. In all 640 personnel of CIFE, DOD, CIFT, CMFRI and the fisheries departments of Goa, Karnataka, Maharashtra, Gujarat, teachers sponsored by N.C.E.R.T. and research scholars of Maldives, participated in the cruises.

During her cruises, new productive fishing grounds have been located. Identification, biology and population dynamics of some of the fishes have been studied intensively and their stocks assessed. Physico-chemical changes along north-west coast of India in relation to fisheries have been studied with a view to understanding the fluctuations in catches of some commercially important fishes.



**Methi cultivation
on beach**

UTILIZATION OF LOW PRICED FISH

The Institute demonstrated successfully better and effective utilisation of low value fish by developing fish wafers, fish kheema, dried laminated bombayduck, smoked mackerel, eels, etc. and conducted training programmes on these aspects.

EXTENSION ACTIVITIES OF MARINE FISHERIES DEVELOPMENT

Keeping the national priorities in mind the Institute organised workshops/seminar on multiuse of coastal zone in 1976 and on management of marine living resources within the Indian EEZ in December 1981. A training programme exclusively designed to cater to the needs of coastguard personnel was also organised by the Institute. The facility of the vessel was extended to the maritime states and the different fisheries organisation under ICAR (CMFRI, CIFT) to cater to their needs. Studies have also been made on particular aspects of economics of fishing operations including wages and wage structure, marketing margins, cooperatives etc. along the Maharashtra coast. Socio-economic conditions of the fisherwomen and their role in fishing industry have also been made.

Recognising the role played by the Institute in human resources development in fisheries, the Commonwealth Secretariat, London, sponsored an Aquaculture Training for Africa/Asia region to train the middle level managers in Aquaculture in developing their skills in management of fish farms. The programme conducted by the Institute during June-July, 1983, was so designed that the knowledge acquired and experience gained by them in India could stand in good stead for development of aquaculture in their respective

countries. Participants were drawn from Bangladesh, Sri Lanka, Zambia, Gambia, Sierra Leone and Egypt.

The Institute has also gone in for active participation in national and international exhibitions and fairs not only to create awareness but also to propagate various technologies developed by the Institute, as was done at the exhibition "Ocean & its Resources" held at New Delhi on November 14, 1983, highlighting the opportunities to rural youth in aquaculture. It has also organised seminars and workshops all over India like "Aquatic conservation and Angling" at Pongdam H.P. (1984) "Coastal Aquaculture" at Cochin, "Mass Awareness Convenient" at Durg, M.P. (1986) etc. The Institute is also utilising mass media from time to time in propagating the technologies. The programme entitled "In search of Fish" on the activities of the Institute modern vessel M.V. SARASWATI produced by Bombay Door-darshan was also telecast on a couple of occasions. The impressive achievements of the Institute during the last quarter of a century were largely made possible by the active cooperation and assistance of the concerned State Governments and national and international agencies. The Institute can take pride in that the alumni of this Institute had occupied and a number of them continue to occupy pivotal positions in fisheries development in India and neighbouring developing countries like Nigeria, Fiji, Sri Lanka, Indonesia and Sudan. Also some of the former staff members of the Institute are today highly placed in the Institute and are on the advisory panel of recognised national and international organisations connected with fisheries management and development. They also act as experts for evaluation of projects formulated by financial and development organisations. CIEF has enormous responsibilities in fulfilling the national priorities and meet the requirements in Human Resources Development in Fisheries at national and international levels.

*Communicated by Prof. Y. Sreekrishna, Director, CIFE,
Bombay - 400085.*

The Central Institute of Fisheries Nautical and Engineering Training

The Central Institute of Fisheries Nautical & Engineering Training (CIFNET) was established at Cochin in 1963 by the Ministry of Agriculture, Government of India. The Institute is the only one of its kind in India providing technical courses to train personnel for Ministry of Transport examinations for the various certificates of competency in the Fisheries, Navigation and Marine Engineering branches. Subsequently, to meet the increased demand of trained manpower for manning oceangoing fishing vessels, two units were started, one at Madras (1968) and the other at Visakhapatnam (1981).

OBJECTIVES

The main objectives of the Institute are:

- * To create technical manpower to man oceangoing fishing vessels, to run shore-infrastructure establishments and to create technical teachers for the government-owned fishermen training centres
- * To provide technical consultancy services in all matters concerning marine fisheries with special reference to technical manpower requirements
- * To conduct studies on fishing craft, gear and equipments and provide extension training to accelerate advancement in fishery technology
- * To help developing nations in the South East Asian, Middle East and African regions to create technical manpower for development of marine fisheries

FUNCTIONS

TRAINING COURSES

The two core training courses are Mate Fishing Vessel Course (MFVC) and Engine Driver Fishing Vessel Course (EDFVC). These two courses are aimed at training Cadets to obtain competency certificate in Fisheries, namely "Mate Fishing Vessel" and "Engine Driver Fishing Vessel" issued by the Ministry of Transport, Government of India. The total intake of these courses is 100 each.

ANCILLARY COURSES

1. Shore Mechanics Course of 12 months for 20.
2. Radio Telephone Operators Course of 9 months for 15.
3. Teacher Training Course of 6 months for 10.

ADVANCED DIPLOMA IN FISHING GEAR TECHNOLOGY

A special course on "Advanced Diploma in Fishing Gear Technology" of 12 months with intake capacity of 8 candidates is conducted at Cochin.

ENGINEER (FISHING VESSEL) COURSES FOR DIPLOMA HOLDERS IN MECHANICAL ENGINEERING

A special programme (for Diploma holders in Mechanical Engineering) of 6 weeks class-room teaching followed by onboard practical training to acquire 6 months qualifying sea service is conducted. This is a crash programme to create Engineers holding (FV) Competency Certificate, who are in very short supply in the country.

SHORT-TERM TRAINING PROGRAMME FOR NATIONAL CANDIDATES

1. Training in Fishing Gear Technology for Fisheries Extension Officers.
2. Short-term course in Ocean Management and Fisheries Technology for Coast Guard officers.



Candidates are given extensive training including that for onboard handling of catches



Handling of purseseine

Net mending
onboard



3. Short-term course in Fishing Gear Technology for Fishery Officers.
4. Short-term course on the operation and maintenance of Electronic equipments for Skipper (fishing vessel) Mate (fishing vessel) Engineer (fishing vessel) Competency certificate holders.
5. Short-term programme in Fleet Management for entrepreneurs/Managers.
6. Condensed Teacher Training Course for inservice staff.

TRAINING PROGRAMME FOR OVERSEAS CANDIDATES

Institute offers training in various technical disciplines related to fisheries to the overseas candidates from developing and underdeveloped countries.

SHORT-TERM REFRESHER COURSES FOR NATIONAL CANDIDATES

1. Mate (Fishing vessel)

2. Engine Driver (Fishing vessel)
3. Skipper (Fishing vessel)
4. Engineer (Fishing vessel)
5. Certificate of proficiency examination conducted by Ministry of Communication.

OTHER SHORT-TERM TRAINING COURSES

1. Fishing Second Hands competency certificate examination
2. Engine Driver (fishing vessel) Competency certificate examination
3. Course on construction of fishing boats in ferrocement in association with FAO
4. Introduction of high opening bottom trawls



Overseas trainees
fabricating
full size net

ACHIEVEMENTS

CANDIDATES TRAINED

A total of 2887 candidates have been trained as given below:

Mate Fishing Vessel Course	1028
Engine Driver Fishing Vessel Course	1008
Boat Building Foremen Course	98
Shore Mechanics Course	170
Gear Technicians Course	133
Radio Telephone Operators Course	189
Engineer (FV) Course for DMEs	18
Teachers Training Course	32
Advance Diploma in Fishing Gear Technology Course	6
Special Training-cum/In-service Training Courses	205

COMPETENCY CERTIFICATE

Skipper (Fishing)	275
Second Hand Fishing	383
Engineer (Fishing vessel)	123
Engine Driver (Fishing vessel)	349

Sixty-eight candidates, from countries such as Nigeria, Tanzania, Zambia, Ghana, Kiribali, PRD Yemen, Fiji, Philippines, Burma, Laos, Bangladesh and Maldives, have also been trained, two of them under the Common Wealth Fund for Technical Cooperation Scheme, under different courses.

INTRODUCTION OF DIVERSIFIED FISHING IN TRADITIONAL SECTOR

High opening bottom trawls were introduced in Gujarat in 1983 to train small-scale fishermen to diversify their fishing effort from shrimping. The High opening trawl differs from the conventional shrimp trawls in its design, construction and rigging. With the introduction of this trawl, the local fishermen have been able to catch the columnar

fishes also in addition to the bottom fishes. The training programme was so successful that about 500 mechanised fishing boats in Gujrat have now adopted high opening bottom trawls, increasing their production considerably.

TUNA LONGLINING TECHNOLOGY AND LOCATION OF TUNA GROUNDS

A large number of officers and crew were trained in the tuna longlining technology. The 'Intensive Tuna Drive' also helped in locating oceanic tuna resources in the areas around equatorial waters, Arabian Sea, Bay of Bengal and Andaman waters and a very rich ground for 'Yellow-fin' in the EEZ off Karwar-Goa.

TECHNIQUES FOR EXPLOITATION OF DEEPSEA LOBSTER

The vessel Blue Fin in May, 1987, confirmed the feasibility of commercial exploitation of deepsea lobsters along the continental slope of southwest coast. Since then, the services of an experienced skipper was made available to the industry to organise lobster trawling.

PERCH RESOURCES

Two training vessels 'PRASHIKSHANI' and 'BLUE FIN' were deployed in Wadge Bank, profitably exploiting the perch resources during monsoon period, when the large vessels would generally be idle because of off season for shrimp.

SEMINAR, WORKSHOP

An International Seminar on Training and Education for Marine Fisheries Management and Development was organised at Cochin in January 1986, under co-sponsorships of the Department of Ocean Development, Marine Products Export Development Authority, Kerala Agricultural University and University of Cochin.

The Workshop, jointly organised by CIFNET, Marine Products Export Development Authority and Association of Indian Fishery Industry, was held at Vizag in April, 1987.



**Overseas student
gets training
in pump assembling**



Engineering training



Training in electronic equipments
— A joint
venture of NORAD and CIFNET

The workshop considered the qualitative and quantitative requirements of technical manpower for the development of fishing industry during the coming years and unanimously passed recommendations for implementation by the concerned agencies to prepare the required manpower in time.

PUBLICATIONS

Institute publishes News Letters, Bulletins, Annual Reports and Fishing Gear Catalogues.

FUEL SAVING IN SMALL BOATS

A training for fuel saving in small fishing craft was conducted in 1983 in association with FAO, under the Technical Cooperation Programme. The objective was to save fuel by fitting Kort nozzle in combination with special type propellers to the existing small craft. Integrated Fisheries Project and Central Institute of Fisheries Technology also participated in the programme. The programme has proved that Kort nozzles in combination with special type of propellers would help save fuel to the extent of 20 to 33%. This was subsequently made use of in two ferrocement fishing boats.

FAO-INDIA TRAINING PROGRAMME

A training programme on the introduction of ferrocement as an alternative to timber in the construction of in-shore fishing vessels was carried out in 1985, also under the Technical Cooperation Programme. 17 National fishing craft technologists sponsored by State Governments, Union Territories, Government of India Organisations and Ship Building Yards participated in the training programme.

DECK OFFICERS TRAINING

In order to improve the quality of deck officers, the existing 15 months Fishing Secondhands Course was upgraded to an 18 months Mate Fishing Vessel Course in 1983, adding Meteorology, Stability and Electronics as detailed subjects in the curriculum. The upgradation of the

Course was also intended to meet the new Mercantile Marine Department examination rules that are expected to come into force by 1988.

FUTURE PROGRAMMES

To meet the demand for highly competent officers in future, two 3-year Diploma courses are proposed to be implemented. One is Diploma in Fishing Engineering and the other is Diploma in Fisheries and Nautical Sciences. Two high level committees headed by the Director, Directorate of Marine Engineering Training, Calcutta and the Principal, Lal Bahadur Shastri Nautical & Engineering College, Bombay, are working out the syllabus, training pattern, examination rules, etc.

It is also proposed to conduct the following short-term courses to meet the requirement of the new Mercantile Marine Department Examination Rules.

1. Radar Observers Course
2. Lifeboatmen Certificate Course
3. Radio Telephone (Restricted) Certificate Course
4. Elementary Fishing Technology Course (for deck officers)
5. Advanced Fishing Technology Course (for deck officers)
6. First Aid at Sea Certificate Course
7. Fire Fighting Certificate Course

The Institute also would shortly start a 12 months advanced Diploma Course in Fleet Management for the benefit of the private entrepreneurs in fishing industry.



Training in
ferrocement boatbuilding

TRAINING IN ELECTRONIC EQUIPMENTS

The training programme on use of electronic equipments for officers working onboard and at shore, like the ones conducted in 1984 and 1986 with the collaboration of NORAD, is proposed to be organized on an annual basis for the benefit of officers belonging to state governments.

SHORT-TERM TRAINING

A 3-month training course for qualified skippers and engineers of fishing vessels is proposed to be conducted at Madras.

UPGRADING CIFNET

Considering the large number of training and development programmes undertaken by the Institute, the Government has approved the upgradation of CIFNET on the basis of recommendations of the Professor Indiresan Committee. A new Extension Section will be formed to impart training in the Advanced Fishing Technology to the small-scale fishermen. It is hoped that the upgradation of the Institute will be completed by 1988.

Communicated by Shri M. Swaminath, Director, CIFNET, Cochin 682016.

Fisheries College, Kerala Agricultural University

ESTABLISHMENT

Fisheries education did not receive much attention in Kerala in the past even though Kerala continued for long to be the foremost State in India in marine fish production and export. It was realised that technical manpower should form the backbone of a developing industry like Fisheries. Fisheries is a highly multidisciplinary subject and, in order to have a successful professional career in the field of fisheries, one should become familiar with a variety of subjects other than Zoology, like Aquaculture, Fishery Biology, Oceanography, Limnology, Processing Technology, Fisheries Economics, Fisheries Statistics etc. It was felt that professional degree programmes in fisheries at the University level similar to the graduate and post-graduate programmes in Agriculture, Veterinary & Animal Sciences, should be started in the fisheries sector also in order to provide the much needed technical manpower in this sector. As per the Kerala Agricultural University Act, 1972, fisheries education comes under the purview of the Kerala Agricultural University. It was against this background that the Kerala Agricultural University started a Fisheries College in October, 1979, with the approval of the ICAR and the Government of Kerala. The College first started functioning at Mannuthy, but was later shifted to its permanent campus at Panangad, Cochin, in May, 1981.

The Faculty of Fisheries consists of seven departments, the Departments of Aquaculture, Fishery Biology, Processing Technology, Fishery Hydrography, Fishing Technology, Fishery Engineering and Management Studies. The present strength of the Faculty is 63 teaching posts of which about 20 posts are yet to be filled up.

FUNCTIONS

The College is established for imparting education and practical training in the different aspects of fisheries in order to produce the much needed professional graduates and post-graduates in fisheries. Training of paratechnical staff and in-service personnel engaged in development programmes is also envisaged.

Under the Faculty it is intended to develop through research viable technologies for the commercial cultivation of fishes and shellfishes, for the mixed farming of crops, live-stock and fish and for the large-scale hatchery production of fish and prawn seed. Studies are also envisaged in the fields of Fishery Biology, Ecology, Processing, Craft and Gear technologies, Fishery Engineering and Fishery Management.

The research results of practical utility are to be transferred to the fish farmers and the fishermen through extension education.

INFRASTRUCTURE FACILITIES

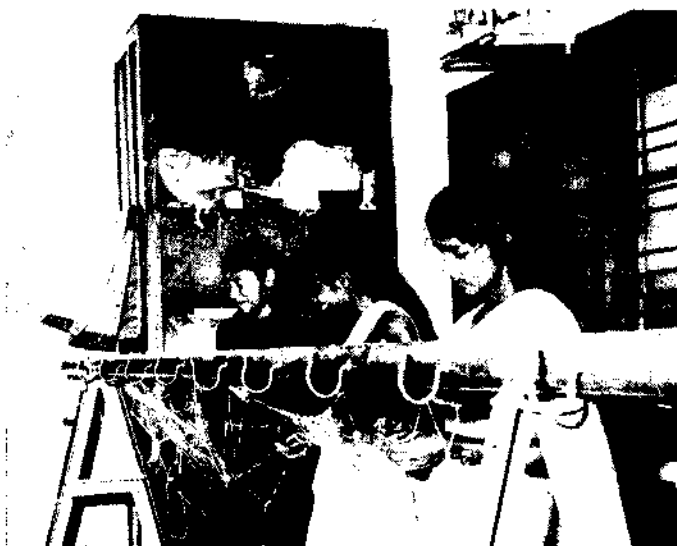
The College is situated in Panangad in a campus of 30 hectares. Much progress in the provision of infrastructural facilities could not be achieved so far mainly owing to the delay in the land acquisition. The College now functions in four semi-permanent academic block buildings having a total plinth area of 1640 sq.m. A Boy's Hostel provides accommodation for 96 students. Construction of 5 residential quarters for Associate Professors and 10 for Assistant Professors has been completed. A master plan for development of the campus has been finalised. It is proposed to construct two permanent academic blocks with about 80,000 sq. ft. area in 3 floors and the estimated amount of construction is Rs. 1 crore. The College has an Instructional Farm at Puduveypu, Cochin, extending over 101 ha with a Field Laboratory and fish ponds to conduct ex-

The semipermanent
building housing
fisheries college
Panangad



Experimental
fishfarm





Students in the
Gear Technology Lab.

of the ICAR and Government of India are admitted over and above the intake capacity.

RESEARCH AND EXTENSION

Fisheries research is undertaken with more emphasis on culture fisheries. Viable technologies for the culture of fishes and prawns in brackishwater ponds, culture of freshwater fishes in homestead ponds in the coastal belt of Kerala and paddy-cum-fish culture in Punja fields of Kuttanad and Pokkali fields have already been formulated based on a series of experiments conducted under the Faculty. Some of the technologies evolved have been tried in farmers' fields as well. Training programmes have been organised for the officers of the Department of Fisheries, Government of Kerala and Peeling shed workers.

periments. The Faculty is having research and extension units at Vyttila, Kumarakom, Moncompu, Vellayani, Pattambi and Mannuthy. The College owns and runs a 43½ ft. fishing vessel, Matsya-I, for training and research purposes.

ACADEMIC PROGRAMMES

The College offers at present the Bachelor of Fishery Science (B.F.Sc.) programme and Master of Fishery Science (M.F.Sc.) programme in the disciplines of Aquaculture and Fishery Extension. The trimester/semester systems of teaching with complete internal evaluation is followed. Admission strength is 20 seats for the B.F.Sc. programme and 4 seats each for the M.F.Sc. programmes. Admission to the graduate programme is made on the basis of the rank secured in the Common Entrance Examination for admission to the various professional courses like Medicine, Agriculture etc. conducted by the Commissioner for Entrance Examinations, Government of Kerala. 30% of the seats are reserved for fishermen students, i.e. the children of fishermen whose main source of income is from fishing and whose income is not more than Rs. 10,000/- per annum, about 37% reserved for SC/ST and backward communities, and 33% for selection purely on the basis of merit. Nominees

PROGRAMMES FOR SEVENTH PLAN

Processing plant complex, a fish-cum-prawn hatchery, playgrounds for students, an ichthyology museum, fish farms, residential quarters and a library building are expected to be taken up during the VII Plan. It is also proposed to start during the Plan M.F.Sc. degree programmes in Fish Processing and Fishery Management and Ph.D. programme in Aquaculture.

Research on Reservoir Fisheries Management will be started. Paddy-cum-fish culture practices will be extended to kole lands. A freshwater fish farm is being developed in the Vellayani kayal area.

Communicated by Dr. M. J. Sebastian, Dean, Fisheries College, Panangud, Cochin 682506.

College of Fisheries, University of Agricultural Sciences, Karnataka

ESTABLISHMENT

The College of Fisheries, Mangalore, a constituent part of the University of Agricultural Sciences, Bangalore, was established in 1969. It has the honour of being the first College to be established to impart professional fisheries education at University level. The Japanese-equipped erstwhile Marine Products Processing Training Centre transferred to the College by the Government of Karnataka had formed the nucleus of the College.

OBJECTIVES AND FACILITIES

The College was established with the primary aim of providing professional education in Fishery Science at undergraduate and post-graduate levels, for furthering knowledge in this field through systematic research and for transmission of knowledge gained from research results. The College has the necessary facilities for academic instruction, practical field experience and research, all at one place. The Main Campus of the College is located on a 15 ha plot, whereas its Technology wing, housing the Departments of Fish Processing Technology and Fishery Engineering, is situated on the meeting place of the Nethravathy, the Gurupur and the Arabian Sea, about 5 km away from the Main Campus. The College has well-equipped laboratories for student training and research and sophisticated Japanese machineries for fish processing. The College has three mechanised trawlers and one purse-seiner and also a fairly well-developed fish farm. The library of the College which has over 13,500 books on fishery science and related subjects and receives about 250 journals and periodicals from different parts of the world is considered one of the best in the country.

The instructional and research activities of the College are carried out through the Departments of Aquaculture,

Fishery Biology, Aquatic Biology, Oceanography, Fishery Microbiology, Fish Processing Technology, Fishery Engineering, Fishery Economics, Fishery Biochemistry and Fishery Statistics. The instructional programme consists of a 4-year B.F.Sc. degree course and a 2-year M.F.Sc. course in Fish Production and Management and Industrial Fishery Technology and 3-year Ph.D. programmes in Fishery Biology, Aquaculture, Aquatic Biology, Fishery Oceanography and Fish Processing Technology. The one-year post-graduate diploma course in fish processing technology (D.F.P.T.) which was being conducted till 1973 has since been discontinued.

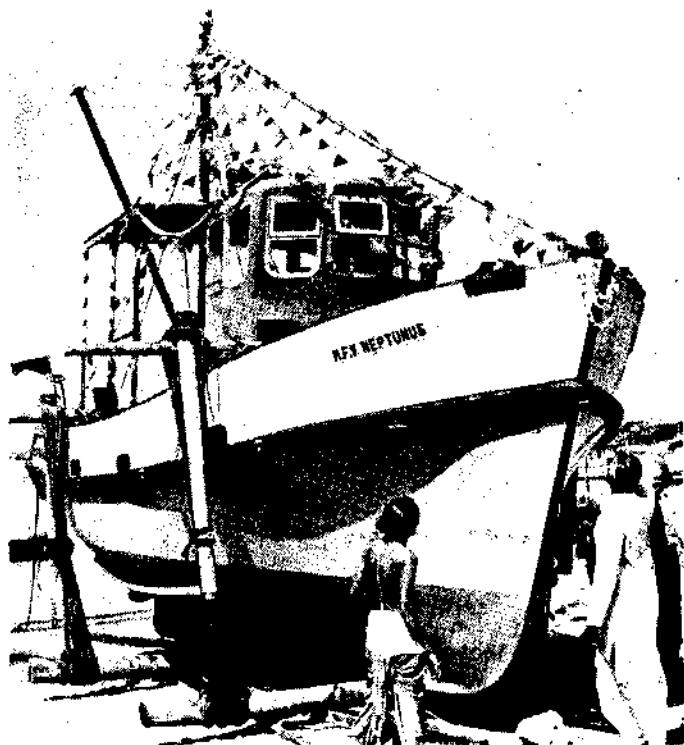
The College also conducts ad hoc short-term training programmes and refresher courses for the benefit of personnel from the Government Departments and the private sector.

ACHIEVEMENTS

TEACHING

The Institute has turned out 266 post-graduate diploma holders, who formed the backbone of the fish processing industry in the country, some of them occupying senior positions. To date, 399, 157 and 1 candidates, respectively, have completed B.F.Sc., M.F.Sc. and Ph.D. programmes at this College. These graduates have found employment in fish processing industry, fisheries departments, central research institutes, Export Inspection Agency, Marine Products Export Development Authority, universities and banks. Many of the graduates have prosecuted/are prosecuting higher studies in U.S.A., U.K., Canada, Australia and Japan.

The College has played host to a number of state, national and international level workshops, symposia, seminars, etc. It has also conducted a number of ICAR sponsored summer institutes.



MFV Neptunus

The institution has to its credit a number of significant research results of great applied value in several areas of fishery science. However, the major findings relating only to the marine sector are detailed below.

RESEARCH

Research studies with emphasis on reproductive biology have shown that the Indian backwater oyster, *Crassastrea madrasensis*, spawns twice a year from March to May and October to December. Settlement of larvae occurs all through the breeding season. The response of adult oysters to variations in environmental stimuli was also studied.

The study of trawl catches has indicated the relative and seasonal abundance of various species in the inshore catches off Mangalore. Over 50 species of fishes, about 10 species of crustaceans and a few species of molluscs have been found to be of commercial importance in the region. Juveniles of a number of fish species were recorded, especi-

ally in summer months, suggesting that the trawling grounds off Mangalore form nursery grounds for some commercially important fishes. Stomatopods form a substantial portion of trawl catches, especially during February and March.

A detailed survey was carried out to assess the brackishwater fish seed resources of Dakshina Kannada. Juveniles of mullets, pearl-spot, the Indian sand whiting, a few species of prawns and the mud crab, *Scylla serrata*, are usually encountered in the estuaries of the district. The estuarine clam resources have also been estimated. *Meretrix meretrix*, *M. casta* and *Katylsia opima* are found to be dominant.

RESOURCE SURVEY.

FISHERY BIOLOGY

Investigations on grey mullets have revealed that the fishery is mainly supported by *Valamugil seheli*, *V. speigleri*, *Mugil cephalus*, *Liza macrolepis*, *L. tade* and *L. parsia*. Their seasonal abundance, sex ratios, size ranges and the gear employed have been studied.

Studies on resource characteristics of silverbellies have indicated the occurrence of 7 species, of which *Leiognathus hindus*, *L. splendens* and *Secutor insidiator* dominate. They are mainly captured by bottom trawls, the peak period of landing being September to December. The catch per unit of effort was found to vary from 18 to 27 kg. The biology of the three species have been studied in detail.

Observations have been made on size and age composition, recruitment, spawning season, fecundity, food habits and seasonal abundance of *Lactarius lactarius*, *Trichurus lepturus* and *Sillago sihama*.

Seasonal variations in milkfish landings along the Karnataka coast have been studied. The landings take place in significant quantities during monsoon at Kundapura and Karwar centres. The estuaries near Kundapura form ideal milkfish seed collection centres during March-May.

Correlation between total length and eye-diameter was worked out in mackerel, *Rostrelliger kanagurta*. The study

revealed significant correlation between the two, which indicates that eye diameter can be used to assess the age of fish.

OCEANOGRAPHY

Studies on vertical temperature and salinity distribution in the Arabian Sea off Mangalore have revealed isothermal conditions and near-isohaline conditions during the winter months. Upwelling is observed during the months April, May, September and October, and sinking is seen during December. The periods of upwelling and sinking have been found to coincide with good landings of pelagic fishes.

Studies carried out on the rate of sedimentation at fishing harbour sites at Mangalore, Malpe and Karwar have indicated Karwar to be the best, followed by Malpe and Mangalore.

Studies carried out near Ullal have served to earmark areas of rip current, which has been periodically taking a toll of human lives. This work of the College has enabled the Government to take necessary action to prevent further loss of human lives on account of rip current.

Temperature, salinity and current patterns have been found to be the prime factors determining the success or failure of the coastal fisheries off Mangalore.

AQUATIC BIOLOGY

An unusual "green water phenomenon" or "green tide" was observed in the coastal waters from Someshwara to Kundapura for the first time during the third week of January, 1987, and is still continuing at a lower magnitude. The phenomenon has been found to be due to very dense blooms of the dinoflagellate *Noctiluca miliaris*, in association with *Protoeuglena*, which imparts the green colour to the water. The areas affected by this phenomenon have been found to be almost bereft of fishes, evidently because of oxygen depletion on account of the death and decay of these organisms.

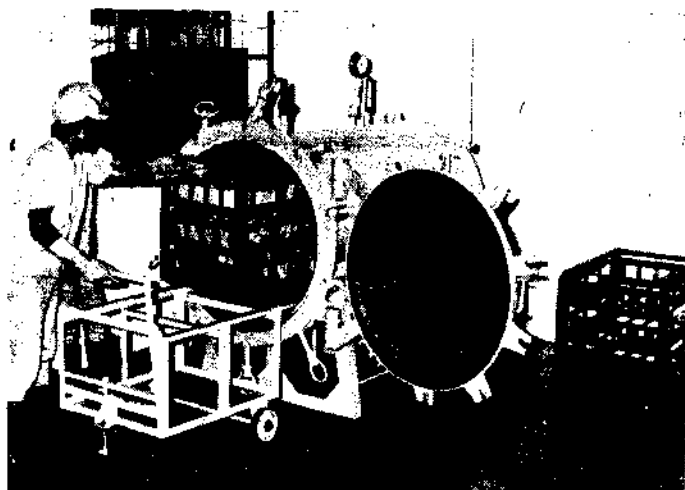
The biology of fouling communities in the Mangalore area has been studied. The extent of fouling on plates of



Fishery biology
Laboratory



Practical training in
fish canning



Fish Canning



**Models of boats
designed at the
College**

different materials such as wood, fibreglass, glass, asbestos, etc. was also studied.

Pollution monitoring work in respect of discharge of effluents by M/s. Mangalore Chemicals and Fertilizers Ltd. into the Arabian Sea has been successfully carried out over the last several years. Bioassay studies carried out in this connection have indicated the tolerance limits of fish and fish food organisms to various toxic substances present in the effluents.

Hydrobiological studies of Gurupur and Nethravathy estuaries have been successfully completed. High and low production areas in the two estuaries have been identified.

FISHERY ENGINEERING

An adapter for seaming quarter dingley cans has been successfully developed for use with the imported oval can seamer. This has enabled the use of the same seaming machine for seaming both the oval and quarter dingley cans.

A drum type meat picking machine developed at the College has proved to be a good import substitute. The machine, which has a capacity of deboning about 300 kg of fish/hour, was fabricated at a cost of only Rs. 18,000 in 1976.

Another gadget developed at the College is the 'line hauler', which can be fitted on board the fishing vessels for hauling long lines. This makes a considerable improvement over the present tedious and time consuming method of manual hauling. Another similar device developed is the net hauler, which can be used on fishing boats for hauling in gill nets.

An effective and speedy brailing equipment has been developed for use by the purse-seiners to facilitate the quick transfer of fish from the net on to the deck or the hold of the boat.

A hand operated stuffer has been developed which can be used in the preparation of several fish products, such as

fish sausage, fish spiral, fish sevu, etc. on a cottage industry basis.

FISH PROCESSING

Microbiological evaluation of salted and pressed sardine was carried out during storage. It was found that pressed sardines with high fat content could be stored for 4 weeks as against 8 weeks in the case of low fat fish.

Apart from preparing the usual canned fish products, a number of new canned products have been developed. Among these may be mentioned, mackerel-in-curry, sardine-in-curry, tuna-in-curry, seer-in-curry, mackerel fillets in oil, canned clams and mussels in brine, oil and masala and canned fish sausage.

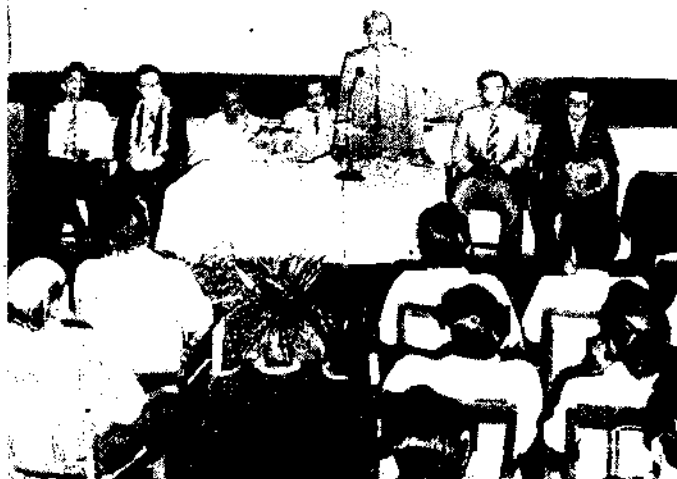
The College of Fisheries is the only institution in the country manufacturing fish sausages. Initially, the Japanese type of fish sausage packed in synthetic casing and fortified with a preservative was only manufactured. However, due to a couple of constraints in preparing this type of sausage, a new type of sausage in natural casing was developed, which could be kept in good condition for about a week in cooler storage and about a month under frozen storage.

The College has also developed a number of fish paste products, such as fish balls, fish cakes with vegetables, shrimps with fish paste, etc. These are required to be preserved under frozen storage.

By treating with acid or enzyme, fish meat could be partially hydrolysed and deodorised (PHD meat), which renders its easy incorporation into any of the common Indian snacks. A large number of fish products have been successfully prepared out of PHD meat, like fish sevu, fish sandige (fish wafers), fish jam, fish chakkuli, fish sauce, fish diamond cuts, fish noodles, etc. The PHD meat can be preserved at room temperature with edible acetic acid or could be kept for a fairly long time in frozen condition without any spoilage.



Fish processing equipment



Prof. HPL Shetty, Director inaugurating a training on processing squids and cuttle fishes conducted by MPEDA with Japanese expertise.

Fish protein concentrate or partially hydrolysed and deodorised fish flour was prepared by a simple, new method without involving the usual solvent extraction. Since no solvent is used, this has overcome the serious drawback of the earlier methods, namely the fear of carcinogenic effect from the solvent residue. This new product keeps in good condition for more than a year. Its protein content varies from 87 to 93 per cent. This powder can easily substitute for PHD meat in the preparation of a number of fish paste products.

By the use of a combination of anti-oxidants and wrapping of the frozen blocks in polythelene pouches, it has been possible to extend the shelf-life of mackerel up to 12 months and that of oil sardine up to 8 months. Against the normal shelf-life of only 3 months for the ordinarily frozen seer fillets, it was possible to achieve a shelf-life up to 10 months by treating the fillets with a mixture of sodium chloride, ascorbic acid monosodium glutamate and sodium tripolyphosphate.

Studies carried out on the frozen storage of minced meat of croaker have shown that the minced meat denatures faster than the fillets or the whole fish. It is, therefore, advisable to freeze fishes, such as croaker in whole condition or as fillets and not in minced meat form.

A simple process of converting trash fishes and fish offal into liquid fish or ensilage has been developed, wherein the enzymes already present in the fish are only made use of for autolysis. The product can be preserved by the addition of an acid for well over a year. This liquid fish was found to be an excellent pig feed as well as a fish feed component.

Prevention of enzymatic blackening known as 'melanosis' in frozen prawns was studied. Survey of conditions leading to black spots and treatments for inhibiting such occurrence were conducted. Proper handling, quick icing, separation on boat from other fishes, clean decks and fish boxes, use of chilled water, etc. were found to be effective in preventing melanosis.

FUTURE PROGRAMME

It is proposed to initiate detailed studies on coastal aquaculture along the Karnataka coast, in addition to taking up detailed investigations on the population dynamics of some of the commercially important finfishes and shellfishes. Hydrographical studies to understand and correlate the factors responsible for fluctuations in fish abundance will be undertaken.

A USDA funded research project on the incidence and characterisation of paralytic toxins from shellfishes of Karnataka is about to be initiated. Two more projects in fishery microbiology, viz. development of tissue culture systems from cultivable fishes and role of bacteriophage in transfer of genetic material between *Vibrio* spp. have been submitted for USDA funding, and it is hoped to initiate investigations on these projects later this year. Work has just been initiated on two research projects funded by Department of Ocean Development of Government of India. They are - 1) Studies on circulation and sedimentation process near the entrances of a few important ports along Karnataka coast and 2) part of the National survey on the occurrence and distribution of pollutants in the Arabian Sea and Bay of Bengal.

Communicated by the Director, College of Fisheries, Mangalore 575002.

The image consists of a dense, repeating pattern of the text "1942-1982" in a bold, sans-serif font. The text is tilted diagonally, running from the bottom-left towards the top-right. The pattern is very tight, with the text overlapping significantly, creating a textured, almost abstract effect. The color is a dark, slightly grainy black on a light background.