

A Profile...



VISAKHAPATNAM REGIONAL CENTRE ICAR- Central Marine Fisheries Research Institute

... in the service of marine fisheries and mariculture
development of the north-east coast of India



VISAKHAPATNAM REGIONAL CENTRE ICAR- Central Marine Fisheries Research Institute

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About ICAR-CMFRI

The ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI) with its headquarters at Kochi is a premier multidisciplinary marine fisheries research institute under the Indian Council of Agricultural Research (ICAR), New Delhi. During the course of over 75 years, the Institute has emerged as a leading tropical marine fisheries research institute in the world. The ICAR - CMFRI, which is celebrating its 75th Anniversary in the year 2022, grew significantly in size and stature by establishing 4 Regional Centres, 7 Regional Stations, 17 Field Centres and 2 Krishi Vigyan Kendras, building up adequate infrastructure and technically competent scientific manpower.



Our Mandate

Monitor and assess the marine fisheries resources of the Indian Exclusive Economic Zone (EEZ) including the impact of climate and anthropogenic activity and develop sustainable marine fishery management plans.

Basic and strategic research in mariculture to enhance production.

Act as a repository of geospatial information on marine fishery resources and habitats.

Consultancy services and human resource development through training, education and extension.

History of VISAKHAPATNAM REGIONAL CENTRE

The Visakhapatnam Regional Centre of ICAR - CMFRI had its beginning in 1947 as a Survey Unit, which was housed in the premises of the Department of Fisheries, Government of Andhra Pradesh. The main function of the Survey Unit was to collect the fish landing data. The Survey Unit was upgraded as a Research Unit and research activities were initiated in the year 1955 in the premises of Department of Zoology, Andhra University. Later, the Calcutta Research Unit of CMFRI was merged with the Visakhapatnam Research Unit of CMFRI in 1962. During 1970, the Research Unit housed within the premises of Department of Zoology, Andhra University was elevated to a Sub-station



and subsequently as a Research Centre in 1976. The Research Centre moved into its own building in 1995, and was further upgraded as the Regional Centre on 17th October, 2001. The Kakinada Research Centre of CMFRI was merged with the Visakhapatnam Regional Centre of CMFRI on 15th February, 2006.

THRUST AREAS OF RESEARCH

Marine Capture Fisheries

- ✓ Policy guidance for sustaining marine fisheries of Andhra Pradesh
- ✓ Spatio-temporal mapping of resource distribution and abundance along the north-east coast
- ✓ Assessment of exploited commercially important pelagic finfishes (tunas, seerfish, mackerel, ribbon fishes and sardines), demersal finfishes (silverbellies, pomfrets, threadfin breams and sciaenids), crustacean resources (penaeid prawns and crabs) and molluscan resources (cephalopods, bivalves and gastropods)
- ✓ Assessment of discards and exploitation of juveniles of commercially important finfishes and shell fishes
- ✓ Taxonomy of marine finfishes, crustaceans, molluscs, echinoderms, cnidarians, poriferans, sea weeds, sea grasses, phyto and zooplanktons

- ✓ Recruitment dynamics and management strategies for sustainable exploitation of fishery resources
- ✓ Population genetic studies in marine fishes

Mariculture

- ✓ Acclimatization and domestication of commercially important marine finfishes in captivity
- ✓ Optimization of water quality, feed and associated management practices for broodstock development of commercially important marine finfishes in various culture systems
- ✓ Standardization of breeding protocol (induced/natural) and seed production for commercially important marine finfishes
- ✓ Larval rearing of marine finfishes
- ✓ Development of nursery rearing systems for commercially important marine finfishes
- ✓ Innovations in live feed culture with reference to phytoplankton



- ✓ Development of culture protocols for mass production of copepods and rotifers
- ✓ Optimization of finfishes grow-out culture in various culture systems
- ✓ Innovations in cage culture
- ✓ Use of artificial intelligence in mariculture
- ✓ Capture based mariculture
- ✓ Assessment of commercially important fish seed resources for cage culture

Marine Environment Management

- ✓ Impact of climate change on marine fisheries for the north-east coast
- ✓ Monitoring the health of sea
- ✓ Correlate environmental changes on the distribution shifts in small pelagics
- ✓ Coastal and marine pollution and its impact on marine life
- ✓ Monitoring and developing strategies for conservation of marine mammals and turtles
- ✓ Observation and monitoring of the hydrobiology of coastal and marine environment

- ✓ Impact of extreme weather events on marine fisheries and aquaculture

Marine Biodiversity

- ✓ Conservation of endangered marine teleosts and elasmobranchs using DNA markers and preservation of germplasm
- ✓ Bio-inventorying of marine organisms
- ✓ Marine management plan for biologically/ecologically significant areas
- ✓ Assessment of coastal and marine biodiversity
- ✓ Economic valuation of coastal and marine ecosystem services

Socio-economic Studies

- ✓ Socio economic studies in marine fisheries
- ✓ Technology transfer and impact analysis
- ✓ Responsible marine fisheries governance
- ✓ Gender mainstreaming and socio-economic empowerment of fisherfolks



MAJOR ACHIEVEMENTS

Marine Capture Fisheries

- ✓ Policy guidance for sustainable management of marine fisheries of Andhra Pradesh
- ✓ Tagging of yellow fin tuna with pop-up satellite tags
- ✓ Biological reference points and stock assessment of commercially important finfishes, crustaceans and molluscs have been made
- ✓ Spatio-temporal mapping of resource distribution and abundance
- ✓ Growth parameter revalidation in captivity-live ageing
- ✓ Catch rate modeling with environmental parameters
- ✓ Carbon foot print of marine capture fisheries
- ✓ Assessment of economic impacts of trawl juvenile by-catch along the coast of Andhra Pradesh

Mariculture

- ✓ Developed low cost Re-circulating Aquaculture System (RAS) for broodstock development and nursery rearing of marine finfishes
- ✓ Captive broodstock of orange spotted grouper (*Epinephelus coioides*), Indian pompano (*Trachinotus mookalee*) and John's snapper (*Lutjanus johnii*) achieved in RAS as well as cage
- ✓ Natural spawning/induced breeding protocol for orange spotted grouper developed
- ✓ Induced breeding protocol of Indian pompano and John's snapper evolved
- ✓ Seed production technology of orange spotted grouper, Indian pompano and John's snapper developed and standardized
- ✓ Technology standardized for mass production of copepod nauplii





- ✓ Culture protocol for mass production of micro-algae optimized
- ✓ Protocols for production of micro-algal concentrates standardized
- ✓ Supply of live feed stock culture to hatcheries along the east coast
- ✓ Standardized nursery rearing protocol of Indian pompano, orange spotted grouper and John's snapper in different culture systems
- ✓ Technology developed for grow-out culture of Indian pompano, orange spotted grouper and John's snapper in cage as well as pond
- ✓ Conducted skill development programmes in the area of live feed production, cage culture and coastal pond culture
- ✓ Cage culture demonstrated in three coastal states and technology transferred to farmers and entrepreneurs
- ✓ Excellent mariculture laboratory for various research activity in the area of mariculture
- ✓ Consultancy services provided on various aspects of mariculture
- ✓ Technology developed and standardized for the onshore pearl culture and patented

- ✓ Blue Carbon Stock status of critical sea grass meadows off Chilika and Pulicat lakes evolved
- ✓ Documented the marine litter status along the beaches of Andhra Pradesh
- ✓ Marine plastic litter assessment along the trawl fishing grounds of Andhra Pradesh
- ✓ Plotted the trends in occurrence of Potential Fishing Zones of high fish availability during different seasons & depth of North Andhra Coast

Marine Biodiversity

- ✓ First aid measures for jellyfish stings
- ✓ Re-description of catostylid jellyfish, *Crambionella annandalei* from Indian waters
- ✓ Documentation of jellyfish fishery and its economic impact along Andhra Pradesh coast

Socio-economic Studies

- ✓ Census of marine fishermen population and their socio economic status in Andhra Pradesh, Odisha and West Bengal
- ✓ Socio economic parameters of fisherfolk of coastal villages along north east coast documented
- ✓ Database on economics of different marine fishing methods and cage culture

Marine Environment Management

- ✓ Designed, fabricated and deployed artificial reefs for stock enhancement along Visakhapatnam coast of Andhra Pradesh

MARINE FISHERY RESOURCES OF ANDHRA PRADESH

Bestowed with 974 km length of coastline covering 12 coastal districts, 533 marine fishing villages, 234 marine fish landing centres and 33,227 sq. km of continental shelf area, the state supports a rich marine fishery. In recent years, the annual marine landings of the state have been on average 2.0 lakh tonnes which are usually dominated by

pelagic resources (~69%), followed by demersal finfishes (20%), crustacean (10%) and molluscan (1%) resources. The major marine resources landed in the state are lesser sardines, oil sardine, Indian mackerel, penaeid prawns and ribbonfishes.

Unlike other states in India, the marine fishery of AP is dominated by the motorized sector which contributes nearly 55% of the annual marine landings of the state. However in terms of individual fishing gears, the major contribution is from mechanized trawl nets and motorized gillnets.



RESOURCE MONITORING AND ASSESSMENT



The Regional Centre is involved in regular monitoring of marine landings, assessment of commercially important marine resources and development of management plans for the marine fisheries. There are 234 landing centres along the coast of Andhra Pradesh, where the fishers land their catch. Most of the landing centres are regularly surveyed for data collection on marine landings using the 'Stratified Multi Stage Random Sampling' design. Major resources are further studied in detail for estimating Biological Reference Points (BRPs) from selected major fishing harbours and stocks are assessed using length based fish stock assessment models. Based on the status of stock, management advisories are issued for sustainable utilization of the resources.

MARICULTURE TECHNOLOGY DEVELOPMENT

With focus on mariculture for increasing national fish production, and with the need for species diversification in aquaculture, package of practices on breeding and seed production and culture for three economically valued marine finfish species viz., orange spotted grouper, Indian pompano and John's snapper was developed at the Centre. Broodstock development was performed for orange spotted grouper and Indian pompano in



marine cage and land based Recirculatory Aquaculture System (RAS), and John's snapper in RAS. Induced spawning was achieved in orange spotted grouper, Indian pompano and John's snapper by hormonal stimulation; and natural spawning by manipulating water quality in orange spotted grouper. Larval rearing protocol was optimised, using a combination of appropriate live feeds during different phases. Nursery rearing was standardised in different culture systems (*hapa* in pond, flow-through and RAS in concrete and fibre tanks) using varied feed combinations. Realizing the importance of skill development and technology dissemination for achieving the true potential of mariculture, multiple training programmes and demonstrations



were performed on different culture methodologies. These include marine cage farming of Indian pompano and orange spotted grouper, and coastal cage farming of Indian pompano and Asian seabass.

BIODIVERSITY PROGRAMMES



Species inventorisation and documentation of different bio-resources distributed along the coast of Andhra Pradesh are regularly carried out. The Centre is also

involved in regular monitoring and development of conservation strategies for rare, endangered and threatened (RET) marine species. Economic evaluation of coastal and marine ecosystem services are being studied at the Centre. Development of marine management plan for ecologically/biologically significant areas (EBSA) along the coast are worked out. Regular monitoring of scyphozoans and cubozoans jellyfish swarms are carried out.

ENVIRONMENT MONITORING

The seasonal changes in hydrobiology of coastal and marine environment along Andhra Pradesh coast were closely monitored. The state of health of critical habitats in relation to water quality indicators were regularly assessed. The centre is also involved in observation and monitoring of pollution and marine litter in critical habitats, fishing grounds and recreational beaches.



Apart from this, regular monitoring and study on the water quality requirements for finfish breeding, mariculture and live feed culture were also being carried out.

SOCIO ECONOMIC EVALUATION OF MARINE FISHING OPERATIONS AND MARICULTURE

Economics of mariculture and marine fishing operations in different sectors of Andhra Pradesh, Odisha and West Bengal are being studied by the Centre. Studies on socio economic evaluation, grass root institutions, gender mainstreaming, diversified livelihoods, and need and impact assessment of technological interventions among different stakeholders are also carried out regularly.



RESEARCH FACILITIES

Mariculture Laboratory

The Centre houses one of the most modern mariculture facilities in the country. The Centre has established a unique sea water intake system which has an excellent slow sea water sand filter system with a storage capacity of 30 tonnes.



Live Feed Culture Facility

The algal lab has stock cultures of *Isochrysis sp*, *Chaetoceros sp*, *Nannochloropsis sp*, *Thalassiosira sp*, *Tetraselmis sp* and *Pavlova sp* which are maintained under controlled temperature and light conditions. The lab is well equipped with instruments like autoclave, milli Q system for double distillation, refractometer, ozone generator, industrial centrifuge, microscope and UV sterilization unit. Stock cultures of zooplanktons such as rotifers, copepods and *Artemia* are also maintained.



Central Instrumentation Facility

A Central Instrumentation Facility has been established to keep pace with the analytical needs of modern integrated marine fisheries research. This facility includes PCR (Thermocycler), refrigerated centrifuge, UV-Vis spectrophotometer, vertical and horizontal electrophoresis units, ultra freezer (-20°C), millipore water purification system, compound microscope with photographic attachment, trinocular stereo zoom microscope, GPS, multiparameter water probe and waterbath.

RESEARCH FACILITIES



Marine Biology Lab

The Centre is equipped with a laboratory for fish dissection and basic analysis of biological aspects of fish, primarily reproduction and diet dynamics. The lab has several equipment including microscopes, digital cameras, lighting systems and freezers. The lab is currently used for biological studies of finfishes and shellfish as well as taxonomic studies of the same.

Marine Environment Laboratory

A laboratory for analyzing physico chemical parameters such as DO, pH, salinity, alkalinity, BOD, TSS, TDS, dissolved nutrients (NH_3 , NO_2 , NO_3 , PO_4), chlorophyll pigments, phytoplankton and zooplankton from seawater and required sediment quality parameters is an added facility to this centre. The lab possesses essential equipment such as BOD incubator, microscopes, UV-Vis spectrophotometer, hot air oven, centrifuge, water bath, pH meter, water, plankton and sediment samplers etc.



Marine Biodiversity Museum

The Marine Biodiversity Museum has collection of the bio-resources of the coast of Andhra Pradesh. The museum houses more than 300 specimens of finfishes, crustaceans, molluscs, echinoderms, sea pens, marine turtle and sea snakes. The museum is open to scientists, researchers, teachers, students and general public. Students constitute more than 80% of the visitors, a fact that highlights the importance of the museum to education.

RESEARCH FACILITIES

Research Vessel

RV Cadalmin 1 is a latest addition to the CMFRI vessel fleet berthed at Visakhapatnam. The vessel is fitted with a four stroke marine engine of 248 hp working at 1800 rpm. The vessel possesses essential navigational, communication and fish finding equipment. All necessary lifesaving equipment and required firefighting accessories are available. The vessel is well equipped for collecting water, sediment and plankton samples. It also has facilities for experimental trawling and analysis of biological samples onboard.



OTHER INFRASTRUCTURAL FACILITIES

Library cum Conference Hall

The Regional Centre has a large collection of important reference books and back volumes of marine fisheries journals of national and international reputation and current issues of periodicals on fish and fisheries, aquaculture, oceanography and molecular biology. Copies of the Aquatic Science, Fisheries Abstracts and Bay of Bengal publications in CDs are also available. Researchers and students from

other universities and institutions also use the library facility. It serves as an excellent reference library in marine fisheries.

The Conference Hall with a seating capacity of 100, facilitates organization of stakeholder consultations, workshops, training programmes etc.

Residential Quarters

The Centre has 14 residential quarters (Type 1 to IV) for its staff, in an area of 3.5 acres.



Farmers/ Trainees Hostel

The Centre has a newly constructed farmers/ trainees hostel with 4 double bedded AC rooms to accommodate 8 guests, and 3 AC dormitories to accommodate 10 trainees.



TRAINING PROGRAMMES AND OUTREACH ACTIVITIES

The Centre conducts regular stakeholder workshops to disseminate the research findings to the fishing communities of the regions, as well as to obtain feedback and first-hand information on the challenges and constraints being encountered by the fishing communities. Awareness campaigns and capacity building programmes are also being organized regularly to enrich the knowledge and skills of fishers on responsible fishing practices and resource conservation to ensure sustainable fisheries. As a part of technology transfer, the Centre organizes outreach programmes like demonstrations and training programmes on stock assessment and other mariculture technologies for the benefit of all stakeholders including fishers, officials of the development departments, scholars, students etc.



TSP AND SCSP PROGRAMMES

The major thrust was on capacity building and socio economic empowerment of Scheduled Tribe and Scheduled Caste beneficiaries. Different training and awareness programmes were organised since 2018 under Tribal Sub Plan and Scheduled Caste Sub Plan components, to bring awareness and inculcate technical knowhow on cage culture of marine finfishes among ST and SC beneficiaries, who are mostly landless and without any permanent source of income. Different aspects of cage culture including cage fabrication, installation and maintenance, feeding and disease management, harvest and sources of financial support available for cage culture were apprised to trainees. Regular field visits for onsite advisories, handholding support and



distribution of critical inputs were also facilitated for enhanced adoption. The beneficiaries trained by the Visakhapatnam Regional Centre have gained skill and will now act as trainers for the new comers who want to initiate cage farming.

LINKAGES

The Centre has well-knit linkages with organizations like CIFT, MPEDA, CIFNET, NIFPHATT, FSI, GSI, NIO, Andhra University and other Central Government organizations. It also has good linkage with the State Department of Fisheries and other Universities.

CONSULTANCY SERVICES

The Centre offers consultancy in the areas of marine fisheries management (estimates and stock assessment); breeding and seed production of marine finfishes, mariculture in cages and ponds; live feed culture technology; biodiversity and environmental impact assessment; design, fabrication and deployment of artificial reefs for marine fisheries management; and socio economic research.

SERVICE PROVIDING ACTIVITIES

The Centre supplies inoculum of live feeds such as marine microalgae and zooplanktons to shrimp hatcheries at a minimal cost, and forms the major contribution to the revenue generation of the Centre. Supply of marine finfish fingerlings to farmers at fixed rates for cage and pond culture is also carried out. Analysis of water and sediment samples of aquafarmers on payment basis, and identification of marine fauna and flora are the other service providing activities. Scientists of this Centre are also involved in delivering guest lectures, awareness talks and disseminating required information for the

stakeholders as a part of scientific social responsibility and contribute for the betterment of society as well as nation.

INTERNSHIP FOR STUDENTS/ RESEARCHERS

The Centre facilitates internship of students to undertake research using its research facilities. The Scientists of the Centre also serves as Guides for the research scholars from recognized academic institutions. Exposure visits of students are also facilitated for awareness creation and motivation.

SWACHH BHARAT MISSION

Cleanliness drives and awareness campaigns are organized regularly at the Centre with the mission on *swachh bharat swasht bharat*. The activities include displaying motivational banners at prominent places, administering 'Swachhta pledge' among the staff members, cleanliness drives in the office and residential premises, weeding out the old records and junk materials, beach walkathon for creation of awareness on single use of plastics and its effects on marine environment, etc.



PUBLICATIONS

From the research outputs; several international and national research articles, popular articles, technical bulletins, books, training manuals, brochures, folders, and pamphlets have been brought out for information dissemination among the stakeholders.



DISTINGUISHED VISITORS TO THE CENTRE



Visit of **Smt. Indira Gandhi, Hon'ble Prime Minister of India**, to CMFRI, Visakhapatnam exhibition pavilion at Indian Science Congress held at Visakhapatnam (3rd January, 1976)



Visit of **Shri. M. Venkaiah Naidu, Hon'ble Vice-President of India** to the Visakhapatnam Regional Centre of ICAR-CMFRI (7th December, 2020)

Recognitions and Accolades

- ▶ Recognized Research Centre for pursuing Ph.D by reputed academic institutions
- ▶ Scientists recognized as Members in various IOTC working groups, IUCN SSCs, national and international plan of actions (NPOA, INPOA), national and state management committees and boards
- ▶ Scientists from the Centre received several prestigious national and international awards
- ▶ The Centre was recognized as the Best Regional Centre among the constituents of CMFRI in 2018

Way Forward

- ▶ Ensuring sustainability - Better managed/certified capture fisheries, fisheries modeling and forecasting, multispecies ecosystem based tropical fisheries management
- ▶ Enhancing production - Mariculture and coastal aquaculture, species diversification, harvesting oceanic/non-conventional resources
- ▶ Bio-secured brood bank of diversified marine organisms for quality seeds in mariculture
- ▶ Increased trainings and demonstrations: Doubling Farmers Income
- ▶ Health assessment and grading of marine ecosystem. Assessing the economic loss to marine ecosystem due to pollution and marine litter. Harnessing the beneficial effect of microbial biodiversity from coastal ecosystems

: NOTES :



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