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DUODECENNIAL REPORT OF ICAR-CMFRI 2012-2024





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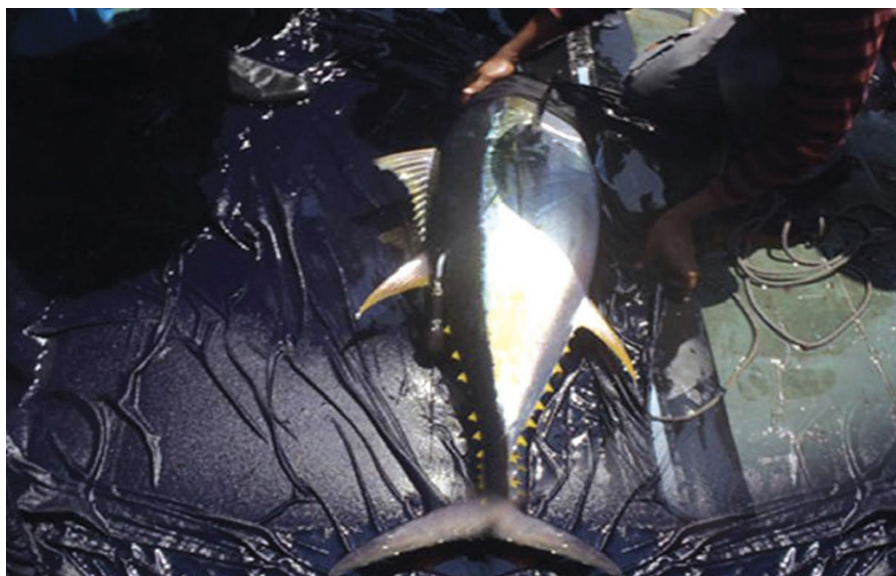
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Preface

This duodecennial report (2012-2024) presents a twelve-year chronicle of the key activities and achievements of ICAR-Central Marine Fisheries Research Institute (CMFRI). It is dedicated to Dr. A. Gopalakrishnan, Director, ICAR-CMFRI, whose exceptional leadership guided the institute through most of this period (2013-2024). On 31st July 2024, Dr. Gopalakrishnan is laying down the office on superannuation, exactly on the 12th anniversary day of his joining ICAR-CMFRI as Director. His tenure at ICAR-CMFRI has been momentous, as evident from the pages of this compendium of selected stories. Each of those are testament to Dr. Gopalakrishnan's extraordinary leadership, unwavering commitment, profound wisdom, and infectious enthusiasm that transcended hierarchy, and inspired the scientists and staff of ICAR-CMFRI in their line of duty. It is not a matter of chance that the Institute has excelled in all spheres of its activity and reached the pinnacle of success but to Dr. Gopalakrishnan's meticulous and painstaking efforts in inspiring and empowering his team. As he embarks on a new chapter of his life, the collective psyche of the CMFRI family is filled with a mix of emotions – admiration, gratitude, anxiety about the future, and above all, well wishes for a healthy and fruitful life ahead for their beloved captain. May his legacy inspire the future generation, and the light ignited by him illuminate our path towards new horizons of excellence and scientific attainments.

With love and affection,
CMFRI Family

India joins top successful countries involved in Pop-up Satellite Tagging of Yellowfin Tuna - A pioneering effort



Tagging of yellowfin tuna by CMFRI team

Pop-up X-tag was used on yellowfin tuna (*Thunnus albacares*) for the first time in Indian waters by the Central Marine Fisheries Research Institute during 2011 to 2014. A total of 15 tags were used in two phases along the Bay of Bengal and the Arabian Sea with the Pop-up time ranging from 4 months to a year. Tagging was done in the Bay of Bengal Region from Visakhapatnam where eight tags were used and along the Arabian Sea seven tags were used off Lakshadweep Islands. The tagging programme is funded by INCOIS under the project entitled "Satellite Telemetry

studies on Migration patterns of Tunas in Indian Seas" (SATTUNA). With this achievement India joins the elite group of countries engaged in satellite tracking of yellowfin tuna. Earlier reports on Pop-up tagging of yellowfin tuna are only from the Gulf of Mexico using Pop-up satellite archival tags during 2009

Migratory movements of yellowfin tuna (*Thunnus albacares*) in oceanic waters near and away from Indian waters remain untested and exchange rates are still unidentified. Tagging studies have been carried out to study the growth and migration of marine fishes.

First instance of tracking *Thunnus albacares* with Pop-up Satellite Tags (PSAT) in Indian waters

However, conventional archival tags used have a number of disadvantages with very poor recovery rates and limited data on habitat and environment. The "Pop-up" tags have been developed to avoid such problems and also to increase the probability of data recovery. These tags are attached externally and have a release mechanism that causes the tag to detach from the fish at a predetermined time and "pop-up" to the sea surface where the data can be recovered via the ARGOS system aboard polar-orbiting NOAA satellites. The first-generation Pop-up tags provided only limited data: more of migratory data and less environmental data. These tags therefore provide fisheries-independent measure of the straight-line distance traveled from the point of tagging. More recently Pop-up tags have become available and its positions as determined by ARGOS which enables temperature, depth and ambient daylight that can be reduced (e.g. as time-at-depth and



Tuna with Pop-up Satellite Tag ready for release



Tagged yellowfin tuna released in to the sea

time-at-temperature histograms and profile-depth temperature data) on board the tag before data transmission.

Tuna mainly the bluefin tunas have been tracked using the Pop-up tags in the Atlantic Mediterranean and Australian waters. The large size and weight of the original tags and the high cost of the tags were the major limiting factor for tagging smaller migrating fishes. With the development of the x-tags, smaller bluefin tuna, marlin, and

yellowfin tuna too can be tagged. The high cost of tags (PSAT) still makes large scale tagging of fishes with satellite tags a challenging proposition. A good scope of fishery for the yellowfin tuna is existing in the Indian waters. To manage the stock and to fish the stocks at a sustainable level, information regarding its migratory patterns, movement for feeding, breeding, its diving characteristics, reasons for the fish to remain within a depth zone and

to know whether the tuna available in our waters belongs to the same stock or migrating from neighboring countries are essential, but hardly known. It is in this context that CMFRI took up the challenging task of tracking yellowfin tuna with pop-up tags. The pioneering work carried out by the Institute has placed the country on par with few other countries of the world that have been successful in using the pop up tags to track marine fishes ●

Chlorophyll based assessment of Indian Marine Fishery Resources

CMFRI's research initiative

Indian marine fisheries have all along remained buoyant to vagaries of fishing effort and other factors with the past decades recording consistently increasing trends despite the disaggregated analyses throw up new scenarios. The most imposing challenge before the planners and hence in the realms of research feeding to policy designing is the real time assessment of harvestable potential and possible mechanism to forecast the near future availability. CMFRI with its internationally acclaimed sampling design has been providing timely estimates of marine fishery resources landed in the peninsular region of the country which has been used by various agencies like Gol and FAO. Many previous attempts to revalidate the marine resource potential were also dependent on these time series of landings. But given an opportunity, a chance to base the entire resource measurement mechanism on a complete coverage platform while assessing the potential would always improve the figures.



Primary productivity, best indicated by chlorophyll concentration at various parts of the EEZ, are the single most dependable factors of resource wealth as they are the first link in the process of existence and proliferation of marine fishery resources apart from being a rapid indicator of their concentration. Organic production based assessment of Indian marine resources was first attempted by CMFRI in the late fifties and early sixties. With the methodologies in vogue those days viz. Oxygen and C14 methods using limited resources available attempts were made by CMFRI scientists to estimate the carbon production and thus the fishery resource potential, after applying globally accepted and locally pertinent conversion factors. Those efforts put the production possibilities of the Indian ocean region at 39-40 million tonnes with 40% attributable to Indian territory which as per the level

of exploitation prevailed elsewhere at that point of time could be taken as 11 million tonnes of harvestable potential. Such pioneering works introduced a very different perspective to the assessment of resource potential but was severely constrained by the assessment coverage of the organic productivity. But the advent of remote sensing tools and the algorithms to convert the optical data into relevant parameters has changed the entire scenario recently. The chlorophyll concentration has been very successfully measured simultaneously across the vast expanse of seas using the satellite propelled OCM sensors. Such measures and derived fishery potential assessments have long been standardized by Space Applications Centre (SAC), Ahmedabad

Reported by: J. Jayasankar,
Senior Scientist, FRAD) ●

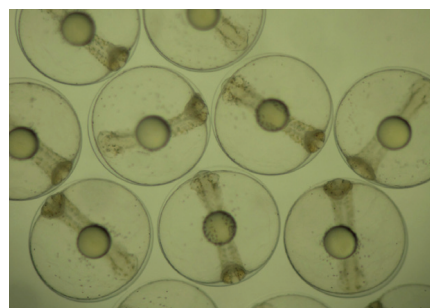
Large scale seed production of Cobia in the Recirculation Aquaculture System (RAS) at Mandapam RC



RAS facility at Mandapam



Fertilized eggs of cobia



Developing eggs of cobia

Successful spawning of cobia was achieved in the Recirculation Aquaculture system (RAS) at Mandapam on 20th September 2013. The RAS facility was effectively utilized for the maintenance of cobia brooders. In this system, the brooders could be conditioned and maintained in healthy condition. One

female and two male brooders were kept in the system. The ova size was assessed by cannulation and based on the same, the brooders were induced with hCG on 18th September 2013. The hatching started by late evening of 20th September 2013 and completed by early morning of 21st September 2013, with a

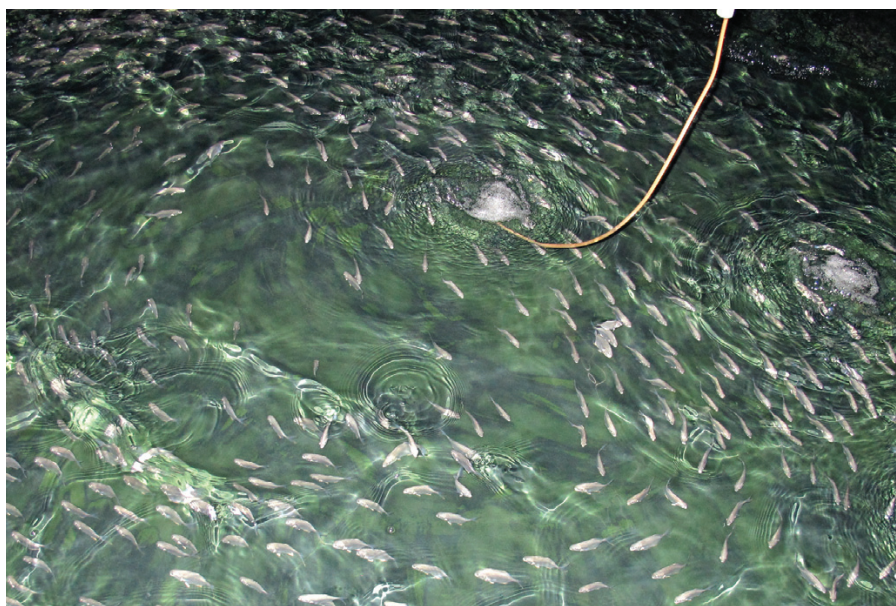
hatching percentage of 86.7% and larval survival of over 14%. The first successful spawning of cobia was achieved in 2010 at Madapam RC of CMFRI. The recent breakthroughs in this realm has resulted in large scale seed production of cobia, thereby enabling their distribution to mariculture farmers in the region ●

Scaling up of silver pompano fingerling production at Mandapam and bulk seed transportation to other states for farming

The first successful brood stock development, induced breeding and larval production of silver pompano is successfully accomplished for the first time in India at Mandapam Regional Centre of CMFRI during July 2011. Thereafter eleven successful seed production trials were carried out

and the larval survival rates were improved. It was noted that the live feed density maintained in the larviculture tanks plays a key role in the larval survival especially in the initial stages of larviculture when rotifers are employed as live feed. The larval survival is directly proportional

to the rotifer density. A rotifer density of 25-30 numbers per ml was yielding the best results. However, the larval stocking density in the larviculture tanks is also related to the live feed density. It was noted that a larval density of five numbers per litre and a rotifer density of 25 per ml is ideal



Pompano seeds in the culture tank

for getting best survival rates. The maximum survival rate obtained was 23.4%. The first farming trial was conducted during August 2011 by transporting pompano seeds from Mandapam Regional Centre of CMFRI to Antervedi in the East Godavari District of Andhra Pradesh located at a distance of 1,200 km and stocked in one acre pond of a farmer. About 3,600 seeds were stocked and fed with indigenous pellet feed and maintained good pond environment, resulting in a survival of more than 95%. The formulated pellet feed cost is about Rs 35/kg. An FCR of 1:1.8 was achieved in this crop. During the course of 8 months they reached a size range of

450-550 g weight, which is an excellent table size for marketing. About 1,325 Kgs of pompano was harvested after rearing 8 months period. The sale price of the produce was between 250 /kg to 350/kg.

Subsequent to the successful demonstration of pompano farming a huge demand emerged for the pompano seeds in Andhra Pradesh and other states. In 2013-14, more than one lakh seeds were produced at the Mandapam Centre and supplied to different farmers and entrepreneurs of Tamil Nadu, Kerala, Karnataka and Andhra Pradesh. The first bulk transportation of seed was done on 05.09.2013 in a truck by employing



A scoop of pompano seeds



Handing over pompano seeds to farmers

1.0 ton capacity tanks (10 Nos.) fitted with oxygen cylinders. To reduce the temperature ice bags were placed in each tank. The seeds were transported from Mandapam, Tamil Nadu to Dilsumaru and Thurpputhadu villages of West Godavari District, Andhra Pradesh by travelling 29 hrs by road. The seeds reached the farming sites without any mortality and were acclimatized to appropriate salinity and temperature and stocked in pens erected inside the ponds. They were fed with formulated feed and were fully acclimatized to the nursery conditions.

Reported by G. Gopakumar, A. K. Abdul Nazar, R. Jayakumar, G. Tamilmani, C. Kalidas, P. Ramesh Kumar & Johnson, B. Mandapam

Successful broodstock development, induced breeding and seed production of Indian pompano *Trachinotus mookalee*

Achieved for the first time at Visakhapatnam RC

Among the many high value marine tropical finfish that could be farmed in India, the Indian pompano *Trachinotus mookalee* is one of the ideal candidate

species, mainly due to its good meat quality and high market demand. It is one of the fast growing carangid and is encountered rarely in the

capture fisheries. The species is able to acclimatize and grow well even at a lower salinity of about 15 ppt and hence it is suitable for farming in the



T. mookalee Brooder



Collected eggs



Blastula stage



Hatching in progress



Newly hatched larvae



DPH 6 larvae



Metamorphosed larvae of mookalee

vast low saline pond waters of our country besides its huge potential for sea cage farming.

At Visakhapatnam Regional Centre of CMFRI, successful broodstock development, induced spawning and larval rearing of Indian pompano was achieved for the first time in the world. Wild collected pompano of size ranging from 2 to 4 kg were stocked in sea

cages. The fishes were fed twice a day with squids and sardines @ 5% of body weight supplemented with vitamin and mineral mixture. After one year of rearing in sea cages, the brooders attained a size range of 4 to 5.5 kg. The sexes were determined by intra-ovarian biopsy and males and females were segregated and stocked in separate cages. Intra-ovarian biopsy

of females was done at regular interval to assess the size of the intra ovarian ova. On 26.02.2014, two females with mature ova and two oozing males were selected for induced breeding. The females weighed 4.5 kg and 4.0 kg where as males were 5.0 kg and 4.5 kg in weight. Selected males and females were stocked in hapa of 3 m depth and 2 m dia, which was fixed inside a 6 m dia sea cage and induced for spawning with a single dose of hCG in the early morning of 26 February 2014.

Spawning was observed after 36 hrs after injection. The floating eggs were collected with a scoop net of 500 u mesh and finally the hapa was lifted for collecting the remaining eggs. The total eggs spawned were estimated to be around 80,000. The fertilized eggs were treated with 15 ppm iodophore solution for 10 min. to avoid contamination. The treated eggs were washed and stocked in glass aquarium for incubation. The size of the fertilized eggs was 950-1000. The eggs hatched out after 22-24 hrs of incubation at a temperature range of 28-30°C. The hatching rate was estimated to be 80%. The newly hatched larvae measured from 2.1-2.2 mm in total length. The mouth opening was formed after 42-46 hrs post hatch. Green water was used for larval rearing. Artemia nauplii were also used in larval rearing tank from 9th day onwards. Weaning of larvae with inert diet was started from 15th day onwards. Metamorphosis of the larvae started from 17th day onwards and was completed by 22nd day. The size of the metamorphosed fry ranged from 16 to 17 mm. This is the first successful larval rearing of Indian pompano in the world. This success will go a long way in promoting mariculture in cages as well as in grow-out ponds in the country.

Reported by Ritesh Ranjan, Sekar Megarajan, Biswajit Dash, Loveson L. Edward, Pralaya Ranjan Behera, Muktha Menon, S. Padmaja Rani, R. D Suresh and Shubhadeep Ghosh, Visakhapatnam RC

Estimates on Marine Fish Landings in India 2013 Released



The Central Marine Fisheries Research Institute had been studying and generating research results for problems and issues that keep cropping up in the Indian marine capture fisheries sector since independence. As a backbone activity for these pursuits, CMFRI has been devising, planning and conducting surveys through the coastal belt of the peninsular India, which leads to the scientific estimates of the fishery resources brought to the shore by our fisherfolk. Dr. A. Gopalakrishnan, Director of the Institute, officially released the marine fish landings report of 2013 comprising estimated figures in a press conference, the first of its kind at CMFRI, Kochi on 10th June 2014. Dr. T.V. Sathianandan, Head-in-Charge, Fishery Resources Assessment Division welcomed the media and emphasized the importance of marine fish landings data for fisheries management in the country. He also gave a brief on the underlying scientific method followed by CMFRI for data collection, which has been recognized by FAO. A panel of experts consisting of Dr. K. Sunil Mohamed, Dr. Prathibha Rohit, Dr. P. U. Zacharia, Dr. G. Maheswarudu and Dr. R. Narayanakumar replied to the various posers of the media.

The report detailed the importance of estimation of marine fish landings and

the adoption of suitable methodology for the same and recent changes in the fisheries sector apart from listing out the 2013 landings statistics. These fishery resource landings estimates have been a corner stone for many research and planning initiatives put forth in India and other countries.

After releasing the report, Director highlighted the salient features of the marine fish landings along the Indian coast during 2013. The overall landings from the Indian coast, touched 3.78 million tonnes in 2013, a dip of four per cent compared to 2012, with Gujarat, Tamil Nadu and Kerala charting the maximum. Gujarat, the highest contributor, accounted for 7.17 lakh tonnes, followed by Tamil Nadu 6.88 lakh tonnes and Kerala 6.71 lakh tonnes. The decline in the landings is mainly due to fall in the commonly available oil sardine and inclement rough seas often making fishing ventures difficult.

CMFRI had sampled a total of 7,860 fishing days across 1,511 landing centres of the peninsular coast, which has resulted in the sampling of 71,920 crafts. The statewise coverage showed that sampling upto 15% of the landing centre days had been accomplished.

Gujarat earns the top slot in the landings chart

Oil sardine, the major contributor

Total landings witness 4% dip

The marine fish landings in India had always been marked for its diversity in terms of types of fish caught. In 2013, out of 507 species landed in the country, 242 belong to demersal resources and 134 to pelagic. The landings of pelagic resources accounted for 56% of the total quantity followed by demersal resources (26%), crustaceans (13%) and molluscan resources (5%).

The important resources in the landings were oil sardine (15.7%), ribbon fishes (6.7%), non-penaeid prawns (5.6%), Indian mackerel (5.3%), penaeid prawns (5.2%) and threadfin breams (4.8%). It was observed that resources like mackerel and ribbonfish witnessed a hike in their landings as compared to previous year. Non-penaeid prawn and Bombay duck, which are endemic to north western coast, have witnessed a significant increase in their availability.

GUJARAT

- Major Resources Ribbon Fishes
- Non-Penaeid Prawns Bombay duck Croakers
- Threadfin Breems Penaeid Prawns

A comparison of the contribution by major gears in the landings of maritime provinces revealed a picture of dominance by trawlnet in majority of states, with some states like Kerala and West Bengal having received near equal contribution from more than one gear. Kerala also reveals pre-eminence of outboard gears of various types compared to other states. Andhra Pradesh has recorded maximum contribution to total landings using non-motorized gears. The east coast revealed more contribution through non-motorized crafts as compared to west coast.

State-wise marine fishery resources in 2013 compared with the previous year threw up many scenarios. Gujarat which has shown a slight dip in total landings, has received high contributions from ribbon fishes, non-penaeid prawns, threadfin breems, which have also recorded increased landings. The Bombay duck fishery witnessed a marginal decline in production and the croaker fishery also had fallen a bit. The landings in Maharashtra was dominated by non-penaeid prawn. Other

traditional resources such as Bombay duck, cat fishes and ribbon fishes have shown hike in landings comparison to 2012. In Goa, oil sardine was the major contributor to the landings. Other resources like carangids, Indian mackerels, other sardines and tunnies have shown considerable rise over their previous year's landings. In Karnataka, oil sardine which is the major contributor, witnessed a dip though Indian mackerel and scads recorded a small increase in landing when compared to 2012. Oil sardine, the major catch resource from Kerala, witnessed a fall in 2013. In Tamil nadu too, oil sardine is the major species landed. The other major species that landed in the fish landing centres of Tamil Nadu included silver bellies, other sardines and penaeid prawns. The landings in Puducherry was dominated by silver bellies and other sardines and their landings were similar in both the years. Penaeid prawns and croakers have shown increase in landings in 2013 as compared to 2012. In Andhra Pradesh, Penaeid prawn, Indian mackerel, ribbon fishes, croakers and tunnies were the major

KERALA

- Major Resources Oil sardine Scads
- Indian mackerel Stolephorus Cephalopods Threadfin Breems

WEST BENGAL

- Major Resources Hilsa Shad
- Bombay duck Croakers
- Penaeid Prawns Non-Penaeid Prawns

species landed and their quantum were moderately similar as compared to 2012. In the case of Odisha, Indian mackerel landings were analogous to 2012, whereas penaeid prawns, croakers and ribbon fishes have shown a decline in their landings. Bombay duck, hilsa shad, croakers, penaeid and non-penaeid prawns have shown improved landings in West Bengal compared to 2012.

However, the report stressed on the need to focus on the recent trend of targeting of juvenile fish to cater to the fish meal sector is a point to bother about in years to come. Another issue is the increased deployment of high-speed, efficient engines which have shown increase in the reach to hitherto less explored areas of EEZ, but have resulted in catches which do not commensurate with the effort.

Since 2013, ICAR-CMFRI has been releasing Indian marine fish landings estimates every year, which are adopted as official statistics by six maritime states/UTs.

Reported by FRAD, Cochin

First success story on sea cage farming of cobia by a Self Help Group of Rameswaram

District Collector flagged off the harvest

Cobia Fishermen Welfare Association, a self-help group from

Rameswaram which took up sea cage farming with the technical support of

Mandapam Regional Centre of CMFRI became the first SHG to do sea cage

farming by incurring all the expenditure themselves. Ten cages of 6m diameter and 3.5m depth were fabricated and floated by them. All the investments in the fabrication of cages, the cost of feeds and managing the sea cage farm were borne by the association. A total of 6400 of hatchery produced cobia fingerlings were supplied from Mandapam Regional Centre. The

farming was initiated during the middle of November 2013.

On 8th May 2014 the harvest of cobia was conducted. Shri. K. Nanthakumar, IAS, District Collector, Ramanathapuram flagged off the harvest. In first phase a total of nine tonnes of fish was harvested. The length of fish ranged from 48 to 62 cm and weight from 1.0 to 2.3 kg. The farm gate price was

₹270 / kg. This can be considered as a major milestone in the development of sea cage farming in India.

A meeting was also organized at Mandapam RC. Shri. K. Nanthakumar, IAS, District Collector, Ramanathapuram was the Chief Guest, Dr. M. Karthikeyan, Deputy Director of Fisheries was the Guest of Honour, Dr. G. Gopakumar, Scientist-in-Charge & Head, Mariculture Division presided over the function. More than 100 fishermen participated in the function.

The harvest made by the self-help group has generated an interest in the fishermen community of the area to initiate sea cage farming of cobia. The district administration and Tamil Nadu Fisheries Department are planning for establishing a finfish hatchery in the area to meet the demand of fingerlings. Attractive schemes to motivate the fishermen to take up sea cage farming are also being taken up.

Reported by G. Gopakumar, A. K. Abdul Nazar, R. Jayakumar, G. Tamilmani, M. Sakthivel, Johnson, B. & Amir Kumar Samal, Mandapam RC



Shri. K. Nanthakumar, IAS, District Collector of Ramanathapuram, Dr. G. Gopakumar, Scientist-in-Charge and Shri. P. Rajendran, Cobia Fishermen Welfare Association holding the harvested fish at farm site



Shri. K. Nanthakumar, IAS lighting the ceremonial lamp



Handing over the harvested fish

CMFRI signs MoU with NIO for collaborative research programme

On 7th July 2014, a Memorandum of Understanding (MoU) was signed by Dr. A. Gopalakrishnan, Director, CMFRI,

Kochi and Dr. S.W. Naqvi, Director, National Institute of Oceanography (NIO), Goa for undertaking

collaborative research programme on "Mud bank" a unique phenomenon observed along southwest coast



Exchange of MoU



Dr. A. Gopalakrishnan, Director, CMFRI and Dr. S.W. Naqvi, Director, National Institute of Oceanography (NIO), Goa signing the agreement. Dr. S. A. H. Abidi is also seen

during monsoon. Mud banks are calm areas when rest of the coastal waters is turbulent with very high waves. Fishermen consider "Mud banks" as blessings since they can operate country crafts in these calm waters and sustain their livelihood. Dr V. Kripa will be the leader of the project for the CMFRI component.

Reports on mud banks date back to early 18th century and detailed studies were undertaken in nineteen seventies by CMFRI under the leadership of Dr. E.G. Silas, Former Director, CMFRI. Subsequent to this, targeted studies by individual researchers were conducted on mud banks. Even today, the mystery regarding formation of mud banks remains largely unresolved.

During some years the mud banks remain for a long period whereas they form and dissipate very fast in other years. Now to understand the science behind the formation of mud banks and how it affects the resources, a multidisciplinary approach is planned by CMFRI and NIO. The physical and chemical oceanographic aspects will be investigated in detail by NIO while CMFRI will explore the biological aspects.

The signing of MoU was in CMFRI where scientists from both the Institutes participated. Dr Kripa welcomed the delegates from NIO and CMFRI. Dr. S. A. H. Abidi, former Member, ASRB gave a special address on the occasion. Felicitations were offered by chief

scientists of NIO Dr. S. Prasanna Kumar, Dr. P. S. Rao, Dr.N.Ramaiah and Dr. P. S. Parameswaran, SIC, RC, Kochi. Dr. K. S. Mohamed and Dr. P. U. Zacharia, Heads of Divisions from CMFRI also welcomed the collaboration and spoke on the occasion. Both the Directors mutually agreed to work jointly for understanding the ocean and its resources and congratulated the efforts made by the scientists who have already started working towards achieving this goal.

The CMFRI, Research Vessel Silver Pompano will be used for the detailed studies of mud banks of Alapuzha, in central Kerala.

Reported by FEM Division, Cochin

CMFRI research support leads to India's first Marine Stewardship Council (MSC) certified fishery

The Marine Stewardship Council (MSC) is a global, non-profit and independent organization working to reverse the decline in global fish stocks through the use of market incentives. The MSC's fishery eco-labelling and certification programme allows



Fisherman with handful of Short necked clam catch



consumers to identify and support environmentally responsible fishing practices through purchasing decisions. Consumer support for sustainable fishing in the market place leads to economic benefits for well-managed fisheries and long-term sustainability of fisheries, ensuring secure livelihoods and continuous availability of fish for food. With its seal of approval on more than 6% of all wild-caught fish, MSC is the world's biggest eco-label for sustainable seafood. If a fishery is

successfully certified against the MSC Standard, products from the fishery can be sold with the MSC's unique ecolabel, which identifies seafood as coming from a well-managed fishery.

Very few fisheries from the developing world are eco-labeled, mainly because of the lack of clear management objectives and regulatory frame-work. The initiatives of CMFRI in studying and managing the Short neck clam (*Paphia malabarica*) fishery of Ashtamudi Lake since the 1990s

helped the WWF, India in identifying this small-scale fishery as an ideal candidate for MSC certification. After three years of relentless hard work, perseverance and innovation, the WWF and CMFRI together have finally achieved a landmark in Indian fisheries by obtaining MSC certification for the Short neck clam fishery of Ashtamudi Lake, Kerala. This is a remarkable achievement in many ways—it is the first MSC certification in India, the third in Asia (after Vietnam and the



Postage stamp released in connection with the MSC certificate launch event



MSC certificate being handed over to Ms. Thankachi Prabhakaran, President of Thekkumbhagam Panchayat by Dr. David Agnew, Director of Standards, MSC, London



MSC Expert Committee at the short-neck clam fishing site in Ashtamudi Lake

Maldives) and one of the very few in tropical waters. Benefits of certification include potential for premium prices, access to new markets, preferred supplier status, potential to attract ethical investment in the fishery or funding for local community social and economic infrastructure, improvements in management of fisheries and public recognition of fishery conservation efforts. The MSC

certification exercise demonstrates the power of collaboration between partners and the importance of a new council-based management system for clam fishery governance.

During the certificate launch function on 5th November 2014 in CMFRI, Kochi, Dr. A. Gopalakrishnan, Director, CMFRI welcomed the gathering. Ms. Leena Nair, Chairperson, MPEDA, Mr. Hem Pande, Additional Secretary, Ministry

of Environment and Forests (MoEF) and Mr. Ravi Singh, CEO and Secretary General, WWF-India gave speeches. The MSC certificate was handed over by Dr. David Agnew, Director of Standards, MSC, London to Ms. Thankachi Prabhakaran, President, Thekkumbhagam Village Panchayat. Dr. K. Sunil Mohamed, Head, Molluscan Fisheries Division (MFD) proposed vote of thanks ●

Pre-launch workshop of All India Network Project on Mariculture



Dr. A. Gopalakrishnan, Director and Dr. G. Gopakumar inaugurating the pre-launch workshop

The Pre-launch workshop of the All India Network Project on Mariculture was held at Karwar Research Centre of CMFRI during 25th-26th February, 2015. Dr. A. Gopalakrishnan, Director inaugurated the workshop and explained the conception of the network project and the overall activities planned under the project. Dr. K.K. Philipose, Project Co-ordinator welcomed the delegates. Dr. G. Gopakumar, Principal Scientist (Rtd.) and Dr. Das, Dean, WBUAFS, Kolkata offered felicitations on the occasion. Scientists from all the participating centres in the project were present and the work plans were discussed.

Project inception cum training workshop of the Belmont forum GULLS project

"Global Understanding and Learning for Local Solutions: Reducing vulnerability of marine dependent coastal communities" was held in Poonthura, Thiruvananthapuram on 25th February, 2015. Mr. Shreekanth, Joint Director of fisheries was the Chief Guest at the programme. Mr. Muhammed Iqbal, Councillor, Corporation of Thiruvananthapuram inaugurated the program. Dr. P.S. Swathilekshmi, welcomed the



Hands on training for fishermen at Karwar RC

gathering and Dr. S. Jasmine, outlined the major activities of CMFRI related to the upliftment of the fishing community. Dr. Shyam. S. Salim, Co-ordinator of the workshop gave a brief description about the project which was followed by the Methodology training and a mock field survey to facilitate a hands on experience in surveying techniques. The projects aims to develop a rapport with the stakeholders at chosen study sites for the community participation in administering adaptation mitigation plans to combat climate change and to achieve sustainable fishing.

Reported by SEETTD Division ●

National Innovations in Climate Resilient Agriculture (NICRA) Project

Review Workshop was organized by the Demersal Fisheries Division during January 29th-30th, 2015 at CMFRI, Kochi. All the NICRA Associates from HQs, Centre Co-ordinators and Dr. E. Vivekanandan, Consultant of the project participated.

One day training programme on "Issues on Environmental Degradation and Coastal & Marine biodiversity" was conducted at Mandapam Regional

Centre on 25th February 2015, under Faculty Development Programme organized by the Mohamed Sathak Polytechnic College, Kilakarai for participants from various polytechnic colleges in Tamil Nadu. Dr. I. Rajendran, Senior Scientist inaugurated the training programme. The event was coordinated by R. Saravanan, Scientist.

JNSF Workshops

Prof. Dr. Trevor Platt (Jawaharlal Nehru Science Fellow) jointly with Dr. J. Jayasankar and Dr. Grinson George

(Fishery Resources Assessment Division, CMFRI) organised following workshops.

"The Scientific Basis of Estimating the Potential Fisheries Yield Using Remotely Sensed Data" during 6th and 7th February, 2015.

"Oceanographic bases for fluctuations in fisheries resources in the Northern Indian Ocean" on the 9th and 10th February, 2015.

A Hands on training programme on open sea cage culture for 15 fishermen from Kerala was held during 8th-9th January, 2015 at Karwar RC ●

Cadalmin™ Antidiabetic extract (ADe) from seaweeds released



Release of Cadalmin™ Antidiabetic extract (ADe) at the ICAR Foundation Day celebrations

Cadalmin™ Antidiabetic extract (ADe), a nutraceutical product developed from seaweeds by the institute with activity against type-II diabetes was released by the Hon'ble Union Minister of Agriculture, Shri Radha Mohan Singh on 26th July 2015 at a function held in Patna during the ICAR Foundation Day. In vitro anti-diabetic experiments showed that the active principles effectively inhibited dipeptidyl dipeptidase, tyrosine phosphatase, amylase and α -glucosidase. The results

demonstrated the potential of the nutraceutical to effectively inhibit the mediators, which are responsible to induce type-II diabetes through various metabolic pathways. The product developed from seaweed was compared with that of standard drugs after administering the animals with streptozotocin (a diabetes inducer). The diabetic control had glucose level recorded at greater than 380 mg/dL, whereas the blood glucose levels maintained at about 74 mg/dL (at 65 mg/kg body weight), when

the animals were administered with the bio active pharmacophores. The HbA1c levels maintained at about 4.6% (normal range 4.3-6.3%) after administering the animals with the nutraceutical product. Pre-clinical trials showed no toxicity related significant changes in the renal or hepatic functions, hematological indices and serum biochemical parameters in the experimental subjects. The results also demonstrated a lack of test substance-related general organ or systemic toxicity and hypoglycaemic disorders



Hon'ble Union Minister for Agriculture Shri. Radha Mohan Singh being presented with the nutraceutical product developed from seaweeds by Dr. S. Ayyappan, DG, ICAR

following oral administration at a dose as high as 2000 mg/kg/d. The active ingredients have been encapsulated in hydroxypropyl methylcellulose shells (hypromellose) replacing the animal derived gelatin in an attempt to improve their greater in vivo

dissolution over hard gelatin capsules. The hydroxypropyl methylcellulose was adopted due to the drawbacks associated with the cross-linking of gelatin and drug incompatibilities and the strict regulations regarding the use of animal derived gelatin requiring

the absence of bovine spongiform encephalopathy/transmissible spongiform encephalopathy. Time dependent shelf life studies were conducted to identify the oxidative changes for the product in an accelerated shelf-life study, which revealed no significant reduction of the anti-diabetic activities and the content of bio-active principles of the nutraceutical at the end of study period. Large scale extraction of the active principles from the raw material was optimized in a factory unit. The total yield of the active principles from the raw material in the factory unit was found to be greater than 20%, which demonstrated the commercial feasibility of the nutraceutical product. The product is being out licensed to an identified bio-pharmaceutical company.

Reported by Marine Biotechnology Division

NICRA Annual Review Meeting hosted at Kochi



Inauguration ceremony of the NICRA Annual Review Workshop

The fourth Annual Review Workshop of the network research

project entitled National Innovations on Climate Resilient Agriculture

(NICRA) was held at CMFRI during 13th-14th August, 2015. The meeting was attended by 186 delegates from 34 ICAR Institutes including State Agricultural Universities (SAU). The workshop was inaugurated by Dr. S. Ayyappan, Secretary, DARE & Director General, Indian Council of Agricultural Research (ICAR), New Delhi on 13th August, 2015. Deputy Director General (DDGs) of respective Subject Matter Divisions (SMDs) of ICAR, Vice Chancellors of SAUs, Directors of ICAR institutes and other senior officers also attended. CMFRI was honoured as one among the four best performing institutes under the NICRA project during the current year.

5 concurrent technical sessions were held that were chaired by Dr. A.K. Sikka, DDG (Natural Resource Management), ICAR, Dr. A.K. Singh,



Dr. A. Gopalakrishnan, Director and Dr. P. U. Zacharia, PI, NICRA (CMFRI) being felicitated by Dr. S. Ayyappan, DG, ICAR

Vice Chancellor, RVSKVV, Dr. B. Venkateswarlu, Vice Chancellor, VNMKVP, Dr. A.K. Singh, DDG (Agriculture Extension), ICAR, Dr. S.M. Virmani, Chairman, Expert Committee for Sponsored & Competitive Grants

component, Dr. J. S. Sandhu, DDG (CS), ICAR and Prof. M. Uday Kumar, Member, Thematic Expert Committee. The session on Fisheries was chaired by Dr. K. K. Vass, Member, NICRA Expert Committee for Sponsored & CG Component. The meeting concluded with a Plenary Session chaired by Dr. S.M. Virmani. Other dignitaries present were Dr. A. K. Sikka, Dr. Ch. Srinivasa Rao, Director, CRIDA and Dr. N. K. Krishnakumar, DDG (Horticulture Science) besides Dr. A. Gopalakrishnan, Director, CMFRI ●

Minimum Legal Size (MLS) implemented by Govt. of Kerala

Based on studies made by CMFRI scientists, the institute recommended Minimum Legal Size (MLS) for 58 commercial species of finfishes and shellfishes last year to the Government of Kerala. The government has now notified vide GIO (P) No. 40/15/

F&PD dated 24.7.2015 the MLS for 14 species as a first step to prevent juvenile fish exploitation in Kerala. Seen as a fisheries management tool with the ability to protect juvenile fish, maintain spawning stocks and control the sizes of fish caught MLS sets the

smallest size at which a particular species can be legally retained if caught. Implementing the same would increase the economic efficiency of the fishery besides affording protection to juveniles and allowing them to grow in weight and length ●

CMFRI identifies 146 potential sites for sea cage farming and 342 sites for seaweed farming along the Indian coastline

Aimed at empowering the coastal population through additional livelihood options, the ICAR-Central Marine Fisheries Research Institute (CMFRI) has envisaged plans to boost mariculture activities across the coastal states of the country. The Institute has identified and geo-referenced 146 potential sites for sea cage farming within 3 km in the sea from the coast along the Indian coastline, with a production potential of 2.13 million tonnes per year. Earlier, the institute had identified 342 potential sites for

seaweed farming with a production potential of 9.7 million tonnes (wet weight) in a year. The details have been submitted to the DoF-GoI, all coastal states/UTs, and NITI Aayog for necessary action. The NCSCM (MoEF&CC), Chennai has prepared digital online maps of potential seaweed cultivation sites in GIS platform, incorporating inputs from ICAR-CMFRI together with thematic layers of coastal zone regulations, sensitive ecosystems, shoreline changes, coastal structures, and village boundaries. ([https://](https://gisportal.ncscm.res.in/portal/apps/webappviewer/index.html?id=de0da170e52c44e996d36f5cf5e1e0fa)

gisportal.ncscm.res.in/portal/apps/webappviewer/index.html?id=de0da170e52c44e996d36f5cf5e1e0fa)

CMFRI has developed and standardised indigenous sea cage farming technology suitable to Indian coastal and open waters. On average, up to 3 tonnes of fish could be produced in a 6-diameter cage within a period of 8 months. It is estimated that farmers could earn an economic return ranging from Rs. 1.5 to 2.5 lakh depending on the species grown from each crop ●

Fish feeds developed by ICAR-CMFRI

ICAR-CMFRI developed fish feeds such as Varna and Varsha, designed to enhance the growth, health, and colour of marine and freshwater ornamental fish, respectively broodstock feed for ornamental fish and grow out feed for silver pompano. Varna, a patented formulation with protein, fat, minerals, and carbohydrates, includes marine protein, soy protein, wheat flour, vitamins, minerals, carotenoids, immune

promoters, probiotics, and antioxidants. Available in different pellet sizes, Varna is produced through twin screw extrusion technology for optimal nutrient delivery. Varsha, an economical diet for freshwater ornamental fish, contains natural colour-enhancing agents and marine source ingredients with a protein and lipid profile of 45% and 6%, respectively. Both Varna and Varsha are quality-assured feeds that meet the specific needs of ornamental

fish, contributing to the growth and sustainability of the ornamental fish industry. In addition, specially formulated feed for ornamental fish broodstock adequately rich in essential nutrients to ensure high fecundity, good larval quality and survival was also developed. To ensure higher growth rate for silver pompano, balanced grow out feed was developed with a better feed conversion ratio ●



'Fishlizer'—an organic fertilizer from marine fish wastes launched

A new organic fertilizer from marine fish waste—'Fishlizer' was launched by Dr. A. K. Singh, Deputy Director General (Agricultural Extension) ICAR on 14th August 2015 at CMFRI. Produced through the microbial degradation of marine fish waste in coir pith medium, a waste product from the coir industry it contains all essential elements for plant growth and enhances flowering and fruit setting in plants. It is being sold through the CMFRI-ATIC-KVK Sales Counter in Kochi ●



Launch of Fishlizer at CMFRI

Marine Fisheries Census–2016



Dr.A.Gopalakrishnan, Director, inspecting the Marine Fisheries Census activities at Thangachimadam

Marine Fisheries Census–2016 was successfully carried out in all the maritime states–Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal: and the UTs of Daman & Diu and Puducherry in a duration of 30 days from 1st February, 2016. The census



Census data verification by FRAD Scientists

focused on gathering information on fishermen population, their socio-economic condition, educational and occupational profile, ownership of crafts and gears, migration to other states for fishing related activities, use of fishing and life-saving equipments and demographic features of the marine fishing villages. This exercise was partially funded by Department of Animal Husbandry, Dairying and Fisheries (DADF), Ministry of Agriculture and Farmers Welfare, Government of India. The massive exercise was co-ordinated and executed by ICAR-CMFRI through its regional, research and field centres located along the coast. There were

mainly three types of schedules for gathering the information at various levels. Schedule-I was for collecting information at the household level and prepared in eight regional languages, namely Gujarati, Marathi, Kannada, Malayalam, Tamil, Telugu, Odiya and Bengali, in addition to English and Hindi. Demographic features of marine fishing villages were collected using Schedule-II. Form a-e of schedule-II were used for collecting the information on fisheries related infrastructure facilities existing in the fishing villages like boat building cum repairing yards, ice factories, cold storages, freezing plants, processing plants, fish curing yards etc. Schedule-III was used for collecting the information about the fishing crafts in the marine fish landing centres. The overall co-ordination of census operation was done by Director, ICAR-CMFRI assisted by Head, Fishery Resources Assessment Division. To ensure maximum reliability and validity, supervision of data collection by the suitably trained scientific and technical staff of the institute was carried out at the field, district and state level. The census operation which collected information from 882,263 households spread across 4057 marine fishing villages along the mainland was successfully completed on 1st March, 2016 ●



Enumerators collecting data from fishermen at Uvari, Tirunelveli



Census enumeration at Kasimedu, Chennai

ICAR-CMFRI signs MoU for commercial production of Anti-diabetic nutraceutical



Cadalmin™ Antidiabetic extract for type-2 diabetes goes commercial: MoU with Celestial Biolabs Ltd.

Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and Dr. A. N. Singh, Managing Director, Celestial Biolabs Ltd., Hyderabad signed a Memorandum of Understanding (MoU) on 25th April 2016 for commercial production and marketing of Cadalmin™ ADe, an anti-diabetic nutraceutical, at a function

held at ICAR-CMFRI in Kochi. The product was officially released by the Hon'ble Union Minister of Agriculture, Shri. Radha Mohan Singh on 26th July 2015 at a function held in Patna on the occasion of ICAR Foundation Day.

Cadalmin™ ADe is effective to combat type-2 diabetes and has no

side effects including hypoglycemia (abnormal lowering of blood glucose levels). The bioactive ingredients in the nutraceutical product interfere with the release of simple sugars from the gut, which in turn reduces postprandial (after eating) hyperglycemia (high blood sugar levels). Cadalmin™ ADe contains 100% natural marine bioactive ingredients from selected seaweeds by a patented technology, and would be made available in 500 mg capsules by Celestial Biolabs Limited, a GMP/WHO certified Biopharmaceutical Company based at Hyderabad. The unique biochemical engineering techniques adopted to retain the antidiabetic activities in the preparation of Cadalmin™ ADe assures higher shelf life. The ICAR-CMFRI is in the process of developing more health products from seaweeds based on the National Policy to harness the potential of this natural wealth from the sea ●

ICAR-CMFRI releases Marine Fish Landing Data -2015

The annual Marine Fish Landing Data in 2015 was released on 30 May 2016 at a press conference held at the Headquarters. The report revealed that India's marine fish catch dropped by 5.3% during 2015 compared to the previous year. As per the scientific data, the overall marine fish landings in the country dropped to 3.40 million tonnes (t) during 2015 against 3.59 million t during 2014, recording a fall of 1.89 lakh t (5.3 %).

A sharp decline of 2.79 lakh t (51%) was recorded in the landings of oil sardines mainly in the south west coast comprising Kerala, Karnataka and Goa. Only 2.66 lakh t oil sardine was landed



Official Release of the Annual Marine Fish Landings Data-2015

during 2015 against 5.45 lakh t in 2014 and its contribution as the single largest species in the landings reduced from

15% in 2014 to 8% in 2015. The catch (in lakh t) of other important species/groups recorded during 2015 were

lesser sardines 2.56, Indian mackerel 2.38, penaeid prawns 1.99, ribbon fishes 1.77, threadfin breams 1.63, croakers 1.55, non-penaeid prawns 1.49, scads 1.12 and Bombay duck

1.10. Among these resources, the catch of lesser sardines, Indian mackerel, threadfin breams and scads improved compared to the last year while the other resources showed decrease in

catch. The high value fish Hilsa Shad, which is the main driver for the success of the fishery in West Bengal, showed improvement in the landings from 5,247 t in 2014 to 20,659 t in 2015 ●

Institute Research Council Meeting held at Headquarters



IRC 2016 in progress

The 23rd Institute Research Council (IRC) Meeting was held at the Headquarters from 26 to 30 April 2016. On the first day, meetings were conducted at respective Divisions where the status of the research projects were presented and discussed. Dr. K. S. Mohamed, Member Secretary,

IRC, welcomed the gathering of 134 scientists from the various Regional Research Centres of the institute. Dr. A. Gopalakrishnan, Director and Chairman, IRC then presented the achievements of the Institute during 2015-16 and flagged action points to be taken during 2016-17 period. During 27 -30th April,

the Heads of Divisions and Principal Investigators of the various in-house and funded projects made presentations of the project works carried out during the year which was followed by discussions. 68 Action Points to be addressed by concerned scientists were recorded at the end of the 5 day session ●

ICAR-CMFRI comes in the Registered Scientific Institutions List of CITES

The Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India (through its letter D.O. No. 4-23/2015/WL, dated 02 June 2016) has communicated that ICAR-CMFRI has been accorded Registration Number (IN 034) in the scientific institutions list of Convention on International Trade

in Endangered Species of Wild Fauna and Flora (CITES) under the Article VII, paragraph 6 of the Convention read with Resolution Conf. 11.15 (rev. CoP12). This permits exemption from provisions for non-commercial loan, donation or exchange between scientists or scientific institutions registered by notified

authority to further research interests. With this, ICAR-CMFRI enters into the exclusive club of institutions, which can acquire, exchange, store, preserve specimens, both live and otherwise, for museum purposes or to conduct taxonomic and species conservation research ●

Breakthrough in seed production of orange spotted grouper

In a major breakthrough for the mariculture sector in the country, ICAR- CMFRI has succeeded in the mass scale seed production of orange spotted grouper (*Epinephelus coioides*), and the achievement is the first of its kind in India. The hatchery seed production of the species, achieved by the Vishakapatnam Regional Centre is expected to boost the sea cage culture enterprises in the country. The orange spotted grouper is a commercially important carnivorous fish with high market demand in many parts of the world. Although initial success in seed production of the fish was achieved in 2014, the survival rate of the larvae was very low. After manipulating different water quality and feeding protocols, enhanced survival rate of >10% was achieved this time. The larvae are now in advanced fry stage with a size of around 3 cm after 42 days of rearing in the hatchery and ready to be moved to the nursery rearing phase. After this the fingerlings can be used for mariculture in grow-out cages. Orange spotted



Larval rearing phase of orange grouper

grouper is a potential species for mariculture because it is compatible with high temperatures hardy in nature and has high market value. In most of the major fish landing centres, the fish fetches ₹400-450 per kg in wholesale market. The live fish sale in international markets fetches 3-4 times higher prices, indicating the prospects of mariculture of the species. Orange spotted grouper

forms the mainstay in the world Live Reef Food Fish Trade (LRFF) particularly in several Asian countries such as Hong Kong, China, Taiwan, Singapore and Malaysia. In India, it is distributed on the east and west coasts.

Reported by Ritesh Ranjan, Biji Xavier, Sekar Megarajan, Shubhadeep Ghosh, Chinnibabu B., Vamsi B., Narasimhulu Sadhu and Biswajit Dash, Visakhapatnam Regional Centre

A new species of mackerel identified

A new species of mackerel named as Indian chub mackerel, *Scomber indicus* which is distinctly different from the other members of the mackerel family both morphologically and genetically

has been identified from the west coast of India (available in eprints @cmfri.org.in). The fish was first found off Gujarat coast in 2015, later it appeared in other areas of the west coast of India up to

Kanyakumari. This year, the species is reported only from Kerala waters being caught mainly by ring seines and trawls and in small quantities by hooks and lines operated around knolls which is landed in fishing harbours of Kochi, Vizhinjam, Alappuzha, Kollam and Kozhikode. Mainly immature fishes were landed this year, and catch is being monitored continuously to understand their biology and interaction with other species.



Scomber indicus

Reported by E. M. Abdussamad, Pelagic Fisheries Division

Unusual landing of large sized queenfish

Heavy landings of large sized queen fish (*Scomberoides commersonianus*) locally known as “Katta” in trawl net (Meenmadi) from Pamban area was recorded at Therkuvadi landing centre, Gulf of Mannar on 21st November 2016. Such high volumes of landings are rare. The average length and weight of the fish landed was 96 cm and 7 kg respectively. Following a glut situation, market price per kg of the queen fish was only ₹90 per kg, lower than the usual price about ₹200. The whole fishes were taken for making dry fish which consumers prefer.

Reported by Surya S., Shanmughanathan K., Saravanan R., Rajkumar M., Remya L, Vinothkumar Ramar and Abdul Nazar A. K., Mandapam Regional Centre ●



Large sized Talang queenfish landings

GIS-based database on fish landing centres in India handed over to Indian Navy



Handing over of the GIS –based database of fish landing centres to the Southern Naval Command

The institute has developed a Geographic Information System (GIS) based database about the marine fish landing centres along the Indian coast. The types of fishing activity, seasonality of fishing and the extent of fishing operations from each fishing centres are available in this database which was handed over to the Indian Navy in order to make the security measures in coastal regions easier. The document with the spatial tags of fish landing centres can also aid disaster management tasks. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI handed over the document to Vice Admiral A. R. Karve AVSM, Flag officer Commanding-in-Chief, Southern Naval Command in a

meeting held at the office of the Southern Naval Command, Kochi. Dr. A. P. Dineshbabu, Principal Scientist at the Mangalore Research Centre of ICAR-CMFRI coordinated the research team that comprised of 22 scientists and 85 other staff to prepare the database comprising 1,278 landing centres spanning all maritime states (Gujarat, 129; Maharashtra, 149; Goa, 34; Karnataka, 93; Kerala, 201; Tamil Nadu, 359; Andhra Pradesh, 204; Odisha, 54 and West Bengal, 55) since they are the reference points for mapping marine fisheries and serve as the basic data for fisheries conservation and management.

Reported by Mangalore Research Centre ●

Anti-obesity nutraceutical developed from seaweeds



In a major advancement in the natural health care industry of the country, the Institute has developed a nutraceutical from seaweeds that can serve as a natural remedy for obesity

and dyslipidemia. The product named Cadalmin™ Anti-hypercholesterolemic extract (Cadalmi™ ACE) was released during the inaugural ceremony of the Platinum Jubilee celebrations of the ICAR-CMFRI at its Headquarters in Kochi on 18th February, 2017.

Obesity, a medical condition in which excess body fat gets accumulated to the extent that it may have a negative effect on health is one of the leading but preventable cause of death worldwide. Increased abdominal (visceral) fat accumulation and obesity is associated with type-2 diabetes, abnormalities in lipid metabolism and coronary artery disease. Approximately 70% of obese patients are dyslipidemic, which include elevated

serum triglyceride (hypertriglyceridemia), reduced high-density lipoprotein, and increased small, dense low-density lipoprotein (LDL) particle number. The treatment of the dyslipidemia which is focused on lipid-lowering therapy by statin treatment, often has adverse effects including drug-induced insulin resistance, chronic inflammation, reduced immunity (by depletion of CoQ10) and increased cancer risk on long term use. The side-effects of synthetic drugs led the scientists of the institute to investigate natural, safer and effective alternatives from seaweeds.

Reported by Kajal Chakraborty, Marine Biotechnology Division

Breakthrough in captive broodstock development and breeding of the Pink ear emperor

The first successful spawning without any hormonal induction and obtaining fertilised eggs of the Pink ear emperor *Lethrinus lentjan*, was achieved by the Vizhinjam Research Centre. Rearing of the broodstock for three months in a Recirculatory Aquaculture System

(RAS) was required for this success. The second spawning with more than 95% fertilization of eggs was also obtained after a week and regular spawning was observed thereafter. The eggs hatched about 16-18 hours after spawning at a water temperature range of 27-29°

C. The newly hatched (pro larvae) larva measured 1100 – 1150µ whose mouth opening formed only after about 48 hours post hatch. The mouth gape was around 110µ. Larval rearing was done in green water by feeding larvae with rotifer, copepod nauplii, artemia nauplii and micro diet. Juvenile stage with squamation was reached in 35-40 days. This is a potential species for mariculture because of its high market value due to its superior flesh quality hardy nature and ability to accept trash fish and compounded feed during culture.



Captive broodstock of *Lethrinus lentjan*

Reported by: Anil M. K., Sugi V. V., Gomathi P., Raheem P. K., Santhosh B., Raju B. P. M. Krishnapriya and O. Shalini

CMFRI gets Rs 9 Crores to set up national broodbanks of marine fishes



holding tanks, recirculation aquaculture systems and photothermal control systems. The proposed facility will sustainably produce fertilized eggs and newly hatched larvae from bio-secure broodstocks of cobia and pompano fed with suitable diets under controlled water quality parameters and photoperiod.

According to Dr A Gopalakrishnan, Director of CMFRI, the new project will help solve the issue of scarcity of quality seeds of cobia and pompano which are among the most suitable species for sea cage farming in Indian waters.

Successful spawning and seed production of silver pompano was also achieved in Vizhinjam RC of CMFRI in 2017 in addition to Madapam RC. Following this, and with the establishment of the broodbanks, CMFRI has achieved a production of 12 million per annum of newly hatched larvae of silver pompano and 8 million newly hatched larvae of cobia per year. ●

The Central Marine Fisheries Research Institute (CMFRI) has bagged an amount of Rs 9 Cr from the Central Government to establish national broodbanks of two marine fishes namely cobia and pompano. The Department of Animal Husbandry, Dairying and Fisheries (DADF) under the Ministry of Agriculture and Farmers Welfare approved CMFRI's proposal to enhance production of farmed

cobia (*Rachycentron canadum*) and pompano (*Trachinotus blochii*) through the establishment of their broodbanks and supply of larvae to all coastal States for seed production.

The broodbank will be set up at Mandapam and Vizhinjam regional centres of the CMFRI and the regional hatcheries will be established in all maritime States. The broodbank will have quarantine facility, broodstock

Anti-obesity nutraceutical product from seaweeds commercialised

The recently developed nutraceutical product named Cadalmin™ Antihypercholesterolemic extract (Cadalmin™ ACe) for reducing obesity and cholesterol was licensed to the VLCC, a leading Indian MNC in wellness and obesity management. Dr. A. Gopalakrishnan, Director ICAR-CMFRI signed a license agreement with Sandeep Ahuja, Director, VLCC Group and Dr. A. H. Zaidi, Executive Vice President (R & D) of the firm ●



Signing of license agreement for the seaweed based nutraceutical

Cadalmin™ Anti-hypothyroidism extract from seaweed released

Cadalmin™ Anti-hypothyroidism extract (Cadalmín ATe), a nutraceutical product with activity against hypothyroid dysfunctions from seaweeds has been released by the Hon'ble Union Minister of Agriculture, Shri Radha Mohan Singh on 16th July 2018 in the gracious presence of the Director General of ICAR, Dr. Trilochan Mohapatra at a function in New Delhi on the occasion of ICAR Foundation Day.

Cadalmin™ ATe provides a unique blend of 100% natural marine bioactive ingredients with anti-hypothyroidism principles extracted from seaweed, with an ecofriendly "green" technology. The bioactive



leads concentrated in Cadalmín™ ATe were found to stimulate thyroid releasing hormone and increase

the activity of selenodeiodinase to produce metabolically active thyroid hormones tetraiodothyronine (T₄) and 3, 5, 3'-triiodothyronine (T₃). Preclinical trials showed no toxicity related significant changes in renal or hepatic functions, hematological indices and serum biochemical parameters in the experimental subjects. The results also demonstrated a lack of test substance-related general organ or systemic toxicity and hypoglycaemic disorders following oral administration at a dose as high as 2 x 10³ mg/kg/d.

Reported by : Kajal Chakraborty, Marine Biotechnology Division

Successful seed production of maze rabbit fish

The maze rabbit fish *Siganus vermiculatus* which can reach above 2 kg is a top priority species

for mariculture. Under the All India Network Project on Mariculture (AINP-M), successful rearing of larvae



to metamorphosis following induced breeding during full moon phase of the lunar cycle was achieved. The breeding pair was intramuscularly injected with Human Chorionic Gonadotropin (HCG) and Greenwater technique was used for egg incubation and larval rearing. Copepod, *Parvocalanus crassirostris*, rotifers (S type & L type), Artemia and artificial pellet feeding regimen was used during larviculture. The larvae completed metamorphosis at 2.5-2.8 cm total length after 36 days of rearing. This is the first report of larval rearing of *S. vermiculatus* to metamorphosis in India.

Reported by: Anuraj A., Suresh Babu, P. P., Jayasree Loka, Raghu Ramudu K., Vaidya, N. G., Srinivas K., Sonali S. M., Praveen Dube, Pramila B., Vineeth T., Manoj H., Nagaraj Durgekar. Karwar Research Centre

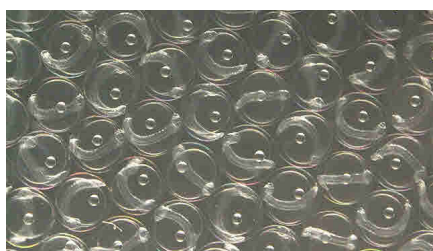
Success in captive spawning and seed production of John's snapper

The first report of successful broodstock development, induced breeding and seed production of John's snapper in captivity in India, which has raised enormous scope for aquaculture business opportunity through species diversification has emerged from ICAR-CMFRI. *Lutjanus johnii* belonging to the family Lutjanidae, has immense potential for mariculture owing to its fast growth rate, easy adaptability to culture conditions, quick acceptance of artificial feed, meat quality and high consumer preference. In an attempt to diversify mariculture, research on breeding and seed production of the species was initiated in 2018 at Visakhapatnam Regional Centre of ICAR-CMFRI, using adult fishes collected from the wild. Later, under a DBT funded project entitled "Developing a new candidate species for mariculture: Marine finfish John's Snapper, *Lutjanus johnii*" work was taken



up on priority. Adult fishes of around 3 kg sizes maintained in the offshore cages installed off Visakhapatnam were selected and transported to the hatchery complex. After prophylactic treatment for two weeks these were transferred to 125 t capacity indigenously developed Re-circulating Aquaculture System (RAS). The fishes were acclimatized and fed with squid, twice a day till satiation. Gonadal profile of the fishes was assessed routinely using live ovarian biopsy. When the ova size of females was found optimum, females and oozing males were injected with inducing hormone for spawning. These responded 42 hours post-induction, and the fertilized eggs obtained were collected using flow-through cum recirculation of tank water. These

were appropriately treated and stocked in two tonne capacity FRP tanks for incubation and larval rearing. Larvae hatched out after 14 hours at 28-30°C ambient temperature. Mouth opened 54 hours post-hatching. The larval rearing was carried out using green water system with different live feeds such as *Nannochloropsis* sp., *Isochrysis* sp., copepod nauplii, rotifers and *Artemia* nauplii. Larvae were weaned on artificial feed from 20 Day post-hatch (DPH). Larvae started metamorphosis from 22 DPH, which was completed by 30 DPH, and by this time the larvae were fully weaned on artificial feed. After 42 days of rearing post-hatch, a survival rate of 3.67% was achieved and the fry reached an average size of 3.8 cm and 0.62 g.



Larval rearing cycle from egg to fry stage of John's snapper

Carbon sequestration potential of mangroves assessed



A study was conducted to estimate the biomass and carbon stocks in a natural mangrove of Muzhappilangad wetland in the Kannur district of Kerala. *Avicennia marina* the predominant mangrove species with an average tree density of 1,592.31 individuals ha^{-1} , overall mean above-ground biomass 260.69 t ha^{-1} and the overall mean root biomass 102.84 t ha^{-1} was recorded. The estimated mean C-stocks were 130.34, 51.42 and 28.68 t C ha^{-1} in the above-ground, root and sediment carbon pools respectively. The above-ground C-stock constituted 61.94% while the root and sediment

C-stock comprised 24.43 and 13.63% respectively. The total carbon stock of Muzhappilangad wetland was 210.44 t C ha^{-1} which is equivalent to 772.32 $\text{t CO}_2 \text{ ha}^{-1}$. The mangrove area of Muzhappilangad is 8.9 ha and therefore it can be assumed that this small wetland of Kerala has the potential to sequester and store 1,872.92 t C , equivalent to an estimated 6,873.61 t CO_2 . Mangroves have immense capacity to sequester and store large quantities of carbon in their biomass and sediments and reportedly upto four times more carbon per unit area as compared to the terrestrial forests

of the tropics. The mangrove cover in India is 4,975 sq. km. (Forest Survey of India, 2019) with the net increase in mangrove cover of 54 sq.km. as compared to the 2017 assessment. The mangrove cover of the country which is 3.32% of the total mangrove area of the world is expected to sequester and store a substantial quantity of carbon. The state of Kerala is endowed with 9 sq. km. of mangrove cover of which 6.24 sq.km. lies in the Kannur district of the state.

Reported by K. Vinod, P. K. Asokan, P. U. Zacharia, C. P. Ansar, A. Anasukoya, V. A. Kunhikoya and M. K. Nikhiljith

Nutraceuticals developed from seaweed commercialized

Cadalmin™ Green Algal extract (Cadalmin™ GAe), Antidiabetic extract (Cadalmin™ ADe), and Antihypertensive extract (Cadalmin™ AHe), three patent-protected nutraceutical products developed from seaweeds by ICAR-Central Marine Fisheries Research Institute, as natural remedies for arthritis, type-2 diabetes and hypertensive disorders, were commercialized with



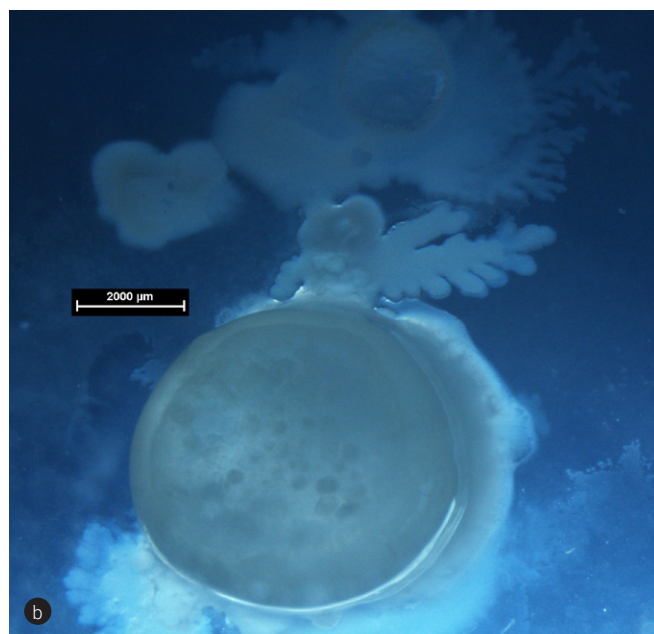
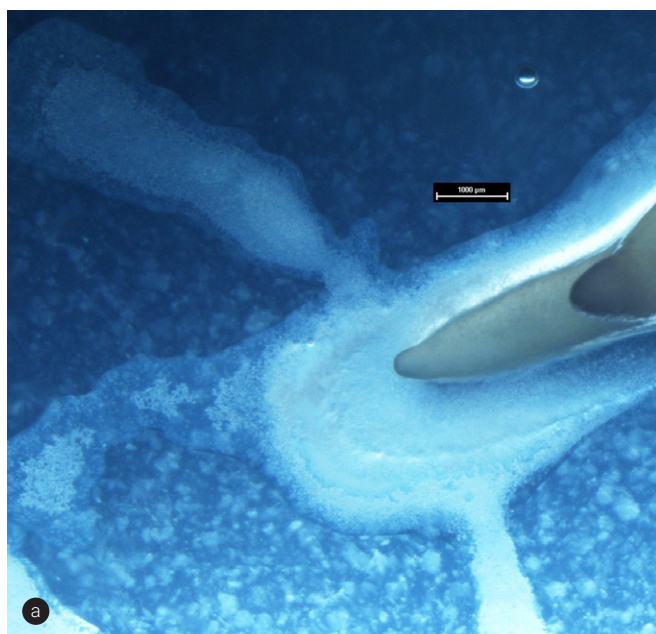
Pioneer Pharmaceuticals Limited-a leading wellness and pharmaceutical company based at Kochi. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI signed an exclusive license agreement with the company for their commercial production and marketing, on 9th

September, 2020. Seaweeds are gaining immense attention in nutraceutical industries due to their protective function against various chronic diseases. The Indian nutraceuticals market has been growing at the compound annual growth rate of 20%

for the past three years, particularly in the functional food segment indicating its acceptance by the Indian consumers and healthcare providers.

Reported by: Kajal Chakraborty, Marine Biotechnology Division

Success story in micro propagation of *Kappaphycus* with gametophyte stage



Micropropagation of *Kappaphycus* (a) Gametophytic stage (b) Callus formation

Spurred by increasing global demand for carrageenan in processed food industry, the seaweed *Kappaphycus* spp has been cultivated in Southeast Asia since early 1970s. This robust red seaweed species shows high growth rate, has short culture period (45-60days) and produces nearly 50% of carrageenan of its dry weight. In India, cultivation of *Kappaphycus alvarezii* has recently picked up significantly in the coastal districts of Tamil Nadu, Andhra Pradesh and Gujarat and there is demand for more seed material from farmers. To meet this demand, development of technologies for transportation of seed in live condition,

maintenance of seed material during adverse environmental conditions and easy methods of seeding is important. For this, micro-propagation of seaweed is being experimented globally. A successful technology to produce seaweed propagules from *Kappaphycus* for commercial farming is yet to be established, unlike for seaweeds such as *Porphyra* and *Laminaria*. In this context, micro propagation of *Kappaphycus* in the tissue culture laboratory of ICAR-CMFRI has indicated encouraging results. It was recorded that along with the formation of callus development of gametophytic stage and profuse branching of

thallus also could be established in the laboratory. By manipulating the concentrations of plant growth hormone administered along with light intensity and photoperiod, tissue culture of *Kappaphycus* could be established in this study. These results are highly encouraging and can assist in scaling up production of seaweed germlings for commercial cultivation. Further work aimed at mass production of seedlings from a limited biomass of plants, under controlled environmental conditions, is in progress.

Reported by: Dr. Reeta Jayasankar, Fishery Environment Management Division

First successful hatchery seed production of Picnic seabream in India



Acanthopagrus berda

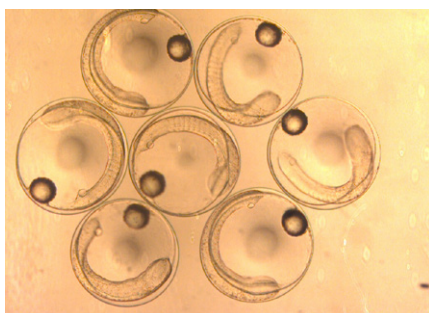
Picnic seabream or black seabream, *Acanthopagrus berda* is an important food fish with high economic value, having strong disease resistance and high growth rate. Carnivorous in nature it feeds mainly on echinoderms, worms, crustaceans, molluscs and small fishes and is a protandrous hermaphrodite. Price of this fish in local markets of India is about ₹470 per kg. Fishes collected from Karwar region were reared in the Marine cage farm of the Karwar Regional Station of ICAR-CMFRI. Special maturation diets and regular ovarian biopsy was carried out to select matured fishes for breeding programme. Matured fishes were available during September to March and females with ripe ovary and males with oozing milt were shifted to the Marine hatchery complex.

Successful breeding and seed production was achieved for the first time in India in February 2021 through induced breeding techniques using Salmon GnRH –Analogue hormone (OFAFISH, Bhoomi Aqua International, India) as the inducing agent. The fishes spawned after 36 hours of inducement

and the pelagic eggs hatched after 22 to 24 hours at a temperature of 28 to 30°C. Fecundity was 0.25 million per female (450 g) and 86% of the eggs hatched after 24 hours. Experimental larval rearing was carried out in 100 litre tanks with various live feed organisms such as copepods, rotifers

and Artemia; stocking 100 eggs per litre. Metamorphosis of the larvae initiated in 24th day post hatch (DPH) with 9 % survival in a tank.

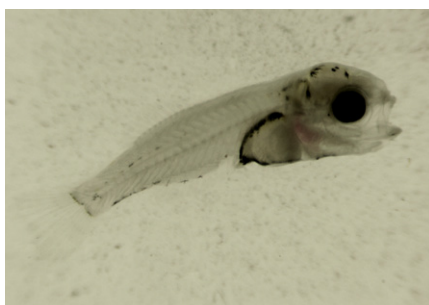
Reported by: Suresh Babu, P. P., A.Anuraj, Jayasree Loka, P.Srinivasa Rao, S.M.Sonali, N.D. Praveen and N. G. Vaidya, Karwar Regional Station



Somite stage of fertilised egg



Fish Larvae (0DPH)



Fish Larvae (14 DPH)



Fish larvae (24 DPH)

Marine Mammal Watch Programme launched

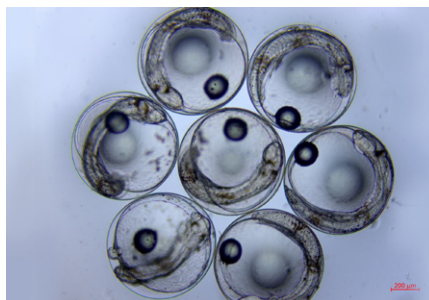
A research cruise for the assessment marine mammal population of the EEZ was jointly launched by ICAR-CMFRI, the Marine Products Export Development Authority (MPEDA) and the Fishery Survey of India (FSI). This joint initiative of the three major central agencies functioning under different ministries assumes significance in the wake of emerging seafood trade-related challenges faced by the fishermen targeting high-value resources and the export market sector in

India. According to the National Oceanic and Atmospheric Administration (NOAA), USA, seafood exporting countries should not allow intentional killing of marine mammals in commercial fisheries and strictly adhere to norms laid out in Marine Mammal Protection Act (MMPA) of their country. The cruise was flagged off by Shri. K S Srinivas, IAS, Chairman, MPEDA in the presence of Dr A Gopalakrishnan, Director, ICAR-CMFRI and Dr L Ramalingam, Director General, FSI

The marine mammal the stock assessment was done using coastal and oceanic sighting surveys following line intersect transect methodology. The stock assessment followed the NOAA framework to calculate the Potential Biological Removal (PBR), by integrating bycatch and stranding data. The comparability finding analysis (CFA) is submitted to the NOAA through MPEDA, which may lead to lifting of US ban on wild caught shrimp export from India ●

Successful captive breeding of Banded Grunter in Recirculating Aquaculture System

In a global first, a team of scientists at the Vizhinjam Regional Centre of ICAR-Central Marine Fisheries Research Institute have reported successful breeding of the banded grunter *Pomadasys furcatus* (family Haemulidae) an important food fish in India and other Indo-West Pacific countries. The brood-stock maturation was done in a Recirculating Aquaculture System (RAS) of 5-ton



Developing eggs



Yolk-sac larvae



Hormone administration in *Pomadasys furcatus*



Seed of *Pomadasys furcatus*

capacity and induced spawning achieved by hormonal induction using LHRH. Fertilized eggs ($782.21 \pm 15.91 \mu$) were transparent, pelagic, non-adhesive with a single oil globule ($180.33 \pm 5.11 \mu$). A green water system with a combination of algae was used for larval rearing. The size of the hatchling ranged from 1581.71μ to 1878.67μ and the mouth (size: $90-125 \mu$) opened on 2nd day post hatch (dph). Larvae were reared using copepods, rotifer, artemia and micro diet. Black pigmentation on the body began by 18 dph, and by 20-25 dph, larvae started moving from pelagic to the benthic realm. Larvae became juvenile (length $- 3.8$ cm; weight $- 0.79$ g) after 30 dph with adult colourations, and by 40 dph, it reached a length of 5 cm and weight of 1.8 g. This fish is a highly euryhaline species that can be used for farming in ponds, cages and recirculating aquaculture systems in seawater and brackish water. This work was done under the All India Network Project (AINP) in Mariculture.

Reported by: M.K Anil, Ambarish P Gop, Surya S, Gomathi P, Siju R and Raju B ●

Hon'ble Vice President Shri M. Venkaiah Naidu dedicates newly bred John's snapper seeds to the nation; releases ICAR-CMFRI's technology



In a function held at the Visakhapatnam Regional Centre of ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), the Hon'ble Vice President of India, Shri M. Venkaiah Naidu formally released the John's snapper seed production technology and dedicated the snapper seeds to the nation. As a customary gesture, the Hon'ble Vice President handed over the snapper seeds to two progressive fish farmers hailing from the region at noon on 7th December, 2020 in the presence of jubilant farmers and dignitaries such as Shri Muttamsetti Srinivasa Rao, Hon'ble Minister for Tourism, Culture and Youth Affairs, Govt of Andhra Pradesh; Shri Vinay Chand, Collector and District Magistrate, Visakhapatnam, Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and Shri K. Muraleedharan, Institute Management Committee member ICAR-CMFRI.



Addressing the scientific fraternity, the Hon'ble Vice President stated that snapper seed production and subsequent mariculture in cages would fulfil the domestic demand of marine finfish as the cheap and best source of animal protein. Being a rich source of omega-3 fatty acids, snapper consumption will improve the general well-being of the country's vast population, and its farming would be lucrative for fish farmers. He emphasized that the existing gap prevalent in the country between demand and supply can only be bridged by marine cage farming and there is a need to further diversify the species mix ●



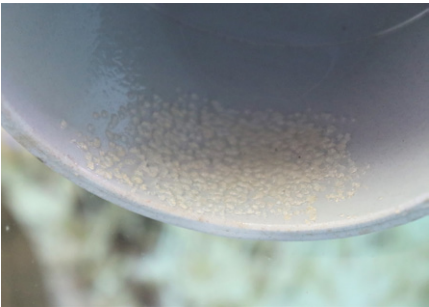
Captive breeding and seed production of Azure damsel

Azure damsel (*Chrysiptera hemicyanea*) is a popular ornamental fish native to the eastern Indian Ocean and western Pacific regions with very good demand in the marine aquarium trade due to its vibrant colouration. Broodstock development and captive breeding for one of the most promising species for community aquariums was successfully accomplished at Vizhinjam Regional centre of ICAR-CMFRI. Azure damsel subadults collected from the coastal waters of Kanyakumari on 31st March 2021 were acclimatized and reared in 150 litre capacity HDPE tanks and pair formation was noticed after two months. A few such pairs were kept in breeding tanks and fed with special

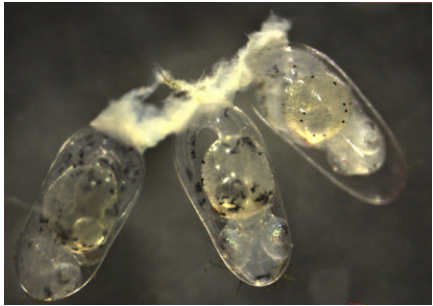


broodstock feed. The first spawning occurred on 03rd June 2021 with eggs hatching on the 4th day followed by the larvae starting to metamorphose on 16-18 dph and completed by 23-25 dph. The juveniles reached 1.5 cm by 60 dph. More than 25 spawnings were obtained from a single group. Larvae were fed with copepod nauplii as live feed up to 12-15dph and a survival of up to 25% was obtained.

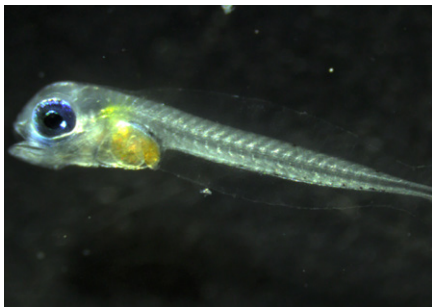
Reported by: B.Santhosh, Ambarish P. Gop, S.Surya, M.K. Anil, Anzeer Muhammed & Aneesh



Egg deposited on PVC pipe



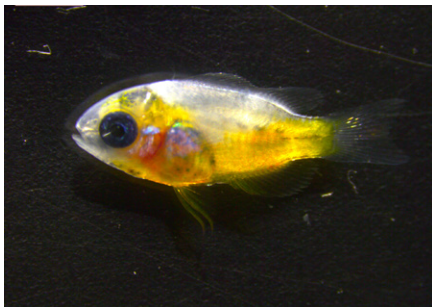
Eggs



Larva (1dph)



Juveniles 50dph



Larva at 18dph

First successful breeding of Lyretail anthias under captive condition

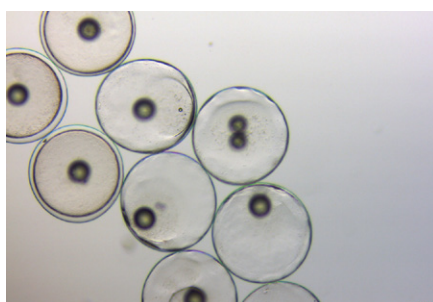
Vizhinjam Regional Centre of ICAR-CMFRI has successfully bred yet another anthias fish, *Pseudanthias squamipinnis* (Peters, 1885) belonging to the subfamily: Anthiinae (Family: Serranidae). Popularly called Lyretail anthias, it is a highly-priced (US\$ 16) coral reef fish distributed in Indo-West Pacific region. Broodstock was developed in the 2 ton Recirculatory Aquaculture System (RAS) and the first volitional spawning without any hormonal induction was achieved on May 11, 2021. Fertilized eggs were pelagic, spherical, non-adhesive, transparent, measuring 596 to 615 μ size with a single oil globule. A green water medium with a combination of algae was used for larval rearing. Eggs hatched out 16-17 hours after spawning at the water temperature of $28 \pm 1^\circ\text{C}$. Newly hatched larvae were planktonic and measured 1.428 ± 0.094 mm in total length. These were reared using copepods nauplii as first feed,



and in later stages, they were fed with rotifer, artemia and micro diet. By 25 days post hatch (dph), larvae were in an

advanced stage of development with all the fins. However, metamorphosis of larvae began only by 30 dph, and was completed between 35 and 40 dph, when larvae became juvenile with adult colourations. This work was done under AINP on Ornamental fish culture.

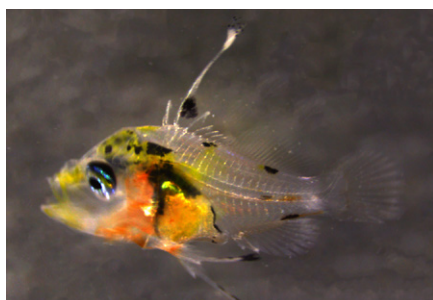
Reported by: M.K Anil, Gomathi P, Ambarish P
Gop, Surya S, Siju R and Raju B



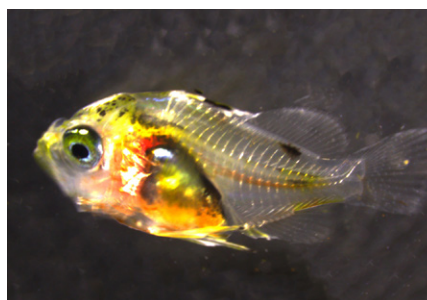
Fertilized eggs



1DPH larva



17th DPH larva



25 DPH larva



40 DPH juveniles

Breakthrough in captive broodstock development and breeding of Marcia's anthias (*Pseudanthias marcia*)



Developing eggs (8 hours)



Hatching 12 hours



2 days old larvae

Successful captive brood stock development, spawning and seed production of the marine ornamental serranid commonly called the Marcia's anthias, was achieved at Vizhinjam Research Centre of ICAR-CMFRI in December 2016. This research work was done under the All-India Network Project (AINP) on Mariculture. *Pseudanthias marcia*, a protogynous hermaphrodite with complicated breeding habits belongs to the Family Serranidae and Subfamily Anthiinae. The species is one of the most expensive reef fishes traded

in the marine aquarium export trade and it fetches around \$25 per fish in international market. At Vizhinjam Research Centre, brood stock of this species was developed in 5-ton Recirculation Aquaculture System (RAS). Spawning took place after 7 months of rearing in the RAS. The eggs hatched out after an incubation period of about 14 hours at a water temperature of 29°C. The newly hatched larvae measured 1400 microns and of larval rearing protocol was standardized at the centre. Mouth opened at 48-50 hours post hatch (ph) and measured

76 to 80 µ. Larval rearing trials were conducted using rotifer (L and S type), wild zooplankton, copepod nauplii, artemia nauplii and microparticulate diet. Larvae metamorphosed to miniature adult shape by 32-34 dph and on 50 dph they reached the pink-coloured juvenile stage (42-43mm) and at this stage, they were transferred to nursery rearing tanks. The average survival was around 11.57 %.

Reported by: M. K. Anil, P. Gomathi, K. K. Philipose, P K Raheem, B. Raju, O. Shalini, P. M. Krishnapriya and A. S. Shibina

Bulk production, and sale of 'designer clowns' and other marine ornamental fish & training to fisherwomen



The marine ornamental fish trade is low volume and high value industry and hence it is very lucrative to initiate a hatchery produced trade. Breeding and seed production of many pomacentrid species, most notably in clown fishes have been successfully developed at CMFRI Mandapam and Vizhinjam centres such as *Amphiprion chrysogaster*, *A. sebae*, *A. ocellaris*, *A. percula*, *Premnas biaculeatus*, *A. frenatus*, *A. nigripes*, *A. akallopisos*, *A. ephippium*, *A. clarkii*, and black *A. ocellaris*; and damselfishes such as *Neopomacentrus cyanomos*, *N. nemurus*, *Dascyllus carneus*, *D. aruanus*, and *Chrysiptera hemicyanea*. From 2015 onwards, the Mandapam centre has successfully raised cross-bred clown fishes or 'designer clowns' (*A. percula*) and the protocols for larval rearing and large-scale fingerling production have

been standardized. The designer clowns such as Picasso, platinum, snowflake and tear-drop, along with year-round production of other clown fishes such as, normal percula clown, tomato clown, skunk clown, black ocellaris clownfish and maroon clown are highly sought-after varieties in the domestic as well as international markets. These are being sold in bulk to hobbyists or traders in Chennai by the institute. The Mandapam Regional Centre of CMFRI, has been helping local fisherwomen to set up ornamental fish units, as an alternative livelihood programme to fisherfolk and organizing regular hands-on training programmes on 'Breeding and Seed production of Marine Ornamental Fishes to Fishers in Gulf of Mannar Region' funded by the Gulf of Mannar Biosphere Reserve Trust (GOMBRT). The technologies

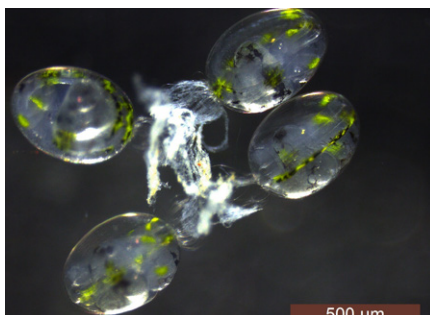
were mostly disseminated to fisherwomen groups, so that they could develop as small-scale entrepreneurs for production of marine ornamental fishes. Support has also been provided to set up nursery rearing units for growing the juvenile fish for 45 days and the institute had started supplying juveniles to fisherwomen and marine ornamental fish farmers for nursery rearing and further trading. More than 30 such units have been set up in Ramanathapuram District itself and the designer clown fishes are sold at a premium rate.

Reported by A.K. Abdul Nazar, R. Jayakumar, G. Tamilmani, M. Sakthivel, P. Rameshkumar, Johnson, B., Amir Kumar Samal & K.K. Anikuttan, Mandapam Regional Centre

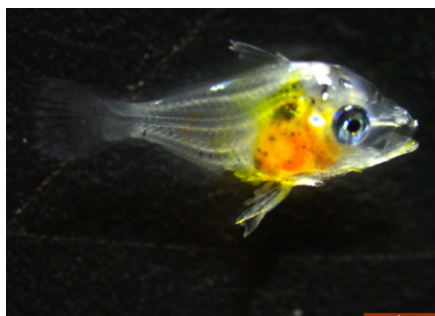
Marine ornamental Black-bar chromis successfully bred in hatchery



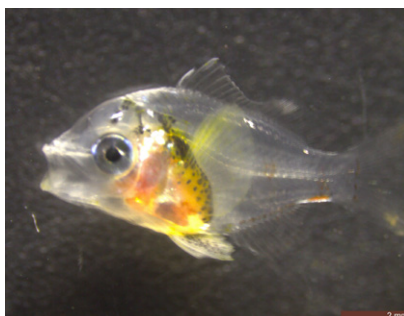
Broodstock of black-bar chromis



Eggs



Flexion larvae



Post flexion larvae

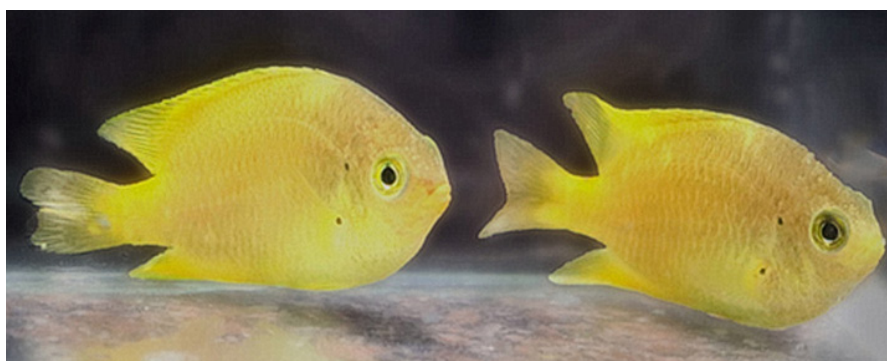
around 3 cm were reared in circular HDPE tanks of 500 L capacity having a simple biofilter setup. Fishes were fed with commercial pellet feeds (0.5-0.8 mm) and fresh feed and after 4 months started spawning. Spawning occurred in the early mornings and the eggs were attached to the PVC pipes provided as substratum. Eggs per spawning ranged from 50-200, were ellipsoid in shape and hatched within 36-38 hours. The newly hatched larvae had very little yolk and started feeding from 2 dph onwards. Selected copepods were given as live feed till the completion of the flexion stage and they completed the metamorphosis by the 45th dph. Black-bar chromis a popular and important marine ornamental fish recommended for community aquariums is categorized as one of the most difficult fish to breed.

Broodstock development, breeding, and larval rearing of Black-bar chromis, *Pycnochromis retrofasciatus* (Weber,

1913) was successful in the Vizhinjam Regional Centre of ICAR-CMFRI. Ten sub-adults of black-bar chromis measuring

Reported by: Ambarish P. Gop, B. Santhosh, M. K. Anil, Muhammed Anzeer, K. S. Aneesh, A. R. Akhil, Vizhinjam Regional Centre

Broodstock development, breeding and seed production of lemon damsel *Pomacentrus moluccensis* Bleeker, 1853



Successful captive brood stock development, spawning and seed production of lemon damsel (*Pomacentrus moluccensis* Bleeker,

1853) was achieved at Vizhinjam Research Centre of ICAR-CMFRI in 2023. Broodstock (4.5-5.4 cm total length and weighing 3.2 - 3.9 grams)

of the species was developed from the wild collected sub-adults in 300 litre aquarium tanks equipped with biofilter. The fish were fed twice a day with pellet feed and once a day with special broodstock diet. Spawning occurred in an interval of every 3-7 days in the early morning and the number of eggs was around 600-1,000. the capsule shaped adhesive eggs attached to the substratum hatched out after 84 hours of incubation. The larvae metamorphosed to juvenile fishes after 33 days of hatching with good survival rates

Successful captive breeding and seed production of Blacktail Humbug Damsel



Dascyllus melanurus adult pair



D. melanurus developing eggs



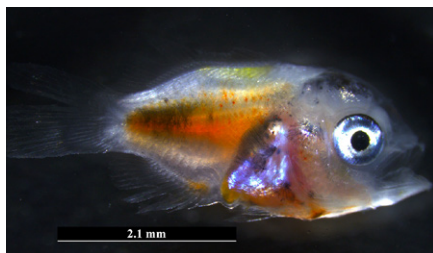
D. melanurus hatchling



D. melanurus 5th day larva



D. melanurus 10th day larva



D. melanurus 20th day larva



D. melanurus juveniles 35th day

Blacktail Humbug Damsel (*Dascyllus melanurus*) is an appealing marine aquarium fish which is relatively easy to care for and adapts well to captive

conditions. When kept in groups, they exhibit fascinating schooling behaviour and in an aquarium, they graze on various types of algae, contributing to a clean

and balanced aquarium ecosystem. Five fishes acquired from a marine aquarium fish vendor were introduced into a two-ton tank equipped with a biological filter, ensuring optimal water quality. At the time of stocking, the fish displayed varying sizes, ranging from 37 to 53 mm in total length. To sustain their growth and maturation, they were fed a diet consisting of commercial pellet feeds, fresh squid, mussel meat, and artemia, which were offered three times daily. After a period of three months, the fish exhibited breeding behaviour, and spawning activities commenced. Notably, the male fish were larger, with an average total length of 55 mm (weighing 5.5 g), while the females measured 41 mm (weighing 2.93 g). The spawning events consistently occurred during the morning, specifically between 9.00 to 10.00 am. Each spawning session resulted in the deposition of approximately 5000 to 6000 eggs in separate batches. The eggs themselves were cylindrical in shape and measured 633.4 μ in length and 501.5 μ in width. The hatching process took place in the late evening of either the 3rd or 4th day after spawning, with the timing influenced by the water temperature. Following hatching, the larvae began feeding within 2 to 3 days post-hatch (dph). Green water, mixed copepods, rotifer, and artemia served as live feed until the metamorphosis stage reached 23 to 25 dph. After the 25th day, micro-feed was introduced to support their continued development. The developmental process included the emergence of three bands, which took approximately 25 to 30 days to form, followed by the appearance of the tail band between 35 to 40 days after hatching.

Reported by M. K. Anil, P. Gomathi and V. Anand, Vizhinjam Regional Centre

Broodstock development and successful spawning of Yellowtail Demoiselle



Day 1 Eggs

Broodstock of *Neopomacentrus azysron*

Broodstock development and successful spawning of Yellowtail Demoiselle (*Neopomacentrus azysron*) in captive conditions is reported. Nine numbers of sub-adults were collected from the coastal waters of Kanyakumari, East-coast of India in the month of November 2022. Transported fishes were quarantined and acclimatized for a week. The collected fishes were in the size range of 5.2-7.5 cm in total length and 1.5-5.4 g in weight. The fishes were fed ad-libitum twice with

commercial pellet feeds (1.2 mm) and once with freshly chopped squid meat in a day. Water quality parameters were regularly monitored and maintained in the optimal range. After 6 months of rearing, species exhibited sexual dimorphism, with mature males being larger than females, and with females taking on more of a rounded belly appearance. First spawning was noted on 12th April 2023 in the broodstock tank with the male of size 9 cm and female 7.2 cm in total length and

weight 11.5 g and 6.7 g respectively. The egg clutch size varied between 600–800 eggs and were increasing in the sequential spawning. Eggs were demersal and found adhered to the substrate provided. Parental care where males guarded and aerated the eggs until hatching, was noted.

Reported by G. Rathi Bhuvaneswari, Ambarish P. Gop, Krishna Sukumaran, F. Muhammed Anzeer, K. S. Aneesh, A. R. Akhil and B. Santhosh, Vizhinjam Regional Centre ●

Breeding, early development and seed production of cloudy damsel, *Dascyllus carneus*

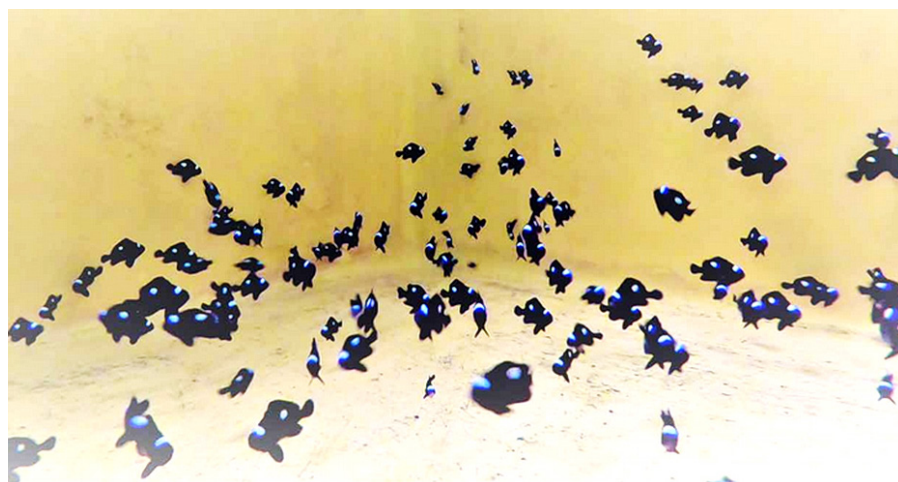
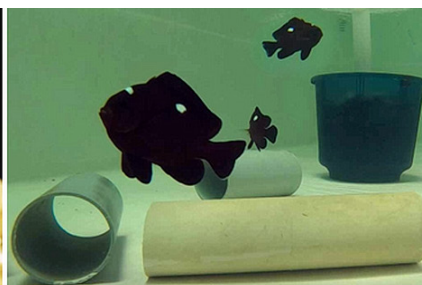


Fishes of the family Pomacentridae are popular in marine aquaria throughout the world. Among these, damsel fishes

of the genus *Dascyllus* has high demand and are mostly collected from the wild. Successful breeding and seed production of Cloudy Damsel (*Dascyllus carneus* Fischer, 1885) was achieved at Vizhinjam Centre of CMFRI. Brood stock from the wild took 4 months to spawn, laid 6500–10,500 eggs per spawning and hatching rate ranged from 90.6 to 98.81%. Newly hatched larvae were the smallest among all the reported larvae of pomacentrid fishes and measured 1.95 ± 0.14 mm in total length. Yolk reserve was completely absorbed within 72 h of hatching. Larvae accepted only copepod naupliar

stages as first feed and calanoid copepod *P. crassirostris* alone was fed until 25 dph. Larvae settled from planktonic stage in 22–23 days and all the larvae metamorphosed into juveniles by 50 dph. Larvae preferred larger stages of copepods in later stages of their development. Finally larval feeding protocols were modified accordingly and better survival was observed. A final feeding regime has been developed and a strategy for the consistent hatchery production of this species was achieved. The larvae were completely weaned to artificial diet from 50 dph with high survival rates ●

Successful mass production of Three spot damselfish through captive breeding



Round the year captive breeding technology for the three-spot damselfish

Dascyllus trimaculatus has been developed by the Mandapam Regional

Centre of ICAR CMFRI in 2019. The brooders collected from wild were conditioned in FRP tanks fitted with a biological filter and fed on special broodstock feed prepared by ICAR-CMFRI. Spawning occurred after four months of broodstock conditioning. Larval rearing was carried out using copepod nauplii (*Parvocalanus crassirostris*) as the first feed followed by rotifers (*Brachionus plicatilis*, *B. rotundiformis*) and *Artemia* nauplii. Adequate microalgal density (*Isochrysis galbana* and *Nannochloropsis oculata*) was maintained in the larval rearing tanks during the entire live feed stage of the larvae. Weaning to formulated feed started from 30 dph (day post hatch). The nursery rearing to marketable size was completed within 60 days. Differential growth and non-uniform size in the juveniles was observed, which calls for extra care during nursery phase, through periodic size grading so as to ensure maximum survival ●

Successful captive breeding and mass seed production of Sapphire damsel



Pomacentrus pavo adult pair



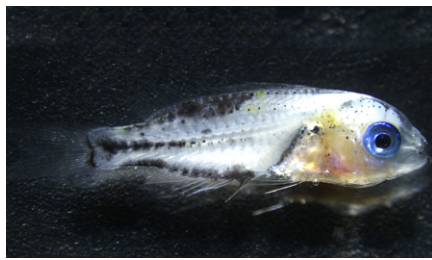
Eggs



5th day larva



Hatchling



25th day larva



P. pavo juveniles

The captivating Sapphire damselfish (*Pomacentrus pavo*) known for its vibrant colours and engaging behaviour, has earned a special place in the hearts of aquarium keepers. Native to the Indo-Pacific region, the sapphire damselfish showcases a striking blend of iridescent blue and green hues that evoke the brilliant colours of a sapphire gemstone. Its name, "pavo," derives from the Latin word for "peacock," which aptly describes its regal appearance. Mass production of seed was achieved using the Recirculatory Aquaculture System (RAS) developed for shellfish and finfish seed production and by fine-tuning the larval feeding strategy. The system has three 3-ton tanks for larval rearing and, 4 cylindroconical

tanks for juvenile production, a central filtration unit.

Seven fish were procured from a marine aquarium fish vendor located in Kanyakumari. These fish underwent a meticulous acclimatisation process and were accommodated within a carefully managed two-ton tank equipped with a well-established biological filtration system that ensured optimal water quality. The feeding regimen consisted of three daily meals comprising commercial pellet feeds, fresh squid, and mussel meat. After four months in captivity, the fish exhibited spawning behaviour. In sapphire damselfish males are larger, with an average size of 100 mm length and 11.19 g in weight. Compared to males, females are smaller, with a

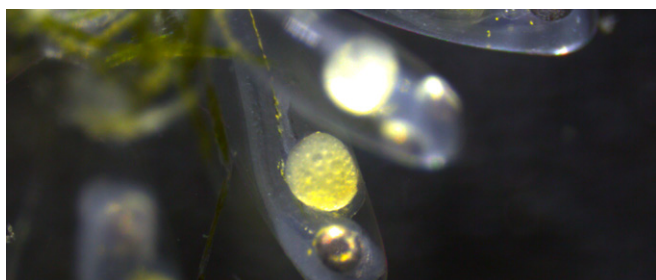
size range of 90 mm in length and 9.0 g weight. Fish spawned continuously, and the egg was laid in the early morning. Eggs were cylindrical in shape and measured 1183.6 in length. Eggs were hatched after 60 hours of egg laying. Newly hatched larvae measured 2784 μ length, and the yolk sac length was 368.7 μ . The mouth opened on 2nd dph, and feeding of larvae began to feed on the same day. Green water medium was used for larval rearing, and the larvae were fed mixed copepods, rotifer, and artemia until metamorphosis. By 40 dph, larvae metamorphosed into juveniles with adult colouration.

Reported by M. K. Anil, P. Gomathi and V. Anand

Captive seed production of Ornate goby



Broodstock of *Istiogobius ornatus*



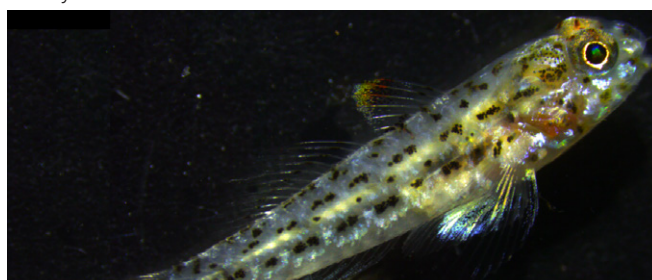
Fertilised eggs



Newly hatched larvae



3 dph larvae



50 dph larvae

The Ornate goby *Istiogobius ornatus* (Ruppel, 1830) is a popular marine ornamental fish with added benefit of being sand cleaners in home aquariums. Previous report of captive breeding of the species is from Taiwan, and this is the first report from India. Four broodfishes collected from coastal waters of Tamil Nadu were transported to the hatchery in oxygen packed polyethylene bags. After 20 days of quarantine period, they were transferred to 250 L rectangular

FRP tanks provided with good aeration, a biofilter and broodstock shelter (mud pot). The broodstock ranged from 60-110 mm in size. Feeding was done to satiation with commercial feed (0.3-0.5 mm), finely chopped fish and squid meat. After 7 months of stocking, spawning was observed during early morning. Males were relatively larger in size and guarded the broodstock shelter. Eggs were laid in a single layer on the substrate that was guarded by the

male. Hatching was observed after 72 hours. Larval rearing was done using a combination of phytoplankton, *Isochrysis galbana* and *Nanochloropsis occulata*, zooplankton, copepod nauplii and adult stages, *Artemia* nauplii and larval feed (300-400 µm). Larval metamorphosis was completed by 60 days post-hatch (dph).

Reported by Krishna Sukumaran, Ambarish P. Gop, Archana Satheesh, F. Muhammed Anzeer, K.S. Aneesh, S. Nisha, B. Santhosh and K. Madhu

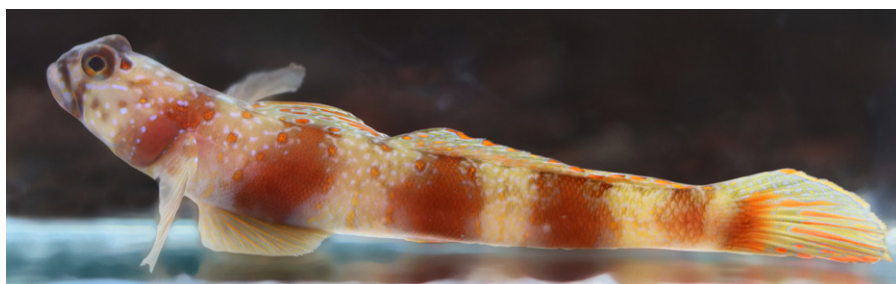
Seed production of Wide-barred shrimp goby *Amblyeleotris latifasciata* in captivity

The Wide-barred shrimp goby *Amblyeleotris latifasciata* Polunin & Lubbock, 1979 belongs to the largest genus of shrimp gobies. *A. latifasciata* is distributed in the Indo-Pacific region. The species is popular in marine aquariums owing to the colourful speckled fins and vertical bars adorning its elongate body. It has a close symbiotic association with pistol shrimp. Most of the scientific studies of shrimp gobies have focussed on this symbiotic association; there is no previous

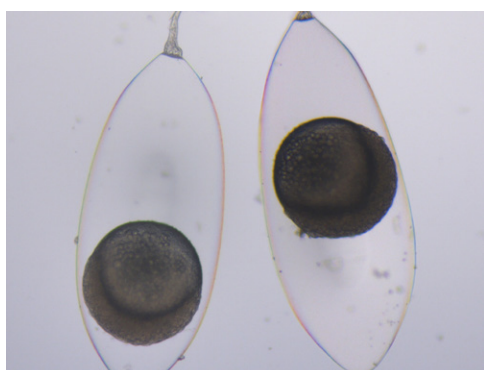
report on captive seed production of *Amblyeleotris latifasciata* or other gobies from the same genus. The species has been successfully bred at Vizhinjam Regional Centre of ICAR-CMFRI. Four numbers of broodfish were collected from coastal waters of Tamil Nadu and transported to the hatchery in oxygen packed polyethylene bags. After 14 days of quarantine period, the fish were transferred to 250 L rectangular FRP tanks. The broodstock size ranged from 90-105 mm. The well aerated tanks were provided with a biofilter

and 5-6 broodstock shelters (PVC pipes: length 250 mm, diameter- 25 mm). Feeding was done to satiation with commercial feed (0.3-0.5 mm) and finely cut fresh squid meat. After 90 days of stocking, spawning was observed during early morning. Over 24,000 eggs were laid in a single clutch within the PVC pipe substrate that was fiercely guarded by the parent fish. Hatching was observed after 70 hours. Larval rearing was done using a combination of phytoplankton, *Isochrysis galbana* and *Nanochloropsis oculata*, zooplankton, copepod nauplii and adult stages, *Artemia* nauplii and larval feed (300-400 µm). Larval metamorphosis was recorded by 70-80 dph.

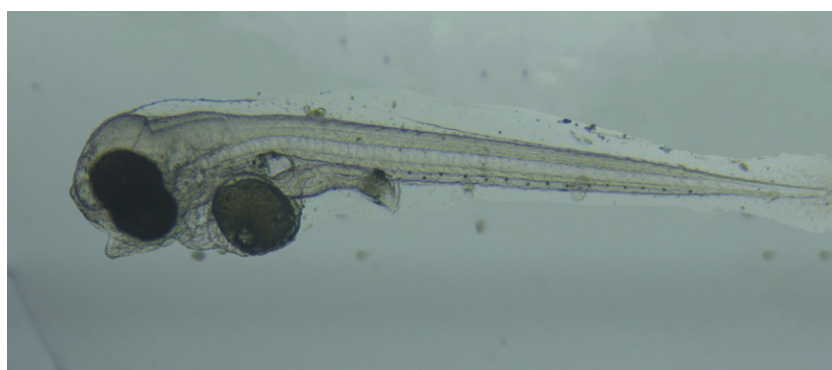
Reported by Krishna Sukumaran, Ambarish P. Gop, Archana Satheesh, F. Muhammed Anzeer K. S. Aneesh and B. Santhosh, Vizhinjam Regional Centre



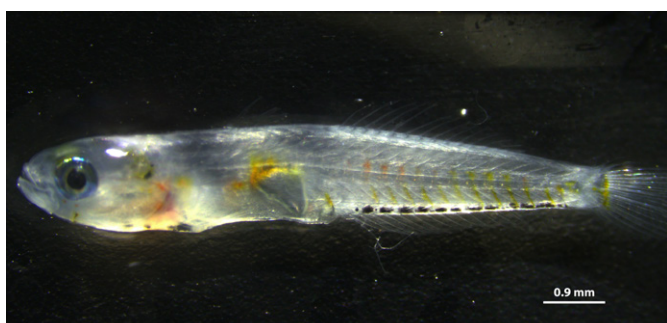
Broodstock of *Amblyeleotris latifasciata*



Fertilised eggs



Newly hatched larva



35 dph larvae



75 dph juvenile

Nutraceuticals from seaweed commercialized

Cadalmin™ Immunoboost extract (Cadalmín™ IBe) and Antiosteoporotic extract (Cadalmín™ AOe), two patent-protected nutraceutical products developed by ICAR-Central Marine Fisheries Research Institute, as natural immune boosting agent and remedies for osteoporotic disorders, respectively from seaweeds, were commercialized with Chazah Pharmaceuticals Limited—a leading wellness and pharmaceutical company based at Kochi. Seaweeds are the natural bounty of the Sea, and are known for their extraordinary medicinal properties.

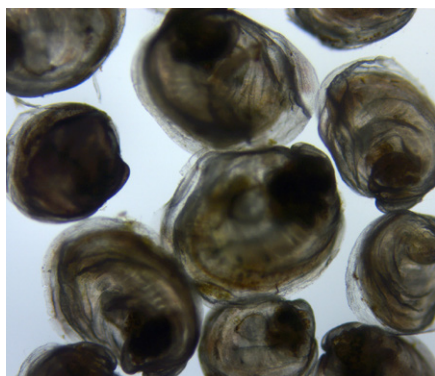
Indian nutraceuticals market has been growing at the compound annual growth rate of 20% for the past three years, particularly in the segments of functional food products, antioxidants, and immunity boosters. India's growth



of nutraceuticals is in double digits which is significantly more than the global surge of 7%. With increasing health awareness, and the shift towards

preventative health care, immunity-boosting and increased regulatory clarity, India's future in this segment is promising ●

First successful production of cultchless spat of *Crassostrea madrasensis* through hormone-induced settlement



Cultchless spat of *C. madrasensis*

The technology of production of spat without using cultch material for attachment at the time of settlement was standardized at Vizhinjam Regional Centre of ICAR-CMFRI. This



Single oyster rearing in downwellers



Cultchless seed of Indian edible oyster

will give a big boost for oyster farming in India as it can promote the large-scale farming of single oysters that are in high demand in Europe and America. Ripe Indian backwater oyster

Crassostrea madrasensis collected from the Ashtamudi Lake were brought to the laboratory after proper quarantine and disinfection and was used for stripping. After opening the shell, male and female gonads were scooped out and squeezed. Squeezed gonads were suspended in seawater separately and filtered through 100 μ mesh. Filtrate of male and female gonads were separately taken in beakers. The sperm suspension was activated using ammonium hydroxide

and mixed thoroughly. Later 100-200 ml solution of sperm suspension was added to a beaker containing eggs to fertilize it. Further eggs were observed under the microscope to check the fertilization rate. Fertilized eggs were transferred to an incubation tank for hatching. The hatched-out D shaped veliger larvae were reared till they reached the eyespot stage (17-21 dph), feeding a combination of microalgae. Once the larva reached the eyespot stage with 250 μ size,

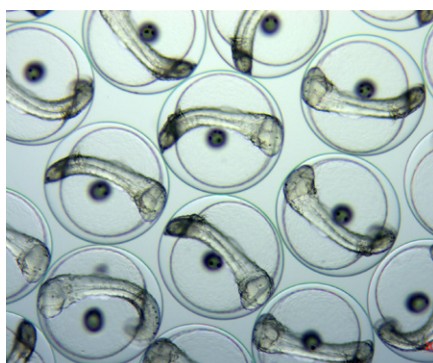
they were filtered using 220 μ mesh and taken for hormone treatment. Eyespot larvae were treated with Epinephrine at the rate of 0.22 mg /5 lakhs larvae and were transferred to the Micro nursery system for further rearing. The treated larvae were settled as single spat with 20% success rate.

Reported by M. K. Anil, P. Gomathi, P. Gop Ambarish, S. Surya, P. M. Krishnapriya, O. Shalini, M. P. Sharanya. and B. Raju

Successful breeding of green snapper *Lethrinus nebulosus*



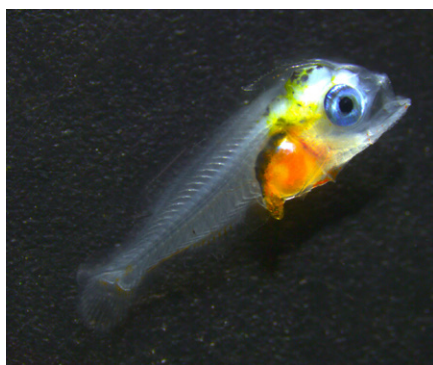
Broodstock development, volitional spawning and seed production of marine food fish spangled emperor, *Lethrinus nebulosus* in Recirculating Aquaculture System was achieved for the first time under captivity in Vizhinjam Regional Centre, ICAR-CMFRI on 26.10.2021. Belonging to the family Lethrinidae, it is commonly called spangled emperor, green snapper, or yellow sweet lip. This species is considered one of the best food fish in many countries as it can grow upto 80cm in length and weigh around 8kg. It also forms commercial fishery in many countries of the Indo-West Pacific, including Red Sea, Persian Gulf and East Africa to southern Japan and Samoa. For the broodstock development in a 10-ton RAS system fish collected from the wild were used after quarantine. Fishes are spawned naturally in the RAS without any hormone application. Fertilized eggs of green snapper were planktonic, spherical, with a single oil globule $743.655 \pm 9.4 \mu$. A green water medium with a combination of algal species was used for larval rearing. Hatching of larvae occurred 16-18 hours after spawning, and the larvae measured $1583.945 \pm 42.95 \mu$.



Developing eggs



Hatchling



14 DPH larvae



21 DPH larvae

*L. nebulosus* seed

Copepod nauplii were used as the first feed, and in later stages, they were fed with rotifer and artemia and then weaned to the artificial diet. Squamation began by 25-27 days post hatch (dph), and the larvae measured

22 mm total length, and it weighed 0.13 g. Metamorphosis of larvae started by 30 dph at a total length of 2.3 cm, and it was completed by 40 dph. A Flow-through system was adopted for further rearing, which improved the

survival at the metamorphosis stage. This work was carried out under the All India Network Project on mariculture.

Reported by: M. K. Anil, P. Gomathi, P. G. Ambarish, S. Surya, R. Siju and B. Raju

Marine mammal survey by CMFRI gets under way

The Central Marine Fisheries Research Institute (CMFRI) has embarked on a 100-day coastal survey to assess marine mammal diversity on the Indian coast. This comes at a time when whale stranding events are occurring more frequently in coastal waters.

The survey is in continuation of a joint research project with the Fishery Survey of India under the Fisheries ministry aimed at assessing marine mammal stock and population in Indian waters.





The survey is being done to study the marine mammal diversity on the Indian coast within 12 nautical miles and analyse the relation between stranding events and changing climatic conditions. They will do habitat modelling and recording of stranding events, considering the potential impacts of climatic and oceanographic conditions on the biological dynamics of marine mammals. This collaborative project also aims to achieve a holistic understanding of marine mammal

behaviour, population dynamics and ecology, setting the stage for effective conservation measures.

Climate change and its impact on ocean ecosystems could be among the contributing factors behind recent incidents of whale stranding. A recent example was the stranding of a 50-foot blue whale carcass that washed ashore in Kozhikode.

The increased frequency of cyclones and storm surges is believed to potentially lead to such events. However, there remains a critical need to study

how extreme climatic events affect the behaviour and distribution patterns of marine mammals.

These species are known to be highly sensitive to a range of biotic and abiotic environmental factors, including habitat alterations, shifts in species distribution, changes in migration routes, and broader climatic changes. Rising ocean temperatures, increased frequency and intensity of cyclones, and storm surges are among the major climatic variables suspected to influence such strandings •

First successful hormone induced breeding and spat production in Short neck clam

Hormone-induced breeding and spat production of Short neck clam *Paphia malabarica* was achieved for

the first time in Vizhinjam Regional Centre of ICAR-CMFRI on 27.03.2022. This species is considered a nutritious

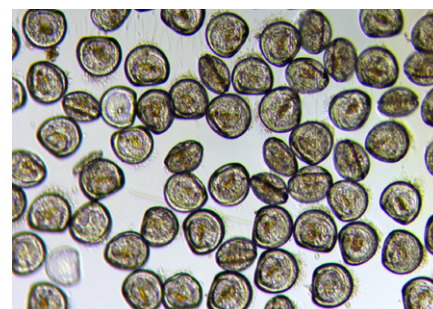
and inexpensive source of protein and produces valuable raw materials for industrial application, making them an



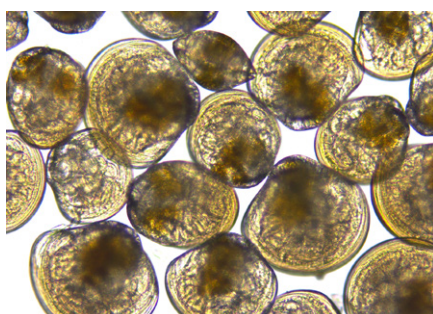
Adult *Paphia malabarica*



Hormonal induction



Pediveliger stage of *P. malabarica*



Umbo stage

Spat of *P. malabarica**P. malabarica* juvenile in downweller

essential source of income for local people. Recent reports show a drastic decline in the short neck clam fishery in Ashtamudi Lake, Kerala, even though this is India's first Marine Stewardship Council (MSC) certified fishery. The depleted resources can be replenished by the successful hatchery production and ranching. For the broodstock development, wild clams of average weight 17.5 ± 0.26 g and total length 34 ± 0.5 mm were collected from the Ashtamudi lake in Kerala. The brooders were conditioned and fed with a mixture

of microalgae for 60 days till the ripe gonads were obtained at a temperature range of 24-25 °C.

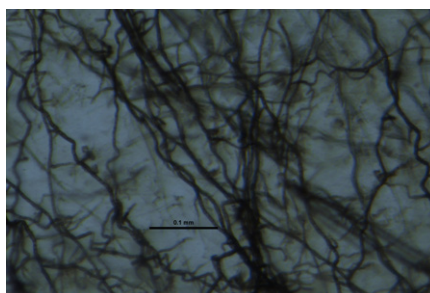
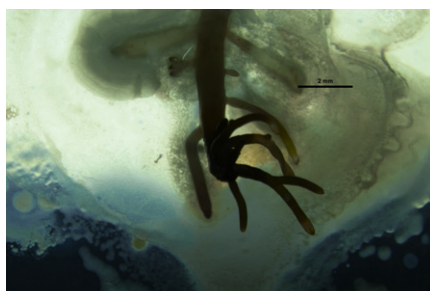
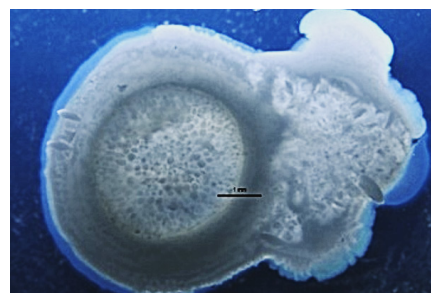
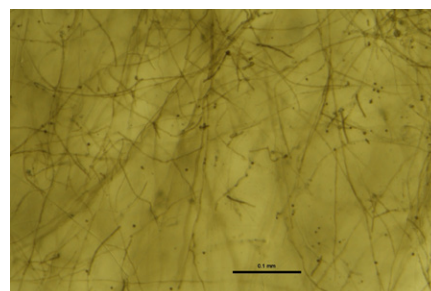
Gonadal conditions were observed microscopically before induced breeding and the hormone was carefully administered; serotonin 2.5 M intramuscularly. Spermatozoa were successfully released within 5–10 minutes, followed by the eggs. Trochophore Larvae (55.1 ± 1.1) were observed after 11.45 hours, followed by veliger larvae (69.58 ± 2.47) 18.04 hours after fertilization. When the newly

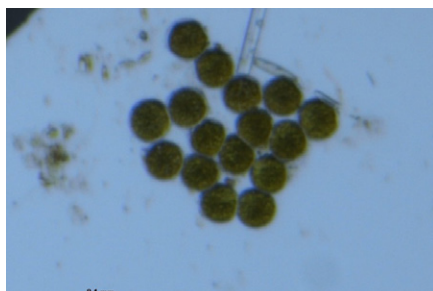
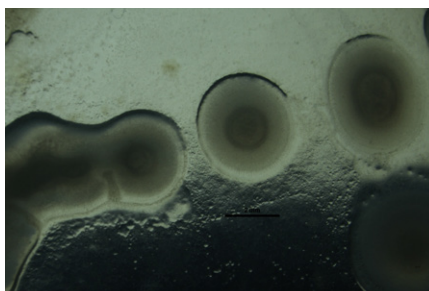
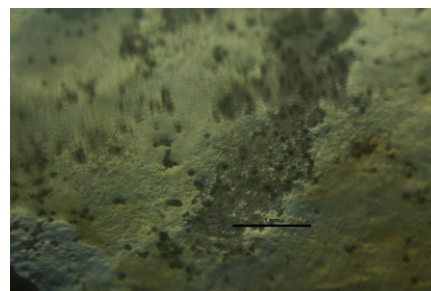
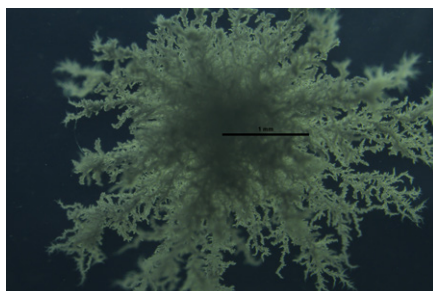
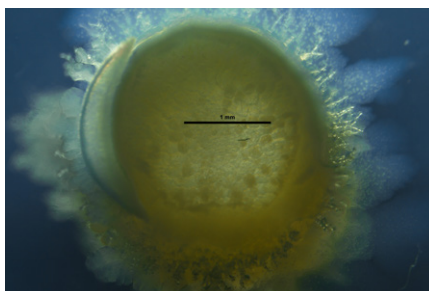
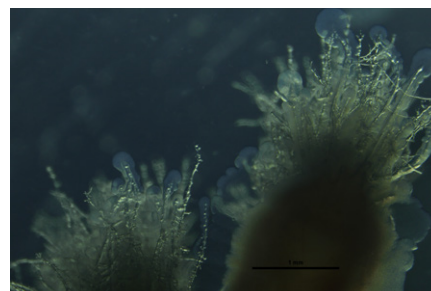
hatched larvae reached the pediveliger stage, they began to settle on 6-7 DPH. Gill development began 13 days after hatching, and by 15 days, most of the larvae had fully developed gills. In 25 days, a completely developed syphon was seen, and this spat with 1mm size was transferred to the downwelling system for further rearing and juveniles (7.2 mm) were produced in 60 days.

Reported by: A. Mariyam fazula, M. K Anil, P. Gomathi, Summaya Rahuman, Ponni J. Mohan and B. Raju

Regeneration of plantlet in seaweeds through micro propagation

Remarkable achievements were made by ICAR-CMFRI in the micropropagation of marine algae in controlled environmental condition with manipulation of plant growth hormone, light intensity, photoperiod and dark incubation. Initially there was success in formation of profuse branching of explants in *Kappaphycus alvarezii*, *Gracilaria foliifera*, *G. crassa* and *G. edulis* followed by callus growth in most of the algae belonging to Chlorophyceae (*Ulva lactuca*, *Halimeda gracilis*, *Codium tomentosum*), Phaeophyceae (*Turbinaria ornata*, *T. conoides*, *Sargassum wightii*, *Dictyota dichotoma*) and from Rhodophyceae (*Gracilaria edulis*, *G. crassa*, *G. foliifera*, *G. dura*, *Acanthophora spicifera*, *Gelidiella*

Branching of *Kappaphycus*Callus of *Gelidiella*Callus of *Kappaphycus*Gametophytic like structure in *G. dura*

Tetraspores of *Gelidiella*Spores of *Gracilaria edulis*Calcium crystals of *Halimeda gracilis*Plantlet of *Acanthophora*Plantlet of *Kappaphycus*Plantlet of *Kappaphycus*

acerosa and *Kappaphycus alvarezii*). Also there was unique observations on the microscopic gametophytic like stages in most of the red algae (*Gracilaria corticata*, *G. dura*, *Acanthophora spicifera* and *Kappaphycus alvarezii*), plantlet formation in green algae from zoospore, spore development from the explants of tetrasporophytic plants of *Gelidiella acerosa*, calcium crystal formation in the micro propagated

alga of *Halimeda gracilis* and finally the plantlet with profuse robust branching in *Kappaphycus alvarezii*. Micropropagation is the method of large production of plants in less time. In this method, a small piece of plant tissue (explant) is cultured in a sterile medium which later develops into new plantlets. Micropropagation facilitates the growth, storage, and maintenance of a large number of plants in small

spaces which makes it a cost-effective process. The success in the plantlet formation in the laboratory condition will definitely pave the way for seed production of *Kappaphycus* in large quantity through micropropagation and also transporting the explants to distance places without any problem.

Reported by Reeta Jayasankar & Reena Joseph

ICAR-CMFRI ranks first among Fisheries & Animal Science research institutes in India

In the latest ranking of the Indian Council of Agricultural Research (ICAR) ICAR-Central Marine Fisheries Research Institute (CMFRI) has won the first position in the category of Fisheries and Animal Science institutes in the country. The ranking was based on the institute's performance in research and other activities during the period 2019-2021. Among 93 institutes under all divisions of Crop Science, Horticultural Science, Natural Resource Management,



Agricultural Engineering, Animal Science and Fisheries Science in ICAR, it achieved the third position. Efforts to popularise mariculture activities through marine fish farming in cages, seaweed farming, technology development for

breeding of commercially important fishes, research initiatives to develop nutraceutical products from marine organisms, inputs for making relevant policies for sustainable marine fisheries, studies on socio-economics aspects

in the fisheries sector and extension activities were major activities the institute undertook during the period. Director Dr. A. Gopalakrishnan, congratulated the entire ICAR-CMFRI family on the achievement ●

Natural Remedy for non-alcoholic fatty liver disease

A nutraceutical for preventing non-alcoholic fatty liver disease (NAFLD) has been developed by ICAR-CMFRI. The product, LivCure extract, is from natural bioactive components extracted from seaweed using an eco-friendly methodology. The Pre-clinical trial showed the product's potential to inhibit hydroxymethyl glutaryl reductase and other pleiotropic target receptors associated with dyslipidemia and pathophysiology leading to NAFLD.

For commercial production of the nutraceutical, ICAR-CMFRI inked a

pact with M/S. Emineotech, a private limited company dealing with health products. The product is expected to hit the market within four months and will be made available on Amazon, Flipkart and other leading e-commerce platforms for online sale, apart from physical market networks across the country.

Reported by: Kajal Chakraborty, Marine Biotechnology, Fish Nutrition and Health Division ●



Turtle conservation activities promoted in Uttara Kannada

Uttara Kannada district with a 140 km of coastline is known for clean beaches and hence sea turtles which prefer clean beaches for nesting and incubation of eggs are recorded regularly. Olive ridley (*Lepidochelys olivacea*) turtles nesting was observed at Majali beach, Devbagh Beach

and Mudga beach in Karwar, Manjuguni beach and Bhavikeri beach in Ankola, Dhareshwar Beach and Gokarna Beach in Kumta, as well as at Tonka beach, Kasarkod, Honnavara during January and March 2023. Turtle nestings were identified and relocated to safer zones

if required by the officials of Coastal and Marine Ecosystem Wing of Forest Department, Govt. of Karnataka along with the cooperation of local people who were monetarily rewarded for joining hands in conservation activity of sea turtles with Forest Department. After 55 to 60 days of incubation, hatchlings were released back to Sea. The Aame Utasava – 2023 to celebrate turtles was held at Vanasiri Bhavan, Karwar on 30-03-2023. It was an awareness programme for public and students on the need of conservation and existing protection under the Indian Wildlife Protection Act (1972). Scientists from ICAR- CMFRI also attended the programme and Dr. Prathibha Rohit and Dr. Mahesh V., made presentations on "Marine protected species with special reference to turtles" in the lecture session organised by the Forest Department ●



Country's marine fish stocks healthy, reveals study



The 'Marine Fish Stock Status of India 2022' report of ICAR-CMFRI indicated that a resounding 91.1% of the 135 fish stocks assessed in 2022 were healthy, marking a significant milestone in India's efforts to maintain the sustainability of its marine fisheries. The study highlighted the substantial reduction in unsustainable fishing practices, with just 4.4% of the stocks facing overfishing. Shri Parshottam Rupala, Hon'ble Union Minister of Fisheries, Animal Husbandry and

Dairying officially released the 'Marine Fish Stock Status of India 2022' report on 31st August 2023 during the 'Sagar Parikrama phase VIII at Kanyakumari, Tamil Nadu. The first of its kind in the country the report gives a holistic picture of the status of the 135 marine finfish and shellfish stocks assessed in the Indian EEZ. The ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India issued an office memorandum concurring with the fisheries management advisories given

in the report and strongly advised state governments to consider the same for improving the health of marine fish stocks in India. The report also caught media attention nationally and appreciation from international organisations like Asia-Pacific Fish Watch. It is hoped that the report will provide insights for making policies for sustainable marine fisheries sector and appropriate tweaking of the Marine Fishing Regulation Act(s) in various maritime states of India in the future ●

ICAR-CMFRI develops nutraceutical to boost immunity

In continuation of its major research works on developing natural remedies from marine organisms against various lifestyle diseases, a nutraceutical product from selected seaweeds to boost the innate immunity related to post-COVID complications has been developed in ICAR-CMFRI. Named as CadalminTM Immunalgin extract (CadalminTM IMe), the product also has antiviral properties

against the delta variant of SARS CoV-2 virus. According to Dr. Kajal Chakraborty, Head of the Marine Biotechnology, Fish Nutrition and Health Division of ICAR-CMFRI who led the research, the product is a 100% natural blend of highly nutritious bioactive ingredients extracted with eco-friendly 'green' technology". CadalminTM IMe elevates innate immune responses by the regulation of the

secretion of pro-inflammatory cytokines and chemokines. The active ingredients in the product is packed in plant-based capsules. Large-scale extraction of the active principles from the raw material was optimized in a factory unit, which demonstrated the commercial feasibility of the nutraceutical product. The process for commercialisation of the product is in progress ●

Carbon stock assessment across estuarine habitats of Karnataka



Under the NICRA project a comprehensive assessment of carbon stocks in natural and

restored mangrove habitats within the Netravathi-Mangalore and Panchagangavali-Kundapura estuaries

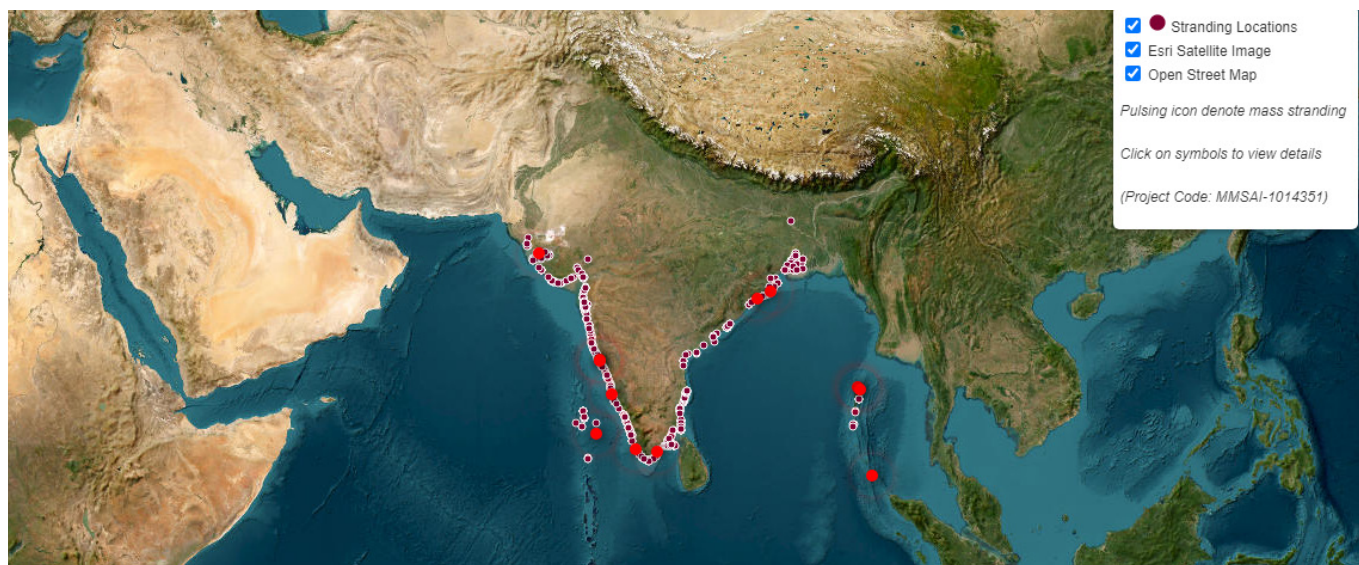
each with their contrasting habitation characteristics were carried out. In the Netravathi estuary, the study sites were situated amidst urbanized structures, such as boat building docks while in Panchagangavali estuary study sites selected were pristine mangrove patches, providing an opportunity to explore carbon storage capacities in both of these distinct environments. The assessment covered a total of 0.4 and 1.2 hectares respectively in the Netravathi and Panchagangavali estuary respectively. The study involved a comparative data analysis of total biomass within both estuarine study areas as well as data on benthic organisms and fish species associated with the mangrove ecosystems ●

Interactive map of marine mammal strandings developed

An online spatial database on marine mammal stranding along the Indian coast has been prepared and rendered as an online interactive

web map. The database covers the strandings reported as early as in 1800 to 2023 and 1217 strandings happened during the period. The map

gives locations of the strandings as dots. The locations of mass strandings are (≥ 40 animals) marked with red pulsing icons. Upon clicking each



stranding location, the map will open a pop-up window with the information viz. common name, scientific name, latitude, longitude, state/UT, year of stranding, state of the animal at stranding and number of animals stranded. The standard operating procedure to be followed in case of

marine mammal stranding and the scientific information of the species are also provided as hyperlinks in the pop-up window. The web map comes handy with information required for field-level conservationists and policymakers alike and is accessible from the ICAR-CMFRI

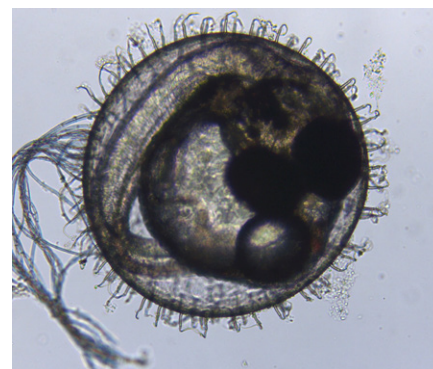
website (https://www.cmfri.org.in/info/Web_Map_Without_Clustering4/Web_Map_Without_Clustering4/MarineMammal_Without_Clustering4.html#5/16.182/81.235).

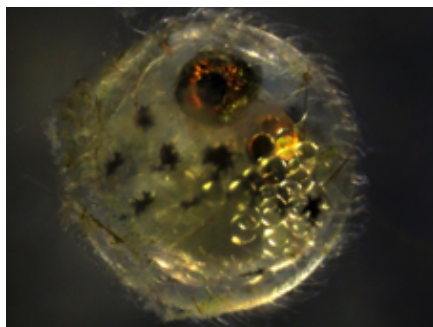
Reported by Shelton Padua, R. Ratheesh Kumar, Grinson George, S. Monalisha and V. Durga ●

Hatchery production protocol developed for marine model fish *Oryzias dancena* & *O. setnai*

ICAR-CMFRI has achieved a significant breakthrough in continuous breeding and seed production of the Indian ricefish, *Oryzias dancena* and Malabar rice fish *O. setnai*, and produced 12 generations of the former at Visakhapatnam and Vizhinjam Regional Centers. The technology for round the year seed production of *O. setnai* was developed simultaneously at Vizhinjam

and Kochi CMFRI. Presently more than 11 generations of Malabar ricefish have been produced at Vizhinjam. This achievement establishes two valuable marine model organisms for research in saline environments, providing an alternative to freshwater models. The Indian and Malabar ricefish species are well-suited for this role due to their euryhaline nature, and a





short generation time of just 58-65 days. This fish is well studied as a model organism for drug screening, regenerative medicine, genotoxicity studies, pharmacological, genomic, nutritional and microbiome studies and transgenics in different laboratories across the world. This breakthrough will enable Indian researchers to conduct a

wide range of studies in the above areas. ICAR-CMFRI is planning to expand the laboratory rearing, mass propagation and maintenance of the living stocks of these two valuable marine model fish species with a view to develop a 'national facility' in its centres (Vizhinjam & Visakhapatnam), by rearing *O. dancena* in saline waters of 25-30ppt (PSU) ●

Postal cover release to mark 75 years of research excellence



On the occasion of completing 75 years, the ICAR-Central Marine Fisheries Research Institute (CMFRI) unveiled a commemorative Corporate My Stamp and special postal cover, signifying the institute's rich legacy and contributions to the field of India's marine fisheries research and development over the time. In the programme held on 21st November 2023, Shri Sayeed Rashid, Postmaster General, Kochi officially released the

stamp and cover by handing over them to Dr. A. Gopalakrishnan, Director, ICAR-CMFRI. In the special release, 5000 sheets of stamps, each containing 12 stamps becomes a prized collectible for philatelists and marine enthusiasts. The stamp's design encapsulates ICAR-CMFRI's dedication to marine research, bearing the inscription '75 Years of Research Excellence' alongside the institute's logo and the image of

ICAR-CMFRI headquarters in Kochi. From a humble beginning in 1947, the institute has emerged as a leading tropical marine fisheries and mariculture research hub in the world with 4 Regional Centres (Mandapam, Visakhapatnam, Vizhinjam and Mangalore), 7 Research Stations (Veraval, Mumbai, Calicut, Karwar, Tuticorin, Chennai, and Digha), along with 17 Field Centres and two Krishi Vigyan Kendras (KVK) under its wings. Speaking on the occasion, Dr. A. Gopalakrishnan mentioned it was a proud moment for ICAR-CMFRI and a testament to the institute's unwavering commitment to advancing marine fisheries and mariculture research for the socio-economic development of the country. Senior officials and scientists, including Senior Superintendent of Post Offices, Sivadasan P. K., Chief Administrative Officer, Hareesh Nair and Comptroller, Prashant Kumar from ICAR-CMFRI, attended the programme ●

Two new species of seer fishes identified in Indian EEZ

A seer fish species named Arabian sparrow seer fish (*Scomberomorus avirostrus*) as entirely new to science and resurrection of the Russell's spotted seer fish (*Scomberomorus leopardus*) which was previously

a synonym of the spotted seer fish are the findings by a team of taxonomists. The spotted seer fish (*Scomberomorus guttatus*) that was once considered a single species, is a complex of three distinct species

which include the newly discovered seer fish, the resurrected seer fish and the existing spotted seer fish. The study highlighted considerable divergence in the morphometry and genetic structure of these fishes



Russell's spotted seerfish (resurrected species)



Arabian sparrow seerfish

collected from different regions of the coast. The new species was given the common name of Arabian sparrow seer fish, owing to its typical bird-beak-like snout. This inhabits the Arabian Sea coast north of Mangalore and its

distribution extends up to the Arabian Gulf based on the available scientific information. Distribution of the other two was along the Bay of Bengal coast north of Nagapattinam, including the Andaman Seas, and China Sea. These

three seer fish species are smaller in size compared to their counterparts and are mostly found in nearshore waters and command high market value (Abdussamad *et al.*, 2023, *Journal of Fish Biology*, 104: 662 -680) ●

Whole genome of Indian oil sardine decoded



In a major breakthrough in Indian marine fisheries research, a team of scientists at the ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), Kochi, has decoded the whole genome of the Indian oil sardine (*Sardinella longiceps*), a popular food fish and a vital fisheries resource in the Indian subcontinent.

This decoded genome will be a valuable resource for understanding the biology, ecology and evolution of the oil sardine and the genome data can be used to improve the management strategies for the conservation and sustainable utilisation of this fish. The decoded genome is 1.077 Gb in size and contains a total of 46316 protein coding genes obtained using the Next

Generation Sequencing technology. Whole genome information can also be utilised for identification of the origin of catch for monitoring trade channels during fisheries certification programmes and tracking the movement of this enigmatic fish. Small pelagic fishes like the Indian oil sardines can also be considered as model organisms to study how fish adapt to climate change because they respond sharply to variations in environmental and oceanographic parameters. The genomic investigations found that Indian oil sardines, in the Indian waters and in the Gulf of Oman are two highly distinct stocks. Understanding these genetic differences could help researchers comprehend how environmental and

oceanographic conditions impact this species in different regions of the Northern Indian Ocean. The genes involved in the biosynthesis of polyunsaturated fatty acids (PUFA) of the oil sardine were also identified, offering insights into the genomic mechanisms behind the high nutritional quality of these sardines. The findings could support scientists in finding critical leads in developing new dietary supplements or fortified foods that are high in PUFAs. Further, studies on synthesizing PUFAs through transgenesis or gene editing techniques in organisms of choice to improve nutritional quality will also benefit from the new information generated (Sukumaran *et al.*, 2023, *Scientific Data*: 10(565), ISSN 2052 -4463) ●

Three colour morphs of Jellyfish recorded from the Indian coastal waters



The continuous monitoring of jellyfish bloom dynamics along the coastal waters of the east and west coasts of India recorded three colour morphs of *Crambionella orsini*. *C. orsini* is a commercially exploited jellyfish that supports active jellyfish fisheries in states like Kerala, Tamil Nadu, and Andhra Pradesh. There are three naturally occurring colour morphs recorded: two from the east coast, viz., shades of tan and cyan and maroon colour from the west coast. It is reported that the colour is mainly due to the metal-binding proteins

Reported by R. Saravanan, S. Thirumalaiselvan and K. Vinod, Mandapam Regional Centre

Ecological informatics: Predicting, protecting, and preserving marine life

Ecological Informatics, with powerful tools to unlock the secrets of life in the oceans from analysing vast GIS remote sensing data, environmental parameters, and ecological networks to building models and conducting AI-ML-aided analysis of data is gaining headlines. The Ecological Informatics wing at the Marine Biodiversity & Environment Management Division on a modelling study predicted potential habitats for the key coral *Acropora muricata* in understudied areas of the Andaman Sea (Anakha *et al.*, 2022. *Journal of Coastal Conservation*, 26, 81p). The key drivers of its distribution include depth, shoreline distance, sunlight, and currents and many previously unexplored islands and reefs were listed as likely coral strongholds, suggesting rich ecosystems in the region. Reef-killing bacterial infections, such as white syndrome, caused by *Vibrio coralliilyticus*, pose a major threat and advanced modelling to predict areas where corals are most vulnerable to

this pathogen were done (Krishnaveny *et al.*, 2023. *Thalassas*, 40: 423-434.). Key environmental factors such as depth and temperature were identified, pinpointing Hawaii, the Coral Triangle, and the Great Barrier Reef as high-risk zones. Seagrasses are vital to the health of the marine environment, but they are facing threats from climate change and human activity. This study used satellite data to track seagrass coverage in the Kalpeni lagoon from 2003 to 2020 (Twinkle *et al.*, 2023. *Ecological Informatics*, 74 (2023) 101964: 110). The results showed a dramatic decline in seagrass coverage, with more than 99% disappearing over the 17 years. This is likely due to rising sea surface temperatures, which stress these important plants.

Snowflake coral, a fast-growing invader from the Caribbean, is wreaking havoc on marine ecosystems worldwide. A recent study used advanced modelling to predict the future distribution under various climate scenarios. While low-

and medium-suitability areas are expected to increase, the surprising finding was a decline in high-suitability regions under the most extreme climate scenario (Nisin *et al.*, 2023. *Ecological Informatics*, 76 (2023) 102145: 1-10). The emerging bacterial threat of *Serratia marcescens* to both human health and coral reef ecosystems is prompting the need for a global risk assessment. Our study used advanced modelling to predict the area most susceptible to *S. marcescens* infections and the human populations at risk. The model identified factors such as density and temperature playing a key role in its distribution (Shana *et al.*, 2023, *Current Microbiology*, 8(59):1-9).

The invasion of non-native species, particularly bivalves such as the South American *Mytella strigata*, is a major threat to aquatic ecosystems worldwide. This study used advanced modelling to predict the habitat suitability of *M. strigata* in the northern Indian Ocean (Nisin *et al.*, 2023. *Science of the Total*

Environment, 916: 1-9). The results identified the western coast of India as comparatively more susceptible to invasion, the distance to the port being the key factor influencing outbreaks. The study also highlights the vast habitat suitability and the existing presence of the species in the region, raising concerns about its potential

to become highly invasive. Given the significant ecological damage caused by *M. strigata* elsewhere, immediate action to manage and restrict its spread in the Indian Ocean includes implementing stricter controls in ports and developing effective monitoring and eradication strategies. The immense potential of bioinformatics

in safeguarding the health and future of our oceans thus extended from predicting coral strongholds and vulnerable reef zones to mapping the distribution of invasive species and human health risks, empowering us to make informed decisions and implement proactive conservation strategies ●

Sea cage models to popularize scientific sea farming

The Karwar Regional Station of the Central Marine Fisheries Research Institute donated sea cage models to the Science Centre in Karwar, Kodibag, to promote awareness and education about marine fisheries and aquaculture among visitors and other interested stakeholders in Karwar. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI; Dr. Kuldeep Lal, Director, ICAR-CIBA, and Dr. Pravin Puthra, former ADG (Marine Fisheries), ICAR were present on the occasion ●



Seaweed-based nutraceuticals commercialised



Cadalmin™ Antihypercholesterolemic extract (Cadalmintm ACE) and Cadalmintm Immunalgin extract (IME), two patent-protected nutraceutical products developed by ICAR-Central Marine Fisheries Research Institute, as natural remedies to combat dyslipidemia and hypercholesterolemic disorders and an antiviral immunity booster from seaweeds potentially to be used against post COVID immunity complications, were commercialized

with Pioneer Pharmaceuticals Limited-a leading wellness and pharmaceutical company based at Kochi. On behalf of the ICAR-CMFRI, Dr. A. Gopalakrishnan, Director, signed an exclusive license agreement with the company for their commercial production and marketing.

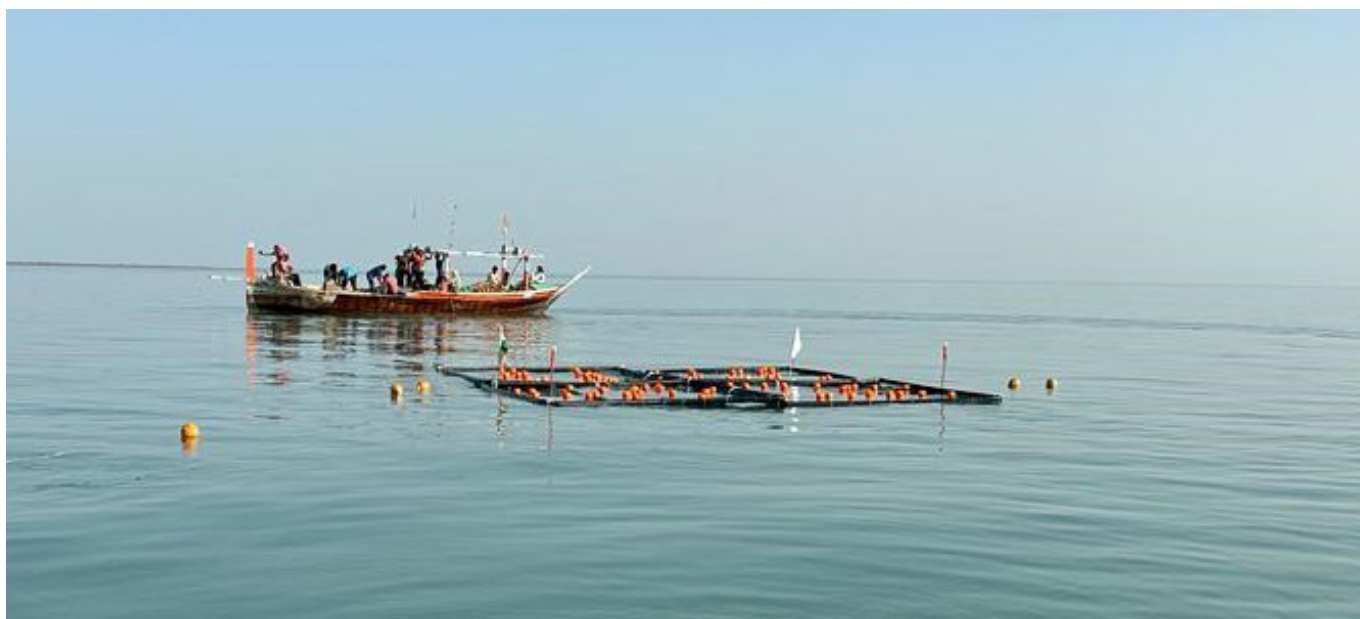
The bioactive principles in Cadalmin™ ACE inhibit hydroxymethyl glutaryl coenzyme A reductase, various target receptors and other rate limiting enzymes, which are responsible to cause dyslipidemic

disorders. Cadalmin™ IMe is a synergistic combination of seaweed-based nutraceutical product, which is a 100% natural blend of bioactive ingredients extracted with eco-friendly 'green' technology as an antiviral immunity booster, which can potentially be used to boost post-covid immunity. The nutraceutical has antiviral properties against delta variant of SARS CoV-2 virus. These nutraceutical products contain 100% natural marine bioactive ingredients from selected seaweeds by patented

technologies, and would be made available in plant-based capsules to meet the dietary needs of the large vegetarian population in India and abroad, by Pioneer Pharmaceuticals Limited. The ICAR-CMFRI is in the process of developing more health products ensuring gainful utilization of the seaweed resources in Indian coastal waters.

Reported by Kajal Chakraborty, Head, Marine Biotechnology Fish Nutrition and Health Division ●

Seaweed farming along Kutch coast to promote Blue Economy



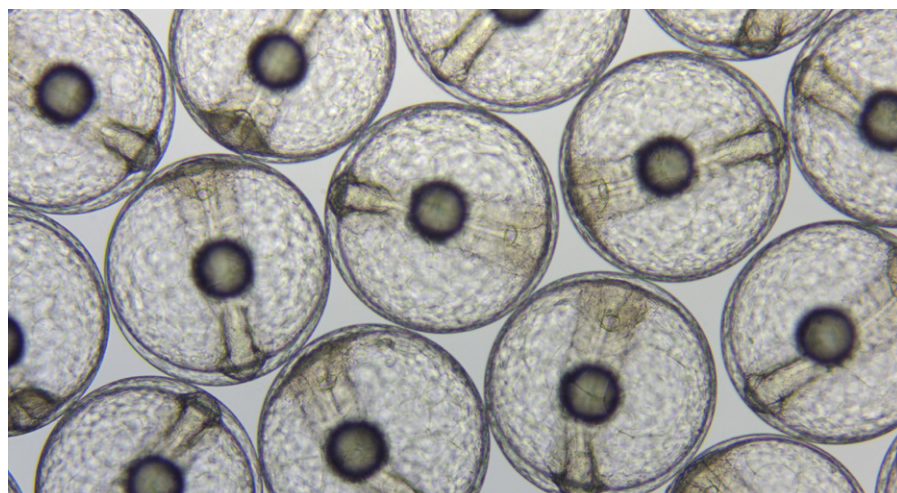
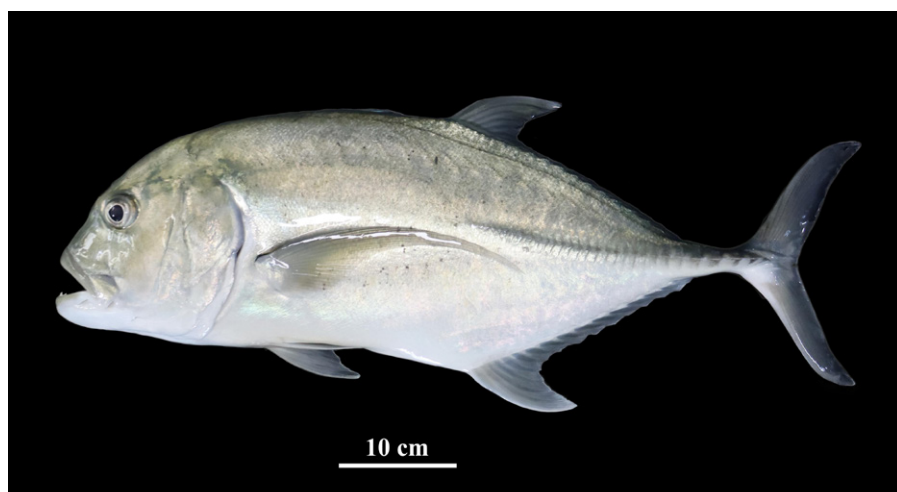
ICAR-Central Marine Fisheries Research Institute has initiated a significant project on seaweed farming along the Indo- Pak border marine creeks Kori, Padala, and other selected locations of the Kutch coast. Funded by the Department of Fisheries, Government of India, and monitored by the Hon'ble PMO and Ministry of Home Affairs, it aims to promote the

Blue Economy in the region through seaweed cultivation, promoting social and economic prosperity. ICAR-CMFRI has successfully installed custom HDPE raft systems with net-tubes and monolines seeded with the seaweed *Kappaphycus alvarezii* at selected in Kori and Padala, marking a crucial milestone. Despite operational challenges such as very high tidal

amplitude, initial assessments have shown promising growth performances, particularly with monoline-based methods, showcasing the potential of this innovative farming technique in challenging marine environments.

Reported by: D. Divu, Suresh Mojjada, P.S. Swathi Lekshmi, P. Abdul Azeez, Jayesh Devaliya and Dipti Singh ●

Breakthrough in Mariculture: ICAR-CMFRI achieves success in induced breeding and captive seed production of Giant trevally



In a landmark achievement for mariculture research, the ICAR-Central Marine Fisheries Research Institute (CMFRI) succeeded in induced breeding and year-round seed production of the Giant trevally (*Caranx ignobilis*). It is a fast-growing, important food fish that can be farmed in marine and estuarine cages, pens and coastal ponds. This fish can grow faster than pompanos and can tolerate wider salinity ranges and water quality conditions. The achievement is considered as a breakthrough in mariculture and is a significant advancement in the efforts to sustainably manage and conserve fish as a new candidate species in the mariculture sector.

Captive breeding of Giant trevally faced significant hurdles for a long time due to its preference for open waters, specific breeding requirements and complex reproductive biology. This breakthrough, with a larval survival rate of over 12% was followed by extensive research and trials conducted by scientists at Vizhinjam Regional Centre of ICAR-CMFRI, Vizhinjam, Thiruvananthapuram, Kerala, India, with the funding support of the Department of Biotechnology, Ministry of Science and Technology, Govt. of India. Research was carried out under the leadership of scientists Ambarish P. Gop, Dr M. Sakthivel, and Dr B. Santhosh. The successful breeding of the species has involved meticulous monitoring of its behaviour, hormone administration and precise environmental control. The research team documented spawning and larval rearing, marking a crucial milestone in understanding reproductive biology, breeding, and seed production technique of the species ●

Breakthrough in mariculture: ICAR-CMFRI achieves captive breeding of high value marine fish Golden trevally

In a landmark development in mariculture in the country, the ICAR-Central Marine Fisheries Research Institute (CMFRI) has successfully developed seed production technology for Golden trevally (*Gnathanodon speciosus*), a high value marine fish. The development is expected to open up a new avenue for sustainable seafood production and boost the country's list of viable candidate species for mariculture. Successful broodstock development, captive breeding and larval rearing of the fish was achieved after five years of research at CMFRI's Visakhapatnam Regional Centre.

Golden trevally or golden king fish is an ideal candidate species for mariculture (marine aquaculture) due to its faster growth rates, good meat quality, and huge market demand for both consumption and ornamental purposes. In domestic market, the fish fetches a price of 400-500 per kg. It is a reef associated fish and lives in company of larger fishes like skates, sharks, groupers etc. Interestingly, juveniles of this species act as pilots for sharks. It is a silver grey fish with yellowish colouration on belly, with



scattered black patches and all fins coloured yellow and a black tail. The juveniles are more golden in colour with the black bands giving them a very attractive look and hence a preference for aquarium keeping.

In India, the fish landing observations show that the Golden trevally are landed predominantly at reef area fishing grounds in Tamil Nadu, Puducherry,

Kerala, Karnataka and Gujarat. The total fish landings estimate for the last five years i.e. 2019, 2020, 2021, 2022 and 2023 was 1106, 1626, 933, 327 and 375 tonnes respectively mainly from Ramanathapuram, Nagapattinam, Chennai, Pudukottai, Trivandrum, Ernakulam, Tirunelveli, Tanjavur, Tuticorin, Udipi and Gir Somnath districts ●

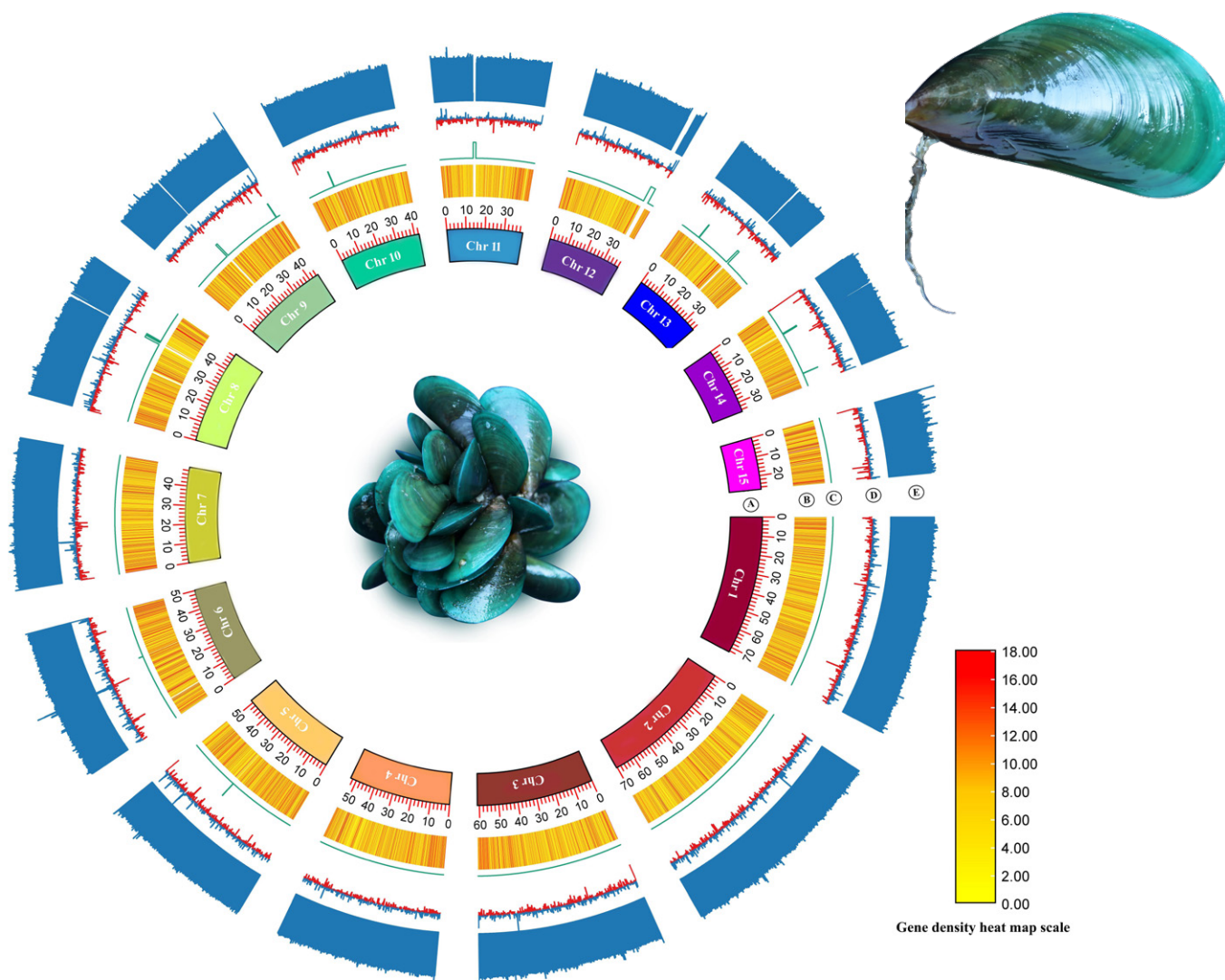
Scientists explore scope for mariculture in Sri Lanka

Dr. Ritesh Ranjan, Senior Scientist, along with Dr. Bobby Ignatius, Principal Scientist ICAR-CMFRI and Dr. Shubhadeep Ghosh, ADG (MFy) visited Sri Lanka to assess the scope and requirements of mariculture research and development in Sri

Lanka. They visited different sites in and around Kalpitiya, Mannar, Jaffna, Trincomalee during 22nd September to 3rd October 2023 to select sites for cage culture, IMTA, marine hatchery, sea weed, oyster and crab culture.

Workshop was organized by the Demersal Fisheries Division during January 29th-30th, 2015 at CMFRI, Kochi. All the NICRA Associates from HQs, Centre Co-ordinators and Dr. E. Vivekanandan, Consultant of the project participated ●

CMFRI decodes genome sequence of Asian green mussel



In a significant breakthrough on bivalve research, the ICAR-Central Marine Fisheries Research Institute (CMFRI) has unearthed the genome secret of Asian green mussel (*Perna viridis*). This is the first-ever chromosome level genome sequencing of a marine invertebrate species from India. Earlier, CMFRI had come out with a similar genome finding for Indian oil sardine.

The Asian green mussel, *Kallummakkaya* in local parlance, is an important aquaculture species

in the family Mytilidae contributing substantially to molluscan aquaculture. CMFRI's research found that the mussel's genome contains 723.49 Mb in size and is anchored into 15 chromosomes. The research was published in the journal Scientific Data by Nature Group. The development will be a game-changer in boosting sustainable mussel aquaculture in the country, as this research will help gain insights into its growth, reproduction and disease resistance.

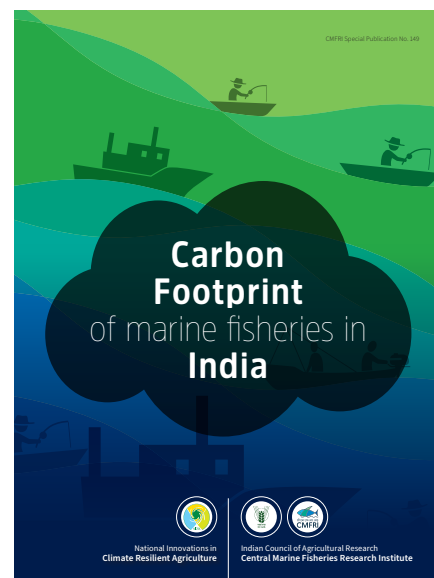
The findings will benefit the

aquaculture sector by improving genomic selection and breeding practices, leading to enhanced productivity and resilience in fisheries. A team of researchers from CMFRI led by Principal Scientist Dr Sandhya Sukumaran carried out this study with funding support from the Department of Biotechnology, New Delhi. The team includes Dr A Gopalakrishnan, V G Vysakh, Dr Wilson Sebastian, Dr Lalitha Hari Dharani, Dr Akhilesh Pandey, Dr Abishek Kumar and Dr J K Jena ●

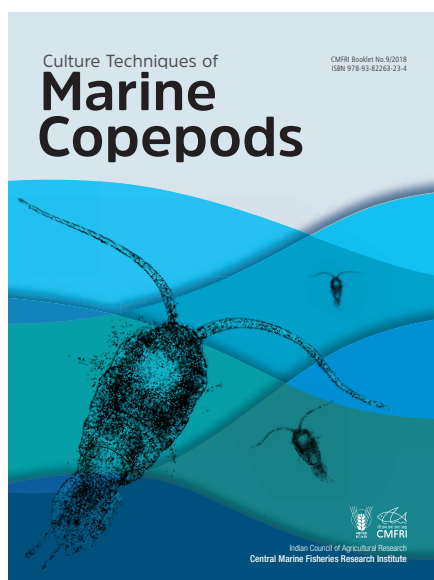
Life Cycle Analysis (LCA) based Carbon Footprint of Marine Fisheries in India estimated

ICAR-CMFRI developed and standardized a comprehensive methodology under the National Innovations in Climate Resilient Agriculture (NICRA) project, for the holistic assessment of carbon emissions encompassing multi-sector, multi-gear marine fishing activities in India. The methodology was specially adapted to suit the small-scale tropical fishing sector contexts and could serve as a model for countries with diverse

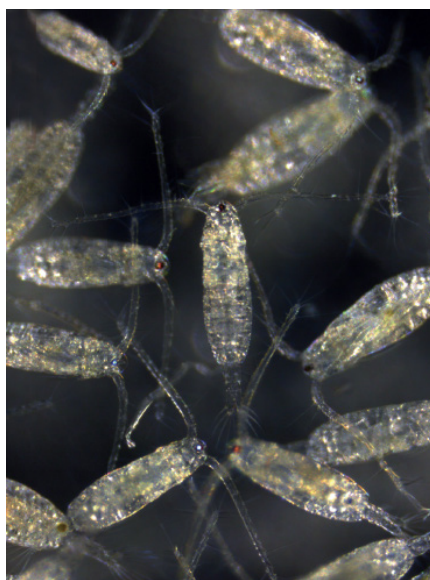
small-scale mechanized/motorized fishing sectors. As per the estimates of the study, the average emissions from the Indian fishing industry during 2023 were 1.52 kg CO₂ equivalent per kg of fish, which is 30% lower than corresponding global estimates. The relatively low carbon emission profile of Indian marine fisheries holds promise for a sustainable, environment friendly fishing scenario with timely and appropriate policy interventions ●



National facility for mass production of marine copepods established at Vizhinjam RC of ICAR-CMFRI



One of the major hurdles for the seed production of many lucrative high value finfishes is the lack of proper technologies for mass production of suitable live feeds to initiate the first feeding of the larvae. The larvae of many species of high value food fishes



are very small and the conventional live feeds employed in the hatchery such as rotifer and Artemia nauplii are not suitable to initiate the larval feeding during the critical stage mainly because of their larger size compared to the mouth size of the concerned fish larvae

and also their poor nutritional value especially the fatty acid profile. Marine copepods are the best live feed due to their small sized nauplii and better fatty acid composition especially the DHA, EPA and ARA combination. But the major bottleneck for employing copepods as live feed is the lack of technologies for their mass culture in hatcheries even at a global level. The Vizhinjam Centre of ICAR-Central Marine Fisheries Research Institute has come out with technologies for mass production of 18 species of copepods under a project funded by the Department of Biotechnology (DBT), Govt. of India. These technologies were successfully applied to commercial seed production of 9 marine food fish and more than 20 high-value marine ornamental species. Regular training programs are being organized, besides distribution of stock cultures throughout the coastal regions to equip entrepreneurs to facilitate satellite production units ●

CMFRI develops Integrated Multi-Trophic Aquaculture (IMTA) Technology



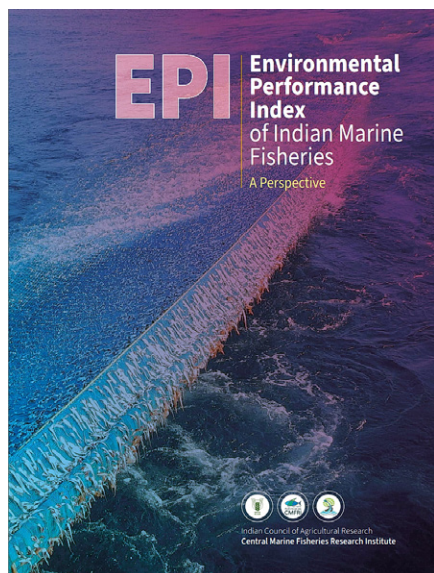
Integrated Multi Trophic Aquaculture (IMTA) is the practice which combines in appropriate proportions the cultivation of fed aquaculture species (e.g., finfish / shrimp) with fed/organic extractive aquaculture species (e.g. shell / herbivorous fish) and inorganic extractive aquaculture species (e.g. seaweed) to create balanced systems for environmental

stability (bio-mitigation), economic stability (product diversification and risk reduction) and social acceptability (better management practices). The CMFRI has successfully developed Integrated Multi Trophic Aquaculture (IMTA) under participatory mode with a fishermen groups at Palk Bay, Ramanathapuram district, Tamil Nadu by integrating seaweed *Kappaphycus*

alvarezii with cage farming of Cobia (*Rachycentron canadum*).

A total of 16 bamboo rafts (12x12 feet) with 75 kg of seaweed per raft can be integrated for a span of 4 cycles along with one of the cages. For example, a GI (galvanized iron) or PVC cage of 6 m diameter and 4 m depth with 750 cobia fingerlings can be integrated with the above seaweed raft system. A complete cycle of seaweed farming extends for an average of 45 days duration and four such cycles can be performed in a row. Generally, a battery of 2 cages with 32 seaweed rafts were used for such culture practice. This is an efficient system that helps in controlling both organic and inorganic pollution from the cages in the natural open waters (~41% reduction) and thereby ensuring ecological balance. It is also an eco-friendly and sustainable option that ensures a steady income for coastal fishers. IMTA could also emerge as one of the significant mitigating measures for the adverse impact of climate change and to earn valuable carbon credit for our country. The increase in the yield of seaweeds through IMTA is generally by 56 % over the normal seaweed farming; and the net increase in overall income is approximately 60% with IMTA integration ●

Environmental Performance Index (EPI) of Indian Marine Fisheries developed



Marine fish landing trends and fish stock assessment have been inseparable with the advent of the information-based study of fisheries be it arriving at management options or status appraisal. The Environmental Performance Index (EPI) is a global measure that evaluates and ranks

countries based on their environmental health, ecosystem vitality, and sustainability efforts. To evaluate the health of Indian marine fisheries and incorporate it into the EPI, the routine Fish Stock Status (FSS) indicator was deemed inadequate. This is primarily due to the multi-species, multi-gear, and multi-fleet characteristics of India's marine fisheries. Hence, a new EPI-FSS index for measuring the fish stock health of Indian marine was developed by the ICAR-CMFRI in 2021. This concept was adapted to develop an easy to calculate and regularly implementable method for assessing fish stock health through two measures, EPI-FSS and Fortified FSS, which used inputs such as estimated landings, optimum sustainable harvest levels, and species vulnerability. Values of EPI-FSS of 4 and above indicated an early phase, between 3 and 4 indicate developing phase, between 2 and 3 sustainable phase and below 2 an overfished phase.

The EPI-FSS index value for India's marine fisheries was 2.35 in 2021 indicating a sustainable phase. From this, it was estimated that 86.2% of the marine fish stocks in the Indian EEZ remained at the sustainable/early/developing phase of harvesting, covering 83 major resource groups across the four regions of India. To enhance the assessment including the overfished stocks, the FSS index was fortified with the inclusion of vulnerability values for both species and different marine fishing regions to arrive at a Standardized Stock Class Ratio (SSCR). The fortified FSS index value was 3.17 in 2021 indicating a developing phase, well within the sustainable limits. The EPI report prepared by ICAR-CMFRI was submitted to the Ministry of Environment, Forest and Climate Change (MoEF&CC), Govt of India; NITI Aayog and the Department of Fisheries (DoF), Govt. of India for further necessary action ●

Department of Fisheries, Govt. of India identifies CMFRI selected 112 coastal villages as Climate Resilient Coastal Fishermen Villages under PMMSY

ICAR-CMFRI under the National Innovations on Climate Resilient Agriculture (NICRA) project has selected a total of 112 climate - vulnerable coastal villages in the mainland and the island ecosystems and has initiated climate resilient fisheries and fish farming activities in those selected villages through strategic research and technology demonstration. The DoF-Gol based on a government order No. J-117012-3/2020-Fy dated 12 February 2024, under the Pradhan

Mantri Matsya Sampada Yojana (PMMSY) has approved developing 100 villages from the list of 112 villages identified by CMFRI as Climate Resilient Coastal Fishermen Villages (CRCFVs) with financial support. The activities in these villages include creating sustainable economic and livelihood opportunities to coastal fishers; developing coastal tourism based on the traditional knowledge, local culture and heritage; providing safety and security of fishermen in these coastal

villages; improving the quality of lives of local fishers through accelerating fisheries and allied economic activities; creation of fishermen organizations, fisheries cooperatives, FFPOs leading to sustainable management of marine fisheries and social security of fishers; developing necessary infrastructure facilities; and development of fisheries entrepreneurship, empowering of local youths and women through skill and entrepreneurship development ●

Seahorse conservation in India - Need for a paradigm shift in approach



Seahorses have great demand in the international market as they are highly sought after for use in Traditional Chinese Medicines (TCM) in south-east Asian countries. They are also highly preferred in the aquarium trade due to their peculiar appearance and features. Besides, they are also used as curios. The heavy demand has resulted in over-harvesting of these syngnathids globally and consequent depletion of their wild population. In India, a total of seven species of seahorses have been reported viz., *Hippocampus trimaculatus*, *H. kuda*, *H. spinosissimus*, *H. hystrix*, *H. kelloggi*, *H. mohnikei* and *H. camelopardalis*. Of these, except for *H. camelopardalis* which is listed as Data Deficient (DD), all other species are listed as Vulnerable (VU) in the IUCN Red List of Threatened Species. Besides, all species of seahorses are listed in the Appendix II of CITES.

In India, a well-established fishery existed in the 1980s in the Gulf of Mannar and Palk Bay regions of Tamil Nadu. In 1990s, as the demand increased, there was targeted fishing through diving, and India emerged as one of the leading exporters of seahorses and the export from India was mainly to countries like Singapore,

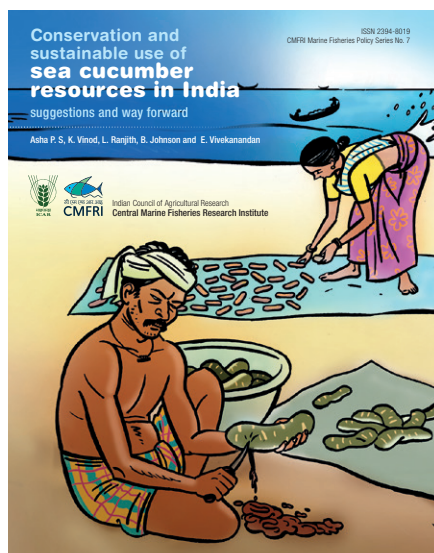


Hong Kong and Malaysia. According to official estimates, India exported about 4.34 t of seahorse worth 2.67 million rupees during 2001-2002. Concerned by the rapid expansion of the fishery, the Ministry of Environment, Forests & Climate Change (MoEF&CC), Government of India declared a moratorium to ban the collection and trade of seahorses which came into force with effect from July 2001, listing all species of syngnathids under the Schedule I of the Indian Wildlife (Protection) Act, 1972. Despite the moratorium, illegal fishing and trade of seahorses continue which defeats the efforts taken by the government for conservation of these vulnerable resources.

In this backdrop, the ICAR-CMFRI undertook studies on the status of seahorses in the Gulf of Mannar and Palk Bay, and to propose a paradigm shift for effective conservation and long-term sustainability of seahorse resources in India. As the moratorium is not supported by the fishers and has

led to illegal fishing, a regulatory fishery with effective monitoring would be a preferred option to achieve the twin goals of sustainable utilization and conservation. The regulatory measures for seahorse fishery management would include issue of license, fixing of catch quota, implementation of Minimum Legal Size (MLS) of capture, sex-selective fishing, rotation of harvest areas, gear limitation, seasonal closures, habitat protection, creating sanctuaries and captive breeding and ranching for replenishment of wild population – all after careful planning and discussion with stakeholders. Involvement of local communities is imperative at every stage of planning and implementation, as community participation will hold the key for success of such conservation and management programmes. It was also suggested that periodic surveys need to be undertaken to assess the wild stock of different species of seahorses and the regulatory measures need to be tuned accordingly ●

Conservation and sustainable use of sea cucumber resources in India



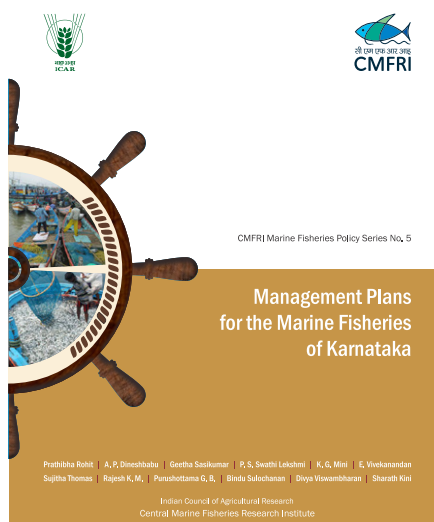
Summary of CMFRI Publication
"Conservation and sustainable use
of sea cucumber resources in India"
Marine Policy Series No.7

Like in many parts of the world, the ever-growing demand for sea cucumbers in the export trade, consequent overexploitation, and inadequate management measures have also resulted in the depletion of its stock in India. The blanket ban enforced and implemented by the Ministry of Environment, Forests and Climate Change, Government of India in 2003 on sea cucumber trade by listing all species of holothurians under Schedule I of the Indian Wildlife (Protection) Act, 1972, has caused a severe impact on the livelihood of depended fishers of Gulf of Mannar and Palk Bay area.

The CMFRI publication "Conservation and sustainable use of sea cucumber resources in India" (Marine Policy Series No.7) is an outcome of several

studies conducted on sea cucumbers by the institute during the last five decades. The publication presents an overview of species diversity, habitat, biological characteristics, fishery, trade, and resource status. This publication is focused on bringing out various management measures based on scientific principles for the conservation and sustainable management of sea cucumber resources in Indian waters. It outlined recommendations based on several workshops and consultation meets held with all the concerned stakeholders to ensure the long-term sustainability of these resources. It will be helpful to researchers and resource managers to manage and conserve the sea cucumber resources in India ●

Management Plans for the Marine Fisheries of Karnataka



Karnataka has been a pioneer in marine fisheries development in India. However, it is crucial to examine the significant changes in this sector over the years and advocate for policy improvements to redefine fishing capacity, effort, and activity. Marine fish stocks have traditionally been managed as common property resources, which are prone to over-exploitation and economic waste, known as the "tragedy of the commons." In fisheries, this issue is evident in excessive fishing fleet capacity and effort, depleted fish stocks, and the risk of stock collapse. Current marine regulatory practices in India include mesh size and gear regulations, zone reservations for various fishing sectors, and closed

seasons. Despite these measures, there is a need for a stronger commitment to protecting the marine environment and implementing programs for sustainable fishery exploitation. Karnataka's marine fisheries policy, based on research from the Central Marine Fisheries Research Institute (CMFRI), provides a foundation for policymakers to address gaps in current regulations and manage fisheries stocks prudently while considering the socio-economic interests of fishers. This brief, a collective effort by scientists from the Mangalore Research Centre of CMFRI, presents quantitative and qualitative arguments to guide decision-makers in implementing effective measures for sustainable marine fishery resource management ●

Policy Guidance on Sustaining the Marine Fisheries of Andhra Pradesh



Andhra Pradesh being a leading seafood producer and exporting state in India, the marine fisheries of the state play an important role in the economy of the state. Moreover, the state is home to more than 1 million fishermen who depend on fishing and allied activities for their livelihood, driving home the importance of marine fisheries in the state. ICAR-CMFRI as part of its research project “Resource Assessment and Management Framework for Sustainable Marine

Fisheries of Andhra Pradesh” brought out a document on “Policy Guidance on Sustaining the Marine Fisheries of Andhra Pradesh” in 2018. The document provided a detailed view of the marine fisheries of the state including the marine landings, status of marine resources of the state, marine fishing gear and catch rates, Life Cycle Analysis (LCA) of marine fishing, marine environment along the state.

Based on the studies of ICAR-CMFRI several recommendations were made to sustain the marine fisheries of Andhra Pradesh, the major ones being listed below:

- Review, updating and stricter implementation of Marine Fishing Regulation Act
- Regulation of fishing effort with Optimum Fleet Size of mechanized trawlers to be restricted to 1300 for entire Andhra Pradesh
- Diversification of fishing effort through conversion of trawlers to longliners and gillnetters
- Minimum Legal Size (MLS) to be implemented for 61 major commercial marine species
- Shark Management Program for

Andhra Pradesh

- Improved Monitoring, Control and Surveillance (MCS) System with a Vessel Monitoring System and logbooks
- Control of coastal pollution
- Marine habitat restoration through Artificial Reefs
- Expansion of mariculture and cage culture technologies in Andhra Pradesh

The marine fisheries sector of Andhra Pradesh is vulnerable to overexploitation of marine resources, environmental degradation and climate change. Thus this sector deserves to be nurtured and managed effectively keeping in mind the challenges faced by the sector. This document was prepared as a snapshot of the marine fisheries sector of the state, including the challenges that the sector faces and suggested several management measures for holistic development of the sector, which if implemented, would help in sustainable management of the state's marine resources thereby assuring the fishermen of Andhra Pradesh of a secure future ●

Guidance on National Plan of Action for Sharks in India

At a time when sharks had gained immense global recognition for conservation concern, and India, being one of the largest contributors to global shark landings, had entered the fray with legal instruments to regulate fishing and trade of these iconic resources, ICAR-CMFRI published the Guidance on National Plan of Action

for Sharks in India. This document presents an overview of the shark fishery in India, current management measures, knowledge gaps to be addressed and suggested action plan for shark fishery management following the lines of the International Plan of Action for Sharks (IPOA-Sharks) of the FAO. The chief

purpose of this document was to provide baseline information for the preparation of an NPOA-Sharks in India, and calls for integrated research and discussion between R&D organisations, Government agencies, NGO's and stakeholders including fishermen, traders and exporters.

India's first move towards shark



conservation was in 2001 when 10 species of elasmobranchs were included under Schedule I of the Indian Wildlife (Protection) Act, 1972. This was the result of rampant whale shark hunting along the north-west coast of India, particularly in Gujarat during the latter half of the 1990 s. In 2013, India went on to promote the “fin-on” policy, i.e. landing of the entire shark. Subsequently India supported the trade regulations on species listed under CITES Appendix II in 2014. In 8 February 2015, the Department of Commerce of the Ministry of Commerce, Government of India issued an order prohibiting the export and import of shark fins in India.

The Central Marine Fisheries Research Institute has served as a pioneering research institute in India working on fishery dependent data analysis for resource assessment of sharks along the Indian coast. The information presented in this document is the outcome of several decades of research carried out on sharks landed along the Indian coast. This guidance document capsules the trends in shark fishing and landings in the country over almost two decades, with insights into the region-wise landings, the biological characters of these fishes that make them vulnerable to overfishing, and trade in different shark products. This document received wide appreciation at the

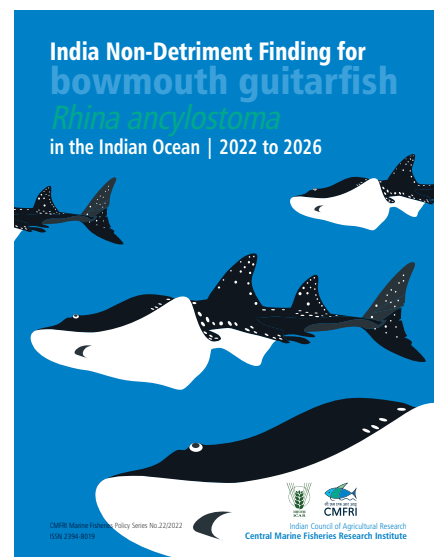
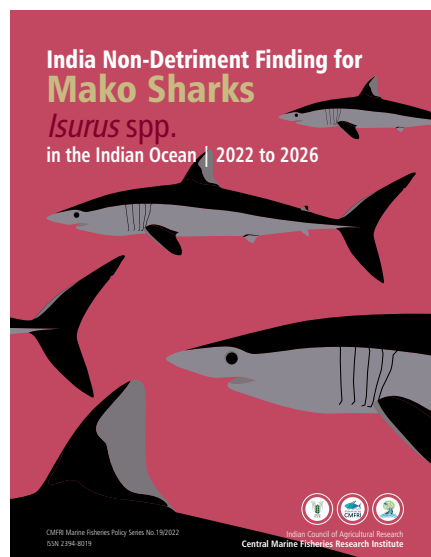
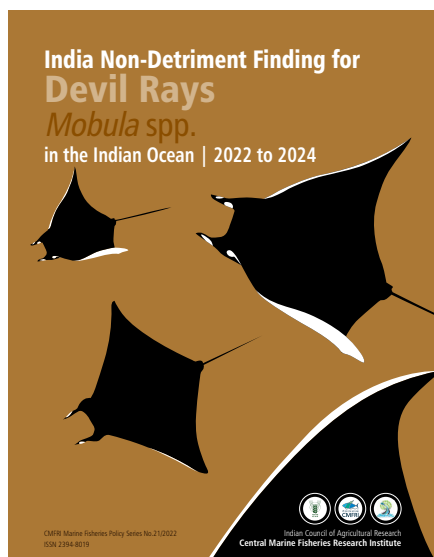
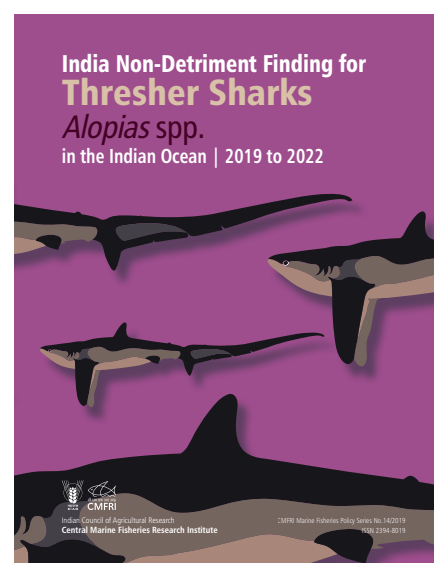
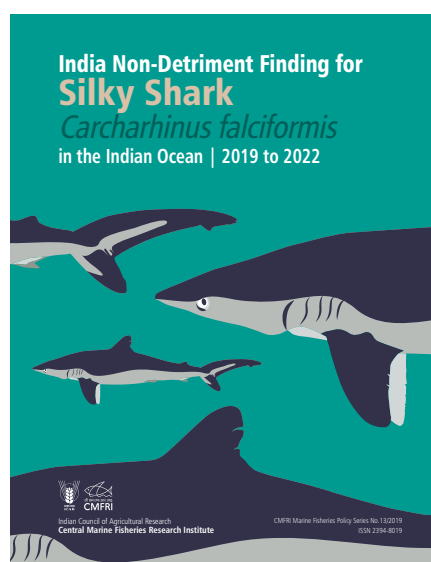
national and global levels and has been recognized as India's precursor an NPOA-Sharks.

CMFRI Marine Fisheries Policy Series to No.6/2017: Non-Detriment Findings (NDF) for the export of Shark and Ray species listed in Appendix II of the CITES and harvested from Indian waters.

CMFRI Marine Fisheries Policy Series No.13/2019 India Non-Detriment Finding (NDF) for silky shark, *Carcharhinus falciformis*, in the Indian Ocean.

CMFRI Marine Fisheries Policy Series No.14; India Non-Detriment Finding (NDF) for thresher sharks, *Alopias* spp., in the Indian Ocean.

CMFRI Marine Fisheries Policy



Series No.19/2022: India Non-Detriment Finding (NDF) for Mako sharks, *Isurus* spp. in the Indian Ocean, 2022 to 2026.

CMFRI Marine Fisheries Policy Series No.20/2022: India Non-Detriment Finding (NDF) for wedgefishes, *Rhynchobatus* spp. in the Indian Ocean, 2022 to 2026.

CMFRI Marine Fisheries Policy Series No.21/2022: India Non-Detriment Finding (NDF) for Devil Rays *Mobula* spp. in the Indian Ocean, 2022 to 2024.

CMFRI Marine Fisheries Policy Series No.22/2022: India Non-Detriment Finding (NDF) for bowmouth guitarfish *Rhina ancylostoma* in the Indian Ocean.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) requires that export permits for specimens of species included in CITES Appendices I and II shall be granted only when a Scientific Authority of the State of

export has advised that such export will not be detrimental to the survival of the species (following a determination known as a 'non-detriment finding'). In 2015, CMFRI identified as a CITES Scientific Authority, was tasked with the preparation of Non-Detriment Findings documents (NDFs) on CITES Appendix II listed species of sharks and rays harvested from Indian waters. Following the inclusion of the Oceanic whitetip *Carcharhinus longimanus*, the hammerhead sharks *Sphyrna lewini*, *Sphyrna zygaena* and *Sphyrna mokarran*, and the manta rays *Manta birostris* and *Manta alfredi* in CITES Appendix II at the CITES CoP16 in 2013, in Bangkok (Thailand), effective from 14 September 2014, CMFRI prepared the first NDF document for the four species of sharks and two manta rays available in Indian waters to ascertain their exploitation status in India in a trade outlook.

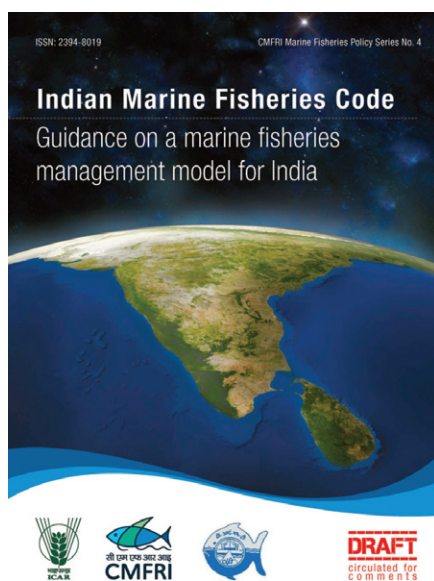
With the inclusion of more shark and ray species in CITES Appendix II at subsequent CITES CoP meetings, CMFRI

has prepared NDFs for the silky shark *Carcharhinus falciformis*, thresher sharks *Alopias* spp., mako sharks *Isurus* spp., wedgefishes *Rhynchobatus* spp., devil rays *Mobula* spp., and the bowmouth guitarfish *Rhina ancylostoma*. The recommendations of the NDFs are based on an exhaustive compilation of primary and secondary data on the fishery, biology and trade of these species. The recommendations of these studies are intended as guidance in regulating or allowing international trade of the concerned species and its by-products, as laid down by CITES Appendix II criteria, and subject to existing regulatory laws on shark fin trade implemented by the Government of India.

Based on the available data the NDFs were either "positive" (fishing and trade were not detrimental to the resource), "positive, with conditions" (to be reassessed after a period of 3 to 5 years) or "negative" (fishing and/or trade was found detrimental to the sustenance of the resource) ●

An Indian Marine Fisheries Code mooted

The Food and Agriculture Organisation (FAO) brought out the

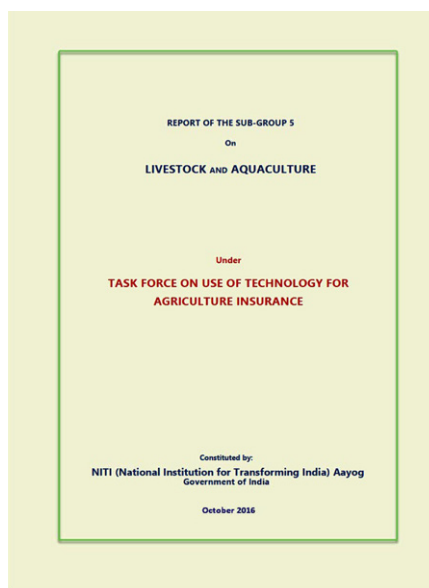
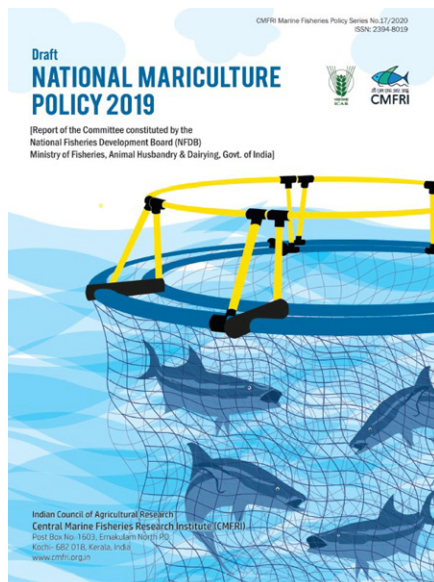


Code of Conduct for Responsible Fisheries (FAO CCRF) in 1995 as a guide for respective countries to implement their own effective fisheries management plan. In India, this Code has not been put into practice although there are several compliances. Now, scientists of the ICAR-CMFRI and ICAR-CIFT, two of India's major fisheries research institutes, have come together to develop a guidance on how the FAO-CCRF can be put into practice in the country. Aptly named as Indian Marine Fisheries Code (IMFC), it is expected to give an impetus to bring about a sea change in the manner in which marine fisheries is managed in the country. The IMFC explains in detail each sub-article of the FAO CCRF and provides information on how it

can be implemented and by whom. Further, it proposes several new bodies which are necessary to place fisheries management in the country on an unassailable footing. It is expected that all fisheries management bodies in the country, both at central and state levels would find the IMFC as a useful guidance for the future.

Mohamed, K. S., Vijayakumaran, K., Zacharia, P. U., Sathianandan, T. V., Maheswarudu, G., Kripa, V., Narayanakumar, R., Rohit, Prathibha Joshi, K. K., Sankar, T. V., Edwin, Leela, Ashok Kumar, K., Bindu, J., Gopal, Nikita and Pravin, P (2017) Indian Marine Fisheries Code: Guidance on a Marine Fisheries Management Model for India. Marine Fisheries Policy Series (4). ISBN ISSN 2394-8019 ●

Four National Documents - Mariculture Policy, Guidelines for Sea Cage Farming, GMP in Seaweed Farming & Livestock & Aquaculture Insurance



According to the vision outlined in the "Viksit Bharat 2047" document of Government of India, the proposed mariculture production from Indian seas is expected to reach around 7-8 million tonnes by 2047, including seaweeds. The Department of Fisheries, Government of India (DoF-Gol), has undertaken several initiatives to achieve this target. As part of this effort, ICAR-CMFRI was tasked with preparing three

important national documents aimed at enhancing Indian mariculture production in a sustainable manner. CMFRI has successfully completed this work involving stakeholders and submitted the following four documents to the DoF-Gol/National Fisheries Development Board (NFDB)/NITI Aayog: i) Draft National Mariculture Policy (2019); ii) Guidelines for Sea Cage Farming in India (2018); iii) Good Management Practices

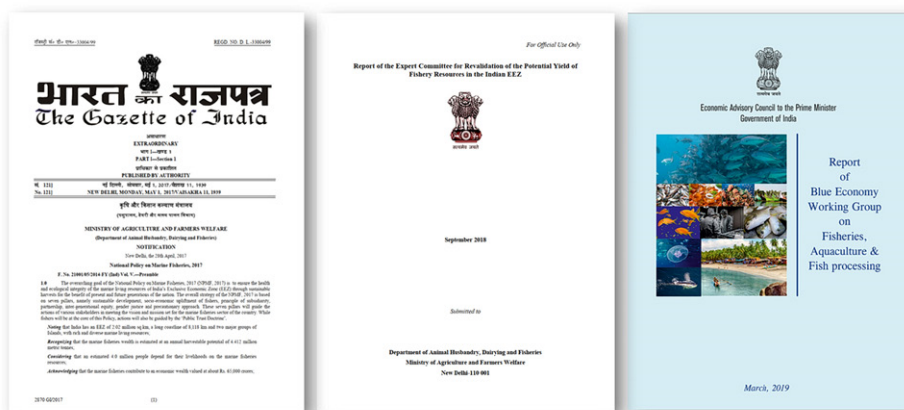
(GMP) in Seaweed Farming (2022) and iv) Use of Technology for Livestock & Aquaculture Insurance.

The draft National Mariculture Policy is currently being finalized as 'Standard Operating Procedures for Mariculture Development' by the DoF-Gol to be issued as a gazette notification, which will enable coastal states to enact relevant legislation. Meanwhile, the Government of Goa has issued a gazette notification regarding its state-level mariculture policy. This policy permits the leasing of selected coastal areas for open-sea mariculture activities, in alignment with the above draft National Mariculture Policy and also referring to CMFRI's assessment of suitable areas for mariculture including seaweeds within 3 km from the coast. The state of Maharashtra has also initiated similar steps in this regard. In the Pradhan Mantri Matsya Sampada Yojana (PMMSY - 2020) of the DoF-Gol, the technical details for sea cage farming and seaweed farming are derived from the two documents prepared by CMFRI. The NITI Aayog, in its document titled "Strategy for the Development of Seaweed Value Chain - Fostering Diversified Livelihoods," has integrated the Good Management Practices (GMP) for seaweed farming prepared by CMFRI. ICAR-CMFRI played a key role also in drafting the Sub-group Report on "Use of Technology for Fisheries and Aquaculture Insurance" which was submitted to the NITI Aayog in 2016. The report highlighted the major gaps and challenges associated with the adoption of insurance among fishers/fish farmers and put forward a comprehensive set of recommendations for enhancing the use of technologies and policy interventions for greater insurance uptake by the fisherfolk.

CMFRI's Contribution in the NPMF (2017), PYE (2018) and the EAC-PM's Blue Economy Working Group on Fisheries, Aquaculture and Fish Processing (2019)

CMFRI has significantly contributed to finalizing the National Policy on Marine Fisheries (NPMF, 2017) of the Government of India (GoI) under the chairmanship of Dr. S. Ayyappan, Secretary DARE & DG, ICAR. This policy, containing 62 points and sections such as preamble, vision, mission, strategy, and way forward, was gazette notified by the GoI on April 28, 2017 (F. No. 21001/05/2014-FY (Ind) Vol. V).

The institute also played a key role in revalidating the Potential Yield Estimate (PYE, 2018) of Marine Fishery Resources in the Indian Exclusive Economic Zone, which determines the harvestable potential of marine fisheries stocks for sustainable fishing. The revised annual PYE (2018) from the Indian EEZ is 7.158 million MT, which includes 5.311 million MT of conventional resources and 1.848 million MT of non-conventional resources.



In line with the major emphasis on the Blue Economy, the Economic Advisory Council to the Prime Minister (EAC-PM) of India assigned Working Group 3, the task of developing a roadmap for the sectors of fisheries, aquaculture, and fish processing, chaired by Dr. George John, Vice

Chancellor of Birsa Agricultural University, Ranchi. CMFRI played a significant role in preparing the final report, particularly in the areas of fisheries and aquaculture. The report was submitted to the EAC-PM in March 2019 for further necessary action.

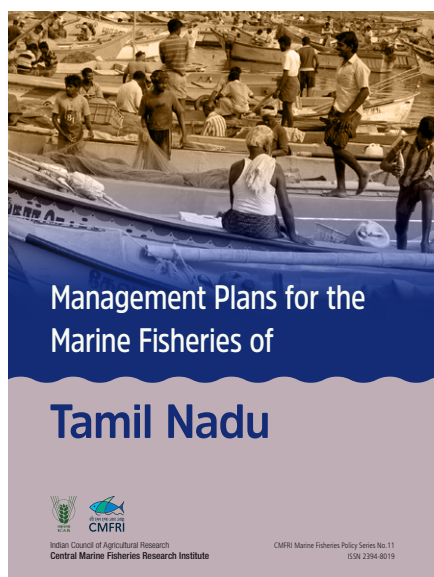
A short note on Management Plans for the Marine Fisheries of Tamil Nadu

The state of Tamil Nadu has a coastline of 1,076 km (13% of the country's coastal length), 1.9 lakh sq. km of Exclusive Economic Zone (9.4% of India's EEZ), a continental shelf of about 41,412 sq. km, and is one of the leading states in marine fish production. The marine fish production of the state was 7.22 lakh tonnes in 2022, increasing considerably by 28.38% from the landings in 2021. The landings have shown an increasing trend since 1985, with Tamil Nadu leading the marine fish landings in the country

in 2022; the state contributed 20.69% of the total marine fish landings in India during the year. The state has a marine fisherfolk population of 10.48 lakh from 608 marine fishing villages scattered along the 14 coastal districts. The state has an efficient fishing fleet comprised of 5,893 mechanised fishing boats and 42,337 traditional crafts. The per capita consumption of fish in Tamil Nadu is 9.3 kg. The shore infrastructure facilities include nine major fishing harbours, three medium fishing harbours, 53

fish landing centres, and 236 fish landing points.

The fluctuations in fish landings warrant constant monitoring and collection of vital data on catch, effort, biology of major exploited species, socio-economic parameters, and environmental parameters. Understanding the variations in the harvested stocks is a challenging task because numerous species and fishing techniques affect the fisheries in the area. Significant alterations have occurred in the utilization strategy of resources as



a result of modifications introduced in the crafts and gear employed in fishing. The management and planning of fisheries involve various geographical aspects, including the distinctiveness of ecosystems, the movement of resources, the delineation of fishing areas, and other regional variations in oceanographic parameters, productivity, and stock characteristics. Habitat loss, environmental degradation caused by human activities, and climate change-induced changes significantly affect the fisheries of any location. Considering these

factors, it was felt that a scientific management approach based on participatory, grassroots-level research including implementation of MLS for 113 commercial marine species can strengthen marine fisheries in the state. Accordingly, ICAR-CMFRI prepared comprehensive management plans for the Marine Fisheries of Tamil Nadu under the ongoing in-house project 'Science for Sustainability: Developing an Integrated Assessment Framework (IAF) to inform management decisions for marine fisheries of Tamil Nadu and Puducherry'.

Recognition for Research on Fish Genetics to Dr. A. Gopalakrishnan



The VASVIK (Vividhlaxi Audyogik Samshodhan Vikas Kendra) Industrial Research Award for the year 2020 in the category of Agricultural Sciences and Technology was awarded to Dr. A.

Gopalakrishnan, Director ICAR-CMFRI. The award includes a cash prize of ₹1.51 lakh and citation, which is in recognition of his significant research contribution on fish genetics. The award committee

observed that genetic studies conducted and the technologies developed have served to produce molecular markers for many endangered fishes which is crucial for biodiversity conservation.

Award for Swacchh Bharat activities



Dr. A. Gopalakrishnan, Director receiving the Swachhata Pakhwada Award

The institute achieved the second position among ICAR institutes for the coveted Swachhata Pakhwada Award under the Swachh Bharat programme of the Government of India. Several activities were undertaken at headquarters and regional research centres during the year. Dr. A. Gopalakrishnan, Director received the award from Shri. Radha Mohan Singh,

Hon'ble union minister for agriculture and farmers' welfare in a ceremony held at Delhi on 8th March, 2018. Meanwhile, activities for achieving a Clean India envisaged under the programme domestic garbage for subsequent disposal by concerned agencies and created awareness on disadvantages of plastic litter to marine environment.

The vermicompost unit set up by the staff of Mangalore Research Centre was used for preparing an additional vegetable patch to the existing plot which has been giving very good yield of vegetables. Cleaning of public places was also undertaken at Vizhinjam and Visakhapatnam Regional Research Centres ●

Rajbhasha Gaurav Puraskar



Dr. A. Gopalakrishnan receiving the award from Shri. Venkaiah Naidu, Hon'ble Vice President of India

Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and Dr. Imelda Joseph, Principal Scientist and Head In Charge, Mariculture Division bagged prestigious Rajbhasha Gaurav Puraskar 2017-2018 for Non-Hindi Speaking Region for their Hindi article 'Mariculture technologies for doubling of income of fishermen' published in the in house Hindi Magazine 'Matsyagandha'. They received the Award from Shri M. Venkaiah Naidu, Hon'ble Vice President of India during Hindi Day Programme organized at Vigyan Bhavan, New Delhi on 14th September, 2018 ●

CMFRI bags the Indira Gandhi Rajbhasha Puraskar for the third time



Dr. A. Gopalakrishnan, Director, CMFRI receives the Indira Gandhi Rajbhasha Puraskar from the Hon'ble President of India. Inset : Indira Gandhi Rajbhasha Puraskar

Indira Gandhi Rajbhasha Puraskar for the excellent work and commendable achievements in the implementation of Official Language Policy during the year 2012-13 in the category of Autonomous Bodies in Region 'C'. Rajbhasha awards

are given by the Ministry of Home Affairs every year on the Hindi Diwas which falls on September 14. It is the third time the institute is bagging the coveted prize.

Dr. A. Gopalakrishnan, Director, CMFRI received the award from

Hon'ble President of India Shri Pranab Mukherjee at a function organized at the Rashtrapati Bhavan, New Delhi on 14th September, 2014. Hon'ble Union Home Minister Shri. Rajnath Singh was also present on the occasion ●

ICAR-CMFRI receives Cashless ICAR Institute Award

Dr. A. Gopalakrishnan, Director, received the 'Cashless ICAR Institute Award' from Shri. Radha Mohan Singh, Union Minister of Agriculture and Farmers' Welfare, for implementing cashless transactions in the institute. The award comprises a citation and a cheque for ₹5 lakhs.

The Krishi Vigyan Kendra, Ernakulam functioning under ICAR-CMFRI also received the award in the category for KVKs. Dr. Sreenath Dixit, Director, Agricultural Technology Application Research Institute (ATARI) received the award for the KVK, Ernakulam from the Union Minister ●



Dr. A. Gopalakrishnan, Director receiving the Cashless ICAR Institute Award from Shri Radha Mohan Singh, Union Minister of Agriculture and Farmers' Welfare.

Awards for ICAR-CMFRI 2014 -2021

Established on February 03, 1947, ICAR-CMFRI has emerged as a leading tropical marine fisheries and mariculture research institute in the world. With its R & D activities aimed at engaging stakeholders to ensure sustainable marine fisheries as well as promotion of mariculture, it has bagged more than 50 accolades at institute and individual levels during 2014-2021 period, including the prestigious Sardar Patel Outstanding Institution Award (ICAR).



Name of Awards

Year

ICAR Awards

Sardar Patel Outstanding ICAR Institution Award (For large institute category)	2019
Cashless ICAR institute (to promote digital transactions)	2017
Best Annual Report Award	2014-15
ICAR Swachhta Pakhwada Award	2018
OFFICIAL LANGUAGE IMPLEMENTATION, Govt. of India	
Rajarshi Tandon Rajbhasha Puraskar (ICAR)	2014-15; 2016-17; 2017-18; 2019-20
Ganesh Sankar Vidyarthi Patrika Award (ICAR) for Hindi Magazine	2019-20
Indira Gandhi Rajbhasha Puraskar (Ministry of Home Affairs, Govt. of India)	2013-14; 2014-15
Rajbhasha Kshetriya Puraskar (Ministry of Home Affairs, Govt. of India) for best performing Institute in Southwest Region of India	2019-20
Rajbhasha Gaurav Puraskar (Ministry of Home Affairs, Govt. of India)	2017-18 - Dr. A. Gopalakrishnan, Director & Dr. Imelda Joseph, Principal Scientist
National Award for best scientific article in Hindi Kendriya Sachivalaya Hindi Parishad, New Delhi	Dr. Reeta Jayasankar, Principal Scientist-2019 Dr. Molly Varghese, Principal Scientist-2015

ICAR SPORTS

ICAR Inter-institutional South Zone Sports Meet-Overall Championship	2015, 2016, 2017, 2018
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INDIVIDUAL RECOGNITIONS

Padma Award	Padma Shri Ali Manikfan (Retd.)-2020
Norman Borlaug National Award for Excellence in Agricultural Research (ICAR)	Dr. Kajal Chakraborty, Principal Scientist - 2020
Rafi Ahmed Kidwai Award (ICAR)	Dr. Kajal Chakraborty, Principal Scientist - 2017
Jawaharlal Nehru Science Fellowship (JNSF), DST, Govt. of India	Dr. Trevor Platt, ICAR-CMFRI - 2014
Lal Bahadur Shastri Outstanding Young Scientist Award	Dr. Eldho Varghese, Scientist-2017
Pandit Deen Dayal Upadhyay Antyodaya Krishi Puruskar, ICAR	Shri Hasam Bhai Jumabhai Musangara (Farmer supported by ICAR-CMFRI on cage farming) - 2016
NAAS Fellowship	Dr. Kajal Chakraborty, Principal Scientist -2017
Jawaharlal Nehru Award for P.G. Outstanding Doctoral Thesis Research in Agricultural and Allied Sciences (ICAR)	Dr. P. A. Vikas-2014; Dr. Bineesh K. K.-2016; Dr. Anusree V. Nair-2017; Dr. Bini Thilakan-2017; Dr. Selsa J. Chakkalakal-2019; Dr. Fasina Makkar-2020
Netaji Subhas ICAR-International Fellowship	Ms. Saima Rehman (2017-18) Mr. Adnan Hussain Gora (2017-18) Mr. Chandrasekar S. (2017-18) Ms. Saloni Shivam (2018-19); Mr. M. Sankar (2019-20)
Ministry of External Affairs & Niti Aayog, Govt. of India- Social Innovation & Blue Ocean Award	Dr. V. V. Singh, Principal Scientist-2016
DBT-Biotech Product, Process Development and Commercialization Award	Dr. Kajal Chakraborty, Principal Scientist-2020
NAAS Recognition Award	Dr. Kajal Chakraborty, Principal Scientist-2020
NAAS Young Scientist Award	Dr. Eldho Varghese, Scientist-2018
Dr. Hiralal Chaudhuri Best Scientist Award (ICAR)	Dr. Grinson George, Principal Scientist-2015-16
Dr. C. V. Kulkarni Best Young Scientist Award	Dr. Grinson George, Principal Scientist - 2015-16
Best Biodiversity Researcher Award, Kerala State Biodiversity Board, Govt. of Kerala	Dr. K. K. Joshi, Principal Scientist - 2017
Young Investigator Award - Advances in Algal Biotechnology, Govt. of Tamil Nadu and Seaweed Research & Utilization Association	Dr. B. Johnson, Scientist - 2016
Gold Medal Award, Asian Fisheries Society,	Dr. A. Gopalakrishnan, Director, ICAR-CMFRI-2016
Taylor and Francis Commonwealth Scholar Best Journal Article Prize	Dr. Sandhya Sukumaran, Senior Scientist - 2015
Dr. PSBR James Memorial Award, MBAI	Dr. K. G. Mini & Team; Dr.K.K.Sajikumar & Team, 2020
Dr. R. Reghuprasad Memorial Award, MBAI	Dr. R. Jeyabaskaran & Team, 2020
Prof. N. R. Menon Memorial Award, MBAI	Dr. P. U. Zachariah & Team, 2020
Young Marine Biologist Award, MBAI	Dr. G. B. Purushottama - 2014; Dr. Sanal Ebenezer, Dr. Divya Viswambharan & Dr. Rajesh Kumar Pradhan- 2020

Awards for ICAR-CMFRI 2020-2022



ICAR AWARDS

Best Institute Annual Report	2020-2021
ICAR Institutes' Ranking	2019-2020 & 2020-2021
First (Fisheries & Animal Science Institutes)	
Third (across all ICAR institutes)	

Government of India

Gold Open Data Champion	Digital India Awards 2020 for ICAR-KRISHI Team
Best Hatchery Award by NFDB	MSR Hatchery, technically supported by ICAR-CMFRI



Asian Fisheries Society Indian Branch (12th Indian Fisheries and Aquaculture Forum, 2022)

Prof. H. P. C. Shetty Award	Dr. Sandhya Sukumaran
Dr. T. V. R. Pillay Award	Dr. Ritesh Ranjan and team
Shri J. V. H. Dixitulu National Award	Dr. Sekar Megarajan and team
Dr. M. C. Nandeesh Award	Shri Prasad, fish farmer, Upunda
AFS Young Scientist Award	Dr. P. Abdul Azeez
Best Oral Presentation (Aquaculture)	Dr. Sekar Megarajan
Best Oral Presentation (Aquatic Biodiversity, Stock Assessment)	Dr. Joe K. Kizhakudan
Best Poster Presentation (Fisheries Economics and Extension)	Dr. Shyam S. Salim and team
Appreciation Award	Shri P. R. Abhilash



Government of Kerala

Thozhil Shreshtha Award	Shri P. M. Dinil Prasad (2022), Cage fish farmer associated with ICAR-CMFRI Project funded by NFDB
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Official language implementation

Kshetriya Rajbhasha Award (for South and Southwest Region) 2021- 2022 from Ministry of Home Affairs, Govt. of India

Kochi Town Official Language Implementation Committee Award 2020-2021 (First Prize)

In-house magazine (Kochi TOLIC) for 2020-2021 Matsyagandha (First Prize)

Commendation Certificate for Official Language Implementation (2021-2022), Ministry of Home Affairs, Govt. of India - Smt. E.K.Uma

Stall awards

Best Stall Award, 1st Indian Fisheries Outlook, ICAR-CIFRI 2022

Best Stall Award (Second Prize), Asian Fisheries Society Indian Branch (12th Indian Fisheries and Aquaculture Forum) 2022



Individual recognitions

The Asian Fishery Society Gold Medal Award	Dr. A Gopalakrishnan, Director (2022)
VASVIK (Vividhlaxi Audyogik Samshodhan Vikas Kendra) Industrial Research Award	Dr. A Gopalakrishnan, Director (2022)
National Academy of Agricultural Sciences (NAAS) Associate (2022)	Dr.Eldho Varghese
Dr. C. M. Singh Award for overall best performance among Ph.D students of ICAR-IVRI	Dr.Sumithra T.G.
Dr. C. V. Kulkarni Best Young Scientist Award	Dr. Sekar Megarajan (2021-2022)
Young Scientist Award, National Academy of Agricultural Sciences	Dr. Reshma Gills (2022)
Netaji Subhas-ICAR International Fellowship	Reshma K. J. (2022)
Jawaharlal Nehru Award for PG Outstanding Doctoral Research in Agricultural and Allied Sciences	Dr. Anusree M. (2022)
Young Scientist Award Society of Fisheries and Life Sciences, College of Fisheries, Mangaluru, Karnataka	Dr. Loveson Edward L. (2022) Dr. Vinay Kumar Vase (2022)

Awards won by CMFRI staff during the 13th IFAF, 23-25 February 2024

Best Presentation Award (ORAL)

Theme 1: OFRM	Swatipriyanka Sen (OFRM19)
Theme 9: AEHC	Shylaja G. (AEHC-30), R. Saravanan (AEHC-53)
Theme 10: PICT	Ancy C. Stoy (PICT 01)
Theme 12: MRSF	Divu D. (MRSF-02) & Raju Saravanan (MRSF-06)

Best Presentation Award (POSTER)

Theme 1: OFRM	Saravanan R. (IAPG-65)
Theme 7: CRFA	Shelton Padua (CRFA -26) & Bindu Sulochanan (CRFA-34)
Theme 8: IFPT	Anju R. (IFPT 09)
Theme 9: AEHC	Prachi Siddhartha Bagde (AEHC52)
Theme 12: MRSF	R. Subburaj (MRSF-22)

PROFESSOR H. P. C. SHETTY Award - 2024	Dr. Grinson George
IFSI Dr. B. C. Jha Young Scientist Award, 2024	Dr. Subal Kumar Roul
AFSIB Young Scientist Award - 2024	Dr. Subal Kumar Roul
13IFAF2024 Best Stall Award (First Position)	ICAR-CMFRI, Kochi

ICAR-CMFRI–Other Awards & Recognitions during 2024

Best Paper Award: JMBAL Award (2021-22) (Awarded in 2024)	Dr G Shylaja
Vasvik Award for 2022 in the Agriculture Science & Technology (Awarded in 2024)	Dr Kajal Chakraborty
Hindi Award – GoI-MoHA – 2022-'23 Southern & South Western Region (Awarded in 2024)	ICAR-CMFRI (2nd Position)
Hindi Award – GoI-MoHA – 2023-'24 Southern & South Western Region (Awarded in 2025)	ICAR-CMFRI (1st Position)
Indian National Science Academy (INSA) Young Scientist Award – 2023 (Awarded in 2024)	Dr Reshma Gills
UK- British Council Alumni Award 2024	Dr Sandhya Sukumaran
Zoological Survey of India (ZSI) Animal Taxonomy Summit 2024 – Oral Presentation	Dr Jeena, NS (2nd Position)
National Academy of Sciences, India (NASI) – Fellow 2024	Dr Kajal Chakraborty
National Academy of Agricultural Sciences, India (NAAS) – Fellow	Dr Eldho Varghese
National Academy of Agricultural Sciences, India (NAAS) – Associate	Dr Sumithra, T.G.

Overall Championship in the ICAR South Zone Sports Meet 2019



Team from ICAR-CMFRI, Kochi won the Overall Championship in the ICAR South Zone Sports Meet 2019 held during 4-8 November in Kochi. The team was enthusiastically felicitated on their success by the institute ●

ICAR-CMFRI team champions in ICAR South Zone Sports Meet

In a hat-trick win(2015-2017), ICAR-CMFRI emerged as the overall champions in the ICAR South Zone Inter-Institute Sports Meet held during 9th -13th October, 2017 at the ICAR- Sugarcane Breeding Institute in Coimbatore. In the meet, 24 ICAR institutes based in Kerala,

Tamil Nadu, Karnataka, Andhra Pradesh and Telangana participated among which the ICAR-CMFRI team members became winners in team events such as football, volleyball and badminton. Individual champions emerged in the competitions for cycling (Shri. Prasad

K. G.) chess (Dr. Veena S), 4 x 100 m relay (Mr. P. Rajendran, Mr. Kaushik T. R., Mr. P. Shrinath, Mr. Vaibhav J. Ghorat), discus throw (Mr. Sukhdhane S. Kapil) and javelin throw (Ms. Smitha K). 54 staff members from the ICAR-CMFRI participated in the meet ●



ICAR-CMFRI sports contingent 2017

Taxonomy and identification of commercially important crustaceans of India



Dr. A. Gopalakrishnan, Director, CMFRI inaugurating the training programme

Crustacean Fisheries Division of CMFRI, has organized a training programme on 'Taxonomy and identification of commercially important crustaceans of India' during 20-24, August 2013 at Cochin. The aim of this training was to impart knowledge on the different aspects related to field identification of commercially important prawns, crabs and lobsters of India through theory & practical classes and field visits. Twenty participants attended the programme. A Poster on "Portunid crab Resources of India" was released by the Director ●



Participants along with the Director, CMFRI and faculty

MBAI and CMFRI organize the International Symposium "Marine Ecosystems: Challenges and Opportunities" – MECOS 2

The International Symposium "Marine Ecosystems: Challenges and Opportunities" (MECOS 2) was jointly organized by the Marine Biological Association of India (MBAI) and ICAR-CMFRI in Kochi from 2nd to 5th December, 2014 at the Dream

Hotel, Kochi. The symposium aimed to bring together scientists, researchers, and teachers working on marine resources and related fields from around the world. A total of 309 abstracts were presented across six tracks: marine fisheries and

management, aquaculture production systems, marine biodiversity, climate change and ecosystem assessment, responsible harvest and post-harvest, and marine biotechnology. Keynote addresses were delivered by prominent figures in marine science, including



Prof. (Dr.) Trevor Platt, Fellow of the Royal Society and Executive Director of the Partnership for the Observation of the Global Oceans (POGO). The symposium also included the presentation of awards, such as the Dr. S. Jones Memorial Prize and the Dr. M. Devaraj Memorial Award, to recognize outstanding contributions to the field of marine biology and fisheries •

ICAR-CMFRI hosts the 5th International Symposium on Cage Aquaculture in Asia (CAA5)

ICAR-Central Marine Fisheries Research Institute and the Indian Branch of the Asian Fisheries Society (AFS) hosted the 5th International Symposium on Cage Aquaculture in Asia (CAA5) in Kochi, India during 25-28th November 2015. The inaugural function held on 25th November 2015 began with a welcome address by Dr. A. Gopalakrishnan, Convener, CAA5

and Director, ICAR-CMFRI. Invitees and delegates from India, Norway, Indonesia, United Kingdom, Korea and Philippines were present on the occasion. He acknowledged the Asian Fisheries Society for providing the opportunity to host this prestigious event at Kochi, which included a symposium theme talk, keynote addresses for each session and lead talks by eminent researchers

and experts in cage aquaculture. 252 participants from 10 countries (Norway, UK, Australia, South Korea, Indonesia, Vietnam, Philippines, Thailand, Iran and China) were present besides Indian delegates. One symposium theme lecture, 6 keynote addresses, 17 lead talks, 141 abstracts, 42 oral and 75 poster presentations were made. An exhibition of cage culture



Release of CAA5 Souvenir (from L-R) Dr. A. Gopalakrishnan, Dr. Alice Joan Ferrer, Dr. J. K. Jena, Dr. S. Ayyappan, Dr. Derek Staples, Prof. (Dr.) Mohan Joseph Modayil and Dr. Mridula Rajesh`

technology, products and services with 21 exhibitors, had stalls displaying their products / services. Presentations in 6 different sessions pertaining to recent advances and research activities in the field of cage aquaculture were made. From over 200 submissions received, the best were summarized in the Book of Abstracts which was also released during the function. Convener CAA5 expressed his hope that the Symposium would meet the objectives and initiatives of ICAR, MPEDA, SAUs and NGOs in contributing to aquaculture growth in India and that it would provide a platform for the country to take up cage culture in a sustainable manner.

Felicitatory messages received from the Hon'ble President of India, Shri. Pranab Mukherjee, Vice President, Shri Mohammed Hameed Ansari, Union Address by the Chief Guest, Agriculture Minister, Shri. Radha Mohan Singh, Hon. Chief Minister of Kerala, Shri. Oommen Chandy and the President, Asian Fisheries Society, Prof. Shuolin Huang who flagged the importance of the symposium were also read out.

After the Welcome address, Dr. Alice Joan Ferrer, Vice President, Asian Fisheries Society, Malaysia spoke

briefly on the activities of AFS past. A two minutes silence was observed as a mark of respect to the departed souls of Dr. S. Z. Qasim, Honorary Life Member AFS, Prof. H. P. C. Shetty, Founder Chairman, AFSIB and past AFS Councillor and Mr. J. V. H. Dixitulu, former Managing Editor of Fishing Chimes.

In his Presidential address, Dr. J. K. Jena, Chairman, AFSIB emphasized the need for governmental policies to

support cage farming in open waters. He said that the slogan at present was not only fish for all for today and tomorrow but also forever. He said that India could take cues from countries such as Norway, Chile and China.

Prof. (Dr.) Mohan Joseph Modayil, Former Member, ASRB and Member Council Advisory Group (CAG), AFS, was the Guest of Honour for the function. He expressed happiness at the response shown by the participants to CAA5



Welcome Address by the Dr. A. Gopalakrishnan, Convener CAA5, Director, ICAR-CMFRI



Address by the Chief Guest Dr. S. Ayyappan, Secretary, DARE & DG, ICAR



Address by Guest of Honour Prof. (Dr.) Mohan Joseph Modayil, CAG, AFS, Malaysia



Presidential address by Dr. J. K. Jena, Chairman, AFSIB and DDG (Fisheries), ICAR



Address by Dr. Alice Joan Ferrer



Address by Dr. Derek Staples, Immediate Past President, AFS

and congratulated efforts to make this conference successful when cage aquaculture is still in its infancy in India. Highlighting the prospects of cage culture to a developing country like India where fish is not only an item of food but also of employment opportunities he pointed out that Asia is now emerging as a superpower in aquaculture. He flagged the issues of environmental safety, entrepreneurship, consumer health and also highlighted prospects of Asian countries to gain from cage aquaculture. He emphasized that there is no need for any competition between countries and what is rather needed is sharing of skills, knowledge and expertise with concerted efforts of Asian countries to take ecofriendly cage culture forward.

Dr. Derek Staples, Immediate Past

President, AFS, in his address stressed that the fisheries society in Asia needs to undergo a major reform with respect to connectivity among Asian countries.

The Book of Abstracts and Souvenir of the Symposium were released by the Chief Guest Dr. S. Ayyappan. In his Inaugural address he opined that it was apt that CAA5 was held in Kochi which may be rightly called the fisheries capital of India. He recounted his first experiments in freshwater cage culture along with Dr. Kumaraiah, way back in 1982. He mentioned that the food basket is getting diversified from cereals to meat to fish and the biggest challenge now is Climate Change which ICAR-CMFRI is also addressing. Highlighting the achievements made by ICAR-CMFRI in cage culture at Veraval, Karwar, Mandapam and Kochi he

mentioned that present day emphasis is on environment friendly and sustainable practices in capture fisheries as well as aquaculture. He expressed hope that the symposium would provide an opportunity for exchange of ideas between India and Norway who are the leaders in cage culture. Today, the Indian youth is looking forward to challenging ideas and opportunities and cage culture will be such an opportunity he added. He further emphasized that multiple use of water should be resorted to and complimented the efforts of the youngsters from Jharkhand on their success in cage farming in the reservoirs. He also said that a strong combination of seed availability, feed, skill and will were the need of the hour for further development of cage aquaculture in India. Stressing that cage



Keynote address by Prof. Trevor Platt in Session I on Marine Production Systems



Keynote address by Mr. Trond Severinsen (Norway) in Session I on Marine Production Systems



Lead lecture by Dr. Asmund Bjordal (Director, Institute of Marine Research, Norway) in Session III



Lead lecture by Dr. Ketut Sugama (Indonesia) in Session III on Breeding and Seed Production



Delegates at the Symposium



Lead lecture by Dr. Kristoffer Lunde (Norway) in Session IV on Nutrition and Feed



Keynote address by Dr. Brit Hjeltne (Norway) in Session V on Health and Environment Management



Keynote address by Dr. Marius Dalen (Norway) in session VI on Economics, Livelihood and Policies

culture can provide opportunity for a paradigm shift for production of food from land to water bodies, Dr. Ayyappan concluded his address by wishing the delegates fruitful deliberations.

The AFSIB R & D Innovation Awards were presented to experts

who had significantly contributed for the development of cage culture in India. This included Mr. Sanjay V. Raut, President (Technical & New Businesses), Garware-Wall Ropes Limited, Pune, Dr. Thampi Samraj, Director, Rajiv Gandhi Centre for Aquaculture, MPEDA, Kochi,

Prof. (Dr.) Mohan Joseph Modayil, Former Member, ASRB and Former Director, ICAR-CMFRI, Dr. G. Syda Rao, Former Director, ICAR-CMFRI, Dr. G. Gopakumar, Emeritus Scientist, ICAR-CMFRI and Dr. P. Kumaraiah, former Principal Scientist, ICAR-CIFA.



Presentation of AFSIB R&D Innovation Award to Prof. Dr. Mohan Joseph Modayil



Presentation of AFSIB R&D Innovation Award to M/s. Garware Wall Ropes Ltd.



Presentation of AFSIB R&D Innovation Award to Dr. G. Gopakumar



Presentation of AFSIB R&D Innovation Award to Dr. P. Kumaraiah

Dr. Mridula Rajesh, Treasurer, AFSIB proposed the vote of thanks.

Distinguished guests at the symposium included Dr. V. V. Sugunan and Dr. Madan Mohan (Former ADGs (Fisheries), ICAR), Dr. P. S. B. R. James, Dr. V. N. Pillai (Former Directors, CMFRI), Dr. S. D. Tripathi (Former Director, ICAR-CIFE), Dr. S. W. A Naqvi, Director, CSIR-NIO, Goa; Dr. P. Ravishankar, Director, ICAR-CIFT, Dr. K. K. Vijayan, Director, ICAR-CIBA, Chennai and Dr. P. Jayasankar, Director, ICAR-CIFA, Bhubaneswar besides many other eminent personalities in the field of fisheries and aquaculture.

The Symposium Theme lecture

"Greening the Asian Cage Aquaculture Construct" was delivered by Prof. (Dr.) Mohan Joseph Modayil. The keynote speakers were Mr. Trond Severinsen (Norway) (Marine Production Systems), Dr. V. V. Sugunan (Inland Production Systems), Dr. G. Gopakumar (Breeding and Seed Production), Dr. P. E. Vijay Anand, USSC (Nutrition and Feed), Dr. Brit Hjeltne, (Norway) (Health and Environment Management), and Dr. Marius Dalen, (Norway) (Economics, Livelihood and Policies). All sessions had lead talks by eminent speakers and scientists from different organisations in India and abroad. They were Dr. Niels Svennevig (Vietnam), Dr. Clive Jones

(Australia), Dr. K. G. Padmakumar (India), Dr. A. K. Das (India), Mr. Uttam Kumar Subuddhi, IFS (India), Dr. Asmund Bjordal, Director, IMR (Norway), Dr. Ketut Sugama (Indonesia), Dr. Kristoffer Lunde, EWOS (Norway), Prof. Trevor Platt (Plymouth, presently Jawaharlal Nehru Science Fellow, India), Dr. K. K. Vijayan, Director, ICAR-CIBA (India), Dr. Indrani Karunasagar (India), Dr. Murwantoko (Department of Fisheries, Faculty of Agriculture (Indonesia), Dr. P. Ravichandran, Member Secretary, Coastal Aquaculture Authority, (India), Mr. Suresh Kumar, DGM, NABARD, (India) and Mr. Jacob Joseph, Asst. Professor, NUALS, (India). There were oral and





Award for best paper presentation to Dr. G. Grinson and Team



Award for best paper presentation to Dr. M. K. Anil and Team



Award for best poster presentation to Dr. K. Madhu and Team



Award for best poster presentation to Dr. P. A. Vikas and Team

poster presentation in each session by scientists and students from different organisations in India and abroad. The Exhibition and Trade show inaugurated by Dr. Derek Staples, AFS (Malaysia) had 22 stalls which included State and Central Government Agencies, ICAR institutes, Fisheries Universities, Entrepreneurs, Banks and NGOs.

The Plenary and valedictory session of CAA5 was held on 27th November, 2015. After the welcome address by Dr. B. Shamasunder, Secretary AFSIB, Dr. S. D. Tripathi, Dr. K. K. Philipose, Coordinator, All India Network Project (Mariculture), Dr. Imelda Joseph, Head in Charge, Mariculture Division, ICAR-CMFRI and Dr. Derek Staples, expressed their views about the Symposium and appreciated the success of the symposium. Dr. J. K. Jena, President, AFSIB presented the concluding remarks and the



Delegates at the National Marine Biodiversity Museum, ICAR-CMFRI



Dr. A. Gopalakrishnan, Director with the invited speakers and the AFS and AFSIB team at ICAR-CMFRI

recommendations of the symposium. Prof. (Dr.) Mohan Joseph Modayil announced the awards for the best three papers and posters. MATSYAFED Kerala was presented with an award in recognition of their support to the cage culture programmes in the country by supplying the nets at nominal rates to the fishers. Mr. V. Dinakaran, Chairman, MATSYAFED and Ex-MLA, on receiving the award, stated that the organization will continue supporting ICAR-CMFRI in their cage culture endeavours. The program concluded with the vote of thanks by Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and Convener, CAA5.

Recommendations of CAA5

Considering the emerging importance of cage aquaculture on the economy and life of the Asian region, the CAA5 recommends

1. A precautionary development agenda for environment and resource friendly, sustainable and inclusive way forward for Asian countries by sharing information and experiences for the benefit of all.
2. Collective efforts between Asian countries to foster a green approach by following best management practices for providing safe fish.
3. Development of breeding and grow-out technologies of indigenous candidate species, specific to each country, with emphasis on diversification in both inland and marine cage aquaculture.
4. Greater focused research attention on feed development, with emphasis on reduced use of fish meal and fish oil, and feed management approach for prospective candidate species for cage aquaculture in the Asian region.
5. Development and implementation of countryspecific disease surveillance and management plans for addressing existing diseases and preventing future outbreaks.
6. A greater thrust on R & D on multispecies farming; involving fish, molluscs, seaweeds and scavengers for utilization of multi-trophic food niches for preventing environmental deterioration.
7. Development and adoption of National policies for each country, taking into consideration harmonized approaches delineating maximum biomass production for sites in inland and marine water bodies, so as to prevent adverse impacts on the aquatic environment of neighbouring countries.
8. Mapping of sites for cage aquaculture, taking into consideration local area development plans, environmental safeguards and user rights; further, notifying and demarcating culture sites must receive attention in each country so as to promote harmonious development.
9. Facilitation of private-public participation in commercial cage farming to attract increased investment and entrepreneurial development.
10. Sharing of knowledge and skill for development of cage aquaculture through collaborative programmes in research, training and human resource development ●

National Workshop on Digital Library Management



Dr. A. Ramachandran, VC, KUFOS inaugurating the workshop

A two-day national workshop cum training on Digital Library Management was held at ICAR-CMFRI organized by its Library and Documentation Centre. Inaugurating the workshop, Dr. A. Ramachandran, Vice Chancellor, Kerala University of Fisheries and Ocean Studies (KUFOS) said the library professionals must be well trained with the latest information management technologies in order to extend the efficacy of the digital library system to the users. The development in information technology has revolutionized the concept of library and digitization of information has made the research activities easier

and effective. Dr. Ramachandran also inaugurated D-Space@CMFRI, a digital archive of information related to the institute. In his presidential address, Dr. A. Gopalakrishnan, Director, ICAR-CMFRI said its library would be made the information gateway in the field of fisheries and marine science in the country. The workshop was intended to

bring together library and information professionals on a common platform for in depth analysis and discussion of various aspects and new developments in the field of digital library system. A special publication 'Glimpses of Marine Fisheries- A Caricature', authored by Dr. A. A. Jayaprakash Principal Scientist (Retd.) was also released.

Dr. V. Gopakumar, Librarian, Goa University, Dr. B. S. Sivaram, National Aeronautics Laboratory, Bangalore and B. Ravishankar Informatics, Bengaluru spoke in various technical sessions. Dr. K. S. Shobhana, Principal Scientist, Mrs. P. Geetha, Officer-in-charge, Library and Documentation Centre and Dr. V. Mohan also spoke on the occasion ●

Journal Club organised invited talks

Dr. Gustav Paulay, Curator of Florida Museum of Natural History, University of Florida, USA delivered a lecture on 'Reef Biodiversity: the Inside Story' at Headquarters. Dr. Gustav, who has specialized in reef biodiversity research and is also an editor of WORMS, the world's largest online database for taxonomy marine species, urged the scientific community to participate in developing online database of the marine biodiversity, helping interested stakeholders get access to the information of the nation's resources. He visited the

National Marine Biodiversity Museum at ICAR-CMFRI which is designated as the National Repository by the Government of India and appreciated its showcasing of varieties of marine species regarded as the largest of its kind in the country. Director Dr. A. Gopalakrishnan presented a memento to Dr. Gustav. Dr. K. K. Joshi, Head, Marine Biodiversity Division and Dr. Shyam S. Salim, Principal Scientist and co-ordinator of the Journal Club, also spoke on the occasion ●



Dr. Gustav being welcomed by Dr. A. Gopalakrishnan, Director

World Fisheries Day celebrated with launch of Aqua Task Force



Launch of the Aqua Task Force

The Krishi Vigyan Kendra Ernakulam of ICAR-CMFRI introduced an Aqua Task Force named Kadamakudy Malsya Karma Sena on 21st November 2016 to help boost fish culture. The task force, comprising a group of youngsters trained by the KVK, was launched by Dr. A. Gopalakrishnan, Director, ICAR-CMFRI at a function held on Pizhala Island, as part of the World Fisheries Day celebration. Under the technical guidance of experts from the KVK,

the young people in the Aqua Task Force will undertake various works to assist fish farmers on payment basis. They are able to help farmers in areas such as farm design, cage fabrication, cleaning, pond preparation, seed sourcing, quality control, feed selection etc. KVK will assist the task force in making project reports to avail

bank loans for aquaculture projects. For availing the services of the task force, KVK can be contacted at 8281757450. A hand book on FAQs on cage farming and a leaflet on GIFT Tilapia farming were also released during the function. These publications can be purchased from KVK sales counter at ICAR-CMFRI, Kochi. A seminar on 'Cage

Aquaculture' was also conducted as part of the programme. Smt. Shalini Babu, President, Kadamakkudy Grama Panchayat presided over the function. Dr. Shinoj Subramannian, Senior Scientist and Head, KVK, Dr. P. A. Vikas, Subject Matter Specialist (Fisheries) were present ●

Platinum Jubilee celebrations of ICAR-CMFRI begin



Hon'ble Governor of Kerala, Justice (Retd.) P Sathasivam inaugurated the year-long Platinum Jubilee celebrations of the institute on 18th February, 2017. Established as a Marine Fisheries Research Station on 3rd February, 1947 in Chennai, the institute now has 11 Regional Research Centres located in Mandapam Camp, Visakhapatnam, Veraval, Mumbai, Chennai, Kozhikode, Karwar, Thoothukudi, Vizhinjam, Mangaluru and Dighe, in addition to 15 field centres spread in the coastal belt of the country and one KVK at

Narakkal, Ernakulam. In his speech, the Governor called upon the scientific community to address the issues being faced by the fishermen and fish farming community while carrying out research in fisheries sector. He appreciated the efforts of ICAR-CMFRI for promoting open sea cage farming across the country that will help to increase fish production. The Governor also released products like Cadalmin Anti-Hyper Cholestrolemic Extract, a nutraceutical product developed for preventing obesity and a mobile app

named 'Fish Finder Version1' to identify fish species in the field. A special postal cover by the Indian Postal Department and new publications of the institute were also released on the occasion. Dr. J. K. Jena, Deputy Director General (Fisheries) ICAR, presided over the function. Dr. A. Jayathilak, IAS, Chairman, MPEDA offered felicitation. Ms. Sumathi Ravichandran, Postmaster General (Kerala) was also present. Dr. A. Gopalakrishnan, Director, announced the future research plans of the institute including a major



Traditional welcome to chief guest and arriving dignitaries



Director welcomes Chief Guest



DDG (Fisheries), ICAR with Director



Director honours Chief Guest of the Celebrations



Launch of Platinum Jubilee Logo



Release of nutraceutical Cadalmin™ ACE



Release of CMFRI Publications



Welcome speech by Dr. A. Gopalakrishnan, Director



Felicitations by Dr. Jayathilak, Chairman, MPEDA



Speech by Dr. J. K. Jena, DDG, ICAR

research project in partnership with the Ministry of Environment, Forest and Climate Change, Govt of India to address the impacts, vulnerability and adaptation strategies of climate change in marine fisheries of the country as part of the Third National Communication (TNC) to the United Nations Framework Convention on Climate Change (UNFCCC). The Mariculture Policy guidelines and development of pelagic fish biomass estimation model with the support of satellite remote sensing technology is also on the anvil, he added. Former Directors of ICAR-CMFRI Dr. E. G. Silas, Dr. P. S. B. R. James, Dr. V. N. Pillai, Prof. (Dr.) Mohan Joseph Modayil, Dr. G. Syda Rao, senior retired scientists and officers graced the function. Dr. K. Gopakumar, former DDG (Fisheries), ICAR, Dr. V. V. Sugunan, former ADG, ICAR, Dr. T. K. Srinivasa Gopal, Former

Director, ICAR-CIFT, Prof (Dr.) N. R. Menon, Professor Emeritus, CUSAT, Prof (Dr.) A. Ramachandran, VC, KUFOS, Dr.(Smt.) S. Girija, Director, NIFPHATT and senior officers of the state fisheries department were also present.

The Platinum Jubilee celebrations were also initiated at the various regional research centres. The programme at Vizhinjam Research Centre led by the Scientist-in-Charge Dr. M. K. Anil, honoured 38 retired staff of the centre followed by Open House programmes with free admission to visitors and general public to the centre's marine aquarium "Sagarika". The Madras and Mangalore Research Centres observed the 70th Foundation Day on 3rd February 2017 and arranged Open House for schoolchildren and interested public. Celebrations at Tuticorin Research centre was inaugurated by

the Sub Collector Mr. Deepak Jacob, IAS, Thoothukudi in the presence of Dr. G. Sugumar, Dean, Fisheries College and Research Institute, Thoothukudi and Mr. Navadeep Raj, Commandant, Coast Guard, Thoothukudi. An Elocution competition on the topic "Green Energy- Opportunities and Challenges" and a drawing competition on "Marine Biodiversity and its conservation" for school students was also held on 2nd February, 2017. Celebrations at Mandapam Regional Centre was inaugurated by Dr. P. S. B. R. James, former Director, ICAR-CMFRI. Prof. M. Salihu, Former Vice Chancellor, Madurai Kamaraj University was the Guest of Honour.

At Karwar Research Centre Open House held on 6th February, 2017 was inaugurated by the honourable Deputy Commissioner of Uttara Kannada District, Mr. S. S. Nakul in the presence of Mr. P. M. Tandel, former member, Coastal Aquaculture Authority of India, Mr. S. L. Yogesh District Manager, Uttara Kannada, NABARD, Mr. M. L. Doddmani, Deputy Director of Fisheries, Karwar, and Mr. Gomes, CEO, BFFDA, Goa. At Veraval, the programme was inaugurated by Dr. Ajay Kumar IAS and Dr. Paul Pandian, Fisheries Development Commissioner, Govt. of India. At Calicut Research Centre Smt. T. M. Mariam Hazeena, Deputy Director, Fisheries Department inaugurated the Open House ●



Dignitaries in the audience

Foundation Day celebrations at ICAR-CMFRI



School children watching marine reef exhibits



Exhibits in Marine Biodiversity Museum at HQ



Open House at Visakhapatnam Regional Centre



Open House inauguration at Madras Research Centre



Retired staff felicitated at Vizhinjam Research Centre



Celebrations organised at Veraval Regional Centre



School children at the Open House in Mangalore Research Centre

Alumni Meet of mariculturists



Mariculturists at their Alma mater

Marking 37 years of mariculture education, research and development in the country, eminent scientists, policy makers, research managers, academicians, industrialists, bankers and administrators who finished their academic programmes in mariculture at the ICAR-CMFRI in Kochi attended the Alumni Meet held on 8th and 9th April 2017.

Padma Bhushan Prof. M. V. Pylee, renowned educationist and former Vice Chancellor of Cochin University of Science and Technology, former Directors of ICAR-CMFRI, Dr. E. G. Silas and Dr P. S. B. R. James, retired Principal Scientists Dr. Vedavyasa Rao and Dr. A. Noble, graced the function. Around 200 alumni from across the country including Dr. J. K. Jena, Deputy Director General (Fisheries) of ICAR, Dr. C. Vasudevappa, Vice



Prof. Pylee addressing the gathering

Chancellor, University of Agricultural and Horticultural Sciences, Shivamogga, Dr. K. K. Vijayan, Director, ICAR-CIBA and Dr. A. Gopalakrishnan, Director, ICAR-CMFRI attended the meet.

The alumni of mariculture batches of post graduate and doctoral programmes at the ICAR-CMFRI are active in the development of India's marine fisheries and aquaculture sectors by involving in the policy

frameworks, research, administration and entrepreneurial initiatives. Based on the FAO-UNDP guidelines and funding, the Post graduate and Ph. D. programmes in mariculture were started at the ICAR-CMFRI in 1979 with the affiliation of Cochin University of Science and Technology (CUSAT). Later, in 1993, these programmes were shifted to the Central Institute of Fisheries Education, Mumbai ●

Union Minister of State for Agriculture & Farmers Welfare Dr. Sanjeev Kumar Balyan visits ICAR-CMFRI

Union Minister of State for Agriculture & Farmers Welfare Dr. Sanjeev Kumar

Balyan visited ICAR-CMFRI on 16th June 2016. He interacted with scientists of

the Institute and urged them to focus on fisher-oriented research activities



to improve the marine fisheries sector of the country. He stressed that long-term planning is required to formulate developmental projects aimed at boosting the production and productivity in the country.

The minister appreciated the scientists of CMFRI for their contributions in sea cage farming, technology development of the species such as cobia, silver pompano, and orange spotted groupers. He also hailed the efforts of ICAR-CMFRI in setting up the National Brood Bank which is an important step in increasing the fish production in the country.



Union Minister of State, Shri. Sudarshan Bhagat interacts with fishermen and fish farmers at ICAR-CMFRI

Shri. Sudarshan Bhagat, Union Minister of State for Agriculture and Farmer's Welfare called for utilizing Geographical Information System (GIS) technology in the fisheries sector to minimize fishing efforts and expense. He was speaking at an interactive meeting with fishermen and fish farmers in the presence of the scientists of ICAR-CMFRI on 5th May 2017. The programme was part of ICAR-CMFRI's ongoing platinum jubilee celebrations.





The Union Minister said the GIS technology would help identify potential fishing zones (PFZ), making fishing easier and less expensive. He also said climate change was one of the major obstacles to the growth of the fisheries sector in the country. Shri. Bhagat urged the scientific community to study the issue and provide alternate means to mitigate the phenomenon. The Minister also hailed ICAR-CMFRI's technology of cage fish farming which has the potential to help the country increase marine fish production 📍

ICAR-CMFRI felicitates India's first fisher woman Smt. Rekha Karthikeyan

At a function held at ICAR-CMFRI on 5th May 2017, Shri. Sudarshan Bhagat, Union Minister of State for

Agriculture and Farmer's Welfare felicitated India's first fisherwoman Smt. Rekha Karthikeyan. She has been

venturing into the sea on outboard boat for around 15 years. Rekha is the first woman in the country who goes into





sea for fishing on motorized boat. ICAR-CMFRI provided financial and technical support to the couple to launch the cage fish farming in sea waters. The minister handed over her seeds of seabass, a high value fish, for starting the cage farming. Ms. Karthikeyan hails from Kundazhiyoor near Chettuva in Thrissur district. Although there are women fishermen engaged in fishing in backwaters, no record about woman's presence in fishing along the Indian coasts is available so far ●

NITI Aayog and ICAR-CMFRI join hands for Sustainable Development Goal 14



Dr. Ashok Jain, Advisor, NITI Aayog speaking at the workshop

Aimed at implementing the Sustainable Development Goal-14 (SDG) 'Effective and inclusive management of marine and coastal ecosystems to promote human well-being and sustainable development' of the United Nations in India, ICAR-CMFRI, Kochi in collaboration with NITI Aayog and WWF-India organised a two-day national workshop on 4th and 5th July, 2017. Representatives of all the coastal States and UTs along with

stakeholders including the concerned officials from the central government ministries, academia and scientists from research institutes, UN bodies and NGOs attended the workshop.

During the workshop, a set of recommendations were finalised by the experts for achieving the stipulated targets included in the Sustainable Development Goal-14 of the United Nations. Dr. Ashok Jain, Advisor to NITI Aayog, P. K. Biswal, Additional

Secretary of Planning and Convergence Department of Odisha, Dr. Sejal Worah, Programme Director of WWF-India, Dr. A. Gopalakrishnan, Director, ICAR-CMFRI, Dr. C. N. Ravishankar, Director, ICAR-CIFT, Dr. Pravin P., Assistant Director General (Marine Fisheries), ICAR and N. Vasudevan, Additional Principal Chief Conservator of Forests, Maharashtra among others lead the discussions at the workshop ●

Indo-German Workshop on marine fish stock assessment



Dr. Michael Vakily inaugurated the workshop on CMSY

An Indo-German training workshop on the use of Catch Maximum Sustainable Yield (CMSY) method for marine fish stock assessment was held at ICAR-CMFRI on 5th and 6th October 2017. The training that focussed on new approaches of fish stock assessment

in cases of a data-poor environment, was given to participants comprising scientists and researchers from India and Bangladesh. Dr. Michael Vakily, Programme Director, GIZ India Biodiversity Programme, Dr. M.L.D. Palomares, Senior Scientist at the

University of British Columbia, Canada and Ms. Crispina Binohlan, Research Associate, FishBase, Philippines delivered the training. Dr. Rainer Froese, Centre of Ocean Research, Germany interacted with the trainees through Skype and gave feedback during the hands-on training. Scientists from ICAR-CMFRI, officials from fisheries institutes in Bangladesh and representatives from the Bay of Bengal Programme also attended the training-cum-workshop. Dr. T. V. Sathianandan, Head, Fishery Resources Assessment Division, ICAR-CMFRI proposed the vote of thanks. Dr. Dineshbabu A. P., Dr. Somy Kuriakose, Dr. Mini, K. G., Dr. Eldo Varghese, Dr. Geetha Sasikumar, Dr. S. Lakshmi Pillai, Dr. Shoba Joe Kizhakudan, Dr. U. Ganga, Dr. Rajesh K. M., Dr. T. M. Najmudeen, Ms. M. Muktha, Ms. F. Jasmin, Dr. Gyanranjan Dash, Mr. K. Mohammed Koya and Ms. M. Kavitha participated in the Training-Workshop ●

Union Minister of State for Agriculture and Farmers Welfare Smt. Krishna Raj visits ICAR- CMFRI



Smt. Krishna Raj, Hon'ble Union Minister of State for Agriculture and Farmers Welfare visited the ICAR-Central Marine Fisheries Research Institute, Kochi (ICAR-CMFRI) on 29th May 2018. During an interface meeting with the scientists of the CMFRI, she urged them to promote seaweed farming which, according to her, has multi-dimensional industrial prospects. According to the minister, seaweed cultivation will greatly be beneficial to the development of various nutraceutical products, medicines and cosmetic products. "Promotion of seaweed farming will also help increase the income of fishermen". The minister also said that small scale entrepreneurship should be promoted in fisheries to improve the living standards



of fishermen and fish farmers. Women empowerment could be

another important outcome of such activities ●

International Yoga Day celebrated



The ICAR-Central Marine Fisheries Research Institute (CMFRI) observed the International Day of Yoga on 21 June 2017 with demonstration of yoga and an awareness lecture organised by the Recreation Club of the institute. Dr (Major) Rajesh Nambissan was the chief guest of the programme. Mr. K. Vijayakumar, Sri Sri Yoga Faculty of the Art of Living Foundation demonstrated the yoga to the staff members of the ICAR-CMFRI, ICAR-CIFRI and ICAR-NBFGR. Around 250 staff members attended the programme. The Regional Research Centres also celebrated the day where invited persons proficient in yoga techniques delivered theory and practical classes for the benefit of all the staff ●

NITI Aayog Member Prof. Ramesh Chand Visits ICAR-CMFRI

Prof. Ramesh Chand, a full-time member of the NITI Aayog and noted agriculture economist visited the ICAR-Central Marine Fisheries Research Institute (CMFRI) in Kochi on 17th November 2017. During an interaction with scientists of the ICAR-CMFRI, he suggested taking proactive measures to sustainably enhance marine fisheries harvests through scientific interventions. Marine fisheries exports sector should give due importance to develop internationally acclaimed brands through high quality value



addition, certification and promotional activities so that India could fully exploit the potentials of niche markets in developed countries, he said.

Urging ICAR-CMFRI scientists to focus more on different ways to increase the fish productivity, Prof. Chand opined that higher production and technology integration is required to boost domestic and overseas trade of fish and other value added products.

Referring to the fluctuation in

fish price, Prof. Chand said that implementing Minimum Support Price (MSP) for fish does not seem to be a practical step due to a variety of practical problems. Instead, implementation of some types of price support through Price Stabilization Fund and formation of Fish Producers Organizations will offer solutions in this regard, he added.

He also said that NITI Aayog is concerned over the present growth rate of employment in rural industries.

“Creating employment is one of the biggest challenges the country is facing today. Growth rate of employment in rural industries is very poor. During 2005 to 2012 it was meagre 0.65% per year. The planning and vision in the area of agriculture and allied sectors should be re-designed so as to generate more job opportunities in rural areas”, he said, urging the scientists to concentrate on value addition in the sector that offer employment opportunities ●

CeRA Workshop organised



Participants of CeRA workshop

A training-cum-awareness workshop on Consortium of e-Resources in Agriculture (CeRA) was held on 15th December, 2017, jointly organised by ICAR-Directorate of Knowledge Management in Agriculture (DKMU), Informatics publishing Ltd. (J-Gate) and ICAR-CMFRI it called for promoting ICT based information dissemination systems to improve agricultural research in the country. The CeRA is a

consortia mode of journal subscription and electronic information services which help in saving huge resources by avoiding duplication in journal subscription by various agricultural research institutes and universities under the National Agricultural Research System (NARS). The workshop aimed to create awareness in using CeRA on J-Gate platform. Dr. S. K. Singh, Project Director, ICAR-DKMA inaugurated the

programme. Librarians from the ICAR research institutes and agricultural universities located in Andhra Pradesh, Telengana, Karnataka, Tamil Nadu and Kerala attended the workshop. Mr. S. K. Joshi, Business Manager and in-charge of CeRA; Dr. G. Maheshwarudu, Head, Crustacean Fisheries Division, Dr. K. S. Shobhana, Scientist in Charge, Library, ICAR-CMFRI and Ms. P. Geetha, ICAR-CMFRI spoke on the occasion ●

Workshop on Next Generation Sequencing



Dr. George Thomas, Chief Operating Officer, AgriGenome Labs inaugurated the workshop on NGS

As part of the Platinum Jubilee celebrations of the institute, a workshop on "Next Generation Sequencing and its applications in fisheries and agricultural sciences for beginners" was organized by the Marine Biotechnology Division in collaboration with AgriGenome Labs Pvt. Ltd., Kochi during 7th-8th November, 2017. Dr. George Thomas, Chief Operating Officer, AgriGenome Labs inaugurated the workshop. 35 participants from various scientific institutions across the country were trained on various aspects of Next Generation Sequencing (NGS)

technology including Sample Quality Control, library preparation, sequencing, application of transcriptome and whole genome data, studying unknown organisms and the application of small

RNA and metagenomics in marine biology. A visit to Agrigenome Labs to give an exposure to the functioning of latest NGS equipments like Illumina HiSeq2000, MiSeq, PacBioRS and

Nanopore Minlon sequencer was also arranged.

Reported by Vijayagopal P, Head, Marine Biotechnology Division ●

Project launch workshop on Fishery Management Plan for Lakshadweep



Project launch at Kavaratti

The In-house Project Resource assessment and management framework for sustainable marine fisheries of Lakshadweep was formally launched by Dr. A. Gopalakrishnan, Director, ICAR-CMFRI at Kavaratti on 30th November, 2017 at a function graced by senior officials of the Lakshadweep Administration. Department of Fisheries, Department of Panchayat and Rural Development, Department of Science & Technology, Marine Products Export Development Authority (MPEDA); besides fishers, members of the women self-help groups, NGOs etc. It was followed by the project launch workshop and consultation of ICAR-CMFRI with the Administration of U.T. of Lakshadweep for long-term association on island fisheries research.

In his presidential speech, Director, ICAR-CMFRI highlighted the research priorities of the Institute for the marine fisheries of the country and promised to extend all technical support from ICAR-CMFRI for the Lakshadweep administration in implementing their prioritized schemes and programmes especially those under the Blue Revolution platform of the Government of India. Dr M. P. Anwer, Director of Fisheries, Lakshadweep, Mr. T. Kasim, Chief Executive Officer, District Panchayat, Lakshadweep and Mr. K. Mohammed koya, Scientist and Principal Investigator of the project also spoke on the occasion. Discussions on specific areas such as the development of data collection system based on the scientific sampling design for estimation of species level landings in

Lakshadweep; gainful utilisation of the fish waste generated from the masmin processing in the islands for livelihood generation and cleanliness of the beach and lagoon; and opportunities in cage based sea farming (food fishes, bait fishes and ornamental fishes) in the islands were led by Dr T.V. Sathianandan, Head, Fisheries Resources Assessment Division, Dr P. Vijayagopal, Head, Marine Biotechnology Division, and Dr Bobby Ignatius, Principal scientist, Mariculture Division, respectively. Proceedings enlisting specific actions was prepared and shared with Lakshadweep Administration for action.

Reported by K. Mohammed Koya, Pelagic Fisheries Division ●

Independence Day celebrations



Dr. A. Gopalakrishnan, Director, CMFRI hoisting the National Flag

The 68th Independence Day was celebrated at Headquarters on 15 August 2014. Dr. (Mrs) B. Meenakumari, DDG (Fisheries) hoisted the National Flag and addressed the staff of the Institute.

The 68th Independence Day celebrations at Mandapam Regional Centre of CMFRI was led by Dr. A. Gopalakrishnan, Director, CMFRI who hoisted the National Flag and

addressed the staff. The Recreation Club also organized sports events and a cultural evening where prizes to the winners in various competitions were distributed ●



Dr. B. Meenakumari, DDG (Fisheries) at the Independence Day celebrations at HQ



Dr. A. Gopalakrishnan, Director, CMFRI delivering the Independence Day speech

International Symposium on societal applications of remote sensing hosted



Dr. T. Mohapatra addressing the delegates

The second international symposium of the Societal Applications in Fisheries and Aquaculture using Remote Sensing Imagery (SAFARI) was held at ICAR-CMFRI during 15th-17th January 2018. Dr. Trilochan Mohapatra, Secretary, DARE and Director-General, ICAR inaugurated the event. In his inaugural address, Dr. Mohapatra urged the scientists to reach out to the community

and stakeholders through useful weather warnings, real-time advisories on nature of the sea, forecasting various ocean phenomena and like by effectively using satellites based remote sensing technology.

The SAFARI is a global research project of the Group on Earth Observations (GEO) and is now embedded in GEO's "Ocean and Society:

Blue Planet" initiative. Dr. J. K. Jena, Deputy Director General (Fisheries), ICAR presided. Dr. B. Meenakumari, Chairperson of the National Biodiversity Authority, Lasse H Pettersson from the Nansen Environmental Remote Sensing Centre, Norway, Dr. Rodney M. Forster from the University of Hull, the United Kingdom and Prof. N. R. Menon, Co-Chairman, Nansen Environmental Research Centre-India, Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and Dr. T. V. Sathianandan, Head, Fishery Resources Assessment Division, ICAR-CMFRI spoke on the occasion. Application of remote sensing in the fresh water, estuarine and marine fisheries, small pelagics, harvest fisheries, aquaculture, fisheries management, socio-economics Minister of State for Tourism, Alphons Kannanthanam, who visited also addressed and interacted with the delegates. A special discussion on disaster management in the wake of the Cyclone Ockhi was also held at the symposium presided by Smt. Mercykuttyamma, Hon' Minister for Fisheries, Harbour Engineering, & Cashew Industry, Government of Kerala, Dr. Maheshwarudu, Dr. T. V. Sathianandan and Dr. Grinson George spoke at the valedictory function.

A SAFARI-2 Pre-Symposium Training Program on 'Using the latest in satellite data for fisheries and aquaculture applications' was also held at ICAR-CMFRI. Information and communication technologies (ICT), fisheries environment, and ecology were the core themes of the symposium. Around 25 International and 210 national participants attended the symposium and presented, their research as oral and poster presentations. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI presided at



Delegates in the audience



Hon' Minister for Tourism Alphons Kannanthanam at SAFARI





Participants of the special session on disaster management



Fisheries Minister Smt. Mercykuttyamma addressing the special session on disaster management



Introduction to the sessions by Dr. T. V. Sathanandan

the valedictory session. Dr. C. Gopal, Member Secretary, Coastal Aquaculture Authority, India, Dr. Marie-Fanny Racault, Earth Observation Scientist, UK, Dr. A.



Dignitaries visit to the exhibition stalls

G. Ponniah, Former Director, Central Institute of CMFRI on January 13th-14th, 2018. 31 participants including 7 from foreign countries benefitted from this

training that included lectures by faculty from Plymouth Marine Laboratory, UK and University of Reading, UK, on the relevant topics and practical classes on ocean-colour data processing and the application of remote sensing data.

An Agri-Aqua-Food fest and exhibition was also held on the side lines of the three-day symposium. Spices Board, Indian Institute of Spices Research, Vegetables and Fruit Promotion Council, Society for Assistance to Fisherwomen under the Fisheries Department (Kerala), Krishi Vigyan Kendra, National Institute of Fisheries Post Harvest Technology and Training, Coconut Development Board, Central Plantation Crops Research Institute and various self-help groups set up stalls to sell their products which was visited by the public in large numbers. The exhibition also included the showcasing of the latest technologies of various research organisations, including ISRO and INCOIS.

AARDO-CMFRI workshop cum training programme on fisheries and aquaculture



Inauguration by Prof A Ramachandran, VC, KUFOS



Delegates attending the workshop

A workshop cum training programme on Fisheries and Aquaculture sponsored by the African Asian Rural Development Organisation (AARDO) and Ministry of Rural Development, Govt. of India was held at the institute Libya, Mauritius

and Sudan) nominated by their respective Ministries participated in the programme which had the overall objective of strengthening the rural sector of respective countries through organized fisheries and aquaculture.

Prof. A. Coordinator of AARDO, spoke on the occasion. Dr. Imelda Joseph and Dr. Somy Kuriakose Principal Scientists, co-ordinated the programme. Resource persons from ICAR-CMFRI, ICAR-Central Institute of Fisheries Technology

headquarters in Kochi during 14th-28th March, 2018. Sixteen participants from 13 countries (Bangladesh, Malaysia, Taiwan, Malawi, Tunisia, Sultanate of Oman, Palestine, Jordan, Lebanon, Iraq, Ramachandran, Vice

Chancellor of KUFOS inaugurated the programme and Dr. A. Gopalakrishnan, Director, ICAR-CMFRI presided. Dr. Khushnood Ali, Head, Research Division and Programme (CIFT) and ICAR-National Bureau of Fish

Genetic Resources (NBFGR) handled the sessions on various aspects of fisheries and mariculture.

Reported by Dr. Imelda Joseph, Course Director ●

Programme to train 5000 fishermen in open sea cage farming launched



Dr. A. Gopalakrishnan, Director interacts with the trainee farmers

A major project for boosting the open sea cage farming in Indian waters aimed at providing training to 5000 fishermen across the country in sea cage farming was launched on 29th January 2018 at Kochi. The project envisages accelerating the process for ushering in the Blue Revolution through mariculture by providing effective training to the fishermen; Financial support of nearly one crore has been provided by the National Fisheries Development Board (NFDB) under the Union Ministry of Agriculture and Farmers' Welfare for this programme.



Inauguration of the training programme at Karwar Research Centre



Participants with Shri. V.P. Thandapani, IAS, Director of Fisheries and Managing Director, TNFDC, Tamil Nadu



Hands on training at Mandapam Regional Centre



Trainees at Veraval Regional Centre

The first phase of the programme at the Institute Headquarters in Kochi began with a three-day training that was attended by 50 fishermen of Kerala. This will be soon be extended to other maritime states also. The programme was inaugurated by Mr. Mahesh, Joint Director (Fisheries), Ernakulam. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI presided over the meeting. Class room sessions and field visits to local cage farms were arranged to provide all round exposure in cage farming techniques to the group. Dr. Imelda Joseph, Dr. Bobby Ignatius, Dr. Shoji Joseph, Dr. K. Madhu and Mr. N. Rajesh of the Mariculture Division handled the different topics in sea cage farming. Technical assistance to the field demonstration sessions were extended by Mr. K. M. Venugopalan

and Mr. Binoy Bhaskaran. Certificates were distributed to the participants at the valedictory programme.

The programme was implemented in other research centres of the institute also. Vizhinjam Research centre organized a training programme for 50 fishermen and an awareness programme on 'Cage farming of commercially important marine fishes' with 100 participants, in Perinad, Kollam district during 23rd-25th January and 23rd February, 2018 respectively. Mandapam Regional Centre trained 150 fishermen from 27 villages in Ramanathapuram district in three batches during January 2018. Hands on training and field visits to Mandapam, Munaikadu and Thangachimadam farming sites was arranged by Dr. M. Sakthivel and Dr. B. Johnson, who co-

ordinated the training programme. At Veraval Regional Centre, 100 fishermen from Veraval, Mangrol, Bhavnagar and other coastal districts of Gujarat were trained in the cage fabrication, installation, mooring concepts and cage farm management aspects in two batches from 19th-24th February, 2018. At Karwar Research Centre the training programmes was held from 5th to 7th March, 2018 with 50 fishermen participants from different parts of the Uttara Kannada district. The program was inaugurated by J. L. Rathod, Chairman and Head, Department of Marine Biology, Karnataka University. In Tamil Nadu, Madras Research Centre trained fifty fisher youth from Kancheepuram, Thiruvallur and Chennai districts from 19th-21st February, 2018 at Kovalam Field Laboratory ●

Village adoption under NICRA project

Alivekodi Village under Paduvari Grama Panchayat in Udupi district was adopted to upgrade it to a "Climate Smart Village (CSV) under NICRA project. A preliminary meeting in this connection was held on 7th March, 2018, in Tharapathi, Alivekodi village. It aimed at creating awareness on alternate livelihood options, facilitating sustainable growth in agriculture and allied sectors such as fisheries, poultry, goat farming etc., while building resilience to current climatic variability and future climate change ●



Dr. P. U. Zacharia, Principal Investigator, NICRA addressing the meeting in Alivekodi Village

International Women's Day celebrated

At Headquarters, Women's Cell of ICAR-CMFRI organized a Colloquium on "Kidney Diseases: What One Should

Know" by a team of Doctors led by Dr. Rajesh R. Nair, Head, Department of Nephrology, Amrita Institute of Medical

Sciences, Kochi on 8th March, 2018 which was attended by all staff. At Karwar Research Centre Mrs. Nafisa



Veteran actor Urvasi Sharada interacts with women employees



Interaction with doctors arranged by Women Cell at HQ

H. A. and Mr. Nitin Raikar, advocates in the District Legal Services Authority, Karwar, spoke about different laws related to women such as domestic violence, workplace harassment, marriage, divorce, property and other

offences against women and children in the programme attended by all staff of the centre.

The Womens Cell at Kochi also organized a women empowerment programme by arranging a motivational

talk by veteran actor and Ex-MP Urvasi Sharada. While sharing her life experience, Ms. Sharada emphasized that real empowerment lies in women recognizing their own strength •

Open Sea Cage Culture and Mariculture Training

The training programme on 'Open Sea Cage Culture and Mariculture' under the Skill Development Programme of National Fisheries Development Board (NFDB) was held at the Mandapam Regional Centre during 19th to 21st June 2018. 50 fishermen from 6 villages

of Rameswaram and Muthupettai regions of Ramanathapuram district participated in the training coordinated by Drs. M. Sakthivel and B. Johnson. A similar training was also arranged by the Karwar Research Centre during 24th to 26th May, 2018 and the Tuticorin Research Centre during 27th

to 29th June 2018 which was attended by 50 selected local fisherfolk each. An Entrepreneurs training programme on 'Sea Cage Culture and Allied activities' was conducted from 28th to 30th May, 2018 at Karwar Research Centre. It was conducted at Visakhapatnam Regional Centre from 14 to 16 and



Dr. Radha Mohan Singh addresses meeting held at Mandapam Regional Centre



Participants of the first batch at Visakhapatnam Regional Centre



Participants of the training programme at Tuticorin Research Centre



Inaugural address at Tuticorin Research Centre



Distribution of certificates at Mandapam Regional Centre



Award of certificates after training at Karwar Research Centre



Joint Director of Fisheries State Fisheries Department Thoothukudi District handing over the certificates to the trainees

24-26 May, 2018 each attended by 50 participants comprising fishermen, aqua farmers and unemployed youths from Krishna and East Godavari district of Andhra Pradesh. All the trainees were given hands on exposure on cage fabrication and they were also trained on different husbandry practices (feeding, cage frame and net cleaning & net change) of fish culture in cages. The programme was co-ordinated by Dr. Sekar Megarajan.

An Awareness Programme on jellyfish sting management was organized at

Ariyaman Beach, Ramanathapuram District for the general public and tourists on the occasion of International day for Biological Diversity, on 22nd May 2018. Prof. Dr. A. K. Kumaraguru, Former Vice-Chancellor, Manonmaniam Sundaranar University participated in the function. A large number of tourists and marine police personnel were trained on the first aid measures for common jellyfish stings.

(Reported by Dr. R.Saravanan, I.Syed Sadiq and A.K.Abdul Nazar, Mandapam Regional Centre)

A Brainstorming session on seaweed resources and its culture potential was organized by Visakhapatnam Regional Centre during 21 -22 June, 2018. Dr. P. Kaladharan, Principal Scientist, ICAR-CMFRI, with more than 25 years of research experience in seaweeds lead the programme. Dr. C. R. K. Reddy, former Principal Scientist CSMCRI and DBT Energy Biosciences Chair, Indian Institute of Chemical Technology talked on the various compounds that can be extracted from seaweeds and their uses. Dr. B. Johnson, Scientis, ICAR- CMFRI

spoke on the socio-economic issues associated with seaweed farming. Dr. Jesmi Debbarma, Scientist, ICAR-CIFT, Visakhapatnam elucidated the by-products and value addition prospects. Dr. (Prof.) P. Yedukondala Rao, Head, Dept. of Marine Living Resources, Andhra University and Dr. Sekar Megarajan, Scientist, ICAR-CMFRI briefed the audience on the

seaweed resources available in the coastal waters of Andhra Pradesh. Enterprising seaweed farmers Mr. Santosh and Mr. Raghusekhar shared their experiences of seaweed farming. Mr. P. Koteswara Rao, Additional Director of Fisheries and Mr. Lakshman Rao, Assistant Director of Fisheries, Andhra Pradesh State Fisheries Department also shared their views on the subject.

The plenary session prepared a roadmap for promotion and expansion of seaweed farming in the state with specific recommendations for the State Fisheries department to implement.

Reported by Dr. Shubhadeep Ghosh, Scientist-in-charge, Visakhapatnam Regional Centre

Union Minister Shri. Radha Mohan Singh Visits ICAR-CMFRI



Shri. Radha Mohan Singh, Hon'ble Union Minister for Agriculture and Farmers Welfare visited the Mandapam Regional Centre of the ICAR-Central Marine Fisheries Research Institute (CMFRI), Tamil Nadu on 1st July 2018. While interacting with the scientists, he stressed the need for the effective implementation of various technologies developed by the institute time to time. Referring to the concept of increasing marine fish production of the country as well as upgrading the living standards of fishermen, the minister said that government will give major thrust to promote mariculture and sea cage farming activities in India.

He expressed his willingness to

have a coordinated effort to double farmers' income through integrated approach and added that scientists should work hand in hand with the field level beneficiaries to attain the goal. Shri Radha Mohan Singh also felt the

need for organizing hands-on-training on marine ornamental fish keeping and rearing to the self-help groups from coastal districts of maritime States and to promote seaweed farming and Integrated Multi-Trophic Aquaculture (IMTA). The minister also visited various facilities of the Centre viz., marine finfish hatchery complex, national marine brood bank and sea cage farm. During the visit, he had an interaction with the fishermen self help groups involved in sea cage farming and distributed seeds of silver pompano and cobia for sea cage farming.

The minister reviewed the progress of research and development activities being carried out by the CMFRI Centre. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI explained the achievements and progress made by the institute in promoting mariculture as an alternative livelihood option for the fisher-folk.



The meeting was also attended by Dr J. K. Jena, Deputy Director General (Fisheries Science), ICAR; Smt. I. Rani Kumudini, IAS, Chief Executive, NFDB, Hyderabad; Dr. Paul Pandian, Fishery Development Commissioner, DAHDF, New Delhi; Shri. S. Natarajan, IAS, District Collector, Ramanathapuram and Dr. G.S. Sameeran, IAS, Director of Fisheries, Govt. of Tamil Nadu.

The Minister chaired the inter session meeting of the consultative committee



of the Agriculture Ministry on Marine Fisheries and Mariculture in India held

at Rameshwaram, Tamil Nadu on 2nd July 2018

South Indian Fisheries Ministers' Conference organised at CMFRI



Inauguration of Southern Fisheries Ministers' Conference in Kochi

The conference of fisheries ministers from south Indian states, was held on 10 and 11 November 2018 at ICAR-CMFRI, Kochi. It was jointly organised by the Fisheries Department, Government of Kerala, ICAR-Central Marine Fisheries Research Institute, ICAR-Central Institute of Fisheries Technology and Kerala University of Fisheries and Ocean Studies (KUFOS). The Hon'ble Chief Minister of Kerala, Shri. Pinarayi Vijayan inaugurated the conference. Fisheries ministers and senior officials from Kerala,

Maharashtra, Andhra Pradesh, Goa, Karnataka, Tamil Nadu, Puducherry, Lakshadweep UT and Andaman and Nicobar UT attended the meet. During the stakeholder meeting that followed, representatives of fishermen associations presented the issues faced by them for the attention of the fisheries ministers. Dr. J. K. Jena, Deputy Director General. ICAR, Dr. Paul Pandian, Fisheries Development Commissioner, Government of India, Dr. A. Ramachandran, Vice Chancellor, KUFOS, Dr. A. Gopalakrishnan, Director

ICAR- CMFRI, Dr. C. N. Ravisankar, Director, ICAR- CIFT, Venkatesapathy S., Director of Fisheries, Kerala, Dr. P. Pravin, Additional Director General (Marine fisheries) ICAR attended the conference.

The malayalam translation of the Kerala Marine Fisheries Act (KMFA) prepared by Dr. C.Ramachandran and team from the institute, based on the request of the state's Fisheries Department to project it among all stakeholders and especially the fishermen community, was also released on the occasion.

Recommendations to ensure good governance and sustainable fisheries sector made at the workshop were as follows.

- Implement Minimum Legal Size (MLS) for marine capture fisheries sector as recommended by ICAR -CMFRI.
- Strengthen fisher folk co-operatives and equip them to undertake deep-sea resource specific fishing.
- Plan training programmes for deep sea fishing implemented under the Government of India's Blue Revolution Scheme and encourage the fisherfolk to participate in such training programmes
- Ban destructive fishing practices such as bull trawling/pair trawling



Release of KMFA translation by Smt. Mercikuttamma, Hon'ble Fisheries Minister, Govt. of Kerala

and use of poisons, chemicals etc. by enforcing appropriate legislations.

- Restrict fishing based on Fish Aggregating Devices (FADs) and allow use of LED lights in fishing only for squid jigging.
- Adopt recommended mesh sizes for fishing nets and also enforce adoption of square mesh cod ends for trawl nets as recommended by ICAR- Central Institute of Fisheries

Technology (CIFT).

- Regulate fishing boat building yards and net manufacturing units by enforcing mandatory registration and licensing under MFRA as already done in Tamil Nadu and Kerala. Encourage units to adhere to prescribed quality standards and adopt designs developed by ICAR-CIFT.
- Prevent illegal, unreported and unregulated (IUU) fishing and

take measures to enforce spatial zoning regulations.

- Take effective steps towards control of plastic pollution of marine waters. Programmes similar to the Suchitwa Sagaram scheme being implemented by Government of Kerala to control marine littering may be implemented in other maritime states also.
- Strictly enforce the uniform ban on fishing during monsoon period.
- Improve safety of navigation and fishing operations by making use of Automatic Identification System (AIS) and Vessel Monitoring Systems (VMS) mandatory in fishing vessels.
- Undertake mandatory accreditation of fish hatcheries to ensure good quality fish seeds for aquaculture.
- Adopt participatory approach in fishery management by amending the Marine Fishing Regulation Act (MFRA) of all maritime states.
- Constitute Fisheries Harbour Management Societies for efficient management of fishing harbours ●

Mahila Kisan Divas Celebrated

Mahila Kisan Divas-2018, for the women fish farmers and entrepreneurs engaged in fisheries sector was celebrated on 15th October 2018 at ICAR-CMFRI headquarters. The program was co-ordinated by the Socio Economic Evaluation and Technology Transfer Division and Agricultural Technology Information Centre of the institute led by Dr. Vipinkumar V. P., Dr. Aswathy and Dr. Reshma Gills. 87 women participated in the event and shared their experiences. Selected women farmers and entrepreneurs were honored on the occasion.

A panel discussion headed by Dr. V. Kripa, Dr. Shoji Joseph and Dr. Rema Madhu on the various issues faced by



Dr. V. Kripa presenting mementos to winners of painting competition

the fisherwomen in fisheries and related activities shared their knowledge related to mariculture, cage fish farming, bivalve farming and related activities with the participants. Dr. Vinita Murali, Gynaecologist, Department of Obstetrics and Gynaecology, Amrita Institute of Medical Sciences,

Kochi delivered a lecture on general health issues of women followed by a discussion session. A painting competition for VHSE girl students on the topic 'Women Empowerment in Fisheries Sector' was also organized and winners were awarded certificates at the function ●

Winter School on Climate change impacts on Indian marine fisheries



Participants of the Winter School with Dr. A. Gopalakrishnan Director, ICAR-CMFRI

ICAR sponsored Winter School programme on 'Climate change impacts and resilience options for Indian marine fisheries' was organized by Demersal Fisheries Division from 8th to 29th November 2018. The programme was inaugurated by Dr. A. Ramachandran, Vice Chancellor, KUFOS, Panangadu and presided over by Dr. A. Gopalakrishnan, Director, ICAR-CMFRI, Kochi. The third edition of Climcard was released on the occasion. Dr. P. U. Zacharia, Course Director and Dr. T. V. Sathianandan, Dr. P. Kaladharan and Dr. T. M. Najmudeen coordinated the programme. 22 participants including scientists and faculty from various ICAR institutes and universities across the country attended the training. e-copy of the Winter School course manual was also released.

The Winter School on 'Recent Advances in Fishery Biology Techniques for Biodiversity Evaluation and Conservation' was organised from 1st to 21st December 2018 at CMFRI, Kochi. Dr C V Ananda Bose, former Secretary, Govt. of India and Member–UN Habitat Governing Council inaugurated the programme. Dr. Rekha J. Nair, Course Director, Dr. V. Mahesh and Dr. Ambarish Gop, Co-ordinated the programme. Participants from Jammu and Kashmir, Uttar Pradesh, Gujarat, Madhya Pradesh, Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala attended.

ICAR sponsored short course on "Application of advanced molecular methods in marine fishery resource management, conservation and sustainable mariculture" was conducted during 24th October–2nd November,

2018 with 22 participants. Genetic and genomic technologies relevant to marine biology and fisheries were covered in the short course. Aspects like population genetics, population genomics, functional genomics, next generation sequencing methods, transcriptomics, eDNA based estimation of marine biodiversity and metagenomics were covered and exposure to the latest technologies was the highlight of the programme ●



Inauguration of the Winter School by Dr. Ananda Bose



Participants of the Short course on genomic technologies in fisheries

Dr. Trilochan Mohapatra visited ICAR-CMFRI



Dr. Trilochan Mohapatra, DG, ICAR and Dr. J. K. Jena, DDG, ICAR with Directors of ICAR-CMFRI & ICAR-CIFT and Heads of Divisions in ICAR-CMFRI

Dr. Trilochan Mohapatra, Secretary, DARE and Director General, Indian Council of Agricultural Research (ICAR) along with Dr. J. K. Jena, Deputy Director General (Fisheries), ICAR visited the institute on 25th May 2019. On the occasion a nutraceutical product developed from seaweeds, Cadalmin™ Antihypertensive extract (Cadalmin™ AHe) a natural remedy for hypertension developed in the Marine Biotechnology Division of ICAR-CMFRI was released. A book 'The Enigmatic Indian Oil Sardine: An Insight' and posters on major edible and ornamental fishes of Lakshadweep Islands prepared by the Pelagic Fisheries Division of the institute were also Council of Agricultural Research (ICAR) along with Dr. J. K. Jena, Deputy Director General (Fisheries), ICAR visited the institute on 25th May 2019. On the occasion a nutraceutical product developed from seaweeds, Cadalmin™ Antihypertensive extract (Cadalmin™ AHe) a natural remedy for hypertension



Release of nutraceutical product Cadalmin™ AHe

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National Symposium on Indian Oil Sardine

The first National Symposium on 'The enigmatic Indian Oil sardine' was held on 6 August, 2019 at ICAR-CMFRI, Kochi. The Indian oil sardine (IOS),

Sardinella longiceps is the largest single fish species contributing to the marine fish landings of the country. It is highly valued as a table fish as well as an

important raw material for the fishmeal industry of the country. The landings of IOS show high annual fluctuations and the recent investigations by the Pelagic



Fisheries Division had revealed that the environmental factors and climate change have an important bearing on the fishery trends. To enable an understanding and development of a fishery prediction model for the IOS, an

exchange of scientific information on the oceanographic aspects and fishery trends was essential and facilitated through the 6 invited presentations from various scientific organizations such as ICAR-CIFT, SAC, NIO, IITM

and INCOIS, at the symposium. The programme was co-ordinated by Dr. A. Gopalakrishnan, Director, ICAR-CMFRI with Dr. Prathibha Rohit, Head, Pelagic Fisheries Division as Convenor

International workshop on elasmobranchs



Participants of the FAO collaborated elasmobranch project workshop with Dr. A. Gopalakrishnan, Director, ICAR-CMFRI

An International workshop "Global Expert meeting on collection and reporting on use, market chain information for shark and ray commodities" was held during 24th-27th July, 2019 at ICAR-CMFRI, Kochi as part of a collaborative research project between the institute and Food and Agriculture Organisation, Rome. Dr. P. U. Zacharia, Head of the Demersal Fisheries Division, presented the presidential address at the workshop..

Marking the 'International Whale Shark Day', the Calicut Research Centre organised an awareness programme 'Conservation of Protected Elasmobranchs' at Ponnani Fishing Harbour, Malappuram District, Kerala on 30th August, 2019. Dr. P.K. Asokan, Scientist-in-charge, Calicut Research Centre welcomed various stakeholders Pamphlets entitled "Save the Whale Shark" prepared by ICAR-CMFRI were officially released, followed by a brief presentation

on 'Marine Protected Animals' by Dr. K. Vinod of Marine Biodiversity Division. Zacharia and Dr Shoba Joe Kizhakudan, of the Demersal Fisheries Division co-ordinated the international meet attended by representatives from FAO, UK, UAE, Australia, Mexico, Argentina, Indonesia, Malaysia, Sri Lanka, Nigeria, Somalia, Myanmar and Namibia and scientists of Demersal Fisheries Division working on elasmobranchs. Dr. Kim Friedman, Senior Fishery Resources Officer, FAO

led the discussions which focused on developing a solid frame work for well-informed guidelines, that all countries can use to improve data collection and mapping of value chains to promote sustainable fishing and trade of this vulnerable marine resource group.

A stakeholders' meeting on the trade of sharks and rays was also held on 24th September, under a FAO-CMFRI Collaborative Project.

Reported by Calicut Research Centre ●



Presidential address by Dr. P. U. Zacharia, Head, Demersal Fisheries Division.

Union Minister for Fisheries, Animal Husbandry & Dairying Shri. Giriraj Singh visits ICAR-CMFRI

Shri. Giriraj Singh, Hon'ble Union Minister for Fisheries, Animal Husbandry & Dairying visited the Mandapam Regional Centre of ICAR-Central Marine Fisheries Research Institute (CMFRI) and interacted with sea cage farmers, seaweed farmers and marine ornamental fish seed rearing SHGs of Ramanathapuram and Thoothukudi districts in Tamil Nadu on 23rd January 2021. During the interactive meeting, he stressed the need for promoting mariculture in the country to increase the fish production and to improve the livelihood of fishermen.

The Minister released a poster illustrating the GIS map of potential seaweed farming locations in India and leaflets in Tamil on the beneficiary oriented schemes for promoting sea cage farming, marine ornamental fish breeding & rearing and seaweed farming supported under the Pradhan Mantri Matsya Sampada Yojana (PMMSY). He also released a multilingual booklet on 'Jellysafe'. He distributed fingerlings of cobia to the beneficiaries of NFDB funded project, seeds of marine



ornamental fish and seaweed seedlings to SCSP women SHGs (7 groups) and "Jellysafe" kit to fishermen. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI welcomed the Hon'ble Minister and officials and briefly explained the achievements and progress made by the institute in promoting mariculture as an

alternative livelihood option for the fishers. Dr. R. Jayakumar, Principal Scientist & Head-in-Charge, Mandapam Regional Centre of ICAR-CMFRI delivered the vote of thanks.

A hovercraft trip was arranged with the support of Indian Coast Guard to the sea cage farming sites in the Gulf of Mannar to observe the farming

activities and Integrated Multi Trophic Aquaculture (IMTA) carried out with the technical support of the Centre. The Union Minister visited facilities such as marine finfish hatchery and marine ornamental fish seed production unit of the Mandapam Regional Centre of CMFRI. He also visited the NFDB funded National Marine Fish Brood Bank of the Centre and observed the cobia broodstock

development activities.

The field visits and interaction meeting were also attended by Dr. Rajiv Ranjan, IAS, Secretary, Ministry of Fisheries, AH&D; Dr. J. Balaji, IAS, Joint Secretary (Fisheries) Department of Fisheries; Dr. K. Gopal IAS, Principal Secretary, Animal Husbandry, Dairying & Fisheries, Govt. of Tamil Nadu; Shri J. Jayakanthan IAS, Commissioner of

Fisheries, Govt. of Tamil Nadu; Shri. Dinesh Pon Raj Oliver IAS, District Collector, Ramanathapuram; Dr. B. Meenakumari, former DDG, ICAR and Chairperson RAC, ICAR CMFRI, Dr. V. Kripa, Member Secretary, Coastal Aquaculture Authority, Shri. G. Rathinaraj, Executive Director, NFDB and Shri K. Muraleedharan, Member of Institute Management Committee, ICAR-CMFRI ●

Dr. Himanshu Pathak, Secretary, DARE & DG, ICAR visits ICAR-CMFRI, Kochi

The Secretary, DARE & Director General, Indian Council of Agricultural Research (ICAR) Dr. Himanshu Pathak visited ICAR-CMFRI, Kochi on 16th October 2023 along with Dr J.K. Jena, DDG (Fisheries Science). He interacted with the Heads of Divisions, scientists and scholars of the Institute and urged them to focus on fisher-oriented research activities to improve the marine fisheries and mariculture sector of the country. He stressed need for "One Scientist-One Product",

a target-oriented programme aiming to have every scientist producing one technology/product, or research output annually with an aim to boost agricultural research and development production and productivity in the country.

Dr. Pathak appreciated the scientists of CMFRI for their contributions in marine fisheries research and sea cage farming, technology development of the species such as cobia, silver & Indian pompano, orange spotted grouper, emperor fish etc., and hailed the efforts

of ICAR-CMFRI in setting up of two National Brood Banks and the DBT-Gol funded Dr EG Silas Centre of Excellence & Innovation on Marine Microbiome & Fish Nutrigenomics—which is an important step in increasing the fish production in the country. He visited several laboratories at the institute and emphasized the importance of fostering close collaboration with private organizations to jointly own technologies through a public-private partnership (PPP) model.●



ICAR-CMFRI hosts third international symposium on marine ecosystems (MECOS-3)

The ICAR-Central Marine Fisheries Research Institute (CMFRI), Kochi hosted the third international symposium on marine ecosystem: challenges and opportunities (MECOS-3) from 7th to 10th January 2019. Organised

by the Marine Biological Association of India (MBAI), the MECOS-3 set a platform for discussion on a wide range of topics, including impact of climate crisis in marine ecosystems, meeting sustainable development

(SDG) goal-14 (life under water) of the UN, development of small-scale fisheries, recent development in aquaculture, eco-labelling and green fishing technologies.

Dr Petri Suuronen, Director, Blue



Economy Natural Resources Institute, Finland inaugurated the symposium. He said that marine fisheries will be more profitable and the people involved in the sector will have a better socio-economic status if ocean resources are made sustainable. A renowned researcher in marine fisheries, Dr Suuronen said that policy makers, government agencies and the whole people working in the sector should cooperate and work together to achieve sustainability in marine fisheries of the country. Dr A Gopalakrishnan, Director of ICAR-CMFRI presided over the function. He

said that essential fish habitats were facing serious challenges because of anthropogenic as well as natural pressures. The third Dr. S Jones memorial prize, instituted by the MBAI for outstanding contributions in marine biology and fisheries, was presented to Dr T Balasubramanian, Vice Chancellor of Chettinad University, Chennai. Dr K Sunil Mohamed, Convenor of MECOS 3 and Dr V Kripa, Secretary of the MBAI also spoke at the inauguration of the symposium.

While addressing the delegates on the third day of the symposium,

Smt. J Mercykuttyamma, Minister for Fisheries, Government of Kerala said that sustainable development of marine fisheries sector should not be limited only on conservation of resources and the environment, instead it should follow a holistic approach giving greater importance on the role of fisheries as sources of livelihood for billions of people. The Minister also added that recognition of the social agency, well-being and livelihoods of people working in the sector is equally important in marine fisheries. ●

Union Minister Rajeev Chandrasekhar visits ICAR-CMFRI



Hon'ble Union Minister of State Shri. Rajeev Chandrasekhar visited ICAR CMFRI on 12th November 2021. He attended an interactive meeting on Atmanirbhar Bharat and India's economic growth with representatives of experts from various sectors at the Central Marine Fisheries Research Institute (CMFRI), Kochi. Heads of various institutions in Kochi, economists, industrialists, entrepreneurs, etc. attended the meeting.



Har Ghar Thiranga celebrated

In connection with the national celebrations initiated by the Union Government on the 75th Anniversary

of Indian independence under 'Azadi Ka Amrit Mahotsav', programmes were

organised in various regional stations and centres of ICAR-CMFRI



Training programme for Kerala State Fisheries Department

A training programme on “Hatchery production and farming of finfishes” for officials of Kerala State Fisheries Department was conducted during the period from 10.10.2022 to 13.10.2022. A total of 10 officers were trained in this training programme ●



ICAR-CMFRI hosts national workshop on Harnessing the Potential of Fisheries in Marine States



The ICAR-Central Marine Fisheries Research Institute (CMFRI), Kochi hosted a high-level national workshop on 'Harnessing the Potential of Fisheries in Marine States' on 5th January 2024. The workshop was organized by the NITI Aayog, in association with ICAR-CMFRI and the Department of Fisheries, Government of Kerala.

Shri Suman Bery, Hon'ble Vice Chairman of NITI Aayog inaugurated the workshop. He underscored the importance of frontier technologies like artificial intelligence in tackling the challenges in the marine fisheries sector. He stressed the importance of understanding the dynamics of demand for prioritising production strategies. Given that demand for fish is on the rise, innovative strategies to enhance productivity are required, Mr Bery said, adding that demand is the driving force of the economy.

Speaking on the occasion, Prof. Ramesh Chand, Hon'ble Member of NITI Aayog said the growth of demand for fish doubled in the past decade ending 2022, compared to the previous decade





ending 2012. Fisheries has a promising export share in agriculture and food commodities, he said. On measures to boost seafood export, Prof. Ramesh Chand proposed enhancing value addition and cutting-edge processing innovations in the sector.

Dr J K Jena, Deputy Director General of Indian Council of Agricultural

Research (ICAR) pitched for exploring untapped potential of oceanic and deep-sea resources. Citing the estimated harvestable potential of oceanic and deep-sea resources, he said that deep sea fishing would offer a potential new frontier for commercial fisheries. Dr Jena emphasised the importance of ensuring quality and enhancing the

skilled capacity to utilise the prospects of deep-sea fishing.

The workshop provided a platform for experience sharing between marine states, enabling open dialogue on the challenges faced and potential solutions. Discussions on critical aspects of certification and sustainability, market linkages, value addition and seafood export, and the challenges in the fishing and seafood industry were held.

Representatives from the governments of Kerala, Odisha, Maharashtra, Goa, Karnataka and Tamil Nadu attended the Workshop. A diverse array of key stakeholders, including policy makers from the Central and state governments, leading industry experts and researchers also attended the workshop that served as a platform for experience sharing between marine states, enabling open dialogue on the challenges faced and potential solutions ●

Shri. L. Murugan, Hon'ble Minister of State for Fisheries, Animal Husbandry and Dairying visits India's first private hatchery M/s. MSR Aqua Private Limited

Shri. L. Murugan, Hon'ble Minister of State for Fisheries, Animal Husbandry and Dairying, and Information and Broadcasting, visited the M/s. MSR Aqua Private Limited, a Multispecies marine fish hatchery at Konapapapeta, Kakinada, on 14th June 2022. Originally a shrimp hatchery, the MSR hatchery is the first private hatchery in India which was suitably modified with the technical guidance of the Mandapam Regional Centre of the ICAR-Central Marine Fisheries Research Institute (CMFRI) to suit the marine finfish seed production, under the NFDB supported project entitled "Enhancing Production

of Farmed Cobia (*Rachycentron canadum*) through the Establishment of Broodbank and supply of larvae to States for Seed Production". Member of Parliament, Smt. Vanga Geetha of Kakinada constituency and Chief Executive of NFDB, Smt. C. Suvarna, IFS also accompanied the Minister.

Technical guidance and support for establishing the hatchery was provided by the Mandapam Regional Centre of ICAR-CMFRI that enabled successful operation and seed production. The hatchery can produce a maximum of 10 million seeds in a cycle. It recently received the Best Hatchery Award

on 21st November 2021 on World Fisheries Day. The hatchery currently has stock of seeds of Seabass, silver pompano and Indian pompano. Dr.A.K. Abdul Nazar, Principal Scientist, ICAR-CMFRI and Principal Investigator of the project, apprised the Hon'ble Minister and the other dignitaries, of the hatchery activities in detail. The dignitaries appreciated the functioning of the hatchery and congratulated the owners of hatchery, Mr. M Venkata Ramana and brothers. Following the visit of the hatchery, a farmers' meet was conducted and seeds of seabass and silver pompano were distributed to the selected farmers ●

Union Minister of State for Agriculture and Farmers Welfare visits KVK-Lakshadweep of ICAR-CMFRI



Sushri. Shobha Karandlaje, Hon'ble Union Minister of State for Agriculture and Farmers Welfare, Government of India visited KVK-Lakshadweep of the ICAR-Central Marine Fisheries Research Institute (CMFRI) on 2nd December, 2022. The Minister visited the KVK premises and observed the technological innovations exhibition held here. The exhibits comprised of the innovations/ technologies of

ICAR institutions/Universities that are suitable for the special agro-ecology of the islands and which are being tested/ demonstrated by the KVK. Seaweed farming activities of the ICAR-CMFRI in the islands was also highlighted.

An interaction meet with the farmers and KVK beneficiaries was held at Muttiaar Beach, Kavaratti. It was attended by Shri. Amit Satija, Secretary (Finance), Shri. Shashank

Mani Tripathi, Secretary (Agriculture), Shri. Rakesh Kumar, Director (Agriculture) and other officials of the UT administration of Lakshadweep. Dr. V. Venkatasubramanian, Director, ICAR-ATARI informed the works carried out by the KVK in the islands and stressed for the convergence in development activities.

During the inaugural speech the Minister stressed on the importance of forming more Farmer Producers Organisation (FPO) in promoting the value added products in coconut and fish. She also stressed to utilize the schemes by Central government in agriculture and allied areas. The lead farmer beneficiaries of the KVK were also honoured in the function. The Minister also released the KVK times complied by KVK-Lakshadweep of ICAR-CMFRI. The event was coordinated by Dr. P. N. Ananth, Senior Scientist and Head, KVK-Lakshadweep and Dr K Mohammed Koya, Senior Scientist of ICAR-CMFRI ●

Workshop on Research Ethics and Practice for young researchers organised



HRD Cell of ICAR-CMFRI organised an Interactive Co-learning workshop on Philosophy, Methods and Ethics in Science during 07-09 June, 2023.

Dr. Vijayakumaran, retired Principal Scientist from ICAR-CMFRI was the resource person for the programme. A total of 20 participants were

trained in the workshop which was coordinated by Dr. P. Shinoj and Dr. Eldho Varghese ●

Stakeholders Workshop to address post-covid socio-economic concerns in the marine fisheries sector

Series of workshops were held as part of ICSSR sponsored research project 'COVID Pandemic and Marine Fisheries Sector in India: Impacts, Externalities and Stakeholders Reflection on Adaptation and Mitigation'. Findings from study conducted which covered 3360 respondents—boat owners, labourers, women, marketing functionaries, traders, exporters and consumers in Kerala, Karnataka, Maharashtra, Gujarat, West Bengal, Odisha, Andhra Pradesh and Tamil Nadu were deliberated in the workshops. Inauguration of the workshop at ICAR CMFRI headquarters by Dr. A.



Gopalakrishnan, Director, on 6th February 2023 was followed by workshops conducted at Madras Regional station (9th March), Visakhapatnam Regional

Centre (13th April) and Mumbai Regional Station (4th May 2023).

Reported by Dr. Shyam S. Salim, Project Leader



Climate Aid to fisher families

In an effort to minimise the losses caused by climate change on the coastal communities, the ICAR-CMFRI provided climate aid to 24 fisher families

belonging to the SC community residing in Chellanam and Puthuveypu. Fishing nets, freezers, ice boxes, motor pump sets, fish seeds and feeds, etc. worth

₹2.5 lakhs were distributed among the fishermen under the Scheduled Caste Sub Plan (SCSP) programme of the NICRA project of the institute



Justice Devan Ramachandran visits ICAR-CMFRI



High Court Justice Devan Ramachandran visited ICAR-CMFRI and graced as Chief Guest at the valedictory of a vigilance awareness campaign held at the Institute on 10th November 2023.

He emphasised the need for inculcating values such as integrity

and strength of character in the young generation, saying that character-building is the foundation of nation-building. Describing corruption as a 'cancer of society', Justice Ramachandran said it impacts the weakest section of society the most, as they are most vulnerable

to exploitation. He opined that 99% of the cases that come to the court are related to corruption, and urged the young generation to understand the dangers of corruption and to work towards building a corruption-free society.

As part of the vigilance awareness campaign, lectures, panel discussion, awareness classes, and various competitions, such as slogan-making, painting, quiz, and poster presentations, were conducted for school students and CMFRI staff. Prizes for the winners were distributed by Justice Devan Ramachandran on the occasion.



Union Minister Shri. Parshottam Rupala visits ICAR-CMFRI

The Hon'ble Union Minister Shri. Parshottam Rupala visited the Vizhinjam Regional Centre of ICAR-CMFRI, Kerala on 30th August 2023. Addressing the gathering at the Centre, the Minister emphasised that offshore cage farming is the immediate focus of the country using bigger cages. "Cage fish farming is to be expanded to the offshore waters with better cage designs having

a size of 30 diameters or above that can accommodate lakhs of juveniles", Shri Rupala said. He added that ICAR-CMFRI should spearhead research and development efforts in creating these advanced cages. The Minister urged ICAR-CMFRI to expand seed production technologies for finfishes to all the coastal states utilising the public-private-partnership (PPP) mode. The

minister also underscored the untapped potential of Pearl Oyster production, urging ICAR-CMFRI to take a proactive role in scaling up its production in a bigger way. Dr L Murugan, Hon'ble Minister of State for Fisheries, Animal Husbandry and Dairying and Shri. V Muraleedharan, Hon'ble Minister of State for External Affairs and Parliamentary Affairs accompanied Shri Parshottam Rupala.



XVI Agricultural Science Congress



The XVI Agricultural Science Congress (XVI ASC 2023), organised by the National Academy of Agricultural Sciences (NAAS), New Delhi and hosted by the ICAR-CMFRI, Kochi convened in Kochi, India, from October 10 to 13, 2023 witnessed over 1,700 delegates comprising experts, researchers, policymakers, and industry leaders participating in an effort to delineate a trajectory towards sustainable agriculture and food security. Inaugurated by Shri Parshottam Rupala, Hon'ble Minister of Fisheries, Animal Husbandry and Dairying, Govt. of India.

The event emphasized the paramount importance of scientific innovations in reconfiguring agri-food systems to meet the sustainable development goals amid environmental challenges and uncertainties posed by climate change. He further stressed the importance of enhancing mechanization in the agricultural production process and that the future of India's agriculture hinges significantly on effectively translating accumulated scientific knowledge into commercial success. Dr. Himanshu Pathak, Secretary, Department of Agricultural Research and Education

(DARE) and Director General, Indian Council of Agricultural Research (ICAR), delivered the presidential address, elucidating Prime Minister Narendra Modi's vision for realizing sustainable development goals through the integration of technology and scientific advancements into agricultural practices.

The ASC themed "Transformation of Agri-Food Systems for Achieving Sustainable Development Goals (SDGs)," had 10 thematic sessions, plenary lectures, panel discussions and symposiums, comprehensively





addressing sustainable land and water management, climate-resilient agriculture, precision farming, alternative farming systems, next-generation technologies, among other pertinent topics. It also featured six plenary lectures delivered by distinguished personalities in the agricultural and allied sectors, offering valuable insights into the latest advancements, emerging trends, and critical challenges facing the agriculture sector ●

Millet and Fish festival organised



Ernakulam Krishi Vigyan Kendra functioning under ICAR-CMFRI organised a Millet and Fish festival from 28th to 30th December 2023.

Dr. C. Tara Satyavathi, Director of ICAR-Indian Institute of Millets Research, Hyderabad inaugurated the event online in the presence of

Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and Dr. L. Narasimha Murthy, Chief Executive, National Fisheries Development Board (NFDB). The fest featured a variety of activities, including millet and fish food festival, buyer-seller meet, technology exhibition and seminars with panel discussions. ICAR-Indian Institute of Spices Research, Kozhikode, National Bank for Agriculture and Rural Development, National Fisheries Development Board, Hyderabad, ICAR-Indian Institute of Millets Research, Hyderabad, and ICAR-Central Institute of Fisheries Technology, Kochi were partners of the event ●

7th International Jellyfish Blooms Symposium

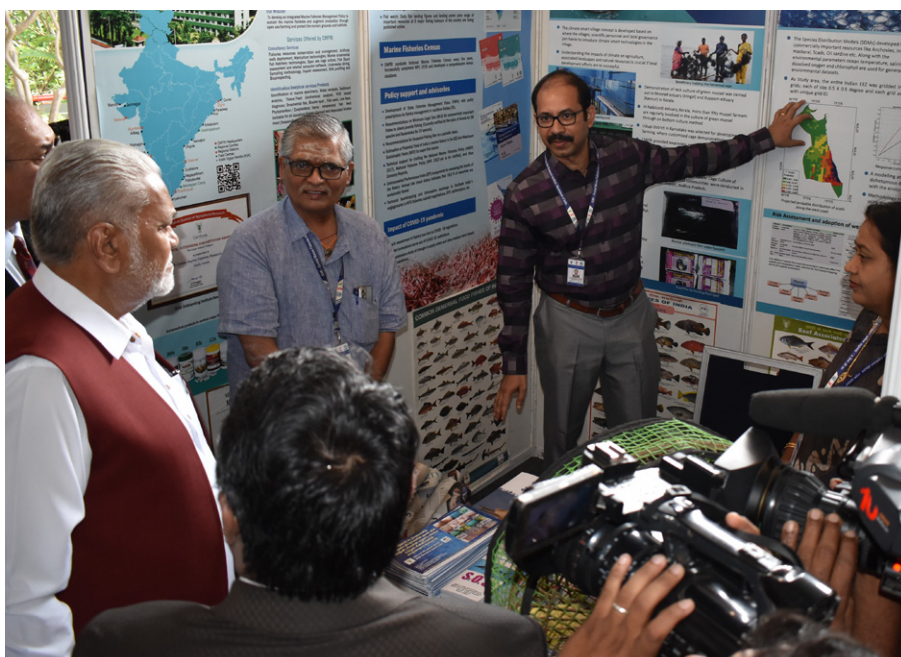


The 7th International Jellyfish Blooms Symposium was organized in Thiruvananthapuram, India, jointly by the University of Kerala and the ICAR-Central Marine Fisheries Research Institute, Kochi, on November 21–25,

2023. The participants came from more than 35 countries for the seventh edition of the symposium held in the United Nations Decade of Ocean Science for Sustainable Development (2021–2030). A

commemorative book on jellyfish bloom dynamics in Indian coastal waters was released and a workshop on the integrative taxonomy of jellyfish was also held during its course •

Climate change and marine fisheries governance issues highlighted



ICAR-CMFRI participated in BOPP-FAO International Conclave on “Mainstreaming Climate Change into International Fisheries Governance and Strengthening of Fisheries Management Measures in the Indo-Pacific Region” held during 16th to 19th October 2023 at Chennai. The Honorable Union Minister for Fisheries, Animal Husbandry and Dairying, Shri Parshottam Rupala inaugurated the exhibition set up on the occasion and highlighted the concept of creating “Climate Smart villages”. Dr. Grinson George, Head, MBEMD, Dr. R. Narayanakumar, Scientist-in-Charge, Madras Regional Station, ICAR-CMFRI briefed the minister about the activities of the institute •

Dr S Ayyappan conferred with MBAI Honorary Fellowship



Dr Ayyappan, a stalwart in India's fisheries research, was conferred with the prestigious honorary fellowship from the Marine Biological Association of India (MBAI) during a function organized at ICAR-Central Marine Fisheries Research Institute, Kochi. CMFRI Director and MBAI President Dr A Gopalakrishnan presented the award to Dr Ayyappan.

On the value of research funding, the former ICAR DG said investment in the field of research is returned to society more than ten times over in terms of societal benefits. Appreciating CMFRI for its pioneering research in the sector, he stressed the need for continued innovation and collaboration in the field.

Dr Ayyappan urged scientists to strive for innovation, bringing new ideas and technologies to the sector. He also emphasized the importance of artificial intelligence (AI) and AI-based tools in future research. Dr Ayyappan is the recipient of India's third highest civilian honour *Padmashri*. He served as DG of ICAR and Secretary of the Department of Agricultural Research and Education (DARE) during 2010-2016.

Visit of Dr. Abhilaksh Likhi IAS, Secretary, to the Department of Fisheries, Govt. of India (DoF-Gol) to ICAR-CMFRI



Dr. Abhilaksh Likhi IAS, Secretary, to the Department of Fisheries, Govt. of India (DoF-Gol) visited the Vizhinjam Regional Centre of ICAR-CMFRI on 31st August 2023. He said that the Central Government is keen on developing bivalve farming, including mussels,

edible oysters, pearl oysters and clams in the country under its PMMSY scheme. He appreciated the efforts of ICAR-CMFRI and its Vizhinjam Centre, which has been at the forefront of providing training to the fish farmers of Kerala in ornamental fish culture and cage culture.

On 15th May 2024, Dr. Likhi, IAS also visited ICAR-CMFRI (HQ), Kochi and had a detailed discussion with the Director, CMFRI; HoDs, scientists, and the HoRC Mandapam Regional Centre of CMFRI regarding the establishment of a 'Centre of Excellence (CoE) on Seaweed Farming & Seed Production' at Mandapam RC of CMFRI, funded by the DoF-Gol. The proposed objectives, work plan, output and the expected outcome etc. of the CoE were finalized. Discussions were also held on the modalities of implementation of the proposed 'Marine Fisheries Census-2025' by CMFRI and funded by the DoF-Gol. He thoroughly appreciated the recent documents published by CMFRI - the *Marine Fish Stock Status of India (MFSS)* 2022 report and the *Carbon Footprint Report of Indian Marine Fisheries* - and suggested that such valuable national documents must be brought out at regular intervals by CMFRI. Dr. Likhi also released the "CMFRI - Eat Right Campus Certificate" awarded to CMFRI, Kochi by the Food Safety Standards Authority of India (FSSAI). This was followed by a joint meeting with all the heads of all fisheries institutions in and around Kochi, which was attended by nearly 30 participants 📍



Marine Biological Association of India confers honorary fellowship to Ali Manikfan



At a function held at the ICAR-Central Marine Fisheries Research Institute (CMFRI), Ali Manikfan, a multi-talented individual and Padmashri awardee with expertise in marine biology, astronomy, shipbuilding, ecology, agriculture among other fields, was conferred with the prestigious honorary fellowship from the Marine Biological Association of India (MBAI) on 11th July 2024.

He interacted with scientists and staff of the Institute. According to him, his close observation of nature and his curiosity of understanding the science behind everything shaped his life. Sharing his journey with marine



scientists and staff of the CMFRI on the occasion, Mr. Manikfan said: "At first it was about survival in the unique environment of Lakshadweep. Later, as curiosity about science

grew, it evolved into a passion. That passion drove me to learn about the sea, marine life, agriculture, astronomy, shipbuilding engineering and everything else" ●

Awareness programs on Artificial Reefs conducted

Extensive awareness programs for marine fishermen under the NFDB-PMMSY Artificial Reef Program were held during October to December 2023. Dr. Joe K. Kizhakudan who leads the programme, held interactions with around 1600 fishermen from 60

villages in Karnataka, 400 fishermen from 30 villages in Gujarat, 600 fishers from 100 villages in Odisha and nearly 100 fishermen in Srikakulam and Vizianagaram districts of Andhra Pradesh. The programs aimed at livelihood enhancement of artisanal

and traditional marine fishermen through the deployment of artificial reefs, enabled by the Department of Fisheries, Government of India.

Reported by: Dr. Joe K. Kizhakudan, Visakhapatnam Regional Centre ●

National workshop proposes to explore potential of untapped mesopelagic fishes



A national workshop on sustainable harvest and utilisation of mesopelagic fishes was organised by the Mangalore Regional Centre of ICAR-CMFRI on 24th May 2024, jointly with Yashaswi Fish Meal & Oil Company, Udupi. The workshop emphasised the need for exploring the immense potential of the under-utilised mesopelagic resources within the Indian Exclusive Economic Zone (EEZ). Majority of these fishes are not used for direct human consumption owing to their high lipid or wax ester content. The experts spoke at the workshop are of the view that a pilot study should be carried to estimate accurate potential yield estimate of these fishes and to understand subsequent factors including the economic

viability for the sustainable utilisation of these resources in the fish meal and cosmetic industry.

Ms. Neetu Kumari Prasad, IAS, Joint Secretary to the Department of Fisheries, Govt. of India; Dr. B. Meenakumari, former Chairperson of the National Biodiversity Authority; Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and Dr. Shubhadeep Ghosh, ADG (Marine Fisheries), ICAR addressed the participants. Dr. B. Meenakumari, Dr. Pravin P., former ADG (Marine Fisheries) and Dr. Prathibha Rohit, former Head, Mangalore & Karwar RCs of CMFRI, were the panellists during the technical discussions. Dr. Shoba Joe Kizhakudan, Head, Finfish Fisheries Division, Dr. Sujitha Thomas and Dr. Rajesh K. M.

from ICAR-CMFRI, Mr Udaya Kumar Salian, the patron of the workshop & Chairman, Yashaswi Fish Meal & Oil Company, Shri Dinesh Kallar, Director of Fisheries, Government of Karnataka, Dr. M. P. Ramesan, Head, Fishing Gear Technology Division, ICAR-CIFT and Dr. Manju Sebastine interacted with the participants

It was decided to apply for a pilot project, jointly by ICAR-CMFRI & ICAR-CIFT to the DoF-GOI under the PMMSY scheme with the following objectives: i) to develop the geo-spatial database to assess and map the spatio-temporal distribution, species composition, abundance, and estimate the accurate potential yield estimate (PYE) of mesopelagic resources; ii) to develop standard protocol for harvesting of mesopelagics along the Indian EEZ; iii) to develop best post-harvest technologies and explore the possibility of utilization of mesopelagics in fishmeal and cosmetic industries; and iv) to determine the financial and economic feasibility of commercial exploitation and value chain development of mesopelagic resources in the Indian EEZ ●

India-Oman Interactive Workshop on elasmobranchs



In May 2024, the ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI) in Kochi, India, hosted a

workshop aimed at capacity building for elasmobranch taxonomy, fisheries management, and conservation. The

workshop, which saw participation from shark and ray researchers from India and Oman, emphasized the need for

sustainable shark fisheries in the northern Indian Ocean. Four researchers from the Marine Science and Fisheries Center and the Aquaculture Centre under the Directorate General of Fisheries Research, Sultanate of Oman and Scientists from ICAR-CMFRI, India attended the program and shared scientific knowledge on marine fisheries practices in the region. The workshop featured a series of insightful sessions on elasmobranch research, conservation strategies, and taxonomy, along with a hands-on session in ICAR-CMFRI's genetics lab on species identification using DNA barcoding. Participants from Oman received technical support in identifying their ray samples. This was followed

by validating the checklist of rays of Oman with the assistance of scientists specializing in elasmobranch research in India. The workshop participants visited the Cochin Fisheries Harbour (CFH) to observe the commercial landings of elasmobranchs. The workshop concluded with a valedictory ceremony, where participants shared feedback and expressed their commitment to ongoing collaboration. Dr. Khalfan Al Rashdi from Oman highlighted potential research partnerships, including species delineation, stock assessment, ornamental fish breeding techniques, artificial reef development, abalone fishery and culture, breeding technology for blue-swimming crabs, and technical

support for the development of live-feed culture systems, open sea cages, and Integrated Multi-Trophic Aquaculture (IMTA). Dr. A. Gopalakrishnan, Director of ICAR-CMFRI, assured continued support for these collaborative efforts, reinforcing the strong ties between India and Oman in marine research and conservation. Dr. Shoba Joe Kizhakudan, Head, Finfish Fisheries Division was deputed to Oman during September 2023 on invitation from the Directorate of Fisheries Research, Government of Oman, to review the shark and ray research projects run by the Oman Fisheries and Marine Science Centre and to train the project staff in shark and ray identification, preparation of NDFs and to finalize their NPOA-Sharks ●

Innovations in seaweed farming by ICAR-CMFRI appreciated

In a significant move, Dr. P. K. Mishra, Principal Secretary to the Honourable Prime Minister, visited the seaweed farming sites along the Indo-Pak border marine waters of Kori and Padala in Gujarat's Kutch district on April 20, 2024. The cage farming ventures developed by ICAR-CMFRI involve specially engineered HDPE rafts for cultivating the robust seaweed species *Kappaphycus alvarezii*, each with a remarkable expected lifespan of 20 years with a potential yield bearing capacity of 300 to 400 kilograms per raft. During the visit, Dr. P. K. Mishra was briefed on ICAR-CMFRI's latest innovations in the domain of mariculture, including the development of region-specific, customized indigenous HDPE seaweed raft designs, advanced cultivation techniques, enhanced production efficiency, and sustainable farming practices. He expressed his strong interest in conversations concerning the project's financial viability and its socio-economic impact on the local communities.



The advanced raft-grid technology, priced at ₹16,000 per raft, features qualities such as adaptability, manoeuvrability and ease of use. The project's strategic importance, especially in sensitive border areas like Kutch, is set to revolutionize the seaweed industry and leverage the potential of cutting-edge technology. This pioneering initiative embodies the spirit of "Atmanirbhar Bharat" and empower seaweed farmers to achieve unprecedented prosperity through mariculture. The delegation accompanying Dr. P. K. Mishra included

Dr. Suresh Kumar Mojjada, ICAR-CMFRI's Nodal Officer of this project, the Director General of the BSF; Principal Secretary, Department of Tourism, Government of Gujarat; Chief Forest Conservator, Government of Gujarat; District Magistrate of Bhuj; Inspector General of Police, Government of Gujarat as well as officials from the Department of Fisheries, Government of Gujarat.

Reported by Suresh Kumar Mojjada, D. Divu, P. S. Swathi Lekshmi, P. Abdul Azeez and Jayesh Devaliya ●

Adoption of sea cage farming technology developed by CMFRI

First fully owned private sea cage farm in the northwest coast

Yet again the Satpati, a coastal village in north Maharashtra becomes first in fisheries development in India. With Mr. Anand M. Tare of this village initiating the farming of lobster in his fully owned sea cage farm off Satpati, it became the village to own the first ever private commercial sea cage farm in the north west coast of India.

The successful farming of lobsters in the cages by CMFRI RC Veraval since 2011-12 had attracted the attention of many prospective fishermen / farmers in the region to seacage farming especially farming of lobster in sea cages and one such person was Mr. Anand Tare. He started the farming with rectangular cages made of locally available materials like casuarina pole, iron rods and fishing nets etc. in a fully exposed sea area having depth of nearly 3 m. Three such modules were made and stocked with lobster juveniles during October, 2013. Following some hitches in farm maintenance including mortality in the cages, he made a visit to the RC and expressed his desire of knowing more about the technology in order to expand the farming activities at Satpati and requested for technical support of CMFRI. Thus, he was imparted with knowhow



Rectangular sea cages established by farmer

on the sea cage farming with hands on training on various aspects of the technology at Veraval. Problems in his farm were found to be due to inadequacy of the site and faulty design of cages.

After having trained at Veraval Centre of CMFRI, Shri Anand got fabricated two numbers of 6 m diameter circular cages made of 1 inch GI pipe and coated with the FRP following the protocol developed by CMFRI for lobster farming and deployed in an area identified suitable for lobster farming. The crop of lobster maintained in the

rectangular cages has been transferred to the circular cages and the farming is progressing well without any problems now. The scientists of the Veraval RC are in constant touch with the farmer and strive to bring a grand success in his endeavour as success stories of this kind would motivate more such entrepreneurs in the region and help the technology developed by the Institute reach to more people along the coast.

Reported by K. Mohammed Koya, Sreenath K.R and H.M.Bhint, Veraval Regional Centre



6m circular GI cage for lobster farming



Circular cage being launched

Artificial Reefs deployed along Tamil Nadu coast

Deployment of artificial reefs were completed successfully in two villages in Kancheepuram district (Nemmelikuppam and Mudaliarkuppam) on 20.02.2014 and 24.02.2014 under the consultancy project on 'Installation of Artificial Reefs in the inshore waters in two villages in Kancheepuram district of Tamil Nadu for the Department of Fisheries, Tamil Nadu. The number of reef structures deployed was 180 at either site.

Artificial reef structures were also successfully deployed off Goonankuppam village in Thiruvallur district on 27.02.2014 and 28.02.2014, Kovalam village in Kancheepuram district on 05.03.2014, Anichakuppam village in Villupuram district on 10.03.2014 and Sothikuppam village in Cuddalore district on 17.03.2014 under the consultancy projects 'Installation



Transporting and deploying reef modules

of Artificial Reefs in the inshore waters of two districts of Tamil Nadu' and 'Installation of Artificial Reefs in the inshore waters of four districts of Tamil Nadu' for IFAD assisted Post-Tsunami Sustainable Livelihood Program of the Tamil Nadu Corporation

for Development of Women. Two hundred reef structures were deployed in each village.

Reported by Shoba Joe Kizhakudan, Joe K. Kizhakudan, K. Vinod, R. Geetha, S. Mohan and A.A.K. Basha, Madras RC

A new communication platform "Kadal Anubhavangal"

An innovative communication platform titled "Kadal Anubhavangal" for learning from stakeholders was launched in the institute. Organised by the Socio Economic Evaluation and Technology Transfer (SEETT) Division the objective is to break the disconnect between the research system and the stakeholders by providing an arena to the stakeholder to share his or her experiences, concerns and suggestions for ensuring a sustainable future for the fishing industry. The first talk in the series organized on 9th July 2015 was delivered by Mr. Jossy Palliparambil, a mechanized boat owner based at Munambam and well known for his stakeholder induced initiatives in Responsible

Fisheries. He made a fervent call for conservation oriented policy instruments, incentive mechanisms and institutional reforms in the sector.

Mr. Jossy was also felicitated on the occasion. Dr. R Narayanakumar, Head, SEETTD Division proposed the vote of thanks



Dr. Madan Mohan, former ADG (Marine Fisheries), ICAR felicitating Mr. Jossy

Ornamental fish culture by fisherwomen SHGs in Ramanathapuram district: A success story



Dr. A. Gopalakrishnan, Director, visiting the ornamental hatchery unit at Thangachimadam

The Mandapam Regional Centre of ICAR-CMFRI has scripted a success story in adoption of ornamental fish culture by the fisherwomen SHGs in Ramanathapuram district, Tamil Nadu. The Centre provided technical guidance on various aspects of ornamental fish culture to the fishers in different villages in the district,

under the GOMBRT funded project 'Capacity building on seed production of selected marine ornamental fishes to fisherwomen in Gulf of Mannar region'. Most of the fisherwomen who were trained at the Centre are playing a major role in boosting the ornamental fish production in the district.

Out of the 66 fishers, who were trained during the year 2014-15, 23 members from Thangachimadam village received 50 per cent subsidy from the State Fisheries Department, Ramanathapuram under NFDB scheme to start the ornamental fish production. Similarly, from the 37 fishers trained during 28th - 30th October 2015, five from Mandapam have initiated the marine ornamental fish culture with their own investment. Percula, sebae and fire clown brooders were handed over to the group from Mandapam on 24th March 2016. As an encouragement to the Self Help Group members, half-inch sized juveniles were also supplied. They grow these to one inch size within a period of 45 days before marketing it. As an alternate livelihood option, this has helped the women groups to attain economic empowerment and enhanced their decision making ability. In the long run, this will pave the way for hatchery produced ornamental fish trade ●

Mera Gaon Mera Gaurav programme

The Mera Gaon Mera Gaurav Scheme was initiated in ICAR-CMFRI in November, 2015. At Headquarters, a committee was formed for implementing the scheme which identified groups of 4 scientists. Each group was allotted 5 fishing villages within a distance of 50-100 km. Benchmark surveys were conducted for obtaining base-line information of the adopted villages and the main problems faced by the village with

regard to fishing as well as farming operations. The surveys covered 44 fishing villages in Kerala falling in Ernakulam, Thrissur, Alappuzha, Kozhikode and Kasargod districts. Apart from this, surveys conducted by various Research Centres of ICAR-CMFRI include 10 fishing villages in Tamil Nadu, 5 fishing villages in Karnataka, 10 fishing villages in Andhra Pradesh and 10 fishing villages in Gujarat.

The scientists of Madras Research

Centre, Chennai conducted meetings with the fishermen in 10 selected villages of Kanchipuram (19th and 29th January 2016), Thiruvallur (21st-22nd January, 2016) and Chennai (25th January) districts and collected details on impact of flood that occurred in Tamil Nadu during December 2015.

Reported by: G. Maheshwarudu, Nodal Officer, MGMG programme and Madras Research Centre ●

Seaweed farming technology transferred to stakeholders in Andamans

The emerging seaweed farming industry in the country will get a major boost, with ICAR-CMFRI transferring its technology of seaweed cultivation suitable for the Islands to the Andaman administration. The scientific inputs on methods of seaweed farming came as the institute's initiative for intensifying its consultancy services. ICAR-CMFRI has recently developed nutraceutical products from seaweeds such as CadalminTM Antidiabetic extract (ADe) to combat type-2 diabetes and Green Algal extract (CadalminTM GAe), to combat arthritis. Seaweed cultivation is generally perceived as an environment friendly mariculture activity while a feasibility study in South Andamans by a team of ICAR-CMFRI scientists revealed that these regions are highly favourable for seaweed farming. Practical training on methods of monoline culture method including fabrication of floating rafts with bamboo, tying of seed material (seaweed fragments) in the ropes



Participants practising tying of seaweed seed material in the rope

and seeded ropes in the bamboo rafts besides collection of wild seaweed and identification of commercially important seaweed species were given to the participants from the Fisheries Department of Andaman Field visits were arranged to the seaweed

farms at Munaikadu, Thonithurai and Kottaipattinam and the seaweed processing unit at Manamadurai. Dr. A. K. Abdul Nazar and Dr. B. Johnson of Mandapam Regional Centre co-ordinated the training programme •

Pearlspot seed production unit with NFDB assistance inaugurated

With funding of National Fisheries Development Board (NFDB) and farmer's participation a network of pearlspot seed production units in Ernakulam district has been developed by KVK to boost local pearl spot production. Selected farmers were trained on seed production in ponds located in their homesteads and such seeds are pooled and supplied through KVK. Since individual units are accredited as KVK's Satellite seed production units,



Handing over of the pearl spot seeds during inauguration

farmers can also sell directly. The inauguration was done on 5th January, 2017 by Prof. K. V. Thomas, MP, Mr. V. D. Satheeshan, MLA, handed over the

KVK accreditation certificates and bill books to farmers. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI, Dr. Sreenath Dixit, Agricultural Technology Application

Research Institute, Bengaluru, Dr. Shinoj Subramannian and Dr. Vikas P. A. from KVK were present ●

Scientific utilization of fish waste under Swachh Bharat Abhiyan programme



Collection of fish waste for production of organic manure

KVK conducted a Cleaning cumth Awareness programme on 17 May 2017 in the Ernakulam fish market. Smt. P. Sreelatha, SMS (Home Science) took the lead and other staff actively participated in the programme. Fish waste collected from the local fish markets was brought to the Mulavukad Satellite Manure Production Unit (SMPU) and used to produce fish waste plus coir pith composted manure. The finished product 'Fishlizer' packed in bags of 200 kg was marketed by KVK through its sales counter and found good acceptance among the public ●

Satellite organic bioinput packing unit becomes operational

KVK's satellite bioinput packing unit was inaugurated on 11 May, 2017 at the Sub-Jail Ernakulam by Director, SICA & DIG of Prisons (South Zone), Pradeep B. Ernakulam Sub jail Superintendent Mr. Somarajan K, Kochi Municipal Corporation ward councillor Smt. Gracy Babu, and KVK Head Dr. Shinoj Subramannian were present. Subject Matter Specialists, Shri. F Pushparaj Anjelo (Agriculture Extension) and Dr. P. A. Vikas (Fisheries) facilitated capacity building programmes for the inmates and establishment of the satellite bioinput packing unit ●



Inauguration of satellite bioinput packing unit

NFDB-funded cage farming project rolled out



Cage farming project launch at Nettoor

A major project to launch 500 cage fish farming units in Kerala supported

by the National Fisheries Development Board (NFDB), Hyderabad has been

initiated. The project envisions subsidy and technical support to the farmers to conduct cage fish farming across the coastal districts in the state. The project was formally launched in Nettoor in Ernakulam district by Sree Bhadra Kudumbasree unit comprising 10 members. Stocking of 1500 and 500 fingerlings of seabass and pearl spot respectively, in four cages was done. Maradu Municipality Chairperson Sunila Sibi inaugurated the event. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI, Dr. Imelda Joseph, Mariculture Division ornamental fishes generated through sale of fingerlings cobia, silver pompano and ornamental and Ajitha Kumar, Ward Councillor spoke on the occasion ●

ICAR-CMFRI hosts Buyer Seller Meet and Kisan Mela



Inauguration of the Buyer Seller Meet by Dr. A. Gopalakrishnan, Director, ICAR-CMFRI

ICAR-Central Marine Fisheries Research Institute hosted a Buyer Seller Meet and Kisan Mela from 14 to 16 November, 2019. It was jointly

organised by Swadeshi Science Movement, ICAR-CMFRI, Ernakulam Krishi Vigyan Kendra and NABARD. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI,

Kochi inaugurated the meet. Thousands of visitors, including students and general public, were made aware of a range of produces from primary



Live fish for sale at the Kisan Mela



Stall for fruits and fruit products sale by Farmer Producers



producers in agriculture and allied areas.

During the Buyer Seller Meet, several farmer producer companies from Kerala, Tamil Nadu and Karnataka found potential buyers to sell their products, including rice, cereals, pulses, vegetable oils, fish, dairy products and numerous value added products. The public also could buy products directly from the producers during the meet and wholesale dealers and major organic purchasers were connected directly to the primary producers helping them to shorten the market chain. The Kisan Mela counter for selling farmed live fish sold out around 2 tonnes of farmed seabass and tilapia.

Awareness campaign against 'Single use plastic'

Reduce use of plastic and total abolition of 'Single use plastic' (SUP) was the major theme of awareness program for "Swachhata Hi Seva" programme at Mangalore Research Centre. The immediate need to use alternative to SUP was campaigned and demonstrated in various places including fisheries harbours. Cloth bags and steel containers were projected as alternatives for single use plastics. Scientist and staff members of the Research Centre actively participated in the awareness campaign.



Onam Celebrations in CMFRI



Winners of the Pookalam Competition being announced



Onam celebrations at Vizhinjam RC



Onam celebrations at Mangalore RC



ICAR-CMFRI celebrates 'Onam', the traditional festival of Kerala at the HQ and various centres with traditional pomp and gaiety. At HQ, Pookalam Competition are held in which many teams participate every year. Traditional onam feast "Onasadya" is arranged in the canteen where the staff and family members participate to make it a joyful occasion. This is followed by cultural programmes and games organised by the recreation club of the institute ●

Outreach to stakeholders in marine fisheries sector under PMMSY

Seventeen awareness cum outreach programmes on *Pradhan Mantri Matsya Sampada Yojana* (PMMSY) were organized by the Mandapam Regional

Centre of ICAR-CMFRI during December 2020 to March 2021. Among the 3185 participants, 1682 were fishermen and 1503 fisherwomen who benefitted

through this programme. Along with PMMSY schemes, awareness on mariculture technologies like sea cage farming, marine ornamental fish



seed rearing, seaweed farming, marine biodiversity conservation, responsible fishing, sea safety, marine pollution & CITES listed elasmobranch species were also given by the scientists of the centre. Officials from the state fisheries department also participated in the programmes.

Puri Field Centre of ICAR-CMFRI organised training programme in collaboration with the Odisha State Fisheries department on 'Sustainable and Responsible Fishing' on 24 March, 2021 at Paradeep Fisheries Harbour, Odisha. 52 participants including fishers, traders, boat owners, auctioneers,



officials from fisheries department, coast guard, marine police and Odisha Marine Fish Producers Association

(OMFPA) and NETFISH-MPEDA, Bhubaneswar; attended the meeting.

Online Training programme with the theme of 'Artificial reefs in coastal fisheries management' was conducted on 15.02.2021 for 22 fishermen participants by Madras Regional Station with Dr. Joe K. Kizhakudan and Dr. Shoba J. Kizhakudan, as Course Co-coordinators. Training on the various aspects of oyster farming was arranged by the Mangalore Regional Centre for farmers in Kundapura on 20 March 2021.

With inputs from Mangalore & Mandapam Regional Centres; Madras Regional Station and Puri Field Centre



MoU for research collaboration on deep-sea fauna signed

ICAR-Central Marine Fisheries Research Institute signed an MoU with Centre for Marine Living Resources and Ecology, Ministry of Earth Sciences, for research collaboration in exploration and assessment of deep-sea fauna in Indian EEZ



Farming of indigenous seaweeds promoted in Lakshadweep

A massive demonstration farming of indigenous seaweed species *Gracilaria edulis* and *Acanthophora spicifera* was launched in nine inhabited islands of Lakshadweep with the technical support of the ICAR-CMFRI. The Lakshadweep administration has prioritised seaweed farming as a major driver for the development of the islands which is in line with a ICAR-CMFRI study that revealed immense potential for production of quality seaweeds for high-end utilisation as food and nutraceuticals in pollution free lagoons of Lakshadweep. 10 women self-help groups benefitting 100 families belonging in different islands are participating in the programme.

Well co-ordinated efforts of the Lakshadweep administration such as Fisheries, Environment & Forests and Rural Development as well as the ICAR-CMFRI have created the demonstration which focuses on capacity building of stakeholders and impact assessment of seaweed farming for a planned development of seaweed farming enterprises in the islands. Under the programme launched on 21 August 2021, so far nearly 400 rafts seeded



with *G. edulis* seed strains grown in the islands by the ICAR-CMFRI as well as the seed sourced from Rameshwaram, Tamil Nadu have been deployed. Additional units to reach the target of 2500 rafts are being added as the seed materials are developed in subsequent farming cycles of 45 days. Recent studies have revealed that indigenous seaweed species in various lagoons of Lakshadweep show nearly 60-fold growth in 45 days for the species *Gracilaria edulis*. Seaweeds are well known for its carbon sequestration properties

and the farming of seaweed has the potential to enhance the carbon credit to the nation while providing a climate resilient livelihood to the islanders. Providing a sound scientific basis for a sustainable seaweed farming enterprise, the ICAR-CMFRI and the Lakshadweep Krishi Vigyan Kendra are assessing the carrying capacity of the lagoons, spatial mapping of suitable farming sites, standardising farming methods for year-round farming in deeper areas and means to ensure quality seeding materials of indigenous seaweed species ●

Bhumija tribes of Odisha benefited from integrated farming practice

Under the TSP programme of Puri Field Centre of ICAR-CMFRI, the Bhumija tribal families of Jugadiha village (Balasore, Odisha) under the Nilamadhab SHG have been assisted

with the necessary technology and farm inputs for the polyculture of grey mullets with black tiger shrimp in high saline coastal ponds, which was later integrated with a poultry

farming system of the "Kuroiler" variety to reduce fertilization costs for the pond and generate additional income. The culture practice was continued for 7 months and the

produce was harvested by organizing a farmers fair cum harvest mela on 24.05.2022 to sensitise the fishermen about the benefits of the integrated farming practice. A total of 1271 kg of grey mullets, 156 kg of black tiger shrimps and 780 kg of chickens were harvested from the integrated culture system in a phased manner according to the local market demand and also to continuously fulfill the protein requirements of the tribal families during the fishing ban period. The total revenues of



₹3,49,674 generated from the sale of fishes & shrimps and ₹1,17,000 from the sale of poultry were distributed to the beneficiaries in the SHG. The successful adoption of this integrated farming practice has strengthened the socio-economic status of the Bhumija tribes of Nilamadhab SHG in Odisha.

Reported by: Rajesh Kumar Pradhan, Gyanaranjan Dash, Swatipriyanka Sen Dash, Biswajit Dash and Madhumita Das

Sea ranching project under PMMSY launched off Tamil Nadu

The Mandapam Regional Centre of ICAR-Central Marine Fisheries Research Institute (CMFRI) has kick-started a sea ranching project under the 'Pradhan Mantri Matsya Sampada Yojana' by releasing a total of 1.38 million green tiger shrimp (*Penaeus semisulcatus*) seeds at Vedalai in the sea grass beds of the Gulf of Mannar on 17 February 2022. The natural habitat of this species is Palk Bay and Gulf of Mannar, with an estimated potential yield of approximately 14,000 tonnes annually from this region.

The project sanctioned by the Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India to the ICAR-CMFRI under Central Sector Scheme

component of the Pradhan Mantri Matsya Sampada Yojana (PMMSY) with a total budget of ₹168.948 lakhs aims to release a total of 200 million green tiger shrimp post larvae 20 (PL20) in a period of four years in the Palk Bay and the Gulf of Mannar region of Tamil Nadu.

The sea ranching of hatchery produced green tiger shrimp seeds in the region is helping to replenish the natural shrimp stocks and sustaining the livelihoods of the fishermen. During the period from 2017 to 2021, a total of 17.245 million seeds were released in this region with the efforts of Mandapam Regional Centre of ICAR-CMFRI and local fishermen.

Following this, the shrimp landings showed an increasing trend in the region (with an average increase of 17.51% compared to the base figure of 2017) during 2018-2022. The fishermen associations in the region felt that, sea ranching of *P. semisulcatus* was effective in replenishing the shrimp resources in this region. ICAR-CMFRI is carrying out in-depth studies including application of molecular genetic markers to examine the impact of sea ranching in the fishery of the species in the region.

Reported by G. Tamilmani, B. Johnson, M. Sakthivel, P. Rameshkumar, K. K. Anikuttan, R. Vinothkumar and R. Bavithra, Mandapam Regional Centre

Biofloc fish farmers reap benefits with support from ICAR-CMFRI

A self-help group belonging to the scheduled caste community in Cheranalloor village in Kerala got a bumper harvest from biofloc fish farming. The harvest mela was inaugurated on 2nd December 2022 by T. J. Vinod, MLA. The Sreelekshmi self-help group used Genetically Improved Farmed Tilapia (GIFT) in 5-diameter biofloc tanks set up adjacent to their households. Aiming to transform the lives of the SC community by helping them become small-scale entrepreneurs in fish farming, the ICAR-Central Marine Fisheries Research Institute (CMFRI) introduced this venture to the families in the locality by extending to them all the support to undertake the biofloc farming. Each harvested fish weighed around 500 g on average, and the fish harvest was done according to the market demand. The farming was



started in November last year by stocking 1800 tilapia seeds with all the assistance, including a biofloc tank, fish seeds, feeds and technical guidance under the central government sponsored Scheduled Caste

Sub Plan (SCSP) programme operated in the institute. This innovative fish farming is also underway in Palakkad, Thrissur, Idukki and Kottayam districts under ICAR-CMFRI's guidance ●

IMTA cages yield bountiful harvest

Inaugural of the Harvest Mela from Integrated Multitrophic Aquaculture (IMTA) demonstration cages under All India Network Project on Mariculture, at Harwada, Uttara Kannada was done on 13-5-2022 by Dr. A. Gopalakrishnan, Director, ICAR-Central Marine Fisheries Research. Under the technical guidance of Karwar Regional Station of ICAR-CMFRI, a fishermen self-help group, Shri Vigneswara Prasanna, carried out the IMTA in two 6m diameter galvanised iron (GI) marine cages at Harwada, Uttara Kannada. The cages were stocked with seabass (*Lates calcarifer*) and silver pompano (*Trachinotus blochii*) while seeded ropes of green mussel, *Perna viridis* were tied on the outer frame of the marine cages. A total of 300 kg of

seabass, 100 kg of pompano and 150 kg of green mussels were harvested after 135 days of culture.

The IMTA demonstration cage at Koderi, Udupi comprising 398 kg of seabass and 60 kg of green mussels was also harvested on 26-

5-2022 by fishermen self-help group, Karavali friends.

Reported by A. Anuraj, P. P. Suresh Babu, Mr. Raghu Ramudu, Mr. N. G. Vaidya, Praveen Dube, Mahendra Pal, Harish Rathod and P. Anjulekshmi ●



National Campaigns celebrating Azadi Ka Amrit Mahotsav



of Integrated Multi-trophic Aquaculture (IMTA) which enables cage farming of fishes and bivalves along with seaweed in coastal waters will boost acceptance of eco-friendly sea farming technologies across the coastal states. Mr. Abhiram Seth, Managing Director, AquAagri Processing Ltd. expressed an interest in collaborating with ICAR-CMFRI for commercial-level micro-propagation-based seaweed seed production. The meet also highlighted the importance of bivalve farming, another non-conventional aquaculture practice where, several women self-help groups are engaging with bivalve farming under the guidance of the ICAR-CMFRI. Dr Brien Roberts, Aquaculture Research Scientist from Australia, and Arun Aloysius, Curatorial Supervisor of Dubai Aquarium and Underwater Zoo also delivered lectures at the event. Dr. P. Laxmilatha, Head I/C, Shellfish Fisheries Division and Dr. V. R. Suresh, Head I/C, Mariculture Division also spoke on the occasion.

Among others, Visakhapatnam Regional Centre organized an awareness programme for the farming community about the scope of diversified livelihood options available with the non-conventional aquaculture systems on 27th July, 2022. Dr. Subal Kumar Roul, Digha Regional Station, organised a programme for fish farmers at Deulbatta Village in Ramnagar (Purba Medinipur), West Bengal. Tuticorin regional station organised an online webinar on 27 July, 2022 where Dr. C. Kalidas and Ms M. Kavitha from ICAR-CMFRI and Shri R. Raxon, fish farmer-entrepreneur gave talks. Veraval Regional Station also organized a 'stakeholders' interaction meet (*gosthi*) on the occasion where Ms Mayuri Thakar, Superintendent of Fisheries, Gujarat State Fisheries Department gave details of government schemes for fishers and fish farmers ●

In connection with the national celebrations initiated by the Union Government on the 75th Anniversary of Indian independence under 'Azadi Ka Amrit Mahotsav', programmes related to fisheries and aquaculture were organised in various regional stations and centres of ICAR-CMFRI. A national campaign on 'non-conventional aquaculture systems'

was held at Headquarters on 27th July 2022 in virtual mode. Speaking on the occasion, Dr. A. Gopalakrishnan, Director, ICAR-CMFRI mentioned about the geo-referencing of 342 suitable farming sites for seaweed cultivation in the country sprawling over 24167 ha with a production potential of 9.7 million tonnes (wet weight) per year. The practice

Legacy of Prof. Trevor Charles Platt, JNSF at ICAR- CMFRI



A Fellow of the UK Royal Society (FRS) and an expert in the area of ecological oceanography and remote sensing, Prof Trevor Charles Platt of Plymouth Marine Laboratory, UK

and former Director at the Bedford Institute of Oceanography, Nova Scotia, Canada had joined the ICAR-CMFRI, Kochi in 2014 as Jawaharlal Nehru Science Fellow (JNSF), awarded by the Government of India for experts in science from other countries. JNSF, named after India's first prime minister, was opened to scientists of any nationality and sought to attract world renowned scientists who are fellows of the Royal Society (FRS) UK or similar academies. The fellowship carried a US\$100,000 salary plus a 5.5-million-Rupees (\$90,000) research grant besides free furnished housing and administrative support. Prof Platt devoted four months a year for four

years to work in ICAR-CMFRI, Kochi, till 2018 sharing his vast knowledge in the fields of remote sensing, ocean optics and biological oceanography related to marine fisheries with local scientists and contributing to new research ideas in cutting edge science such as Societal Applications in Fisheries and Aquaculture using Remotely-Sensed Imagery (SAFARI) and international collaborations. Prof. Platt played a key role in CMFRI's research activities in marine fisheries using satellite technology. He also imparted training to Indian scientists and research students in the area of ocean optics and the country has gained immensely through his presence in ICAR-CMFRI ●

Farming of indigenous seaweed species in Lakshadweep spells success

seaweed farming with TSC-Purple Turtle Company, Thoothukudi. Guided by the ICAR-CMFRI and the Lakshadweep Administration this development has the potential to boost the local economy and provide additional income for the islanders, especially women.

The seaweed farming enterprise was initially launched in Chetlat, one of the smaller islands in Lakshadweep with a population of nearly 2,500. Six plots of 100 tube nets each, with a seed stock size of 3 tons per plot, were established in September 2022. The first harvest yielded nearly 15 tons in 45 days. The entire harvest was used to expand the farm horizontally, increasing the farm size to 30 plots with 3,000 net tubes by the end of November 2022. Subsequent harvests were done every 30 to 45 days, and the farm was further expanded in the same



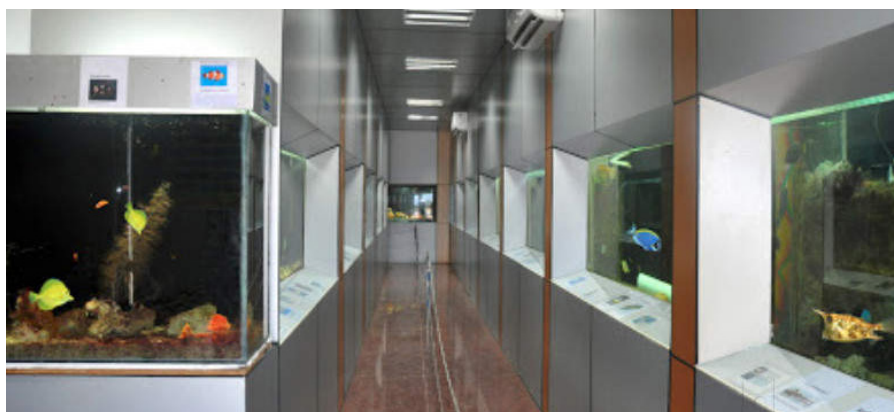
atoll as well as in the neighbouring atolls of Kiltan and Kadmat. Women are the main workforce, and coming from different Self Help Groups are engaged in various farm activities such

as preparing tube nets, seeding, and harvesting. The program generated nearly 3,000 man-days during the 8-month culture period, with an average daily earning of ₹380 ●

Sagarika: A Marine Research Aquarium showcasing India's marine biodiversity



The ICAR-Central Marine Fisheries Research Institute (CMFRI) in Vizhinjam, India, houses "Sagarika," a public marine research aquarium that showcases the wonders of the ocean. Established in 1996 and later moved to the CMFRI campus near Kovalam beach in 2014, Sagarika features a diverse collection of marine fishes, including angel fishes, butterfly fishes, banner fishes, damsels, clown fishes, sergeant majors, and lion fishes. It also displays invertebrates such as shrimps, crabs, lobsters, and seaweeds. These are exhibited in 25 large glass aquaria with a capacity of 1300 liters each, a 4,000-liter acrylic cylindrical tank, and three large concrete tanks. This creates a mesmerizing underwater world for visitors, featuring colourful reef ecosystems inhabited by a variety of fish species. Sagarika is more than just a display of marine life; it's a research and development centre that facilitates studies on the biology of hundreds of indigenous marine animals. The aquarium has been instrumental in pioneering marine ornamental fish breeding in India and serves as an educational resource for the public,



attracting over a million visitors, especially school children. It has also won prizes

for being the best marine stall in all the aquarium shows it participated in ●

Institutional Repository : Eprints@CMFRI



The open-access repository of ICAR-CMFRI, Eprints@CMFRI, officially launched on November 26, 2010, by Dr. S. Ayyappan, Secretary of DARE and Director General of ICAR, has gained global recognition and expanded its reach significantly up to 2024.

It was ranked second among the world marine science repositories according to the TRANSPARENT RANKING: All Repositories by Google Scholar (<https://repositories.webometrics.info/en/transparent>) with a content coverage of more than 18000 documents published by CMFRI authors in peer reviewed journals and other publications from its beginning in 1947.

It is the second largest Indian repository in all categories only after ICAR-Krishikosh, which carries the publications from all ICAR institutes.

5,149,000 Downloads across the world till 2024 shows the popularity of this service among the fisheries academia. An all-time high download status of 94317 documents was reported during the month of December 2023.

E-prints@CMFRI offers an intuitive

search feature that allows users to filter documents by year, author, subject, document type, and division. This robust search functionality enables efficient retrieval of specific research materials, enhancing the research experience.

E-prints@CMFRI is indexed by several prominent databases and search engines, ensuring wide visibility and accessibility of its research content. Some of the key indexers include

1. Google
2. Google Scholar
3. OpenDOAR (Directory of Open Access Repositories)
4. OA.mg
5. Core.UK
6. OAlster

This platform ensures that the CMFRI research outputs are available to a global audience, facilitating the exchange of information and fostering collaboration. By providing open access to its resources, E-prints@CMFRI aligns with the broader objectives of transparency, accessibility, and the advancement of science. The platform not only facilitates the internal management of these resources but also provides global access, ensuring

that the research is widely available to marine scientists, policymakers, and other stakeholders interested in fisheries and marine conservation.

A closed access Institutional Repository 'DSpace@CMFRI' also was started in 2016 to house the rare volume collection available at CMFRI. DSpace@CMFRI is specifically designed to store and manage rare volume collections housed in the CMFRI Library. These rare and valuable documents are meticulously scanned and preserved in digital format as PDFs, ensuring their availability to CMFRI staff and scholars. However, access to these collections is restricted to users within the CMFRI intranet, providing a secure and controlled environment for internal academic and research purposes.

This initiative allows CMFRI to preserve its valuable collections while offering convenient access to researchers and scholars. By digitizing rare documents, DSpace@CMFRI helps safeguard these resources for future generations and enhances their usability for ongoing research in marine and fisheries sciences ●

Puri Field Centre of ICAR-CMFRI inaugurated



Director with dignitaries and staff of Puri Field Centre

The Office cum Research Laboratory of Puri Field Centre of ICAR-CMFRI, was formally inaugurated on 7 December, 2015 by Dr. A. Gopalakrishnan, Director in the presence of distinguished officials from Odisha State Fisheries Department including Mr. P. Krishna Mohan, IFS,

Director of Fisheries, Mr. Basant Dash, Deputy Director, (Marine Fisheries), Mrs. Urbashi Behera, Additional Director of Fisheries and Mr. Shashi Kanta Mishra, Asst. Engineer, CPWD, Odisha. In her welcome address, Dr. (Mrs.) Reeta Jayasankar, Scientist-in-charge, Puri

Field Centre thanked Mr. Satyabrata Sahoo, IAS, former Commissioner cum Secretary, Animal Resource Development Department (Fisheries), and Mr. Bishnupada Sethi, IAS for providing all support during setting up of the centre. Dr. A. Gopalakrishnan appreciated the cooperation between the State and Central Fisheries Departments to address the issues of stakeholders and highlighted the opportunities to take up marine fisheries activities in Odisha to new heights through collaboration in cage farming, coastal aquaculture and seaweed farming with the active technical backing from this centre. Some of the fish farmers present expressed their difficulties in getting seed from Chennai and Mandapam for crab and finfish farming and requested for setting up such hatcheries in Odisha also. After the formal inauguration, the dignitaries visited the laboratory and hatchery facilities developed at the Centre ●

Platinum Jubilee Hall inaugurated

The Central Marine Fisheries Research Institute set up on February 3, 1947 celebrated its Platinum Jubilee Year in 2017. The Platinum Jubilee Hall constructed on the seventh floor of the Institute was formally inaugurated by Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR during his visit to Kochi on 15th January, 2018. Later, the venue was used to host the International SAFARI Symposium which was attended by several delegates from India and abroad ●



Inauguration of the Platinum Jubilee Hall

A new regional research centre comes up in Digha, West Bengal



Digha Research Centre of ICAR-CMFRI



Inaugural function at Digha

With the aim to fulfill the research and development needs for the marine fisheries in West Bengal and Odisha, the 11th regional research centre of ICAR-CMFRI has been set up in Digha, West Bengal. Dr. J. K. Jena, Deputy Director

General (Fisheries), ICAR, was the chief guest at the inaugural ceremony. On the occasion, a training programme on marine cage culture was conducted at the Centre in collaboration with the West Bengal University of Animal and Fishery

Sciences by Dr. Shubhadeep Ghosh and Team from Visakhapatnam Regional Centre. A total of 54 fish farmers and fishermen from various associations of East Midnapore district participated in the training programme ●

Indigenous RAS facility dedicated to the nation



Dr. Trilochan Mohapatra, DG, ICAR at the RAS facility in Visakhapatnam Regional Centre

Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR visited the Vizhinjam and Visakhapatnam Regional Research Centres of the Institute on 28th October and 7th November, 2017 respectively. The indigenous Re-Circulatory Aquaculture System (RAS) developed by the Visakhapatnam Regional Centre of

ICAR-CMFRI was dedicated to the nation by the Hon' DG, ICAR on 7th November 2017. Dr. Shubhadeep Ghosh, Scientist-in-charge, Visakhapatnam Regional Centre welcomed the distinguished visitor and explained the activities of the centre. Established for facilitating broodstock maturation and spawning of marine finfish,

the RAS facility minimizes consumption and wastage of water and successfully overcomes the challenges of maintaining live broodstock in sea which involves high costs, bio-security problems and possible impacts on marine ecosystem. Dr. Mohapatra observed the functioning of the RAS where broodstock of orange spotted grouper (*Epinephelus coioides*) and Indian pompano (*Trachinotus mookalee*) are being maintained currently. He also visited the newly developed live feed culture units set up for the brine shrimp *Artemia* and copepods, besides the mariculture hatchery where rearing of grouper seeds and mass culture of algae and rotifers was progressing. An inhouse publication titled "Prioritized species for mariculture in India" was released on the occasion by the Hon'ble DG who also interacted with the scientists and staff of the Institute.

The DG accompanied by Assistant Director General ICAR (IPTM & PME),

Directors and scientists from various Institutes of ICAR such as CTCRI, CIFT, CSSRI, CPCRI, IIHR and ATARI also visited the Vizhinjam Research Centre of ICAR-CMFRI on 28th

October 2017. Dr. A. Gopalakrishnan, Director ICAR-CMFRI apprised the hon' DG about the on going activities of the research centre. Appreciating the achievements, the DG urged the

scientists to focus on implementation and widespread dissemination of technologies developed by the institute to the fishermen and fish farmers ●

Dr. E. G. Silas Centre of Excellence and Innovations in Marine Fish Microbiome and Nutrigenomics



The Project entitled “Dr. E. G. Silas Centre of Excellence and Innovations (Dr. EGS–CoEI) in Marine Fish Microbiome and Nutrigenomics” has been implemented in the ICAR-CMFRI with the financial support from the Department of Biotechnology (DBT) in 2020. The project encompasses two sub-projects:

Unravelling larval microbiome and immunome of targeted fin fishes for improved mariculture production.

The sub-project I aims to decipher the microbiome and immunome profiles during early life stages of the most commercially important marine fish species of India namely, cobia (*Rachycentron canadum*) and silver Pompano (*Trachinotus blochii*). Better microbial management and immunomodulation strategies/protocols/products will be explored through this to address the poor growth and survival

rates during the larval stages of the fish. The products and strategies/protocols evolved through the research will also be evaluated in orange-spotted grouper (*Epinephelus coioides*), another commercially important marine fish species to check the enhancement in cross species fish larval survival.

Application of nutrigenomics for improved growth and immune functions of larval stages in targeted marine fin fishes.

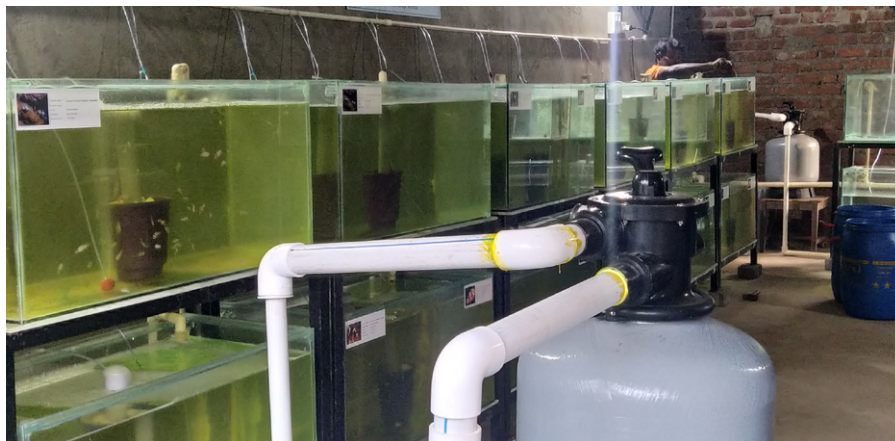
The sub-project II primarily envisages to study the interplay between marine fish larval nutrition genome and health. The nutrigenomics tools will be applied to precisely predict the critical nutritional requirements of cobia and Silver pompano larvae. Suitable feeds/feed supplements/feeding strategies will be developed through the identified nutritional gaps for enhancing the growth, survival and quality of targeted fish species. The products developed through the research will also be evaluated in orange-spotted grouper to check the enhancement in cross species fish larval survival.

The project envisages to address the poor larval growth and survival rates of commercially important maricultured finfishes of India through a holistic approach incorporating microbiome, immunity, nutritional and genetic factors and their interactions by establishing “Centre of Excellence and Innovations (CoEI) in Marine Fish Microbiome and Nutrigenomics” at ICAR-CMFRI, a premier research institute undertaking marine fisheries research in India. The approach

will be initially applied in the most commercially significant maricultured species of India in selected candidate fish species like cobia and the products and strategies/protocols developed through the research will also be evaluated in orange-spotted grouper, another commercially important species to check the enhancement in cross species fish larval survival. The identified microbial immunity/nutritional manipulations which are beneficial to the host will be utilized for developing novel strategies to improve larval growth, quality and survival of target species. Simultaneously, the proposed CoEI would advance the state-of-the-art facilities in aquaculture microbiome and nutrigenomics and contribute to expertise within India. The facility will function as a platform for national fish microbiome, immunome and nutrigenomic research, attracting foreign collaborations on advanced research. EGS–CoEI will be the first CoEI in marine fish microbiome, immunome and nutrigenomics research in India. Considering the matchless contributions of Dr. E.G. Silas, former Director of ICAR-CMFRI to the development of fisheries and mariculture in India, the Centre is entitled ‘Dr. E.G. Silas Centre of Excellence and Innovations’.

The Dr. EGS–CoEI has received financial support from the Department of Biotechnology (DBT) under the Ministry of Science & Technology, Government of India [Sanction Order No.BT/AAQ/3/SP28267/2018 dated 11.05.2020] ●

Solar powered marine ornamental fish rearing units set up



Sanstha Maryadit, Village Dharavali, Mumbai. The established recirculating (RAS) marine ornamental fish rearing units are fully powered by solar energy. Four varieties of juvenile marine ornamental fish (percula clown, tomato clown, maroon clown and designer clown fish) were reared in captivity for 45 days till they attain marketable size by the trained beneficiaries.

Reported by: Ramkumar S., Nilesh A. Pawar, Santosh N. Bhendekar, Punam A. Khandagale, Vaibhav D. Mhatre, Umesh H. Rane, Ajay D. Nakhawa, K.V. Akhilesh and Anulekshmi Chellappan

Under the Tribal Sub Plan (TSP) Scheme 2020-21, the marine ornamental fish rearing technology

was extended to the Warli Scheduled Tribe beneficiaries of Kalbadevi Adiwasi Matsyavyavsaay Sahakari

FISH@CMFRI (Facility for Integrated-modelling Simulation and High-end analytics)



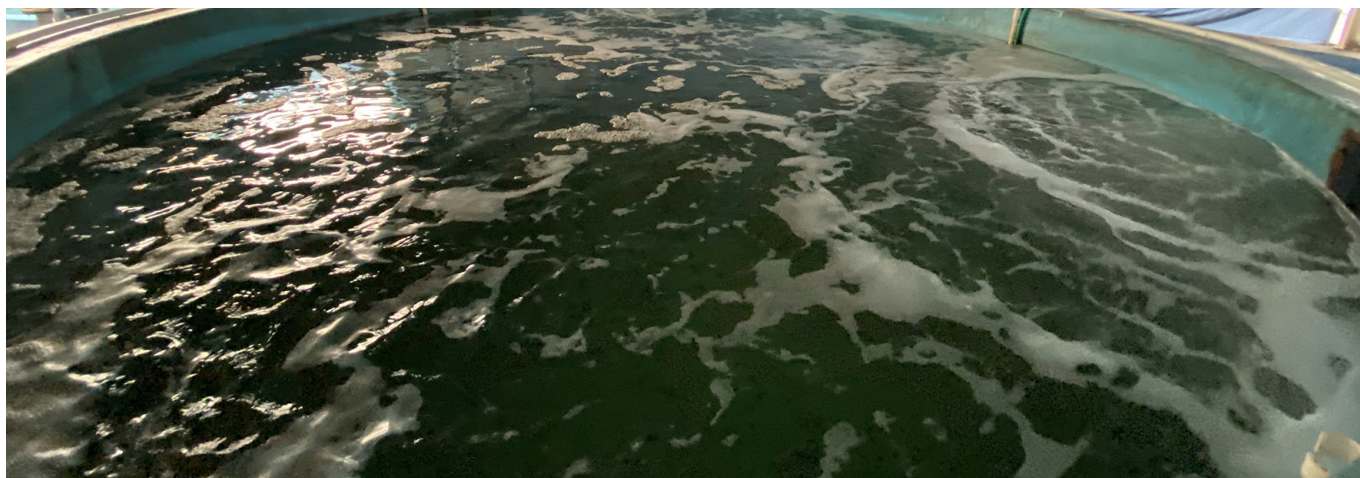
The ICAR-Central Marine Fisheries Research Institute (CMFRI) established a High-Performance Computing facility named FISH@CMFRI in Kochi to support the REVIVAL project (REhabilitation of Vibrio Infested waters of Vembanad Lake) funded by the Department of Science and Technology (DST). FISH@CMFRI was specifically designed to handle the computationally demanding tasks and mathematical modeling required for this project, housing a



high-power cluster-based parallel processor stack for downloading,

processing, analyzing, and plotting data. With an equipment budget of approximately 33 lakhs from the DST-REVIVAL project and about 20 lakhs for other infrastructural needs, FISH@CMFRI represents a total investment of over 5 million Indian Rupees. The facility boasts impressive computing capacity with 3 TFLOPS of processing power, 4 computer nodes, 8 processors, 96 cores, 64 GB memory per node, 256 GB total RAM, and 4 TB of usable storage capacity. It also includes a 10 Gbps Ethernet primary interconnect and a 1 Gbps Ethernet administration and management network. Ultimately, FISH@CMFRI serves as a valuable resource for scientists and researchers at CMFRI, providing them with the tools they need for their downloading, analytical, and computational needs

Super intensive finfish RAS developed



Most of the global finfish mariculture production comes from net cages. However, coastal net cage farming has many disadvantages. Firstly, more than 70 % of the nitrogen given as feed in cages is lost to the open water polluting the environment and large-scale adoption of coastal cage culture will inevitably lead to massive self-pollution, besides economic losses due to parasitic and viral diseases emerging from the polluted ecosystem. In addition, the cages are vulnerable to natural calamities such as high waves, wind and floods leading to huge crop losses. Hence, globally land-based RAS is gaining popularity, especially for the production of high-value finfishes as it offers many advantages such as total control over most of the critical water quality parameters, and limited use of land and water while maximising production. This production mode which is sustainable, eco-friendly and bio-secure offers flexibility in the site and

species selection as well as easy and total harvesting and planned production cycles, irrespective of the seasons. High capital cost which is one of the major bottlenecks in the land-based RAS can only be offset by adopting an intensive farming mode.

To develop land-based super-intensive farming technology Vizhinjam Regional Centre of ICAR-CMFRI set up a system comprised of a 30-ton dual-drain tank, balancing tank, drum filter, foam fractionator, biological filter, degassing unit, cartridge filter, UV filter, oxygen concentrator and Speece cones (down-flow bubble contactor). The dual drain system helps to remove the concentrated waste through the central drain and the side drain helps to remove the surface film and part of the circulating water. The balancing tank regulates the amount of water going out through these drains. The drum filter helps to remove particles larger than

60 microns from the circulating water whereas the foam fractionator removes dissolved and colloidal organic matter and particles less than 60 microns. The biological filter removes ammonia by nitrification whereas degassing unit strips CO₂ and other harmful gases. The cartridge filter removes any particulate matter left in the water before it enters the UV filter which eliminates parasites, bacteria and viruses. The oxygen concentrator-Speece cone assembly helps to maximise the dissolution of pure oxygen into the system water to sustain the high stocking density. The system will be used to develop and fine-tune a super-intensive mode of production. Preliminary results of studies done in the Fingerling Production Units (PFU) have given excellent growth.

Reported by: M. K Anil, Raju B, Jose Kingsly and Anand V. ●

Mariculture support for Indian Pompano gets a fillip



An indigenously developed Recirculatory Aquaculture System (RAS), a culture system for rearing marine finfish in controlled conditions with minimum use of water and efficient management practices. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI inaugurated the facility developed at Visakhapatnam Regional Centre of ICAR-CMFRI on 20.03.2023. It is expected that the development will pave the way for entrepreneurs to invest in mariculture. It can produce a fish seed of 12 gm at only ₹11.20 and is standardized for rearing fish seed of average 0.5 gm size. Dr. A. Gopalakrishnan opined that along with the training programs on nursery rearing of Indian pompano in RAS to fish farmers, students and entrepreneurs, it is ensured that skilled manpower will be available for scaling up production in the future.

The newly constructed Farmers Training Hostel "Indian Pompano" was also inaugurated. Products from Visakhapatnam Regional Centre including



a centre profile and two products Cadalmin Nann Con and ICAR-CMFRI Marine Microbial Consortium (MMC) were released. Cadalmin Nann Con is an indigenous, packaged concentrate of *Nannochloropsis oculata* which is a critical feed for rotifers, in turn used as live feed for marine finfish larvae in hatcheries. This product has a shelf life of 5 months and can be reconstituted as required. The ICAR-CMFRI MMC is an indigenously developed multi-strain probiotic supplement for marine

finfish in nursery and grow-out culture systems which helps in improving growth, survival and gut health of marine cultured fish. Three MoUs were also signed on the occasion which included with MSR Aqua Pvt. Ltd. for broodstock development and seed production technology for Indian pompano, another for providing technical services on sea cage farming of Indian pompano and one for technical services in seaweed cultivation as a knowledge partner ●

Innovative Field Upweller Nursery System developed for bivalves



Field Upweller Nursery System

The Field Upweller Nursery System represents an innovative solution designed for the nursery rearing of bivalves, offering a practical approach to growing hatchery-produced spat to seed stocking size, ready for direct use in grow-out operations. While achieving this growth in the hatchery using mass-cultured phytoplankton is possible, the sheer volume of phytoplankton required for commercial hatcheries, which produce hundreds of millions of seeds, makes it economically unviable. The institute has recently developed a highly adaptable and scalable Field Nursery Silo System to overcome this challenge. The system comprises 6 nursery silos, with the option to expand the capacity by adding more silos as required. Each silo boasts a diameter of 60 cm and a height of 90 cm. The nursery silos are divided into two parts: the bottom unit serves as the entry point for natural water, which then passes through a mesh attached to the bottom part of the upper unit. Spats are stocked in the



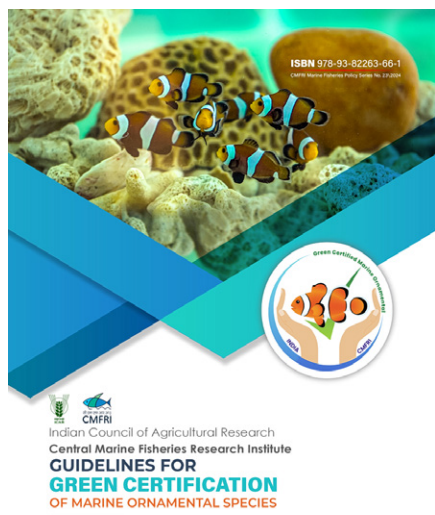
Upweller grown green mussel and oyster seeds

mesh bottom of the upper unit. The water that passes over the spat returns to the natural water body, such as an estuary or the sea, creating an ideal environment for the bivalves' growth. A pump is seamlessly integrated into the system to facilitate this continuous water flow, ensuring a steady supply of natural water rich in phytoplankton and other organic and inorganic materials. By adopting this field nursery silo system, significant cost savings and faster growth are achieved compared

to the alternative of producing vast quantities of phytoplankton in the hatchery. Notably, each nursery silo can comfortably accommodate up to 100,000, 4-6 mm spat of mussels or 20,000 oysters or 500,000 clams spat, streamlining the seed production process and making it efficient and cost-effective.

Reported by M. K. Anil, P. Gomathi, B. Raju, O. Salini and P. M. Krishna Priya, Vizhinjam Regional Centre

CMFRI prepared Green Certification Guidelines for wild-caught Marine Ornamental Fishes



The Central Marine Fisheries Research Centre has prepared Green Certification Guidelines of marine ornamental species in consultation with the Marine Products Export Development Authority

for wild collection and captive breeding so that dependence on collection of specimens from coral reef habitats could be gradually reduced.

The guidelines are expected to ensure the adoption of green methods throughout the ornamental fish supply chain, enhancing sustainability and market value. These guidelines could be aligned with existing ornamental fish breeding standards and adapted from global benchmarks such as those of the Marine Aquarium Council, tailored specifically to suit Indian conditions.

With increasing global interest in aquarium fishes, the ornamental fish trade currently has an annual turnover of USD 7.5 billion, growing at a rate of eight per cent per annum. Despite India's rich and diverse marine ornamental fish resources, the country accounts for less

than one per cent of the global market share. In contrast to the total marine exports of Rs. 19,500 crore from India last year, ornamental fish contributed only Rs. 6.5 crore, with 90 per cent of the exports sourced from the wild.

As a step toward promoting sustainable alternatives and enhancing livelihood options, CMFRI also inaugurated a training programme on marine ornamental fish breeding, designed to provide fisherfolk with viable alternate income opportunities.

The Mandapam Regional Centre of CMFRI has made significant strides in this area by developing breeding and hatchery technologies for 16 commercially important species with high international demand, strengthening the institute's role in advancing marine ornamental aquaculture ●

World Bank Team at Mandapam Regional Centre



World Bank Team along with officers from the district administration at the cage farming site.

The World Bank Team held discussions with various Government organizations in Ramanathapuram at District Collectorate on 4th November

2015 in connection with the Tamil Nadu Pudhu Vaazhu Project being implemented at Ramanathapuram district since 2006. The project will

be renamed as Tamil Nadu Rural Transformation Project (TN RTP) from September 2016. The meeting was chaired by the District Collector. Dr. R. Jayakumar, Senior Scientist, Mandapam Regional Centre participated in the meeting and based on the discussions, it was decided to select Ramanathapuram district to promote cage farming activities as an alternate livelihood option and an entrepreneurial development programme. Later, along with officers from the district administration, the World Bank Team visited Mandapam Regional Centre where various activities of the centre were explained. The team also visited the sea cage farms at Marakayarpatinam.

Reported by Mandapam Regional Centre ●

Asian Fisheries Society's Gold Medal award

Dr. A. Gopalakrishnan, Director ICAR-CMFRI was awarded the coveted Gold Medal by the Asian Fisheries Society (AFS), an organisation devoted to the

fisheries sector of the Asia-Pacific region. The award is in recognition of the institute's efforts for the successful conduct of the International Conference

on Cage Aquaculture (CAA5) held at Kochi in November 2015.

In addition to the research activities, ICAR-CMFRI has been providing training programmes as well as a series of demonstrations of cage farming in all the maritime states to popularise this farming method among the fisherfolk. Under the guidance of ICAR-CMFRI, more than 750 cage culture initiatives with active participation of fishermen are underway in various parts of the country. Dr. A. Gopalakrishnan, who took charge as Director in 2013, received the Gold Medal and Citation from Prof. Shuolin Huang, President of the AFS, at the 11th Asian Fisheries and Aquaculture Forum (AFAF) held in Bangkok, Thailand. Besides, Dr. A. Gopalakrishnan was also elected as India's representative in the Executive Council of the AFS at its 13th General Body meeting held in Bangkok.



Dr. A. Gopalakrishnan, Director receiving the AFS award

CMFRI staff contribute to Cyclone Ockhi relief fund

Staff at Headquarters in Kochi and the research centres at Vizhinjam and Calicut in Kerala contributed ₹4.53 lakh to the Kerala State's Cyclone Ockhi special relief fund. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI handed over the

cheque to Mr. Pinarayi Vijayan, Hon'ble Chief Minister of Kerala on 20th February 2018. Similarly, the staff of the Madras, Mandapam and Tuticorin Research Centres contributed ₹1,90,566 towards the relief fund of Tamil Nadu state. The

cheque was handed over to Mr. Edappadi K. Palaniswami, Hon'ble Chief Minister of Tamil Nadu on 27th February, 2018 jointly by the Scientists in Charge of the Mandapam, Madras and Tuticorin regional research centres.



Fund collected for relief work being handed over to the Chief Ministers of Kerala and Tamil Nadu

National and International recognition to sea cage farming promotion activities of ICAR- CMFRI



Shri. Hasanbhai receiving ICAR's Pandit Deen Dayal Upadhyay Antyodaya Krishi Puraskar award

The open sea cage farming model developed by ICAR-CMFRI has received national recognition, with a farmer associated with the institute bagging the prestigious Pandit Deen Dayal Upadhyay Antyodaya Krishi Puraskar (Zonal award) instituted by ICAR. Mr. Hasanbhai Musangara Jumabhai, a

fisherman of the tribal Sidi community from Gujarat received the award for his active involvement in the open sea cage farming guided by the Veraval Regional Centre of ICAR-CMFRI. The award comprised ₹50,000 and a citation. Mr. Hasanbhai is the leader of a Fishermen Co-operative Society in Gujarat named

Bharat Admjuth Matsyodyog Mandal-Talala. The society successfully utilized the indigenous open sea cage farming method developed by ICAR-CMFRI and popularized it among their community to increase the fish production. The award is given every year to recognize the contributions of marginal, small and landless farmers for developing sustainable, integrated models of farming or innovations in any field of agriculture.

Scientists offered the community farming demonstration, training and hands-on exposure of the farming, under the Tribal Sub Plan (TSP) outlay of the institute. The farming group was supported financially and technically by the institute every year since 2011. The sea cage farms, regarded as one of the largest in the country, comprises 22 galvanised iron (GI) cages of 6m diameter. The farmers who gained confidence to operate the farm by themselves have obtained four crops of lobsters and cobia, leading to improved livelihoods and increased fish production ●

Indian delegation to Norway

As part of an Indian delegation visiting Norway, Dr. A.Gopalakrishnan, Director, ICAR-CMFRI participated in the meeting with Ms. Elisabeth Aspaker, Fisheries Minister, Trondheim, Norway on 19th August, 2015 ●



Consultative Meeting of Fisheries Institutes

The Department of Fisheries, Government of Kerala organized a consultative meeting of the research and academic institutes in the fisheries sector at the ICAR-CMFRI on 7th July 2016.

Smt. J. Mercykutty Amma, Hon'ble Minister for Fisheries, Government of Kerala presided over the meeting. She stressed the need for effectively disseminating the technologies being developed by the research

institutes to the fishermen and fish farmer communities. She said that a committee of experts representing from all the fisheries research institutes functioning in the state will be formed to monitor the dissemination of the technologies to the targeted groups. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI offered all support to the State government for the improvement of the fishery sector in Kerala and suggested that effective precautionary measures by strengthening the curbs on fishing of juvenile fishes and regulations on fishing effort should be implemented. Directors and representatives from, ICAR-CIFT, ICAR-CIFRI, ICAR-NBFGR, ICAR-KVK, MPEDA, CIFNET, NIFPHATT, Dr. A. Ramachandran, Vice Chancellor, KUFOS and officials from the Fisheries Department also attended the meeting ●



Art route to create awareness on marine pollution

As part of its Swachh Bharat Abhiyan initiatives an art installation covering an

area of more than 2500 sq.ft. has been set up on Fort Kochi beach to attract

the public attention to the grave issue of coastal pollution and its impact on marine ecosystem and human health. Set up with the support of Cochin Shipyard Limited, the art work, which consists of giant fish like structures, was inaugurated by Ms. Soumini Jain, Mayor, Cochin Corporation on 21st January, 2017.

ICAR-CMFRI's The 'Fish Cemetery' is a symbolic expression of dead fishes as a drastic impact of the excessive presence of plastic wastes in the sea. The two-month long awareness campaign was launched against the backdrop of excessive accumulation of plastic wastes causing danger to the marine ecosystem and to the human health too ●



Inauguration ceremonies at Fort Kochi Beach

CMFRI signs MoU with Mangrove Foundation



Exchange of MoU

Memorandum of Understanding was signed with the Mangrove and Marine Biodiversity Conservation Foundation of Maharashtra for collaborating in the

field of sustainable marine fisheries, aquaculture research, development and extension for a period of five years. Dr. A. Gopalakrishnan, Director, ICAR-

CMFRI and Mr. N. Vasudevan, Executive Director, Mangrove Foundation signed the MoU on 4th July, 2017 at the ICAR-CMFRI Headquarters in Kochi •

ICAR-CMFRI partners with ISRO to forecast Potential Fishing Zones

The institute has joined hands with the Indian Space Research Organisation (ISRO) to identify and forecast Potential Applications Centre (SAC) of the ISRO have jointly launched a research

project for identifying, forecasting and monitoring PFZ in coastal and offshore waters of Tamil Nadu. The collaborative project named 'SAMUDRA' is aimed at helping fishermen easily locate

shoals of fish without wasting time and fuel. The research work focuses on developing and running a satellite-based ocean forecasting model to provide PFZ advisories •

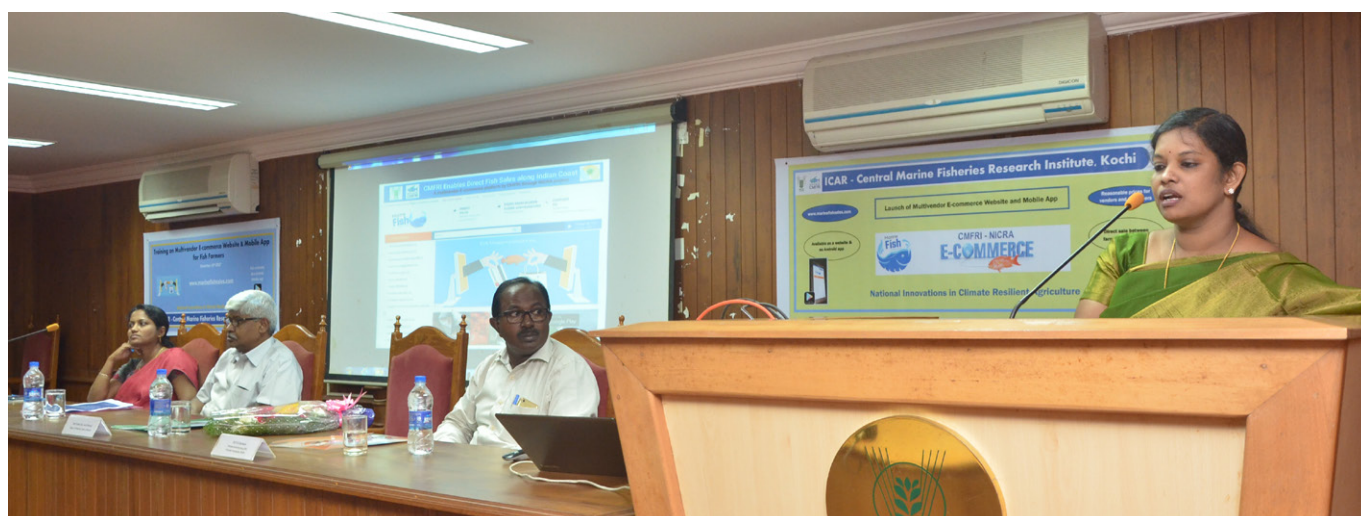
Minimum Legal Size for Fish Catch in Karnataka

In December 2019, the Karnataka Department of Fisheries, based on the recommendations of the ICAR-Central Marine Fisheries Research Institute (CMFRI), introduced a significant policy measure to protect the state's marine resources. This initiative involved establishing minimum legal sizes for 19 fish varieties, aiming to conserve

juvenile populations and prevent over-exploitation. The order specified legally permissible minimum sizes, defined by total length (TL) and dorsal mid length (DML), for commonly caught species like seer, pomfret, cuttlefish, squid, ribbon fish, tuna, pink perch, groupers, and anchovies.

This measure was welcomed by the Karnataka Coastal Fishermen's Action Committee, representing 63 fishermen associations across the state's coastal districts. They viewed it as a crucial step toward safeguarding fishery resources and ensuring the sustainability of fish populations •

ICAR-CMFRI develops E-commerce Website and Mobile App for online fish sale



As an adaptation strategy to improve income of fishermen and to help them cope up with adverse climatic events, the ICAR-Central Marine Fisheries Research Institute, Kochi (CMFRI) has developed a multivendor E-commerce website (www.marinefishsales.com) and associated android app ([marinefishsales](https://play.google.com/store/apps/details?id=com.marinefishsales)) through the National Innovations on Climate Resilient Agriculture (NICRA) project. The website and mobile app is aimed at helping fish farmers and fishermen

to sell their farmed fish and marine catch directly to the customers online and to fetch better income without depending middlemen.

The web application was released by Dr. Trilochan Mohapatra, Director General, ICAR & Secretary DARE, on 7th August 2018 during the sixth NICRA annual review meeting held at NASC, New Delhi. Various fishermen SHGs can register as vendors (fishers and farmers) based on their fish products

and update their stock availability under pre-approved categories and products, which shall be displayed in the website and associated mobile app. Customers visiting the website or app could place the order and subsequently the registered fisher/farmer shall be notified through email and SMS, upon which the quality products within the pre-assigned time frame shall be delivered, enabling direct product sale between customers and SHGs ●

Minimum Legal Size (MLS) for marine capture fisheries management in Maharashtra

The marine capture fisheries sector of Maharashtra has undergone tremendous change in terms of fishing patterns, fishing methods,

spatial expansion of fishing grounds, multiday fishing and innovations in crafts and gears, among others. With the increasing demand for marine



fish for consumption and other non-food utilization of fishes, exploitation of juvenile fishes is becoming more common. Exploitation of juveniles which causes 'growth overfishing' is a major concern as it affects the health of fish stocks and the ecosystem which impacts livelihood of fishers and causes much economic loss to all stakeholders. To address the growing concern of juvenile fish exploitation in Maharashtra, the ICAR-CMFRI recommended Minimum Legal Sizes (MLS) for 58 commercially important fish species. This initiative aimed to curb growth overfishing and ensure the sustainability of the state's marine fisheries. The MLS recommendations were based on various criteria, including size at maturity, size at 50% maturity, and size at sexual differentiation, depending on the species and its resilience to fishing pressure. This science-based approach to fisheries management reflects ICAR-CMFRI's commitment to conserving marine resources and ensuring the long-term health of fish stocks ●

CMFRI Signs MoU with MS University

The Central Marine Fisheries Research Institute (CMFRI) has signed a Memorandum of Understanding with Manonmaniam Sundaranar University (MSU), Tirunelveli to carry out collaborative research programmes and to develop adequate manpower for exploring the prospects of the marine biodiversity in the region.

CMFRI Director Dr. A Gopalakrishnan and MSU Vice-Chancellor Dr. K Bhaskar

signed the MoU, which is expected to pave a way for the fine blend of academic learning and hands-on experience in research for the research aspirants of both the organizations in the area of marine biodiversity with special reference to the richness of Gulf of Mannar. Tuticorin Research Centre of the CMFRI will play the lead role in the collaborative research programmes. According to the MoU, the CMFRI, the

largest marine fisheries research centre in the country, will be recognized as approved research centre of the MSU and the scientists of CMFRI will act as the approved Research Guides of the University. This will help the research fellows at the CMFRI working in the area of marine biodiversity to receive Ph.D. award issued by the University on the successful completion of their projects ●

Memorandum of Understanding inked

In a move to strengthen research networks in marine biodiversity and allied areas, ICAR-CMFRI has inked an Memorandum of Understanding (MoU) with Maharaja's College, Ernakulam, one of the oldest colleges in Kerala. The MoU was signed by Dr. A. Gopalakrishnan, Director ICAR-CMFRI and Dr. K. N. Krishnakumar, Principal, Maharaja's College. The linkage is aimed at boosting research works related to marine fisheries, marine biotechnology, marine biodiversity and mariculture along with various awareness programmes in connection with conservation of marine environment, preventing marine pollution and promoting citizen science projects by involving college students.



Signing of MoU with Maharajas College

An MOU has been signed between the Fisheries Department of Puducherry and ICAR-CMFRI to initiate a project

on bivalve farming in Puducherry and Karaikal under the FIMSUL II program, with an outlay of ₹47 lakhs ●

Indigenous RAS facility to give a fillip to mariculture



RAS facility at Vizhinjam Research Centre

Design, dimensioning and performance evaluation of a research facility for studies on the requirements of fish in RAS environments has been completed by the scientists of Vizhinjam Research Centre of ICAR -CMFRI. Uniqueness of this new system that it is a simple design as well as cost-effective. It

operates with a single pump, with regulation of percentage outflow through overflow and central drain by a single valve and aeration and stripping of CO₂ achieved by venturi with low costs incurred.

Maturation of most coastal fishes can be achieved under controlled hatchery environment with good quality seawater,

appropriate feeding strategies and without the stress of overcrowding and related disturbances. RAS allows fish breeders to manipulate environmental conditions that are critical in maturation processes such as temperature, photoperiod, food availability and other water quality parameters in addition to facilitating observation of

the behaviour of the fishes to perform various husbandry steps appropriately.

Three units of a Recirculatory Aquaculture System of 30 tonnes capacity, were constructed and made functional at new hatchery complex of Vizhinjam Research Centre of ICAR-CMFRI. These indigenously developed low-cost RAS systems were developed and perfected

for brood stock development of marine fishes to support mariculture activities of the institute. It includes 2000 to 30000 litre capacity Fibreglass Reinforce Plastic (FRP) tanks with mechanical and biological filtration sub systems. Facility for disinfection, temperature control and photoperiod manipulation, using equipment such as, proteins

skimmer, UV filters, chillers, biological filter cabinets and LED lighting with timer control are available. Funded by the National Fisheries Development Board (NFDB) the trial runs of the RAS with pompano fishes were successfully made.

Reported by: Anil M.K., Scientist-in-Charge, Vizhinjam Research Centre

MOU signed with Yashaswi Fish Meal and Oil Company

ICAR-CMFRI has signed MOU with Fish meal and oil company to undertake the consultancy project on Fishery and stock assessment of small pelagic in purse seines along Karnataka coast on 21st December 2023



MoU with ISRO for real-time monitoring of wetlands

In a major step towards the conservation of small wetlands across the country, ICAR-CMFRI signed a Memorandum of Understanding (MoU) with the Space Applications Centre (SAC) of the Indian Space Research Organisation (ISRO) on 8th April 2019 in Ahmedabad. According to the MoU a mobile app and a centralised portal with a complete database of more than five lakh small wetlands across the country will be developed by SAC for real-time monitoring and further conserving the wetlands. This work is proposed under the National Innovations in Climate Resilient Agriculture (NICRA) project of ICAR-CMFRI for which MoU was

National Resilience Framework for Fisheries and Wetlands (NRFW)





Signing of MoU on Wetlands Database development between SAC and ICAR-CMFRI

signed by Shri Nilesh Desai, Associate Director of SAC and Dr. P. U. Zacharia, Principal Investigator, NICRA project. The acquisition and integration of wetland data into a common digital repository, will help the stakeholders and the public to obtain time-to-time information on wetlands. The already developed geospatial wetland database of ISRO will be further strengthened by ICAR-CMFRI with field level inputs

of physical, chemical and biological parameters of the wetlands with the support of other fisheries research institutions. By generating periodic field level wetland datasets on water and sediment quality, biodiversity and species health, a comprehensive wetland information system which could facilitate the village level wetland advisories to the local people by scientific communities is envisaged.

The data generated will be stored in the SAC server with access to authorised scientific communities while ICAR-CMFRI will act as the nodal centre for approving the latest data updates on wetlands submitted by collaborating fisheries institutions and stakeholders. This can pave the way for enhanced climate change resilience of small wetlands in the country ●

ICAR-CMFRI extends support to transgender community amid COVID-19

The ICAR-Central Marine Fisheries Research Institute, Kochi, Kerala has extended support to the Transgender Community in Ernakulam, Kerala affected by the COVID-19 lockdown today.

Under its Recreation Club, the Institute provided the Food Kits including Vegetables among the Transgender Members. Earlier, the Institute had also helped Athidhi Achuth to become the country's first Transgender Entrepreneur in fisheries sector by providing with a Modernized Fish Vending Stall. Athidhi helped the Institute in identifying the members from the community who longed for needing a helping hand during the difficult time.

While distributing the Kits having



28 food items to the Members, Dr. A. Gopalakrishnan, Director, ICAR-CMFRI highlighted the Institute's plans which aims at empowering the community by encouraging them to become Small-Scale Entrepreneurs in Cage Fish Farming through proper training. The

Director stressed that the Cage Fish Farming is one of the best options of gender mainstreaming and turning into Cage Farming Ventures would be greatly beneficial to them for earning an additional income ●

ICAR-CMFRI attends the Expert Advisory Panel of FAO-CITES



The 7th FAO-CITES Expert Advisory Panel for the Assessment of the Proposals to Amend Appendices I and II of CITES Concerning Commercially-Exploited Aquatic Species was convened by FAO, Rome during 18-22

July 2022. Dr Shoba Joe Kizhakudan, Principal Scientist, Finfish Fisheries Division, Madras Regional Station of ICAR-CMFRI was deputed to participate as a member in the Expert Advisory Panel. It was tasked with assessing

each CITES species proposal put forth for consideration at the CITES Conference of Parties (CITES CoP19) in Panama during 14-25 November 2022. In addition, Expert Panel participants discussed technical aspects of the proposal in relation to biology, ecology, trade and management issues, as well as, to the extent possible, the likely effectiveness for conservation. The meeting served to bring together fisheries management, species, and trade experts who evaluated each of the proposed species against the criteria set forth by CITES, to qualify for listing in its Appendices. The resources deliberated upon included 20 sharks+45 look-alike species of sharks, 2 freshwater sting rays, 6 guitarfishes, one family of sea cucumbers and one species of ornamental fish. The Expert Panel report can be accessed at <https://www.fao.org/documents/card/en/c/cc1931en/> ●

Delegation from Michigan State University, USA visits ICAR-CMFRI



As part of a student exposure-cum-training programme jointly organised by the ICAR-Central Marine Fisheries Research Institute (CMFRI), Kochi and the Michigan State University

in the United States, a delegation of students and faculty from the MSU's James Madison College visited the ICAR-CMFRI and Kerala during the period of 11-26 July 2023. This was

the third such programme hosted by the ICAR-CMFRI on the basis of an MoU between the two institutes. Dr. Shyam Salim, Principal Scientist, ICAR-CMFRI co-ordinated the programme ●

Technical support for strengthening sustainable harvest of shrimp and cephalopod from trawl fishery

Following a request from the Seafood Exporters Association of India (SEAI), ICAR- CMFRI will provide technical backstopping for strengthening the sustainable harvest of 11 selected shrimp and cephalopod trawl fishery resources of Kerala. The institute will carry out a consultancy research project aimed at assessing the stock health and fishery performance of kiddi (karikadi)

shrimp, flower tail (poovalan) shrimp, red ring deep sea shrimp, nylon shrimp, deep sea non-penaid shrimp, squid, cuttlefish, octopus, ribbon fish and two species of threadfin breams. An MoU was signed by Dr. A. Gopalakrishnan, Director, ICAR-CMFRI and A. J. Tharakan of the SEAI on 19th June 2023. The consultancy project aims to achieve a slew of objectives, including setting fisheries

management target levels for these species, reporting on the incidental occurrence of sawfish, guitarfish and juvenile sharks in the trawl fishery of Kerala and providing indicative management actions. The project will focus on the application of appropriate models tailored to the life-history patterns of the selected species and the strengthening of the existing database on the bycatch ●



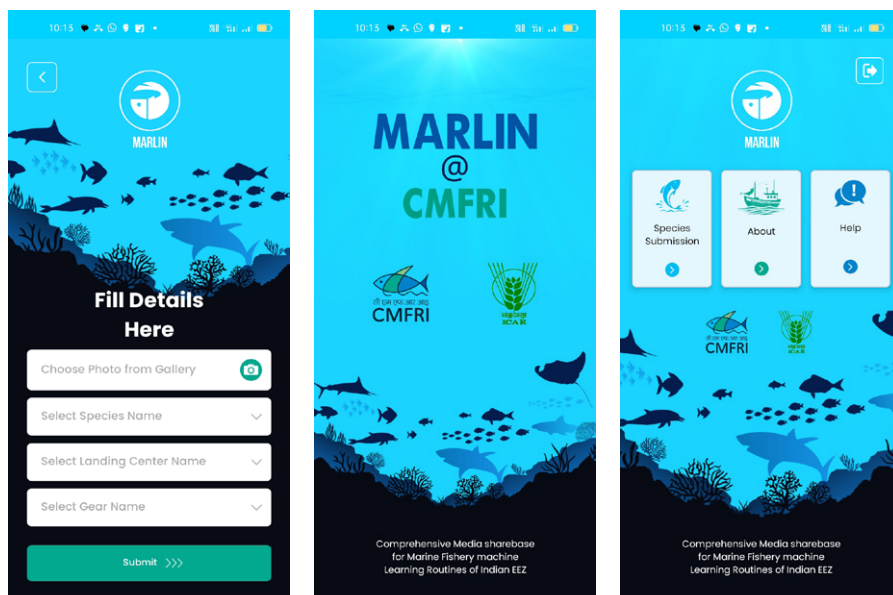
Knowledge partner MoU signed with the Government of Andhra Pradesh

ICAR-Central Marine Fisheries Research Institute signed a memorandum of understanding with the Government of Andhra Pradesh as knowledge partner for providing technical services in marine fisheries and mariculture on 21st November, 2022 in the presence of the Honourable Chief Minister of Andhra

Pradesh, Shri Y. S. Jagan Mohan Reddy. As part of the agreement, the institute would provide technical backstopping on various aspects of seaweed farming to identified fisherfolk and entrepreneurs as an alternate enterprise. The technical assistance would encompass all aspects of training, setting up of seed

production/nursery facilities and devising appropriate location-specific farming methods. Other dignitaries present included Smt. Poonam Malakondaiah, IAS, Chief Secretary, Agriculture and Cooperation Department and Shri K. Kannababu, IAS, Commissioner of Fisheries ●

CMFRI launches mobile app to encourage citizen science initiative in marine fisheries research



The ICAR-Central Marine Fisheries Research Institute (CMFRI) has come up with an innovative mobile app 'MARLIN@CMFRI' to encourage citizen science initiatives in marine fisheries research. A gateway for comprehensive media sharing, this app is poised to transform marine

fishery research, species identification, and assessment efforts within India's Exclusive Economic Zone (EEZ).

'MARLIN@CMFRI' allows the public to effortlessly upload photos of marine fish species encountered in the vast expanse of the Indian EEZ, leading to the development of a rich visual repository

of marine fishery resources. The app encourages users to provide species details ensuring that the database is scientifically enriched, facilitating accurate species identification. This data will contribute to the development of a sophisticated, AI-powered system for automated identification of marine fishery resources.

Geotagging is a pivotal feature of this mobile app that enables users to pinpoint the exact location where each marine species was landed. This data enhances the precision of the database, providing crucial information for researchers and conservationists studying the distribution patterns of various species within the Indian EEZ. The app is a collaborative platform that unites individuals passionate about marine conservation. By bridging the gap between citizen science and cutting-edge technology, 'MARLIN@CMFRI' transforms every user into a crucial contributor to the understanding and preservation of marine biodiversity.

CMFRI signs MoU with Neat Meatt Biotech to develop lab grown fish meat



CMFRI has partnered with Neat Meatt Biotech, a start-up working towards developing cultivated meat, to develop lab grown fish meat. According to the MoU with the firm, CMFRI will carry out research on early cell line development of high value marine fish species. This involves isolating and cultivating fish cells for further

research and development. Additionally, CMFRI will handle genetic, biochemical, and analytical work related to the project. The institute is equipped with a cell culture laboratory with basic facilities, providing a solid foundation for research in cellular biology.

Neat Meatt, with its expertise in cell culture technology, will lead

the optimization of cell growth media, development of scaffolds or microcarriers for cell attachment, and scaling up production through bioreactors. They will also provide necessary consumables, manpower, and any additional equipment needed for the project ●

MoU signed for the commercialization of Cadalmin™ Silvergrow

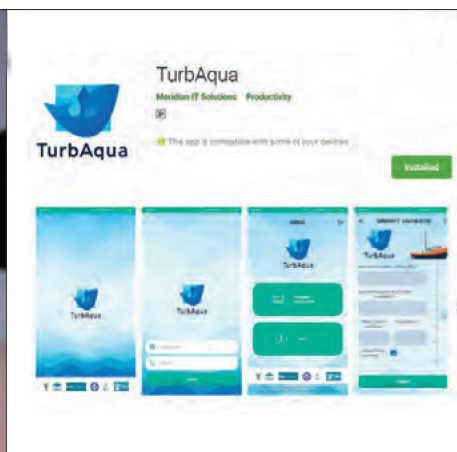


Cadalmin™ Silvergrow, a novel Silver pompano grow out feed developed by the Marine Biotechnology Fish Nutrition and Health Division of ICAR-Central Marine Fisheries Research Institute, is commercialized with ABIS Exports India Pvt. Ltd., a leading

fish feed company in India. Dr. A. Gopalakrishnan, Director, ICAR-CMFRI signed a license agreement with Mr. Mohammad Asif Qureshi, Vice president, ABIS Exports India Pvt. Ltd., on 13th October, 2023 for its commercial production and marketing

with a license fee of ₹0.50 lakhs for 3 years. The primary objective of this MoU is to create a framework for cooperation and research collaboration to facilitate the outreach of pompano grow-out feed developed by ICAR-CMFRI ●

Rehabilitation of *Vibrio* Infested waters of Vembanad Lake: pollution and solution (REVIVAL)



With the increase in cholera outbreaks across the world and the realization that northern Indian Ocean is a major reservoir of *Vibrio cholerae*, the projects 'Rehabilitation of *Vibrio* Infested waters of Vembanad Lake: pollution and solution (REVIVAL)' and 'Pathways of Dispersal for Cholera And Solution Tools' (PODCAST)' were conceived by CMFRI jointly with the Nansen Environmental Research Centre, India (NERCI), Kochi; National Institute of Oceanography (NIO) Kochi Centre; and Plymouth Marine Laboratory, U.K. to study the major environmental reservoirs of *Vibrios*, their connectivity and oceanic transmission routes, link with climate events and the resultant impacts on public health. The aim of

the projects was to generate maps of *Vibrio* hotspots and develop a forecast system for cholera outbreaks, in Vembanad Lake, a Ramsar Site in Kerala and two other coastal locations along the west and east coasts of India in consultation with local populations, health personnel and decision makers, with an ultimate goal to help in reducing the risks of waterborne diseases in humans. The studies combined *in situ* and remote sensing approaches (relating public health with remote sensing) to elucidate the responsible environmental conditions and propose remedial action for faecal and microbial contaminations in the Vembanad Lake and nearshore waters of Kochi, thus enhancing welfare by improving public health.

Awareness raising among the general public, and their participation in conservation efforts have been shown to be important for the successful restoration of many ecosystems. As part of educating the society about the deterioration of Vembanad Lake, which is their lifeline, a citizen-science network was established to increase scientific understanding by enabling public participation in data collection and monitoring. With public support a database on the water clarity of Vembanad Lake has been created, which is growing into a time-series, and has the potential to aid climate-related research in the long-term. For this purpose, a hand-held mini Secchi disc fitted with Forel-Ule colour code designed and fabricated by the U.K.

partner Plymouth Marine Laboratory was used. The instrument measures the water colour and clarity of rivers and lakes. For recording and storage of data, a mobile application named 'TurbAqua' was developed by CMFRI. A working manual was prepared both in English and Malayalam with an aim to guide the citizen scientists involved. Two citizen science workshops were organized

at CMFRI, Kochi (on 05 August & 20 December 2019) to educate the public on the relevance of water quality in determining environmental and public health, involving more than 250 students from 16 colleges around the vicinity of Vembanad Lake and more than 300 stakeholders of the lake. Theory and practical training were given to both the groups and the

data retrieved on to the CMFRI server from the mobile applications show the enthusiasm with which citizens are participating in the water quality monitoring of the lake. The ongoing programme in which the citizens work in tandem with the scientists, aims to revive Vembanad Lake and potentially expand the citizen science groups to a global network. ●

MoU between ICAR- CMFRI and Nitte DU, Mangaluru



ICAR Central Marine Fisheries Research Institute signed a Memorandum of Understanding (MoU) with Nitte Deemed University (DU), Derlakatte, Mangaluru, Karnataka on 05 July 2024, agreeing to cooperate in skill-based training education and to bridge the gap between basic and applied research. DST-TEC (Govt. of India) enabled this collaboration, which would pave the way for the development of the scientific relationship between Nitte DU and ICAR-CMFRI to foster translational research and communication for advances in multidisciplinary fields. This programme would provide a conducive environment for researchers, students, faculty, fisheries industrialists, and aquaculture

enthusiasts to develop networking and seek solutions on a real-time basis. This partnership intends to include activities like manpower training, support and advice to develop projects for funding, conducting collaborative projects, lectures and sharing experience in product development, organizing webinars, joint conferences and symposia, exchanging technical information and knowledge development, and promoting other cooperative activities in the fields of mutual interest. The MoU exchange took place in the Board Room of Nitte DU between Dr A. Gopalakrishnan, Director, CMFRI and Dr M S Moodithaya the Hon'ble Vice Chancellor, Nitte DU on 05 July 2024. Dr Harsha Halahalli,

Registrar, Nitte University; Dr Indrani Karunasagar, Director Projects and DST-TEC; Dr Praveen Kumar Shetty, Director Research & Development, Dr Grinson George, Head of Division of Marine Biodiversity and Environment Management and Dr Sujitha Thomas, Head, Mangalore Regional Center of CMFRI and the DST-TEC staff were present on occasion. Before signing the MoU, Dr A Gopalakrishnan, Director ICAR-CMFRI gave a presentation on ICAR-CMFRI - its inception, mandates, salient achievements and on-going projects - at the DST Technology Enabling Center. The faculty and students of Nitte University Centre of Science, Education & Research (NUCSEER) attended the talk ●

International Indian Ocean Expedition Commemorative Celebrations



Front row (L to R): Dr. V.N.Pillai, Dr. Naveen Shah, Dr. S. W. A. Naqvi, Dr. G. Subbaraju, Dr. E.G. Silas, Dr. M. Sakthivel, Dr. N.R. Menon, Dr. Rosamma Stephen, Dr. C.B. Lalithambikadevi, Dr. Vijayalakshmi R Nair, Dr. Saramma U. Panampunnayil. Back row (L to R): Dr. K.S. Mohamed, Dr. A. Gopalakrishnan, Dr. Rami Reddy, Dr. K.V.K. Nair, Dr. C. Sankarankutty, Dr. T. Balachandran, Dr. K.K. C. Nair, Dr. Jacob George, Dr. V. Kripa



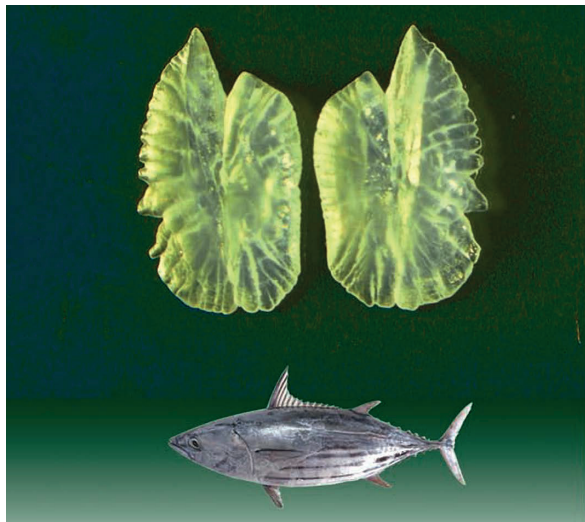
Dr. E.G. Silas, former Director, CMFRI, receiving the IIOE memento from Dr. S.W.A. Naqvi, Director, NIO



Dr. K. S. Mohamed proposes vote of thanks

A special programme to commemorate the 50th Anniversary year of the International Indian Ocean Expedition (IIOE) was organized on 04th December, 2014 at CMFRI, Kochi. Dr. V. Kripa, Head, Fishery Environment Management Division welcomed the gathering. Dr. S.W.A. Naqvi, Director, National Institute of Oceanography (NIO), Goa and Dr. A. Gopalakrishnan, Director, CMFRI gave felicitations and presented mementos to all the esteemed IIOE participants and Contributors (1960-65). A special talk on 'Current Status of Indian Ocean Oceanographic Research' was delivered by Dr. S.W.A. Naqvi. Dr. K. Sunil Mohamed, Head, Molluscan Fisheries Division proposed the vote of thanks which was followed by cultural programmes and dinner ●

Fish Ageing laboratory established at CMFRI Headquarters



A well-equipped Fish Ageing laboratory was established at the Institute headquarters with the aim of supporting the marine fisheries research and length frequency based fish stock assessment programmes by age validation using hard parts of fish. Skill development and training in fish ageing using hard parts is another objective of this centre. The facility was inaugurated by Dr. A. Gopalakrishnan, Director, CMFRI, on 30th June 2015 in the presence of Heads of Divisions, scientists and staff of the Institute. Ongoing programmes are ageing of Indian oil sardine (*Sardinella longiceps*), Indian mackerel (*Rastrelliger kanagurta*), Silver pompano (*Trachinotus blochii*) and Mahimahi (*Coryphaena hippurus*)

and otolith morphometric studies for species/stock confirmation. Fisheries research aimed at effective management of exploited resources to maximize and sustain production requires understanding of biology and population dynamics of the component species for assessing level of exploitation and stock health. Precise estimates of age and growth of individual species in the ecosystem is one of the basic requirement in the above process. These information are mostly derived from length composition of the species in the catch, following modal progression analysis. This however has its own limitations because of various biological, ecological and fishery dependent factors and sampling

bias involved in the entire process. Hence, to validate the age and growth information naturally encoded in the hard parts such as scales, otoliths, opercular bones, spines and vertebrae have been used in several fish species worldwide. Fishes grow continuously throughout their life but their rate of growth may vary depending on season, biological factors and diurnal rhythms etc. and will be reflected as bands on hard parts. The bands formed during slow growth phase will be laid close together and appear more darker. During fast growth phase rings will be laid wide apart and therefore appear lighter. An adjacent dark and light band is considered a day's growth.

The lab is equipped with an ultrasonic cleaner for cleaning otoliths prior to sectioning for ageing studies. Blocks are prepared using Silicon Rubber moulding unit. High precision IsoMet low speed saw is used for sectioning. The Ecomet grinding and polishing unit is used for the preparation of otolith sections to be viewed for age rings. The images are acquired by a microscope with inbuilt image analyzing software for age determination as per protocol. Training programmes will be organized on fish ageing for scientists and students.



Fisherwomen turned fish otoliths into ornamental gems - A CMFRI success saga



Fish otoliths, commonly known as “lucky stones” or “ear-stones,” are natural calcium carbonate structures found in bony fish that are made into various ornaments and jewelry such as necklaces, pendants, bracelets, earrings, and accessories such as keychains etc. They are highly valued for their unique, species-specific shapes and smooth, ivory-like appearance. Historically and in some cultures today, otoliths are carried as good luck charms to ward off illness or bring safety at sea. ICAR-CMFRI, successfully trained fisherwomen from Kerala in transforming discarded fish otoliths, natural ear stones used in fish age studies into exquisite ornaments, creating a new avenue for sustainable livelihood. Training programmes organized by Drs E.M. Abdussamad and S. Surya covered otolith extraction from fish, cleaning, and crafting attractive jewels, thus marking India's first organized initiative in fish otolith-based jewelry. Marine fish species like *Otolithes ruber*, *Arius maculatus*, *Uranoscopus* spp. etc. were utilized to craft unique earrings, necklaces, and bracelets. Following the training, the Kerala Arts and Crafts Village, Thiruvananthapuram recognized the artistic value of these creations and

offered to showcase and market them. The fisherwomen later formed self-help groups, turning fishery byproducts into eco-friendly jewelry under the brand “Sea Gems.” These are sold in coastal gift shops, trade exhibitions and through online marketing channels. This initiative not only empowered coastal women but also demonstrated how scientific research can be innovatively extended to promote sustainability, creativity, entrepreneurship and community upliftment. Similar trainings are now being organized by the Vizhinjam Centre of ICAR-CMFRI to equip the private entrepreneurs of other coastal states.

Reported by Finfish Fisheries Division



Species Prioritized for Indian Mariculture

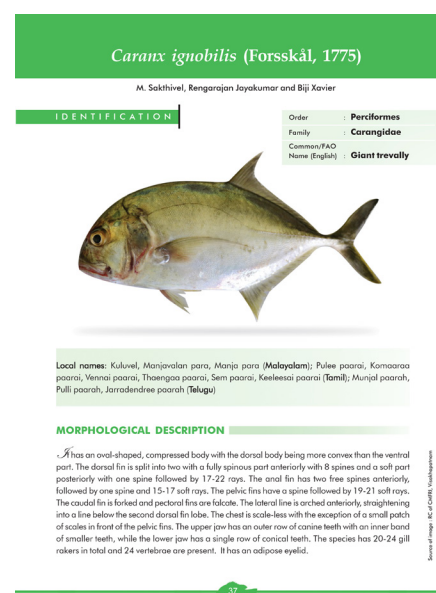
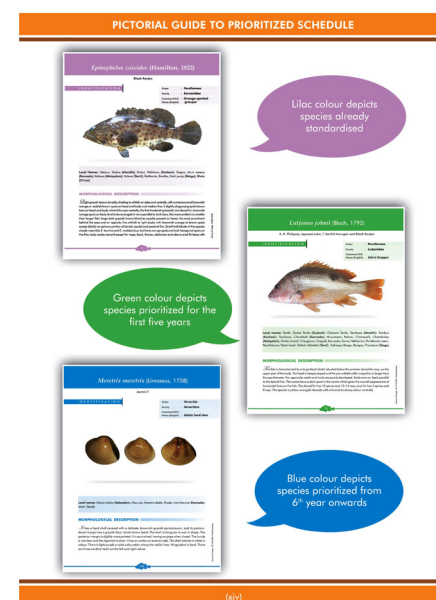


Mariculture, in the past, concentrated wholly on culture of shrimps and it is only in the last few years that finfish mariculture has assumed importance. However, information on mariculture of finfish and other shellfishes are scanty with no organized database encompassing all aspects. Seed production technology has been developed by ICAR – CMFRI recently for a few species namely *Rachycentron canadum*, *Trachinotus blochii*, *Epinephelus coioides* and *Trachinotus mookalee*. Additionally, a large number of marine species are available in India which are amenable to mariculture but for which there are several challenges which have not been properly documented. With no concerted efforts in the past, it was decided to have a list of prioritized species of finfishes and shellfishes on which focused research can be undertaken in the near future. In view of the above, a workshop/consultation held at Mandapam Regional Centre of CMFRI in November 2013, and following this, a list of prioritized finfishes and shellfishes was prepared for food fish, conservation, ornamental and region-specific mariculture for the country. A total of 76 species (marine food fishes -27 finfish species, 7 molluscan

species, 4 shellfish species; 2 species of sea urchins; 31 species of highly sought after species for marine ornamental fish farming; 5 species for conservation mariculture) were selected based on a number of criteria such as economic value of the species; biology of the species; salinity and temperature tolerance; disease resistance; suitability for farming; ease of captive broodstock development and breeding; ease of larval and nursery rearing; ease of handling; compatibility with other species; cost-effectiveness of culture etc. Among these, some species were given higher priority for the first 5-6 years and other species for the following years so as to make research more efficient. A compendium was also prepared in 2017 with factsheets of individual species containing the challenges and the research gaps.

The compendium served as the base material for species prioritization in mariculture research and different centres of CMFRI could successfully develop breeding, round the year seed production and sea farming of nine prioritized marine food fish species during 2017-2024 such as giant trevally (*Caranx ignobilis*), golden trevally (*Gnathanodon speciosus*), John's snapper (*Lutjanus johnii*), pink-ear emperor fish (*Lethrinus lentjan*), spangled emperor fish (*Lethrinus nebulosus*), banded grunter (*Pomadasys furcatus*), goldsilk bream (*Acanthopagrus berda*), Maze rabbitfish (*Siganus vermiculatus*) and fanged seabream (*Sparidentex jamalensis*). MoUs were signed with seven hatcheries in different states for nursery rearing of hatchlings of these species, thus giving a big boost to the mariculture activities in the country. Similarly, seed production techniques were developed for more than 21 prioritized high-value marine ornamental fishes since 2016 such as azure damsel, cloudy damsel, four stripe damsel, lemon damsel,

three-spot damsel, sapphire damsel, humbug damsel, Marcia's anthias, sea Goldie, purple fire-fish, red-head dottyback, coral demoiselle, yellow tail demoiselle, black-bar chromis, ornate goby, wide-barred shrimp goby, four designer varieties of cross-bred percula clown fish and red carpet sea anemone. Training programmes are being organized regularly especially to fisherwomen and private entrepreneurs to promote marine ornamental fish farming in a large scale. ●



Dr. A. Gopalakrishnan bids adieu from ICAR-CMFRI



Dr. A. Gopalakrishnan, Director, ICAR-CMFRI is laying down office on 31 July 2024, on reaching superannuation, after 11 years of dedicated service as the Director of the institute. Known for making the institute more people-centric, his tenure is marked by numerous projects that significantly benefited the public and shaped ICAR-CMFRI's research to serve societal needs. One of his notable contributions was the expansion of cage fish farming and over 5,000 enterprises across the country have adopted this technology, providing livelihoods to thousands of families. Dr. Gopalakrishnan also made a revolutionary move by assisting transgender individuals to become entrepreneurs in the fisheries sector, integrating them into the mainstream and improving their living standards through various research projects. Special training for women to attract them to the fisheries sector and annual awards to encourage excellence were among his initiatives. He recognized Rekha Karthikeyan from Chettuva, Thrissur, the only woman in India engaged in deep-sea fishing, helping her overcome challenges and obtain a fishing license.

Under his guidance, the SCSP and TSP schemes of the central government, were effectively implemented and over a thousand families from these communities became small-scale entrepreneurs in the fisheries sector.

He created avenues for fishermen to communicate their issues and seek solutions at any time through regular stakeholder meetings conducted. Another significant achievement was developing artificial breeding and seed production technology for 11 commercially important marine fish species, more than 12 highly expensive marine ornamental fishes, two marine model fish species; and identifying suitable sites for cage fish farming and seaweed cultivation along the Indian coastline. Drafting of the Mariculture Policy to streamline these practices was a milestone during his tenure. The establishment of the National Brood Banks for cobia, silver pompano and 18 marine copepods opened new opportunities for seed production technology, IMTA, inviting numerous startup entrepreneurs into the hatchery sector and sea cage farming. Additionally, ICAR-CMFRI, under his visionary leadership, developed 14 nutraceutical products from seaweeds to combat lifestyle diseases like diabetes, arthritis, cholesterol, hypertension, thyroid issues, and fatty liver, thus increasing public awareness and popularity of ICAR-CMFRI. It also contributed to numerous policy formulations, playing a crucial role in central and state government policies. A notable study by ICAR-CMFRI last year (MFSS, 2022) demonstrated that the marine fish stocks in Indian waters were not over-exploited, significantly influencing India's stance against fisheries subsidies'

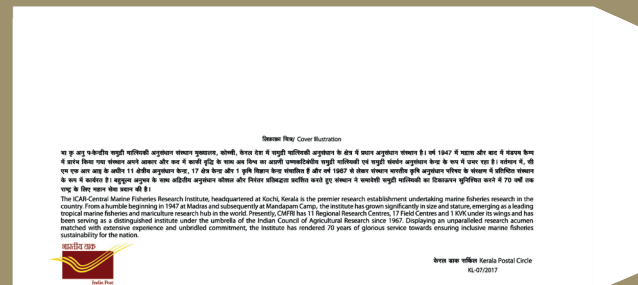
removal in WTO negotiations. Research on marine mammals like the whales and sea turtles garnered his attention. Systematic publication of annual fish landing data from Indian coasts and public awareness campaigns began under Dr. Gopalakrishnan's directorship. Over INR 150 crores were secured for research projects from various agencies, apart from regular government funding. Dr. Gopalakrishnan also played a pivotal role in establishing 'Dr. EG Silas Centre of Excellence & Innovation (Dr EGS CoE&I) on Fish Nutrigenomics & Marine Microbiome' at CMFRI, Kochi with full funding support from the Department of Biotechnology, Govt. of India. The Citizen Science Research Project, involving students and the public, gained public acclaim. The 'Fish Cemetery' art installation, part of the coastal plastic waste awareness campaign, organized during the Kochi Biennale, was widely appreciated.

Under his leadership, ICAR-CMFRI received over 140 national and international awards, including the prestigious Sardar Vallabhbhai Patel Award in 2019 for the best ICAR research institute. The institute was also ranked high in the ICAR rankings during his tenure. Significant international training programs aiding the fisheries sector's development in Afro-Asian countries were also organized. Upon the request of the Government of Oman, ICAR-CMFRI provided technical assistance for their shark conservation and management programs. During his 11-year tenure, Dr. Gopalakrishnan signed 79 MoUs for research collaboration and executed 45 consultancy projects. He also organized the Fisheries Ministers' Conference of South India aiming for uniform implementation of marine fisheries regulations nationwide, in ICAR-CMFRI. Dr. A. Gopalakrishnan retires as Director with the satisfaction of leading the institute to the pinnacle of achievements. ●



भारत कृ अनु प-केन्द्रीय समुद्री मत्स्यिकी अनुसंधान संस्थान (सी एम एफ आर आई) मुख्यालय, कोच्ची, केरल देश में समुद्री मत्स्यिकी और समुद्री संवर्धन अनुसंधान के क्षेत्र में प्रमुख अनुसंधान संस्थान है। वर्ष 1947 में मद्रास और बाद में मंडपम कैम्प, तमिल नाडु में प्रारंभ किया गया संस्थान अपने आकार और कद में काफी वृद्धि के साथ अब विश्व का अग्रणी उष्णकटिबंधीय समुद्री मत्स्यिकी एवं समुद्री संवर्धन अनुसंधान केन्द्र के रूप में उभर रहा है। वर्तमान में, सी एम एफ आर आई के अधीन 11 क्षेत्रीय अनुसंधान केन्द्र, 17 क्षेत्र केन्द्र और 2 कृषि विज्ञान केन्द्र संचालित हैं और वर्ष 1967 से यह संस्थान भारतीय कृषि अनुसंधान परिषद (आई सी ए आर) के तहत प्रतिष्ठित संस्थान के रूप में कार्यरत है। बहुमूल्य अनुभव के साथ अद्वितीय अनुसंधान कौशल और निरंतर प्रतिबद्धता प्रदर्शित करते हुए संस्थान ने समावेशी समुद्री मत्स्यिकी का टिकाऊपन और समुद्री संवर्धन के द्वारा समुद्री मछली उत्पादन में वृद्धि सुनिश्चित करने में 75 वर्षों की महत्वपूर्ण सेवा प्रदान की है।

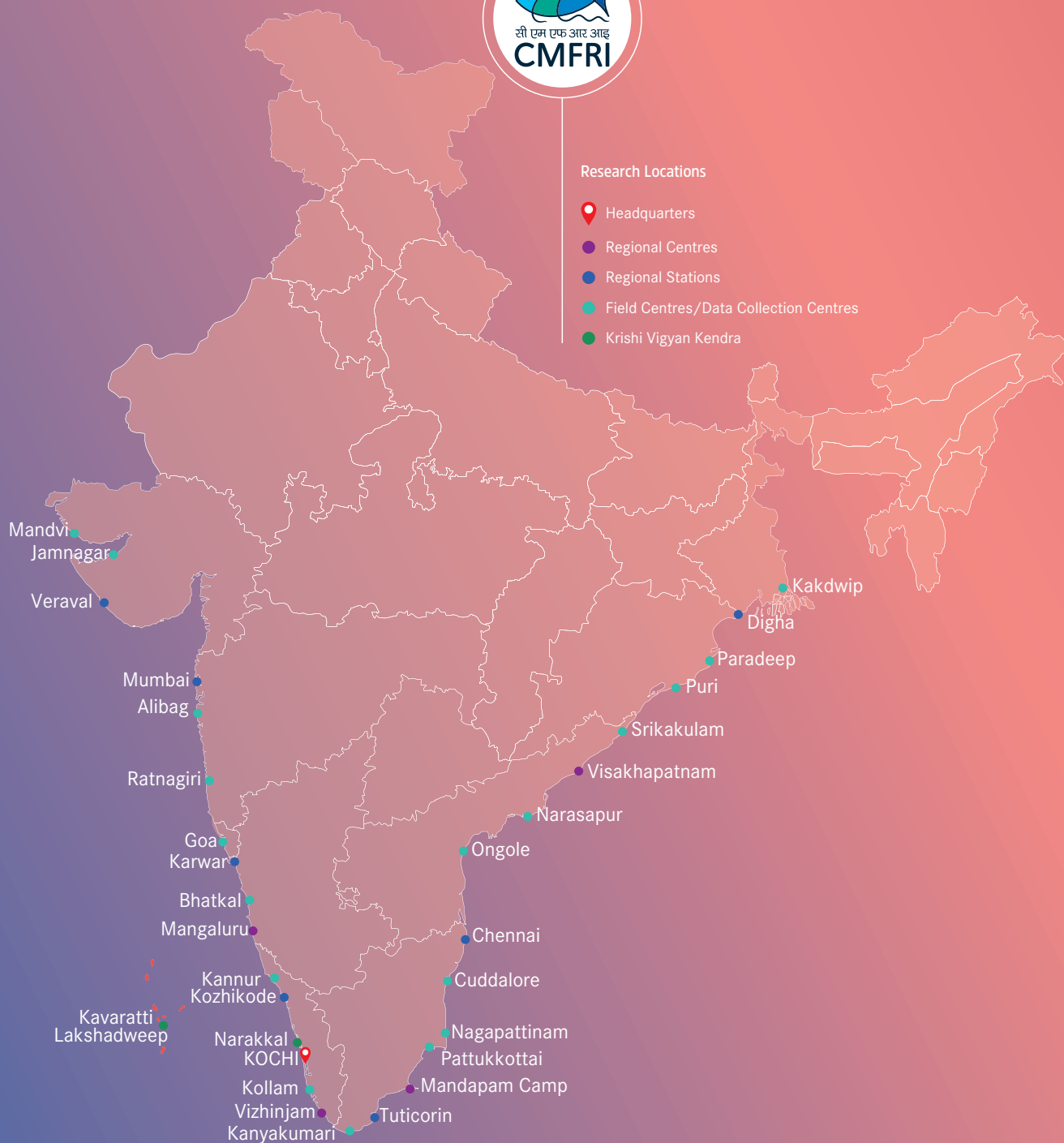
The ICAR-Central Marine Fisheries Research Institute (CMFRI), headquartered at Kochi, Kerala is a premier research establishment undertaking marine fisheries and mariculture research in the country. From a humble beginning in 1947 at Madras and subsequently at Mandapam Camp, Tamil Nadu, the institute has grown significantly in size and stature, emerging as a leading tropical marine fisheries and mariculture research hub in the world. Presently, CMFRI has 11 Regional Research Centres, 17 Field Centres and 2 KVVKs (Krishi Vigyan Kendras) under its wings and has been serving as a leading institute under the umbrella of the Indian Council of Agricultural Research (ICAR) since 1967. Displaying an unparalleled research acumen matched with extensive experience and unbridled commitment, the Institute has rendered 75 years of glorious service towards ensuring inclusive marine fisheries sustainability and augmenting marine fish production through mariculture.





Research Locations

- Headquarters
- Regional Centres
- Regional Stations
- Field Centres/Data Collection Centres
- Krishi Vigyan Kendra



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