


# ICAR-Central Marine Fisheries Research Institute – a historical relook during the last seven decades

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The proposal for establishment of a Central Fisheries Research Institute was first made in 1943 by the late Dr. Baini Prasad, the then Director, Zoological Survey of India, which was endorsed by the subcommittee of the Policy Committee on Agriculture and Fisheries in its 1945 report. Subsequently, on the basis of the "Memorandum on the proposed Fishery Research Institute" prepared by Lt. Col. R.B. Seymour Sewell in 1946, the Central Marine Fisheries Research Institute (CMFRI) was established on 3rd February 1947 by the Government of India under the then Ministry of Food and Agriculture with headquarters at Madras, which was later shifted to Mandapam Camp in 1949 and them to Cochin in 1971. In 1967, the administrative control of CMFRI was transferred to ICAR. Dr. H. Sreenivasa Rao, a doyen of Pelagic fisheries was the first Chief Research Officer, who made to function CMFRI as a premier research establishment to undertake marine fisheries research in the country.

Apart from the Headquarters, the ICAR-CMFRI, country's National Research & Development body in marine fisheries, has 11 Regional Research Centres located respectively at Mandapam Camp, Visakhapatnam, Veraval, Mumbai, Chennai, Calicut, Karwar, Tuticorin, Vizhinjam, Mangalore and Digha in addition to fifteen field centres throughout coastal belt of the country and 2 KVKs, one at Njarakkal, Ernakulum and the other at Kavaratti, Lakshadweep. CMFRI team presently comprises 154 scientists and over 600 other staff working in as many as 10 Research Divisions.

Apart from estimation of marine fish landings, its valuation and taxonomic studies, the research activities of CMFRI are diversified to a variety of niche areas such as sea farming and coastal mariculture, development of hatchery technologies for commercially viable marine

fish species, cage farming, biotechnological applications of marine resources, biodiversity studies, development of sustainable ecosystem management interventions, policy studies and so on. The major mandates of CMFRI are as defined below:

- Monitor and assess the marine fisheries resources of the Exclusive Economic Zone (EEZ) including the impact of climate and anthropogenic activity and develop sustainable fishery management plans.
- Basic and strategic research in mariculture to enhance production.
- Act as a repository of geo-spatial information on marine fishery resources and habitats.
- Consultancy services and human resource development through training, education and extension.

## Growth of CMFRI

### *First Decade (1957-'66)*

Under the leadership of Dr. S. Jones, as the Director, CMFRI devoted its research attention towards the estimation of marine fisheries landings and effort, taxonomy of marine

A bumper catch of ribbon fish landed at Sasoon Dock, Mumbai.

organisms and the bio-economic characteristics of the exploited stocks of finfish and shellfish. One of the major achievements was the development of Stratified Multistage Random Sampling Method (SMRSM) for fish landings and effort estimation.

### *Second Decade (1967-'76)*

During 1967, CMFRI was taken over by the Indian Council of Agricultural Research - ICAR and in 1971, the headquarters of CMFRI was shifted from Mandapam to Kochi, under the leadership of the then Director Dr. S. Z. Qasim. During the early nineteen seventies, CMFRI turned to augmenting production from the sea through mariculture as a pioneering step in the entire South Asian region.

### *Third Decade (1977-'86)*

In the 4th decade, led by Dr.E.G.Silas as the Director, a major part of the research effort was diverted towards sea farming and mariculture

Larval rearing in the laboraory.

and this effort paid rich dividends in the form of viable farm and hatchery technologies.

Centre for Advanced Studies in Mariculture (CAS) was established under UNDP-ICAR Programme which pioneered human resource development in Mariculture Research and Development.

A classroom at the CAS in Mariculture.

Research efforts helped India enter the global tuna fishing scenario.

A major thrust was given on infrastructure development through acquisition of land, buildings, laboratories and research vessels

The CMFRI owned fishing vessel SKIPJACK 3.

for the headquarters, regional and research centres. Multiple scientific research cruises were conducted using FORV *Sagar Sampada*, *Skipjack* and *Cadalmin*.

Sea turtle hatching programme at Kovalam, Madras.

Pioneering research attempt on remote sensing and satellite imaging was done in this decade. Exploration of new areas on conservation and management of mammals and sea turtles was another priority in addition to strengthening research acumen through international collaboration.


Research Vessel CADALMIN for costal reserach.

***Fourth Decade (1987-96)***

The 4th decade navigated by Dr. P.S.B.R. James, witnessed a sustained tempo of marine fisheries research with the infrastructure development. A new thrust was given on technology transfer for marine fisheries resource augmentation. On the mariculture front, commercial bivalve farming became a

Floating raft for the culture of mussels is being made

popular women empowerment programme during this period. CMFRI Head Quarters was shifted to the present building during this period.

***Fifth Decade (1997- '06)***

The 5th decade witnessed the guidance of three Directors Dr. M. Devaraj up to 1999, Dr. V.N. Pillai up to 2000 followed by Prof.Dr.Mohan Joseph Modayil up to 2007 who led the major part of the decade. In the beginning phase of the decade, priority was given for breeding and aquariculture of marine ornamental species. In the later phase of the period of Prof. Modayil, launched multidimensional activities such as modernization of CMFRI

The library at CMFRI Headquarter.

and centres, establishment of modern library as state of the art Digital Repository, Marine

A view of the museum of Marine living resources.

Biodiversity Museum, Multipurpose Hatchery at Mandapam, establishment of two new divisions namely, Mariculture and Marine Biodiversity and initiation of Sea Cage Farming as the hallmarks of the decade. The crowning glory came in the form of CMFRI bagging the Best ICAR Institute Award in 2007.

***Sixth Decade (2007-'17)***

The 6th decade under the leadership of Dr. G. Syda Rao gave emphasis on the Institute's multidisciplinary approach to research in marine capture and culture fisheries which gained recognition as a premier institute comparable to any well-established marine laboratory in the world. Boosting the mariculture through popularization of sea cage farming throughout the Indian coastal belts and breakthroughs in breeding and hatchery production technology of cobia and silver pompano were a couple of major achievements.

***Last part of the decade from 2013 onwards till date***

Under the leadership of the present Director Dr. A. Gopalakrishnan, focussed attention was given for sustaining the marine capture fisheries and promoting mariculture through inter-state collaborative networks. The major hallmarks include the establishment of National Broodbank Facility for Cobia and Pompano, initiation of All-India Network Programme in Mariculture, establishment of Marine Policy Cell and Fish

Onshore mariculture facilities developed at Fisheries Harbour Laboratory of CMFRI, Cochin.

Ageing Laboratory, formulation of National Marine Fisheries Policy, commercialization of nutraceutical products, providing inputs

A view of the cage culture.

to the state governments on Minimum Legal Size, Policy Briefs on Fish Aggregating Devices, Sharks, Sea-cucumber, Sea-horse, light fishing

A view of the fish hatchery at Mandam Regional Centre of CMFRI.

etc., Marine Fisheries Policies for Coastal States, Breeding and Seed Production of Orange Spotted Grouper, Indian Pompano and Pink Ear Sea-breams, International collaborations,

Establishment of GIS Data Base of fish landing centres, securing ISO-Certification, inclusion in the prestigious CITES listed organizations in the country, winning 'Best Annual Report Award' of ICAR 'Swatch Bharath Award', Engagements with regular stakeholder consultancy taken to the new heights through novel initiatives in co-governance, responsible fisheries, gender mainstreaming, enabling farmers to achieve national level recognitions etc. A Research Centre was also established in Digha in West Bengal to address the issues on marine fisheries and mariculture along the North-East coast of India.

## Research Priorities

The Institute's programmes are implemented through ten divisions, at the headquarters and 11 regional/research centres and 16 field centres representing the major ecological provinces of the country.

A bumper trawl catch made by *Cadalmim*.

The CMFRI presently conducts research on characteristics of exploited marine fish stocks, carries out exploratory surveys, assesses the under and unexploited resources, undertakes research in fishery environmental characteristics and ocean-dynamics and socio economic aspects in marine fisheries. Besides, CMFRI is actively engaged in marine biotechnology research especially on genetics, feed and bio prospecting. Realizing the limited potential of the oceanic resources to meet the growing demand from fish-eating population of the country, CMFRI has allocated significant part of its research resources to develop mariculture technologies.

A net work project on mariculture led by the institute presently carries out comprehensive research progammes developing alternative production strategies for the future. Accordingly, considerable research thrust is given to develop hatchery technologies, seed production protocols, and mass rearing techniques of promising species of marine fish.

Recently, CMFRI has embarked on climate change adaptation and mitigation research for the marine fisheries ecosystem that can significantly contribute in readying the sector to minimize the impact of climate change. Based on the findings of the studies, several solutions for climate change adaptation and mitigation have been mooted for proactive action against climate change and to equip the fisher folk to adapt to evolving climate scenarios.

## CMFRI's Major Contributions to the Nation

CMFRI undertakes annual estimation of the marine fishery resources for more than 1200 species covering 1511 fish landing centres on a GIS platform for marine fish stock assessment. The institute maintains a National Marine Fishery Resources Database which is generated based on continuous and perpetual field data collection on marine fishery resources over decades. The Fishery Resources Assessment Division of CMFRI undertakes the Marine Fisheries Census across the maritime states of the country every 5 years to assess the human, capital and infrastructural resources associated with marine fisheries in the country.

In a major development in ensuring security at the sea, the CMFRI has developed a GIS-based database about the marine fish landing centres along the Indian coast. Aimed at ensuring the safety and security of the fishermen at sea, the CMFRI prepared the inventory of all the fish

landing centres in the country, describing their GIS (Geographic Information System) location, types of fishing activity, seasonality of fishing and the extent of fishing operations from each fishing centre. The Institute handed over the database to the Indian Navy in order to make the security measures in coastal regions easier. The database is expected to be a major development towards ensuring safety and security of fishermen and monitoring intrusion into Indian Territorial waters by neighbouring countries.

Cage culture technology, a promising avenue for large scale commercial production of marine food fishes to meet the future demand of fish in the country has been developed and popularized by CMFRI during the past decade. Due importance would be given to popularize the farming technologies developed by conducting demonstrations in the farmers' fields. At a time when capture fisheries production is going through a stagnation stage, the mariculture can be considered as the only option to meet the ever increasing demand for the marine food products. Open sea cage farming method developed by CMFRI is one of the best farming models which could be effectively popularized among the fishermen community in the country.

Integrated Multi-Trophic Aquaculture (IMTA) and mariculture for biodiversity conservation are also the areas which need more focused research. CMFRI has successfully conducted the demonstration of IMTA under participatory mode with a fishermen group by integrating seaweed with cage farming of cobia. It has been proved that in one crop of 45 days the seaweed rafts integrated with cobia cage will give an average yield of 260 kg per raft while the same was 150 kg per raft for the rafts which were not integrated.

The Institute has developed and popularized hatchery production technology for mussel, edible oyster and 12 varieties of marine ornamental fishes for commercial exploitation. In a major breakthrough in mariculture, CMFRI succeeded in captive breeding and successful round the year seed production of five species of finfishes viz., Cobia, Silver pompano, Indian pompano, Pink ear emperor bream and Orange spotted grouper for the first time in the country. Apart from these species, CMFRI is in the process of developing technologies for three more marine species which will boost mariculture activities.

The mariculture sector will address the ever increasing demand for the quality seafood for human consumption and, to some extent, bridge the gap between demand and supply in marine fish production as the amount of wild caught fish remain stagnant for years and scope for increasing prosecution form capture sector is very little. Mariculture can be considered as one of the best alternate livelihood options for the coastal fishermen community.

CMFRI scientists have so far described 255 marine species new to science from various groups of fishes and zooplankton. The researchers at CMFRI have coordinated India's first Marine Stewardship Council (MSC) certification for the short-neck clam fishery in the Ashtamudi Lake, Kerala. 'Choose Wisely' – a sustainability labeling code developed by CMFRI was adopted by the ITC chain of restaurants all over India serving seafood. Research conducted at CMFRI has helped in delineating the scientific reasons behind the recent decline in oil sardine fishery along the south-west coast of India, to support formulation of management guidelines to improve the status of the fishery.

CMFRI has been working in the frontier area of marine bioprospecting/bioactive molecule discovery from seaweeds and developing high value nutraceutical products as dietary supplements and health management. The Institute has developed and commercialized the nutraceutical products CadalminTM Green Algal extract (CadalminTMGAe) and Antidiabetic

extract (CadalminTMADe) as green alternatives to synthetic drugs to combat rheumatic arthritic pains and type-2 diabetes, respectively. CadalminTMAntihypercholesterolemic extract (CadalminTMACe) has been developed from seaweeds to combat dyslipidemia and obesity, and the product is being out-licensed to a pharmaceutical company. The nutrition research team of CMFRI has developed commercialized fish feeds, 'Varna' and 'Varsha' for ornamental fishes.

Studies on climate change impacts on marine fisheries, carried out by the Institute, has been helpful in identifying the vulnerabilities associated with marine fisheries ecosystem and for coming up with resilient strategies. CMFRI had launched 'Fish Watch', a web portal for real time landing and market information from the eastern and western Indian coastal belts. Two new fishing vessels FV *Silver Pompano* and FV *Cadalmin* have been commissioned for offshore research.

Under the Human Resource Development initiatives, CMFRI conducts regular training programmes in fisheries and marine biology. So far, the institute has produced over 300 Masters and 160 Ph.D. degree holders.

m@krishi service for fishermen in the State of Maharashtra provides information on Potential Fishing Zones (PFZ) through mobile phones in local language to fishermen reducing the scouting time for fishing by around 50%, reducing the fuel consumption and profit to the tune of 25-35%.

CMFRI offers Consultancy Services in specialized areas to over 100 clients generating remarkable revenue.

## CMFRI's Role in Marine Fisheries Policy Making

Right from its formative years, CMFRI has contributed significantly towards policy discourses related to marine fisheries sector in India. Some of recent policy initiatives in which CMFRI has taken active participation include:

- Formulation of National Marine Fisheries Policy, 2016- draft.
- Report of the Technical Committee to Review the Duration of the Ban Period and to Suggest Further Measures to Strengthen the Conservation and Management Aspects, 2014.
- Preparation of the Marine Fisheries Policy documents for ensuring sustainable management of marine fisheries of Kerala & Lakshadweep Islands, Karnataka & Goa and Andhra Pradesh.
- Development of Marine fisheries management code.
- Policy guidance on Fish Aggregating Device (FAD), based on which Government of Karnataka banned FAD assisted cuttlefish fishery.
- Guidance on National Plan of Action (NPOA) for sharks in India for increasing awareness of the need to ensure their sustainable exploitation and conservation.
- Policy guidance on light fishing, submitted to Government of Karnataka & Goa.
- Trawl Ban Committee Report submitted to Government of Kerala.
- Task Force Report on 'Use of Technology in Agricultural Insurance' submitted to NITI Aayog.
- Developed Minimum Legal Size (MLS) estimates for 58 species of commercially important marine fishes aimed at restricting juvenile fishing. Based on this Govt. of Kerala notified MLS for 14 commercially important species in the Gazette.

## Outreach Activities

The Agricultural Technology Information Centre (ATIC) of CMFRI serves as a 'single window delivery system' for the technologies and services as an interface between fisher folk,

entrepreneurs and scientists. ATIC regularly takes part in exhibitions and other extension platforms to showcase the research outputs and achievements of CMFRI. Similarly, KVK-Ernakulum of CMFRI develops and disseminates location specific technological modules and acts as Knowledge and Resource Centre for agriculture, fisheries and allied activities. Besides, scientists at various research centres and divisions of the Institute regularly take part in various extension and outreach activities for the benefit of the fisher folk at large.

## Academic Collaborations

CMFRI collaborates with a number of research and academic organizations in and outside the country for strengthening its research programs and for complementing its academic and human resource development activities. Some of the prominent research/ academic collaborations include:

- Faculty exchange programme with Plymouth Research Laboratory, United Kingdom.
- International research collaboration with Michigan State University, United States, Rhodes University, South Africa and Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia as part of the GULLS project.
- Technical collaboration on Bay of Bengal Programme (BOBP) and Bay of Bengal Large Marine Ecosystem Project (BOBLME).
- Research project linkages with Indian National Centre for Ocean Information System (INCOIS), National Institute of Oceanography (NIO) and several other fisheries research institutes and government departments.
- Academic partnerships with universities such as Cochin University of Science and Technology (CUSAT), Kerala University of Fisheries and Oceanic Sciences (KUFOS), Mangalore University and Manonmaniam Sundaranar University, Tamil Nadu.

Over the past seven decades the Institute has grown significantly in size and stature emerging as a leading Tropical Marine Fisheries research Institute in the world displaying an unparalleled research acumen and unbridled commitment which helped in boosting the marine fish production and management of the fisheries sector and for the livelihood of 40 lakh fisher folk of the country.

## Conclusion

Sustainable fisheries management options, if implemented properly, indicate possible enhancement of harvestable potential in Indian EEZ to the extent of 6 million tonnes per annum or more. Opportunities in open sea cage culture and related developments in the field of mariculture during the last 5 years show a way forward in open sea mariculture practices and propose a production ideal to the tune of 4 million tonnes per annum in the coming years from mariculture sector alone. High mariculture production, in countries such as China, South East Asia and others, is due to production of sea weeds and molluscs, but the Indian sea food market comprises mainly of fin fishes of edible standards. If properly implemented, there are possibilities that the marine fish production may be enhanced to the tune of 10 million tonnes per annum (6 million tonnes from capture and 4 million tonnes from mariculture) by 2050.