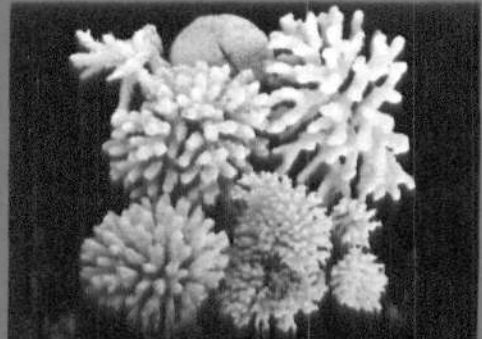
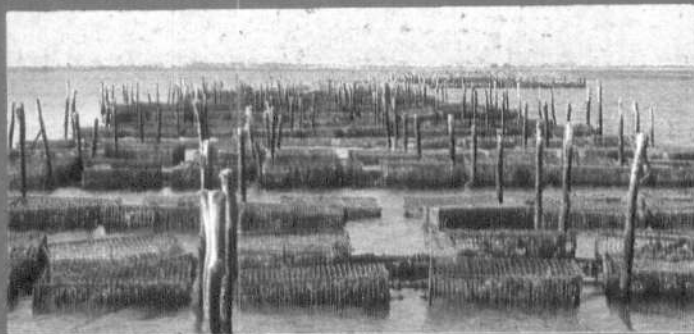
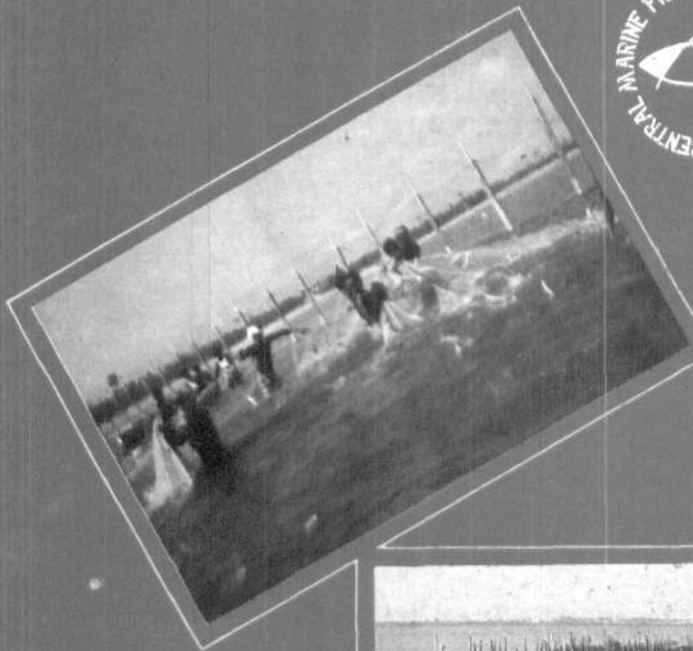


# CMFRI

MARINE FISHERIES RESEARCH IN INDIA



केन्द्रीय समुद्रीय मत्स्यकीय अनुसंधान संस्था  
कोचीन

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE  
COCHIN

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

# केन्द्रीय समुद्रीय मत्स्यकीय अनुसंधान संस्था

कोचिन - 682031

## भारतीय कृषि अनुसंधान परिषद

सन् 1947 में केन्द्रीय समुद्र मत्स्य अनुसंधान संस्था की स्थापना हुई। इसका मुख्य कार्यालय कोचिन में है। संस्था के अधीन मण्डपम कैंप में एक प्रादेशिक केन्द्र तथा वेरावल, थंबई, कारवार, मांगलोर, कालिकट, विधिजम, टटिकोरिन, मद्रास, काकिनाडा, बाल्टियर और मिनिकोय में (लक्षद्वीप) अनुसंधान केन्द्र भी हैं। इसके अलावा पूर्वी-पश्चिमी तटों में स्थित 28 क्षेत्रीय केन्द्रों से भी मत्स्यकी संपदा से संबंधित जानकारी इकट्ठा करती है।

लक्ष्य:-

अनुसंधान द्वारा शोषित समुद्र मत्स्य की निर्धारण एवं मोनिटरिंग करके युक्त शोषित एवं परिरक्षणीय बना देना,

अनन्य आर्थिक मेखला के अपूर्ण शोषित एवं अशोषित समुद्र मत्स्यकी संपदा का निर्धारण

मत्स्यन पौतों के उपयोग करने से होनेवाला पर्यावरण परिवर्तन के कारण समुद्री मत्स्यकी संपदा में उतार - चढ़ाव के बारे में समझना

खुले समुद्र में फिनफिश और सीपी केलिए योग्य तकनीकियों का विकास करना और इससे समुद्र मत्स्यकी उत्पादन बढ़ाना और

तकनालजी का हस्तांतरण, स्नातकोत्तर शिक्षा तथा लघु अवधि के विगेष प्रशिक्षण कार्य चलाना

फ्रेम शोध कार्य

संस्था के मुख्यालय, क्षेत्रीय केन्द्र तथा अनुसंधान केन्द्रों में वैज्ञानिक और तकनीकी कर्मचारियों द्वारा संस्थान के

आठ गवेषण विभाग के अधीन देशीय एवं प्रादेशिक अनुसंधान कार्य करते हैं। संस्था के अंतर अंतर्विभागीय और अन्य एजेन्सियों के सहयोग से अंतर्संस्थानीय योजना भी चल रहा है।

संस्था के गवेषण विभाग नीचे दिये गये हैं :

मत्स्य संपदाओं की गणना विभाग

बेलापवर्ती मत्स्यकी विभाग

डेमेर्सल मत्स्यकी विभाग

क्रस्टेशियन मत्स्यकी विभाग

मलस्कन मत्स्यकी विभाग

मत्स्यकी पर्यावरण मेनजमेंट विभाग

शरीर विज्ञान, पोषकत्व और रोगविज्ञान विभाग

विस्तार एवं मत्स्यकी अर्थ विज्ञान विभाग

उपर्युक्त विभागों द्वारा संस्था के अनुमोदित अनुसंधान परियोजनाओं के कार्यान्वयन होते हैं। उसके समाप्ती, अनुवर्ती, अद्यतन तथा नए परियोजनाओं को समाविष्ट करने के लिए सामयिक समीक्षा भी करते हैं।

ग्रंथालय एवं प्रलेख विभाग एक सेवा विभाग है।

संस्था के मुख्यालय में विविध विभागों केलिए सुसज्जित प्रयोगशालायें और अनुसंधान केन्द्रों में कैचर मत्स्यकी एवं समुद्री संवर्धन आदि के अनुसंधान केलिए आवश्यक प्रयोगशालायें हैं। मण्डपम कैंप में स्थित प्रादेशिक केन्द्र में निजी प्रयोगशालायें, ग्रंथशाला, संग्रहालय और समुद्र जलजीव भी हैं।

अनन्य आधिक मेखला में पोतों के जरिए शोधकार्य करने के लिए संस्था के निजी अनुसंधान पोत - आर. वी. स्किपजक है। यह समुद्र विज्ञान संबंधी कार्यकलाप के लिए सुसज्जित 32.6 मी. पोत है। इसके अतिरिक्त संस्था के 13.4 मी. के कटामरैन श्रृंगला के 12 छोटे पोत (बोट) भी हैं।

एफ ओ. आर. वी. सागर संपदा समुद्र विकास विभाग के मत्स्यकी एवं सागर विज्ञान संबंधी अनुसंधान पोत है। इसमें मत्स्यकी, समुद्रविज्ञान और मेटेोरियो-लजिकल अनुसंधान के लिए अनिवार्य सभी सुविधाएँ उपलब्ध हैं। इस जलयान के वैज्ञानिक कार्यकलापों का प्रबन्धक सी. एम. एफ. आर. ऐ. है। एक देशीय सुविधा होने के नाते सी. एम. एफ. आर. ऐ. तथा अन्य संगठनाओं द्वारा इस जलयान के जरिए अनुसंधान कार्य कर रहे हैं।

इस संस्था में स्थापित फार्मों तथा हैचरियाँ नीचे दिये गये हैं।

झींगे हैचरी प्रयोगशाला, त्रारक्कल, कोचिन।

सीपी हैचरी, टूटिकोरिन

मत्स्यकी संवर्धन फार्म, टूटिकोरिन

लैगून फार्म, मण्डपम कैप

सीपी मत्स्यकी प्रजनन प्रयोगशाला, कोवलम (मद्रास के निकट)

खुले समुद्र चाटी संवर्धन - टूटिकोरिन, कालिकट विधिजम

पेन और केज संवर्धन, मण्डपम कैप

#### समय क्रियाकलाप और उपलब्धियाँ

संस्था समुद्री कैप्चरे मत्स्यकी के शोषित संपदा के मानिट्रिंग और स्टाक निर्धारण, अपूर्ण शोषित के सर्वेक्षण और निर्धारण और देश के अनन्य मेखला के अशोषित एवं नए संपदाओं के सर्वेक्षण आदि में संस्था अधिक ध्यान दिया है। इसके फलस्वरूप विविध समुद्रवर्ती राज्यों और संघ राज्य क्षेत्रों के समुद्र मत्स्यकी उत्पादन की प्राक्कलन बहुप्रक्रम विभागीय सैम्पल के रूप में बना गया है। यह सूचना राष्ट्रीय समुद्र मत्स्यकी संपदा डाटा केन्द्र से प्राप्त है। मत्स्य जीवन की विविध दशा को ठीक प्रकार समझने

के लिए मत्स्य समुद्र विज्ञान और पर्यावरण मानेजमेंट कार्य सूचना संपदा पर्यावरण से संबन्धित है। मत्स्यकी की पूर्वानुमान, सुसंगत डाटा के अनुसार किया जाता है। मत्स्यन क्षेत्र की नक्शा संपदा डाटा और क्षेत्र स्थिति में सुगम बना दिया है। मत्स्यकी की रिमोट सेनासिंग जैसे सीमान्त क्षेत्रीय अनुसंधान कार्य में भी संस्था काम करता है।

सन् 1970 के आरंभ में संस्था में समुद्री संवर्धन की शोध कार्य शुरू हुई और झींगे का संवर्धन, खाद्य शक्ति संवर्धन, मसल संवर्धन, फिनफिश संवर्धन और समुद्र शैवाल संवर्धन आदि के लिए स्थिर प्राद्योगिकी स्थापित की। इन प्राद्योगियों का परीक्षण कर्षकों के फार्म तथा पाइलट परियोजनाओं के जरिए किया गया। वैज्ञानिक तकनालजी द्वारा संवर्धित झींगे का उत्पादन दर प्रति हेक्टर प्रति फसल 1600 कि. ग्रा. हो गया है। संवर्धित मुक्तों के उत्पादन के लिए प्रयुक्त भारतीय प्राद्योगिकी भारत में प्रथम बार व्यवसायिक मुक्ता संवर्धन परियोजना की स्थापना के लिए सहायक हुआ। राफ्ट संवर्धन द्वारा उत्पादित संवर्धित मुक्ता के उत्पादन दर 60 से 70 प्रतिशत था। खुले समुद्र में मसल का उत्पादन दर 10-15 है। शक्ति फार्मिंग प्रतिवर्ष प्रति हेक्टर क्षेत्र में 150 टन उत्पादन दिखाया।

शरीर विज्ञान, आनुवंशिक प्रजनन, पोषाहार तथा रोगविज्ञान आदि में किये गये शोध कार्य ज्ञान के सोभान्त, गुण का समुन्नति और अधिकतम उत्पादन आदि की ओर प्रकाश डाला है।

ऐ. सी. ए. आर. / एफ. ए. ओ. / यु. एन. डी. पी. के प्रायोजित समुद्री संवर्धन के उच्च शिक्षा कोचिन विश्व विद्यालय के सहयोग से कराया जाता है। इसमें स्नातकोत्तर शिक्षा, समुद्री संवर्धन में शोधकार्य आदि कार्यकलाप होते हैं। एम. एस. सी. और पीएच. डी की उपाधि कोचिन विश्वविद्यालय देता है।

योजना, विकास, मानेजमेंट तथा संरक्षण आदि के लिए मत्स्यकी संपदा सूचना संस्था में प्राप्त है। विविध माध्यम सरणि - जैसे परामर्श / प्रशिक्षण / समर - इन्स्टिट्यूट / "प्रयोगशाला से कृषि क्षेत्र तक", प्रशिक्षकों के प्रशिक्षण केन्द्र और कृषि विज्ञान केन्द्र (फार्म विज्ञान केन्द्र) आदि से संस्था में साबित विविध तकनालजी, सभी मत्स्यकी से संबन्धित लोगों को हस्तांतरित करने के लिए प्राप्त है।

## MARINE FISHERIES RESEARCH IN INDIA

### Historical background

Until the 1940s the Government of India did not have any direct interest in the fisheries of the country except for the enactment of the Indian Fisheries Act of 1897. Although Fisheries Departments such as the one at Madras were started by the Provincial Governments in the beginning of this century, these Departments were mainly revenue oriented and fisheries remained as a deferred subject at the Central Government level. However, faunistic surveys on fishes carried out by the naturalists under the British Government resulted in monumental work such as "The Fishes of India" by Sir Francis Day which considerably added to our knowledge on marine and freshwater fishes.

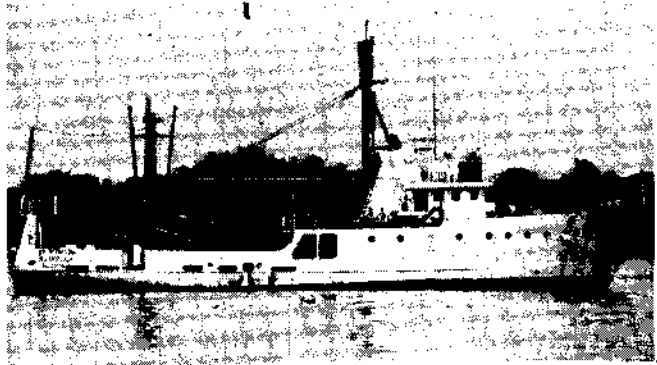
During the Second World War and in the post-war years, the general food scarcity and the lack of adequate supplies of protein rich sea food prompted the Government of India to take necessary steps for the research, development and conservation of the fishery resources of the country. As part of the post-war reconstruction and development programme taken up in the early forties the **Central Marine Fisheries Research Institute** was started on 3rd February 1947 with temporary Headquarters at Madras which was later shifted to Mandapam Camp in 1949.

### Foundations of organised marine fisheries research

The Institute was directly under the control of Ministry of Agriculture and Irrigation, Government of India, until October 1967 when the Administrative control of the Institute was transferred to the Indian Council of Agricultural Research. In 1970, the headquarters of the Institute was shifted from Mandapam Camp to Cochin. The different laboratories and administrative sections at Cochin which were housed in rented buildings since then, moved into the Institute's permanent laboratory cum administrative buildings in February 1986.

### Objectives

During the first two decades of its growth the primary objectives of the Institute have been : to conduct investigations which would lead to estimation and conservation of marine fishery resources of the country, to gather detailed information on the individual species of fish which constitute chief fisheries of the country, their potential, rational exploitation and conservation and also to study such environmental factors as are likely to influence the nature and magnitude of these fisheries. As these objectives were getting fulfilled to certain extent and as the national priorities in the fisheries sector were undergoing re-orientation since the early 70s with the emphasis on mariculture and exploitation of the resources of the Exclusive Economic Zone, the basic objectives underwent modifications to cater to the needs of the industry and development agencies.



R. V. Skipjack

The objectives of the Institute during the VIth Plan period were to conduct short-term and long-term multidisciplinary researches on the marine capture and culture fisheries of the country in order to provide RESEARCH support for the rational exploitation, conservation and management of marine and brackishwater resources for stepping up production from the coastal water areas and the Exclusive Economic Zone and DEVELOPMENT support for growth with stability of the industrial artisanal and culture fisheries through transfer of technology, dissemination of information, education, training and extension.

## THE INSTITUTE'S SET-UP

The Director of the Institute is overall incharge of Research management and Administration. He is assisted by the Heads of Divisions, Administrative and Accounts Officers and also by the different sections of the Institute. The Director is responsible to the Director-General, Indian Council of Agricultural Research which provides the finances for the functioning of the Institute.

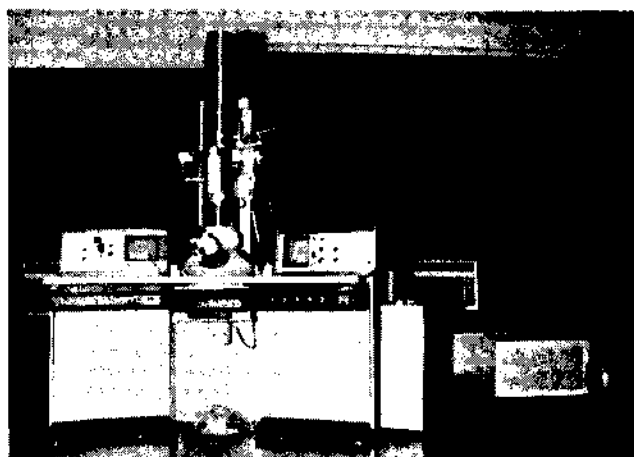
Besides the Headquarters at Cochin, the Institute has at present a Regional Centre at Mandapam Camp and 11 Research Centres at Veraval, Bombay, Karwar, Mangalore, Calicut, Vizhinjam, Tuticorin, Madras, Kakinada, Waltair and Minicoy. Smaller establishments known as Field Centres are located at 28 Centres along the coasts of India. The Research Centres at Bombay, Calicut, Madras and Waltair are proposed to be upgraded as Regional Centres. The Institute has also established field experimental laboratories at Narakkal (near Cochin), Kovalam (near Madras) and Veppalodai (near Tuticorin).

### Growth in organisational structure and facilities

In keeping with the re-oriented objectives and the need for implementation of the various programmes of the Institute the Scientific Divisions of the Institute increased from 3 to 5 in 1975 and from 5 to 9 in 1982. The main functions of the existing 9 Divisions of the Institute are as follows:

The **Fishery Resources Assessment Division** looks after the estimation of All India marine fish production, production means and effort, conducting periodical frame surveys and the running of the National Marine Living Resources Data Centre (NMLRDC). Relevant economic aspects of marine capture fisheries and mariculture, socio-economic impact studies and all aspects of marine fisheries extension are tackled by the (ii) **Fishery Economics and Extension Division**. The major functions of the Divisions of (iii) **Pelagic Fisheries**, (iv) **Demersal Fisheries**, (v) **Crustacean**

**Fisheries** and (vi) **Molluscan Fisheries** are to monitor the characteristics of the respective commercially exploited resources, their stock assessment, management and conservation measures and the mariculture of fin fishes and shell fishes. The (vii) **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 (viii) **Physiology, Nutrition and Pathology Division**. The (ix) **Library and Documentation Division** looks after book and journal procurement, reference service, reprography and printing of Institute's journal and other publications.



Transmission cum Scanning Electron Microscope

### Research facilities

**Laboratories :** The four storeyed laboratory-cum-administrative building of the head quarters at Cochin houses well equipped laboratories of different Divisions handling various research problems in capture fisheries, mariculture and related subjects. Common facilities include Transmission-cum-Scanning Electron Microscope, Atomic Absorption Spectrophotometer, Amino Acid Analyser, radio isotope laboratory, etc. Computer facility will be added shortly.

The Regional Centre at Mandapam Camp has a large campus with permanent laboratories. All the Research Centres have essential laboratory facilities for fishery work.

**Research Vessels :** The Institute's own research vessel R V *Skipjack* (OAL:32.6m) is equipped for bottom and midwater trawling, purse seining and oceanographic work in the EEZ.

FORV **Sagar Sampada** is a fishery and oceanographic research vessel owned by the Department of Ocean Development, Government of India. Scientific programmes of this national facility are managed by CMFRI as the nodal agency. *Sagar Sampada* (OAL:71.5m) is a modern research vessel with sophisticated facilities for fishery, oceanographic and meteorological research.

**Cadalmin I to XII:** This series of research boats are of OAL 13.4m and are equipped for inshore fishery work and they are based at headquarters and different research centres of the Institute.

**Mobile Laboratory :** The Institute has a well equipped mobile laboratory for carrying out on-the spot field investigations.

**Mariculture farm and hatcheries:** The Institute has the following farm and hatchery facilities:

Prawn hatchery at Narrakkal  
Shellfish hatchery at Tuticorin  
Finfish culture farm at Tuticorin

Lagoon farm at Mandapam Camp  
Shellfish breeding laboratory at Kovalam, near Madras  
Saltwater farm at Muttucad, near Madras  
Pen and cage culture at Mandapam  
Open sea raft culture at Tuticorin, Calicut and Vizhinjam

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

**Other facilities :** Besides the laboratory and library facilities, the Regional Centre has residential quarters for the staff and has a guest house for visiting scientists. A marine museum houses reference collection of several species of fishes and marine organisms. A running seawater aquarium facilitates studies on live marine fauna.

#### **Manpower at the Institute**

The sanctioned strength of scientific, technical and other staff at the end of VI Plan is as follows:

Scientists	:	238
Technical Staff	:	458
Administrative Staff	:	176
Supporting Staff	:	291
Auxilliary Staff	:	16

## **OVERALL ACHIEVEMENTS OF THE INSTITUTE**

### **CAPTURE FISHERIES**

The major emphasis in the Institute's research efforts is continuing on capture fisheries which account for the bulk of the marine fish production in the country. The main programmes on capture fisheries undertaken by the different Divisions are:

monitoring the resource characteristics, biological studies on commercially important groups, recruitment studies, spawning behaviour, feeding habits and forecasting fisheries on a long-term or short-term basis. Through exploratory surveys and

charting of productive grounds as also the assessment of the stocks, the Institute suggests measures for proper management of our resources in the inshore and offshore regions of the EEZ. The achievements made in capture fisheries can be reviewed as follows:

### **Fishery Resources Assessment**

#### **Scientific system for estimation of fish production**

The Institute has developed a multi-stage stratified random sampling design for the estimation of marine fish landings in the country and for obtaining production at national and state levels and the stock assessment of our multi-species fisheries. The production estimates are regulated with effort expended in terms of manpower deployed. The design developed by the Institute has been recommended by the FAO for adoption by other developing countries.



Indian Oil Sardine

#### **Census of fishermen population and production means**

Information on fishermen population, gears, crafts, employment details, educational standards and infrastructure facilities available in the marine fish landing centres have been collected periodically through frame surveys. The most recent census was conducted in 1980. This census data is widely used by the Central and State Agencies for planning and development purposes.

### **NMLRDC**

The National Marine Living Resources Data Centre functioning at the Institute has been recognised by the Planning Commission as the repository of all fishery resources data and the Centre is being developed further with computer facilities for codification and dissemination of data.

#### **Assessment of fish stocks**

Based on the exploited data collected in the past years the Institute has been able to assess the stock of a number of important groups such as prawns, tunas, catfish and cephalopods.

#### **Pelagic Fisheries**

##### **Potential of pelagic stocks**

Through monitoring of the resources from the research centres and through intensive exploratory studies utilising the Government of India vessels, the Pelagic Fisheries Division has been able to provide information on the nature and extent of distribution of the pelagic resources in the inshore regions and in the regions beyond the presently fished grounds. These investigations have brought to light the high potential for resources such as anchovies, ribbonfishes, horse-mackerel and mesopelagic fishes on the continental shelf and slope. Participating in the Indo-Polish Industrial Fisheries survey by M. V. MURAENA valuable information on the distribution and abundance of prom-frets, horse-mackerel and ribbonfish along the northwest coast have been collected. Stock assessment studies on oil-sardine, mackerel and anchovies have indicated high potential and the possibilities of increasing production from these stocks.

##### **Impact of changing pattern in exploitation**

Consequent on the large scale introduction of purse-seiners in Karnataka and on limited scale in Kerala a detailed study was initiated to assess its impact on the artisanal fishery. The studies in Kerala have indicated

that there is no tangible direct impact of purse-seining on the artisanal fishery for oil-sardine at the present level of exploitation. The tuna resources of the shelf waters and oceanic regions have been studied in detail and the extent of the distribution, potential resources and management strategies have been brought to light.

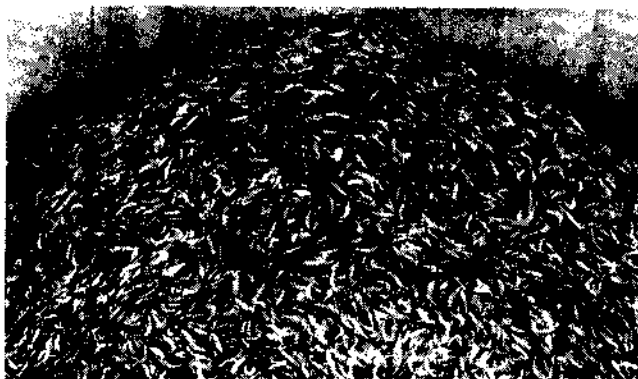
#### **Conservation of Bombay duck resources**

The Bombay-duck is an important major fishery in the northwest coast. Continued studies on the stock of this species has revealed that the present level of exploitation is close to the maximum sustainable yield and any further expansion in the fishery would result in over-exploitation of the stocks. However, higher sustainable yield is possible by increasing the size at capture.

#### **Demersal Fisheries**

##### **Charting of exploited grounds**

By frequently participating in the exploratory surveys conducted by the Government of India vessels, this Division has charted out of productive fishing grounds upto 50m depth and the extent of resources



Bumper catch of prawns

of common demersal fishes such as ghol, dara, karkara, koth and wam have been delineated for the northwest coast. Similarly the resource characteristics of catfishes, nemipterids and their stocks have also been assessed.

#### **Potential of ground fish resources**

Along southwest coast of India valuable information on deep sea prawns and lobsters occurring in the shelf edge and slope and the enormous potential of bathypelagic



Deep sea prawn  
(*Heterocarpus woodmasoni*)

fish complex has been collected. With the rapidly increasing number of small mechanised fishing crafts in recent years the inshore fisheries are subjected to heavy fishing pressure and many of the demersal resources have shown that their stocks have been indiscriminately removed since the trawling gear is mainly for the small sized shrimp. The Institute has developed suitable management strategies for the diversification of the fishing effort to underfished areas.

#### **Crustacean Fisheries**

##### **Taxonomy and biology of Indian prawns**

The steady growth in the export of marine prawns and the consequent introduction of large number of small mechanised boats for prawn fishing necessitated a concerted effort by the Institute to study the prawn fisheries on an all India basis and as a result, a wealth of information has been collected on the taxonomy and biological aspects of several species of Indian prawns. Their life cycle and juvenile phase in brackishwater environment have also been studied in detail. These studies were necessary for understanding the fluctuations in the marine prawn fishery.



### Stock assessment and management advice

In the recent years detailed stock assessment of important prawn species has been made realising the fact that there has been some economic over-fishing in certain sectors of our coast. The Institute has shown that increasing the fishing effort in the presently fished areas is not likely to increase the prawn catch from most of the centres. Stock assessment studies carried out on *Parapenaeopsis stylifera* and *Metapenaeus dobsoni*. have indicated that in the case of *P. stylifera* differential fishing pressure for males and females would result in favourable recruitment of the species into the fishery. While this was not the case with regard to *M. dobsoni*.

### Unexploited new resources

Through exploratory surveys detailed analysis of the deep sea prawn resources in the depth zone of 100-450m has been made and a total of 22 species of prawns were observed in the catches of which 5 species of pandalids, 2 species of aristeids, 2 species of solenocerids and 4 species of penaeids were found to occur in commercial quantities. The potential deep-sea prawns that could be commercially exploited from the Quilon Bank and off Ponnani has been estimated to be about 5300 tonnes from a productive area of about 5000 sq.km.

### Migration of prawns

Intensive tagging programme on prawns has revealed that the white prawn *Penaeus indicus* migrates from south-west coast to the east coast following the coastal currents. Drift bottle experiments conducted to study the coastal currents which aid in the migration of prawns have indicated that the stocks are capable of migrating even to far off distances such as the east coast of Africa.

### Molluscan Fisheries

#### Surveys of molluscan resources

Through resources surveys, an inventory of molluscan resources such as clams, oysters and mussels has been made covering the coasts of India including Andaman & Nicobar Islands. The clam resources of the estuaries in Karnataka and Kerala have been investigated in detail in the context of spurt in the export of clams including baby clams. Such resources surveys have also been carried out on the green mussel and brown mussel along the west coast and blood clam and windowpane oyster especially in the Kakinada Bay. The potential for these resources has been estimated with a view to increasing production and proper management.



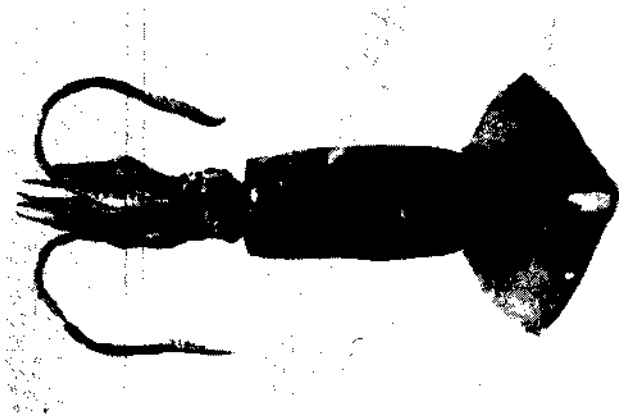
FORV Sagar Sampada

### **Underwater surveys of pearl and chank beds**

Pearl oyster and chanks are important resources in the Gulf of Mannar and the south-west coast. The scientists at the Tuticorin Research Centre have been regularly carrying out underwater surveys using SCUBA equipments to assess the population of pearl oysters and chanks in the natural beds. These surveys help in predicting the pearl and chank fisheries in the region.

### **Squids and cuttlefishes**

The commercially important cephalopods comprising the squids, cuttlefishes and octopus have assumed great importance in the fishery in view of the potential for export. Besides the resources available on the continental shelf exploratory surveys have indicated much concentration of cephalopods in oceanic waters. Resource characteristics and stock assessment of most of the commercially important species of Loligo and Sepia have been made.



Oceanic squid

### **Fishery Environment Management**

#### **Oceanographic features in relation to fisheries**

The study of fishery related environmental factors have received considerable attention since the beginning of the Institute. Initially hydrography and plankton production in inshore waters were studied with meagre facilities. Since the early 60s through participation in research and exploratory cruises

the Institute has been able to intensively study the oceanographic features such as coastal upwelling, mixing of water masses, and circulation in neritic waters. As a result fluctuations in the major fisheries of the inshore area were understood.

#### **Primary productivity of the seas**

Pioneering studies on the productivity of the seas around India were made using radioactive C<sup>14</sup> technique. The rates of primary production were computed to estimate potential harvest that could be realised from the shelf area along the east and west coast.

#### **Use of space technology**

In recent years space technology such as remote sensing and interpretation of satellite imageries has been utilised for evaluating the productivity of the waters in relation to the fisheries potential.

#### **Other fishery related environmental factors**

Other important achievements of the Division have been in the following areas:

Secondary production and its relationship to the distribution of fishes in the EEZ; quantitative and qualitative abundance of fish eggs and larvae on the west and east coasts of India; distribution of the Antarctic krill; isolation and mass culture of uni-cellular algae for hatchery development of larvae; ecology of mangrove areas and their influence on the fishery resources; coral resources and behaviour of reef fishes; marine pollution monitoring with reference to heavy metals, pesticides and industrial effluents; formation and environmental characteristics of the mud banks of Kerala; screening of bioactive agents from a number of marine animals and plants.

#### **Conservation of Marine Resources**

The inshore regions of our seas have been exploited over the years continuously for various demersal and pelagic resources

both by traditional and mechanised sectors. The data collected by the Institute over a long period indicate that the production from the presently exploited area has reached a plateau in recent years. Some resources like those of prawns in certain pockets have of late come under heavy fishing pressure, showing declining trends. Due to industrialisation and man-made changes in the coastal areas the marine living resources are subjected to considerable environmental stress and this calls for close watch on maintaining the stability of the resources and improving their capacity to regenerate.

Considerable damage to ecosystems in certain regions has resulted in depletion of resources such as corals and coral reefs on account of continuous indiscriminate exploitation and also due to changes brought about by development projects along the coastline. Certain marine mammals and other animals have been affected in one way or other by these developments. Specific reference may be made to the possible effects on the nesting grounds of sea-turtles, destruction of corals in the island ecosystems and habitat destruction of the sea-cow (dugong).

Because of the concern for maintenance of the aquatic environment in a healthy state, which in turn will provide suitable conditions for growth and development of different resources, the Institute is involved in a number of conservation oriented research programmes to provide necessary technical advice for formulating guidelines for conservation of marine living resources of the country.

#### Achievements of FORV Sagar Sampada

As already indicated, CMFRI has been identified as the nodal organisation by the ICAR to manage scientific programmes of this research vessel owned by the Department of Ocean Development. The vessel is fully equipped for collection of marine fishery resources data and the related

oceanographic and meteorological parameters in the EEZ and beyond. The vessel commenced its regular cruises from January 1985 and it has completed 20 cruises upto September 1986 spending 396 days at sea and covering a track distance of 105,250 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. By participating regularly in the cruises of this vessel, the scientists of the Institute have obtained a great deal of information on various fishery resources and related environmental parameters of the EEZ.

The highlights of the research data collected on board the vessel are as follows:

For the first time an authentic record of the occurrence of the large deep sea prawn, *Plesiopenaeus edwardsianus* at 870m depth off Trivandrum was made. The vessel was responsible for the location of spawning grounds for several species of fishes over the Angria Bank. Spawning and nursery grounds of ribbon fishes off Veraval and nursery ground for young *Lactarius* at 100m depth off Okha were located. Extensive swarms of oceanic crabs along the SW coast during SW monsoon period have been observed and large tuna shoals have been located during post-monsoon months off the 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 period. During the months January-February the presence of large quantities of lantern fishes in the lower Bay of Bengal and equatorial region was identified. The phenomenon of seasonal concentration of white baits in the Gulf of Mannar during SW monsoon was confirmed. The vessel has been able to locate large concentrations of trumpet fishes at 200m depth and high concentration of threadfin bream, cuttlefishes and squids in the Wadge bank during August-September period. Along the south east coast large concentration of berried oceanic crabs

were observed during January-February period.

## Fishery Economics and Extension

### **Economics of production**

With increasing emphasis on the utilization of the resources of the EEZ and the formulation of integrated rural development programmes in mariculture, the whole range of economics of production of both capture and culture fisheries and also socio-economics of fisher folk has gained considerable importance. The Fishery Economics and Extension Division created at the Institute in 1982 has carried out several investigations on the economics of capture fishery operations at selected centres in Karnataka and Kerala. These investigations have helped the Institute to recommend measures for overcoming economic impacts suffered by traditional fishermen consequent on the introduction of purse-seiners in the inshore region.



Data collection on socio-economic aspects

### **Case studies on socio-economic aspects**

Through 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 petty money lenders. The Institute has also conducted studies on the economics of different types of fishing units, marketing aspects such as price spread at various levels and also the role of women in small scale fisheries activities. Projects aimed at evaluation of economic returns in mariculture operations have also been undertaken in recent years.



Laboratory for physiology and nutrition experiments, Cochin

## Physiology, Nutrition and Pathology

Since 1982, the Institute took up appropriate multi-disciplinary programmes on Physiology, Nutrition and Pathology of shellfishes and finfishes which are complementary or supplementary to the ongoing research programmes in mariculture. The current programmes are on basic and problem oriented research such as respiratory metabolism and energy utilization in lobster; 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

### Immediate need for augmenting production through mariculture

With the world trend in marine fish catches levelling off in the face of increasing demand, attention is being turned to culture fisheries to augment production. Although there is considerable scope for exploitation of the potential resources in the EEZ of our country it requires building up of capital intensive infrastructure and hence the need for immediate attention on culture fisheries for future development.

### Development of proven technologies in Mariculture

#### (i) Prawn culture

The Institute took up experimental studies on various aspects of mariculture since early seventies and within a short time, rapid strides have been made in the inter-disciplinary projects on mariculture. Significant success has been achieved in the breeding of more than 8 species of



Prawn hatchery at Narakkal

marine penaeid prawns, domestication of the commercially most important species the white prawn, *Penaeus indicus*, larval rearing and seed production techniques,

live-feed culture and formulation of compounded feeds. Employing scientific methods in the field culture of prawns, using laboratory reared post-larvae for stocking, a production rate upto 602kg/ha/54 days has been obtained. Induced breeding of crustaceans through eye-stalk ablation has led to development of hatchery techniques.

The Institute provides technical assistance to prawn farmers and development agencies for accelerating the programmes in prawn culture. Recently at Tuticorin, the scientists helped a private prawn farmer to culture prawns in salt pan areas and a record production of 600 kg/0.5 ha was obtained in a period of 6 months.

#### (ii) Indigenous technology for pearl culture

Indigenous development of pearl culture technology has led to establishment of a commercial pearl culture project in India for the first time. Cultured pearls are produced through raft culture with a production rate of 60-70% of nucleus implanted



Shell fish hatchery at Tuticorin

oysters in 3 to 24 months. Hatchery technology for production of pearl oyster spat has been developed to make pearl production programme independent of fluctuations in natural stocks.

### (iii) Mariculture of other species

Open sea mussel farming techniques have given high production rates (10-15kg mussel per metre length of rope, equal to 60-70 tonnes/ha). Oyster farming technology has been established to produce 150

tonnes/ha/annum. Both oysters and mussels have been successfully bred in the laboratory. Culture of blood clam Anadara has given production rate of 2.6 tonnes/625m<sup>2</sup>/6months. Seaweed culture has indicated a production of 3.5kg/metre length of rope.

## EDUCATION, TRAINING AND TRANSFER OF TECHNOLOGY

### Education

Although the research programme of the Institute are mostly of an applied nature, basic research on complementary aspects of capture and culture fisheries have been carried out mainly through research scholars and fellows who do post-graduate work. The Institute has been recognised by many Universities as a centre of post-graduate research leading to M.Sc. and Ph.D. degrees. Over 50 scientists of the Institute hold Ph.D. degrees and they have been recognised as guide or supervisors for students working for Ph.D. degree. Scientists also serve as members of Advisory Committees, Panels, Board of Examiners, etc. of many universities.



Laboratory for environmental studies, Cochin



CAS Students

### Centre of Advanced Studies in Mariculture

A Centre of Advanced Studies in Mariculture was established at the Institute as a project sponsored by the ICAR/FAO/UNDP

in 1980. The main objective of the centre is to catalyse research and education in mariculture for augmenting the cadre of personnel to meet research, managerial and executive level of manpower. 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 41 candidates have been awarded the degree between 1980 and November 1985. 17 candidates are undergoing semester courses belonging to the Vth and VIth batch. In the Ph.D. programme 11 scholars have completed the research work and 3 have been awarded Ph.D. degree of the University of Cochin.

Under the Expert Consultancy Programme 12 experts have visited the Centre to advise on various specialised aspects in

Mariculture and more than a dozen scientists of the Institute were trained abroad as Faculty members in identified priority areas. The Centre has also been able to complete 41 short-term and 13 long-term research projects covering different aspects such as physiology, nutrition and pathology especially of cultivable organisms.

### Summer Institutes

Between 1974 and 1985 the Institute has conducted 4 Summer Institutes on identified subject areas such as coastal aquaculture, breeding and rearing of marine prawns, culture of edible molluscs and on hatchery production of prawn seeds and culture of marine prawns. The Summer Institutes provided an opportunity to the participants to learn new technologies developed at the Institute and to discuss problems associated with them.

### Training and transfer of technology

One of the objectives of the Institute is to effect transfer of technology through various training programmes organised regularly at the Institute. Under this programme training is imparted in important areas such as marine prawn culture, pearl culture, edible oyster culture, fishery resources, assessment, underwater diving and use of acoustics in fishery exploratory surveys. The candidates for these trainings are sponsored by maritime State Government Departments, Agricultural Universities, Developmental Agencies such as MPEDA and also those from abroad. During the past 5 years more than 200 personnel have been trained under these training programmes in various disciplines.

### Krishi Vigyan Kendra

The Krishi Vigyan Kendra (KVK) of CMFRI was established at Narakkal in 1976 and has been engaged in giving intensive practical training of durations ranging from 5 to 30 days in prawn and fish farming and related aspects. The KVK is thus devoted to impart need based skill oriented vocational

training to fish farmers and farm women who intend to go for employment. 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 farm. The Kendra has trained so far 4159 persons consisting of 1935 men and 2224 women. Of these 1884 persons belonged to the Scheduled Caste and 7 persons from Scheduled Tribe. Besides the main subject of fisheries the KVK has also conducted short duration courses on Agriculture, Animal Husbandry, Home Science, Health and Hygiene, etc. with the help of specialists drawn from the respective fields. Follow up surveys conducted to assess the impact of the training have revealed that about 30 to 37% of the trainees have taken up employment directly or indirectly connected with prawn and fish farming. The Kendra has been carrying out extension programmes such as Lab-to-Land Programme conducting Science Camps, Krishi mela, film shows besides publication of extension material.



Women trainees of KVK, Narakkal

### Trainers' Training Centre

The Trainers' Training Centre was sanctioned for the Institute in October 1983. Although regular staff have not yet been recruited the TTC has organised with the help of the Scientists of the Institute

training courses on hatchery production of penaeid prawn seeds for the benefit of senior level officers of the Maritime States. Practical training on all aspects of hatchery management including induced breeding, rearing of larvae, culture of live-feed, etc. have been given to the participants.

#### **Lab-to-Land programmes**

As part of the Golden Jubilee Celebrations of the ICAR, Lab-to-Land programmes were organized by the Institute during 1979-80. The proven technologies developed by the Institute on various aspects of mariculture were taken up for a massive transfer to fishermen and small farmers in the coastal area. About 300 families were benefitted by the scheme and they were distributed in the coastal districts of Kerala, Karnataka and Tamil Nadu. The farmers were trained in scientific methods of culturing prawns, fishes, mussels and seaweeds at the respective places where technologies were developed. The ICAR provided critical financial inputs and the scientists rendered technical assistance in the farmer's own field.

#### **Blending sea farming with traditional capture fisheries**

In order to benefit fishermen and their family members whose labour potential

has not been fully utilised an operational research project on Blending sea farming with capture fisheries has been undertaken since 1979 at Kovalam near Madras. Under this project 975 fishermen belonging to 175 families were trained in the methods of mariculture of fishes, prawns and molluscs in such a way that these could be undertaken along with their routine capture fisheries



Farm grown mullets

operations. The project demonstrated the scope for overall improvement of socio-economic conditions of the fishermen in this area. This integrated approach of blending capture fisheries with mariculture is a new concept in marine fisheries sector.

### **LIBRARY, DOCUMENTATION & PUBLICATION**

The Institute has built up steadily one of the most excellent Library facilities with a holding of more than 50,000 books and periodicals. In view of the expanding activities of the Institute and to keep abreast with the latest technologies developed in various fields a separate Division for Library and Documentation has been created in 1982 and the main functions of this Division

are procurement of books and journals, technical processing, circulation, reference assistance to readers, documentation, printing, etc. The Library extends its service to other Institutes, Universities and other organizations.

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 of the Institute as detailed below:

1. *Indian Journal of Fisheries* (33)
2. *CMFRI Bulletins* (35)
3. *CMFRI Special Publications* (27)
4. *CMFRI Newsletters* (30)
5. *Marine Fisheries Information Service* (64)
6. *Annual Scientific Report (1984-85)*

#### BUDGET OF THE INSTITUTE

The details of Plan and Non-Plan expenditure during the VI Plan and budget estimate for the first year of VII Plan are indicated below:

#### VI Five Year Plan

Year	Non-Plan	Plan
1980-81	102,65,009	68,61,072
1981-82	115,00,502	116,35,936
1982-83	133,08,784	185,07,188
1983-84	153,74,835	178,45,262
1984-85	176,11,062	174,01,123

#### VII Five Year Plan

1985-86	262,01,000	175,00,000
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#### LINKAGES WITH OTHER ORGANISATIONS

CMFRI has maintained and developed linkages with several national and international R & D departments and organizations as also Universities for collaborative work in marine fisheries research. Apart from the Institutes and departments under the Government of India, Maritime States, ICAR, MPEDA, the Institute had collabora-

tive programmes involving international bodies such as UNDP, FAO, ICLARM AND SEAFDEC. The Institute has been offering consultancy to various organizations, Institutes, departments and entrepreneurs on matters pertaining to marine capture and culture fisheries.

#### FUTURE PROGRAMMES

Considering the fact that 4 Fishery Institutes under the ICAR have grown in size and have developed several infrastructure facilities and have provided valuable data and information on marine and brackish-water fisheries and in order to avoid duplication of work and to lay stress on certain identified areas, the ICAR has reoriented the objectives of the Fisheries Institutes and during the VII Plan period CMFRI will have the major objectives as follows:

- To conduct research for assessing and monitoring the exploited marine fishery resources leading to rational exploitation and conservation;

- To assess the under-exploited and un-exploited marine fisheries resources of the Exclusive Economic Zone;
- To understand the fluctuations in abundance of marine fisheries resources in relation to changes in the environment by conducting vessel-based programmes;
- To develop suitable mariculture technologies for finfish and shellfish in open-sea to supplement marine fish production; and
- To conduct transfer of technology and post-graduate and specialised short-term training programmes.

For want of adequate sea-going facilities, initially, the Institute had not been able to lay adequate stress on the assessment of offshore and oceanic fisheries resources. At the moment, the Institute is poised to monitor the presently exploited fishing zones and the inshore resources as well as to undertake research programmes for assessing the underexploited, unexploited and new fisheries resources in deep and distant waters with the help of the large vessel *R. V. Skipjack* recently acquired by the Institute and by utilising the facilities available with FORV *Sagar Sampada* whose research programme is planned by the Institute.

Translation of results of research to the fishermen, farmers, industry and the development departments will receive high priority.

It will be the primary concern of the Institute to monitor and maintain the present level of marine fish production, to advise and formulate guidelines for augmenting production from offshore and oceanic areas of the EEZ as well as to bring about further development, refinement and propagation of culture technologies, including training and post-graduate education.

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 genetic resources, seaweed resources, edible oyster production, *beche-de-mer* resources etc. From the conservation point of view the Institute proposes to have schemes for the conservation of the marine mammal, **dugong** and its habitats and also on corals and coral reef resources. The Institute will be rendering advise to maritime States on management of marine fishery resources in detailed manner. Similarly the Institute is already rendering technical advise to State Governments for setting up of hatcheries for prawn seed production. The Institute is planning to have a time bound project with the collaboration of all Fishery Institutes to develop a national strategy for the exploitation and utilization of the fishery resources of the EEZ.

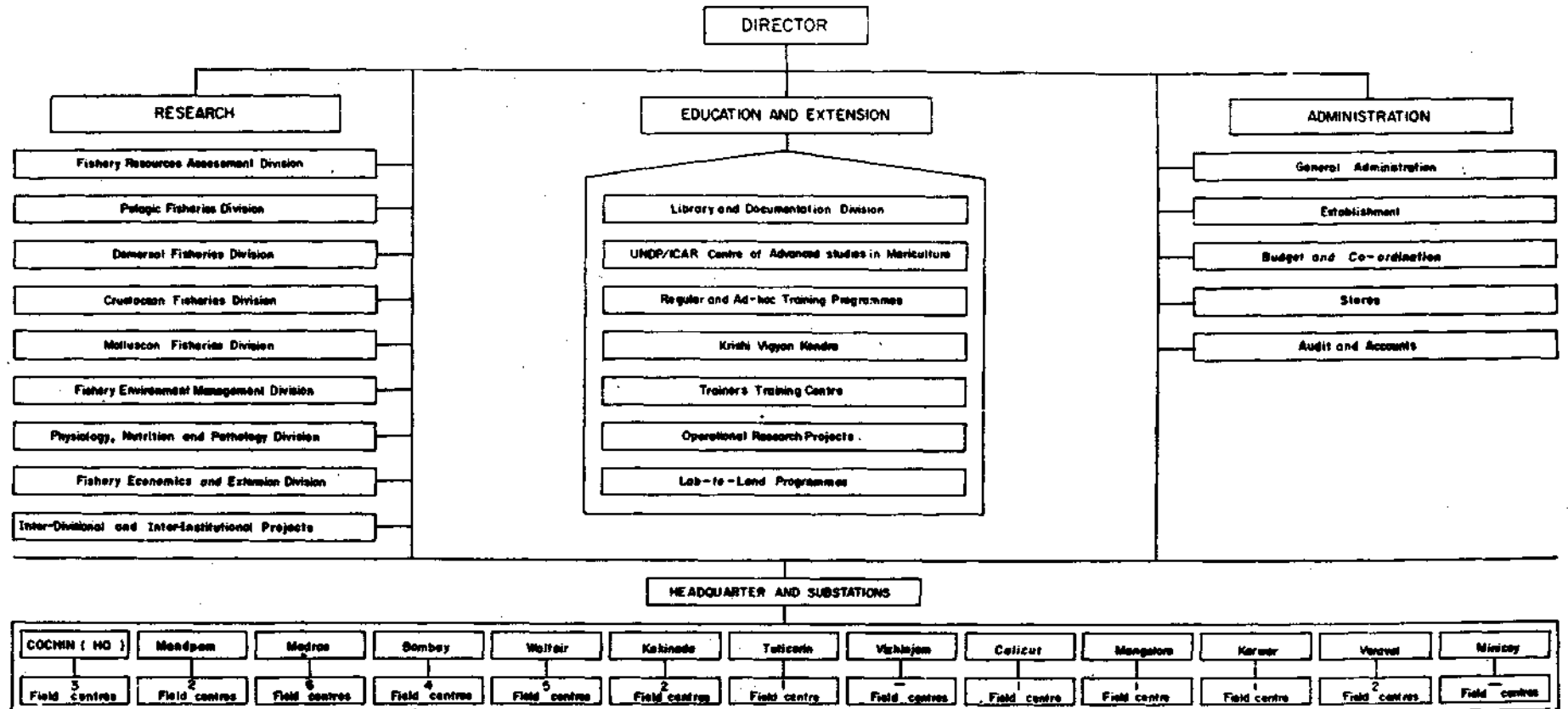
It is hoped that, with the cooperation of all related institutes, organisations and universities in the country, the CMFRI will move into 21st century with a better understanding of the potential, distribution and fluctuations in abundance of the marine fisheries resources for their rational exploitation, conservation and management.



Institute's Library

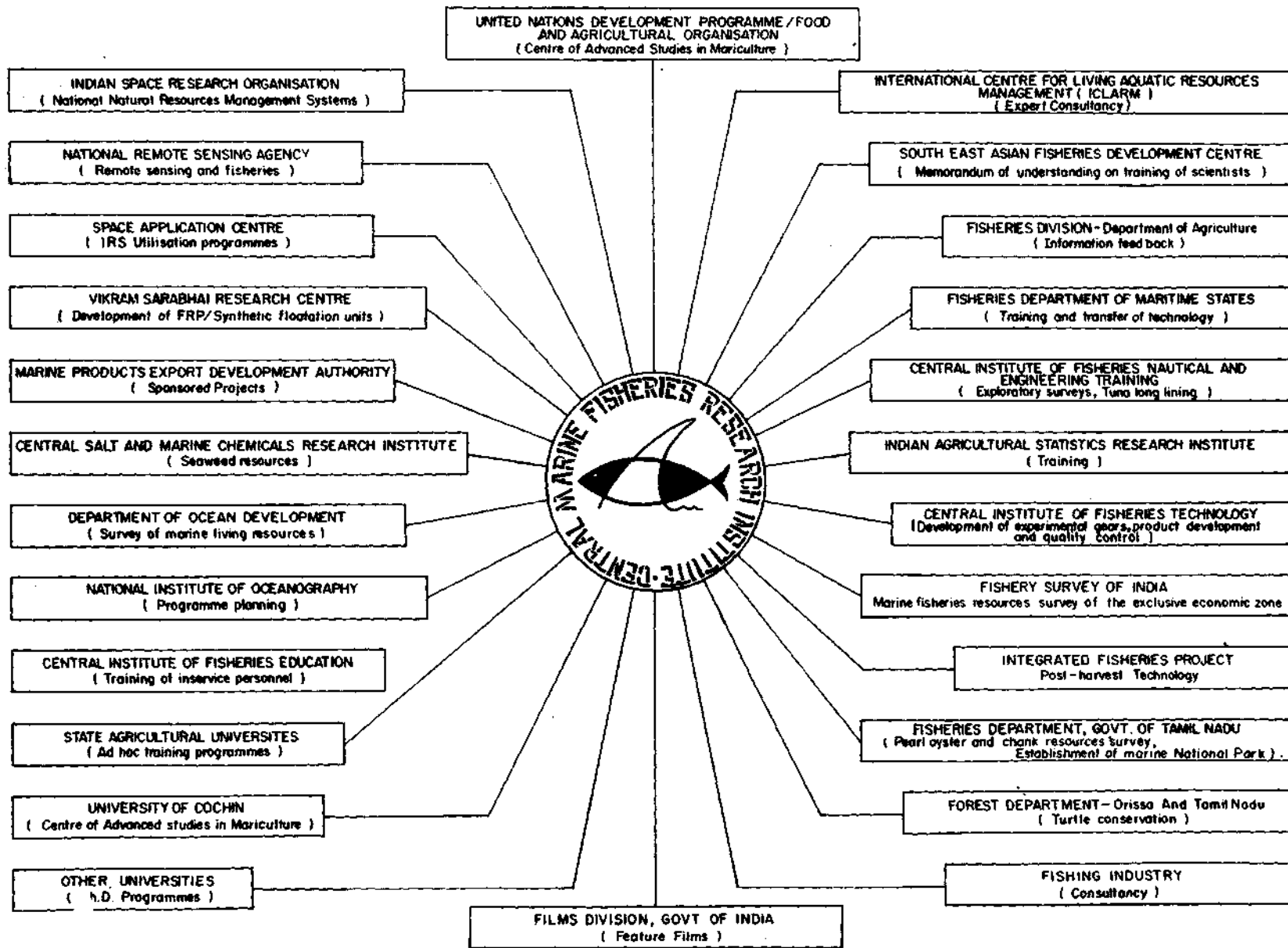
The immediate objectives of the Institute would be to fully utilise the infrastructural facilities available with the Institute at headquarters and other research centres for monitoring the exploited inshore marine fisheries resources leading to rational exploitation and conservation, assess the under-exploited and unexploited marine fisheries resources of the EEZ, understand fluctuations in abundance of marine fisheries resources in relation to changes in the environment by conducting vessel based programmes, development of suitable mariculture technologies for finfish and shellfish production in open sea and conduct transfer of technology programmes and post-graduate education, research and training programmes.

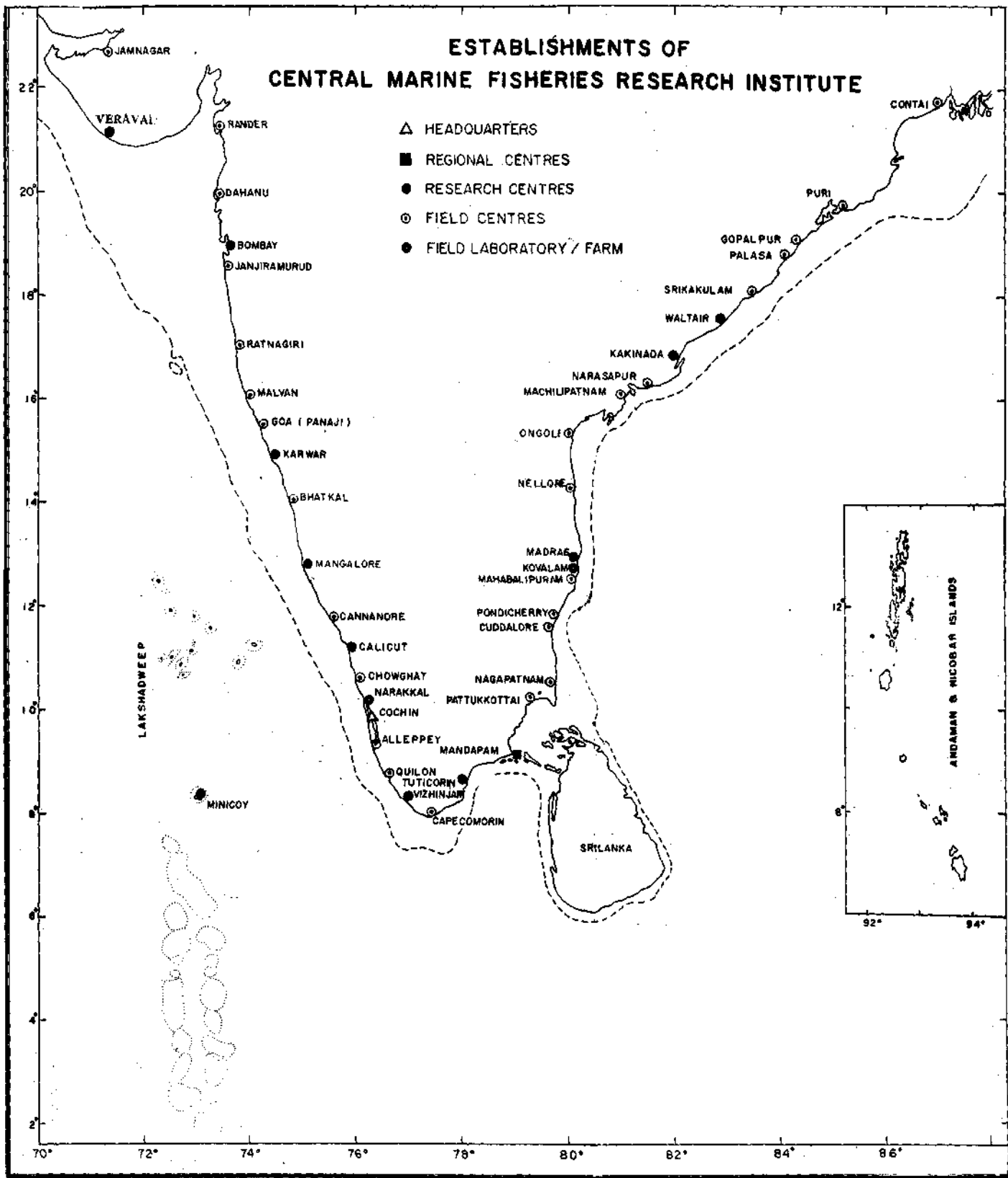
**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE (ICAR)-ORGANISATIONAL CHART**



**CENTRAL MARINE FISHERIES RESEARCH INSTITUTE, COCHIN  
( ICAR )**

**LINKAGES WITH OTHER ORGANISATIONS IN THE ON-GOING RESEARCH PROGRAMMES**





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